FORMER BORDENS FARM PRODUCTS
35-18 STEINWAY STREET
ASTORIA, NEW YORK

Remedial Action Work Plan

NYSDEC BCP Number: C241294

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Certifications

I, Noelle M. Clarke, P.E., certify that I am currently a NYS registered professional engineer and that this Remedial Action Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10) and DER Green Remediation (DER-31).

Noelle M. Clarke, P.E.		
NYS Professional Engineer #072491	Date	Signature

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Acronyms

mg/kg..... Milligrams per Kilogram
AMI ..... Area Median Income
ASP ..... Analytical Services Protocol
AWQSGVs ..... Ambient Water Quality Standards and Guidance Values
BCA..... Brownfield Cleanup Agreement
BCP ..... Brownfield Cleanup Program
bls..... Below Land Surface
BOA..... Brownfield Opportunity Areas
CAMP ..... Community Air Monitoring Plan
C/D ..... Construction and Demolition
CEH..... Center for Environmental Health
CFR ..... Code of Federal Regulations
CO2e ..... carbon dioxide equivalents of global warming potential
COC ..... Certificate of Completion
CP ..... Commissioner Policy
CPP ..... Citizen Participation Plan
CQAP ..... Construction Quality Assurance Plan
CSM ..... Conceptual Site Model
CVOCs ..... Chlorinated Volatile Organic Compounds
CY ..... Cubic Yards
DEC..... Department of Environmental Conservation
DER-10..... NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation
DMM..... Division of Materials Management
DO ..... Dissolved Oxygen
DUSR ..... Data Usability Summary Report
EA..... Exposure Assessment
EC ..... Engineering Control
ECL ..... Environmental Conservation Law
EDD..... Electronic Data Deliverable
EJ ..... Environmental Justice
ELAP ..... Environmental Laboratory Approval Program
ESA ..... Environmental Site Assessment
FER ..... Final Engineering Report
Ft ..... Feet/Foot
HASP..... Health and Safety Plan
HAZWOPER ..... Hazardous Waste Operations and Emergency Response
HVAC ..... Heating, Ventilation, and Air Conditioning
IC..... Institutional Control
ng/L ..... Nanograms per Liter
NYCDEP ..... New York City Department of Environmental Protection
NYCDOH..... New York City Department of Health
NYCDOT ..... New York City Department of Transportation
NYCRR..... New York Codes, Rules, and Regulations
NYSDEC ..... New York State Department of Environmental Conservation
NYSDOH..... New York State Department of Health

NYSDOT ..... New York State Department of Transportation
MG..... Million of gallons
MMBtu..... Million of British Thermal Units
MWH ..... Megawatt Hours
OSHA..... Occupational Safety and Health Administration
PAHs ..... Polycyclic Aromatic Hydrocarbons
PCBs ..... Polychlorinated Biphenyls
PCE..... Tetrachloroethene (Perchloroethene)
PDF ..... Portable Document Format
EJA..... Environmental Justice Area
PFAS..... Per and Polyfluoroalkyl Substances
PFOA..... Perfluorooctanoic Acid
PFOS..... Perfluorooctane Sulfonate
PGWSCOs..... Protection of Groundwater Soil Cleanup Objectives
PID ..... Photo Ionization Detector
PPE ..... Personal Protective Equipment
PVC..... Polyvinyl Chloride
QAPP ..... Quality Assurance Project Plan
QA/QC..... Quality Assurance/Quality Control
RAOs..... Remedial Action Objectives
RAWP..... Remedial Action Work Plan
RI..... Remedial Investigation
RIR ..... Remedial Investigation Report
RRSCOs..... Restricted Residential Soil Cleanup Objectives
SCG..... Standards, Criteria, and Guidance
SCOs..... Soil Cleanup Objectives
SEQRA..... State Environmental Quality Review Act
SMP..... Site Management Plan
SOE..... Support of Excavation
SoMP..... Soil Management Plan
SOP..... Site Operations Plan
SSO..... Site Safety Officer
SVOC ..... Semivolatile Organic Compounds
SWPPP ..... Stormwater Pollution Prevention Plan
TAGM..... Technical and Administrative Memorandum
TAL..... Target Analyte List
TCE ..... Trichloroethene
TCL..... Target Compound List
TCLP ..... Toxicity Characteristics Leaching Procedure
TOGS ..... Technical and Operational Guidance Series
USEPA ..... United States Environmental Protection Agency
USGS ..... United States Geological Survey
UUSCOs..... Unrestricted Use Soil Cleanup Objectives
VOC..... Volatile Organic Compounds

Executive Summary

Roux Environmental Engineering and Geology, D.P.C. (Roux), on behalf of LMXD INNOQ B1 LLC and STEINWAY 1 OWNER LLC (collectively referred to as the Volunteer), has prepared this Remedial Action Work Plan (RAWP) for the property located at 35-18 Steinway Street, Astoria, Queens, New York (Site), identified as a portion of New York City Tax Block 668, Lot 5. An application to subdivide Lot 5 into two lots has been filed with the City of New York and the tentative lot assigned to the Site is Lot 6. A Change of Use notification will be filed with NYSDEC regarding this tax lot change.

On November 25, 2025, the Volunteer executed a Brownfield Cleanup Agreement (BCA) with the New York State Department of Environmental Conservation (NYSDEC) to investigate and remediate the Site under the NYSDEC Brownfield Cleanup Program (BCP). On January 22, 2026, a BCA amendment was executed to add STEINWAY 1 OWNER LLC as a Volunteer. The Site is identified under the NYSDEC BCP as Former Bordens Farm Products site control No. C241294. Application of Unrestricted Use Soil Cleanup Objectives (UUSCOs), Restricted Residential Soil Cleanup Objectives (RRSCOs), and Protection of Groundwater Soil Cleanup Objectives (PGWSCOs) as defined in 6 New York Codes, Rules, and Regulations (6 NYCRR) Part 375-6-8(b) Environmental Remediation Programs (including revisions adopted on December 31, 2025) are proposed for the Site.

Currently, the Site consists of an asphalt-paved parking lot associated with an adjacent existing commercial building. The Site is located in an area zoned as M1-4/R9 and M1-4/R7-3. The site and the surrounding area are within the special purpose district MX-24, which permits side-by-side residential and non-residential uses. The Site is bounded by the intersection of 35th Avenue and 38th Street to the north, beyond which are commercial establishments including Uno Pizzeria, Applebee's Grill & Bar, Panera Bread, The Yoga Room, Riviera Gentleman's Club, and Metropolitan Lumber. To the south, the Site is bordered by a P.C. Richard & Son appliance store, with multi-family residential buildings beyond. Steinway Street lies to the east, across which are New York City (NYC), Playground 35, a vacant commercial building, and the Luxury of Queens car dealership. The NYC Transit Authority (NYCTA) M/R Subway runs beneath Steinway Street. To the west, the Site is bounded by 38th Street, beyond which are the UA Kaufman Astoria Cinemas and a film and TV production studio (**Figure 1**).

The anticipated redevelopment for the Site consists of an approximately 25% affordable housing mixed residential and commercial building with 27 floors and a cellar. The cellar of the building, which will be present across the entire Site, will include a parking garage, retail storage space and mechanical space. The first floor of the building will include retail space and the residential lobby. The second floor will include residences, amenity space, and a terrace. The third floor through the 27th floor will consist of residences. Additional amenity spaces are planned for the 10th floor and roof. The proposed redevelopment plans, including floor plans for all levels of the proposed buildings, are included as **Appendix A**.

A Track 1 Unrestricted Use remedy and application of Unrestricted Use Soil Cleanup Objectives (UUSCOs) as defined in 6 New York Codes, Rules, and Regulations (6NYCRR) Part 375-6-8(b) Environmental Remediation Programs is proposed for the Site.

The Remedial Investigation Report (RIR), submitted under separate cover, summarizes the findings of previous investigations on-Site. The Remedial Investigation (RI), detailed in the RIR and this RAWP determined the nature and extent of contamination at the Site, characterized environmental media,

qualitatively assessed the potential exposure of receptors to Site contaminants, and developed any other additional data necessary to support the development of a RAWP. Sections 2 through 6 of this RAWP are identical to those same sections in the RIR, except that several of the appendices are not included in this RAWP and can be found in the RIR to limit the file size. The RI for this Site did not identify fish and wildlife resources.

All work summarized in the RIR was completed in accordance with the NYSDEC -approved Remedial Investigation Work Plan (RIWP) for the Site dated April 28, 2025 and approved on November 17, 2025, the NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation (DER-10, May 2010), the Sampling, Analysis, and Assessment of PFAS under NYSDEC's Part 375 Remedial Programs guidance (adopted on December 31, 2026) document dated April 2023 (NYSDEC April 2023 PFAS Guidance), and/or the New York State Department of Health's (NYSDOH's) Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York, October 2006 and Revised February 2024 (NYSDOH Guidance).

This RAWP provides an evaluation of a Track 1 Unrestricted Use Remedial Action Alternative, a Track 2 Restricted Residential Use Remedial Action Alternative and a Track 4 Restricted Residential Use Remedial Action Alternative, their associated costs, green and sustainable remediation evaluation and the recommended and preferred remedy. The remedy described in this document is consistent with the procedures defined in DER-10 and complies with all applicable standards, criteria, and guidance. The remedy described in this document also complies with all applicable Federal, State and local laws, regulations and requirements.

Significant Threat

The NYSDEC and NYSDOH have not yet determined if the Site poses a significant threat to human health and the environment.

Site Description/Physical Setting

A Site location map is included as **Figure 1**.

Property Location	
Property Name:	Former Bordens Farm Products
Property Tax Identification and associated address:	35-18 Steinway Street
Property Neighborhood, City, County, State:	Astoria, Queens, Queens County, New York
Property Topographic Quadrangle:	USGS; 2019, Central Park, NY 7.5 Minute Topographic Quadrangle
Nearest Intersections:	Steinway Street and 35th Avenue; and 38th Street and 35th Avenue

Property Information	
Property Acreage:	0.739 acres (32,172 square feet)
Property Shape:	Polygon
Property Use:	An asphalt-paved parking lot associated with an adjacent existing commercial building

Property Information	
Improvements:	The Site has been a parking lot since 1984, and no buildings are currently present

Summary of Remedial Investigation

During December 2025, Roux conducted the RI fieldwork which included the installation of soil borings, groundwater monitoring wells, and soil vapor installation points throughout the Site, from which Roux collected soil, groundwater, and soil vapor samples.

Field activities completed during the RI included the following:

- Advancement of nine soil borings between 20 and 30 ft bls;
- Laboratory analysis of 42 soil samples along with two quality assurance/quality control (QA/QC) samples;
- Installation of five permanent groundwater monitoring wells with the collection and laboratory analysis of five groundwater samples along with one QA/QC sample;
- Installation of nine soil vapor points and the collection and laboratory analysis of nine soil vapor samples along with one QA/QC sample;
- A survey of the groundwater monitoring wells;
- Collection of a comprehensive water level gauging round from the new permanent monitoring wells; and
- Implementation of CAMP.

In general, the data generated indicated the following Site-wide conditions:

- The Site is underlain by historical fill (consisting of sand, gravel, brick, asphalt, concrete, and glass) to depths ranging from 2 to 18 feet below land surface (ft bls). The historic fill layer was observed to be thicker in the south/central portion of the Site where there appeared to be a former cellar that had been filled in with fill/demolition debris. Historical fill materials overlie native fine to coarse sands and gravel with varying amounts of sand, silt, and clay.
- According to water-level data collected from the permanent wells on December 18, 2025, the elevation of the water table surface at the Site ranged from 19.96 feet North American Vertical Datum of 1988 (ft NAVD 88) at the monitoring well in the western portion of the Site to 20.32 ft NAVD 88 at the monitoring well in the eastern portion of the Site. Groundwater was measured at depths from 18.23 ft bls to 21.22 ft bls throughout the Site. Groundwater flow is generally to the west.
- The only volatile organic compound (VOC) detected in soil exceeding NYSDEC UUSCO and PGWSCOs was acetone. No VOCs exceeded RRSCOs. In groundwater, no VOCs were detected at concentrations exceeding 6 NYCRR Part 703 Ambient Water Quality Standards and Guidance Values (AWQSGVs).
- Semivolatile organic compounds (SVOCs), mostly polycyclic aromatic hydrocarbons (PAHs), were detected at concentrations above NYSDEC UUSCOs, RRSCOs and PGWSCOs in historical fill present across the Site. SVOCs were not detected at concentrations exceeding AWQSGVs. This data indicates that SVOCs in soil are not a source of groundwater contamination at the Site.
- Metals were detected in soil at concentrations above NYSDEC SCOs across the Site. Cadmium, trivalent and total chromium, copper, lead, mercury, nickel, and zinc were detected at concentrations above NYSDEC UUSCOs, RRSCOs, and/or PGWSCOs. Metals contamination is related to the presence of urban fill at the Site. Some metals were detected at concentrations above

NYSDEC PGWSCOs in soil but were not detected in exceedance of AWQSGVs indicating that metals in soil are not a source of groundwater contamination at the Site. All of the metals detected above AWQSGVs are naturally occurring.

- Polychlorinated biphenyls (PCBs) were detected in two soil samples at concentrations exceeding NYSDEC UUSCOs, but none in exceedance of their RRSCOs or PGWSCOs and they were not detected in groundwater. Therefore, PCBs in soil are not a source of groundwater contamination at the Site.
- One pesticide was detected in one soil sample at concentrations exceeding NYSDEC UUSCOs, but not in exceedance of the RRSCOs or PGWSCOs and they were not detected in groundwater. Therefore, pesticides in soil are not a source of groundwater contamination at the Site.
- PFAS compounds were detected in soil (in one sample) and groundwater. The one exceedance of PFAS in shallow soils did not exceed the PGWSCO, so PFAS in soil is not considered a source for the PFAS impact in groundwater and PFAS are not considered contaminants of concern in groundwater for the Site.
- Petroleum-related and chlorinated VOCs were detected in soil vapor samples at relatively low levels across the Site. Petroleum-related and chlorinated VOC concentrations are likely due to background levels of these compounds present in urban areas and are not considered contaminants of concern for the Site. Although a direct comparison cannot be made to the NYSDOH Matrices without indoor air samples, only ethylbenzene and m,p-xylene could fall in the monitor or mitigate sections of the matrices. The remaining analyte concentrations would fall in the no further action of the matrices. The relatively low-level concentrations of petroleum-related and chlorinated VOCs, combined with the absence of these compounds in groundwater and soil, indicate it is unlikely there is an onsite source of soil vapor impacts.

In addition, in situ waste characterization sampling was performed concurrently with the RI in order to inform decisions related to remedial and redevelopment excavation and waste disposal. The waste characterization sampling are described herein and included as **Appendix B**.

Conceptual Site Model

The following section explains the occurrence of contaminants and their fate and transport at the Site in the context of the local Site stratigraphy and hydrogeology.

Based on the soil, groundwater, and soil vapor results discussed in Section 4.2, soil is impacted at the Site, but groundwater and soil vapor are not significantly impacted. The spatial distribution of contaminants of potential concern in various media is shown in **Figures 4 through 6**.

The historical fill at the Site consists of sand and various amounts of gravel, brick, asphalt, glass, and concrete, which is typical of historical fill material found in urban environment. The depth to the bottom of the historical fill layer ranged to depths of 2 to 18 ft bls across the Site. This historical fill material overlies deeper native deposits consisting of mostly fine to coarse sands and gravel with varying amounts of sand, silt, and clay.

Based on the Site-wide detections and exceedances of NYSDEC SCOs (and/or guidance values for PFOS and PFOA), shallow soil throughout the Site is primarily impacted with SVOCs and metals likely due to historical fill materials. At most soil boring locations, a sample interval was found within six feet beneath the historical fill and native soil interface to have no exceedances of NYSDEC SCOs. As such, the impacted historical fill material is not a source of contamination in deeper native soils.

Groundwater concentrations of metals and PFAS exceeded the NYSDEC AWQSGVs. The metals detected exceeding the AWQSGVs (iron, magnesium, manganese, and sodium) are considered naturally occurring and are not considered contaminants of concern at the Site. There is no documented use of PFAS at the Site and known historical Site uses do not indicate the past use of these compounds. The one exceedance of PFAS in shallow soils did not exceed the PGWSCO, so PFAS in soil is not considered a source for the PFAS impact in groundwater and PFAS are not considered contaminants of concern in groundwater for the Site.

Based on the Site-wide detections, petroleum-related and chlorinated VOCs were detected in soil vapor at the Site at relatively low levels. Petroleum-related and chlorinated VOC concentrations are likely due to background levels of these compounds present in urban areas and are not considered contaminants of concern for the Site. Although a direct comparison cannot be made to the NYSDOH Matrices without indoor air samples, only ethylbenzene and m,p-xylene could fall in the monitor or mitigate sections of the matrices. The remaining analyte concentrations would fall in the no further action of the matrices.

Qualitative Human Health Exposure Assessment

The following table summarizes the exposure assessment:

Environmental Media and Exposure Route	Human Exposure Assessment
Direct contact with subsurface soils (and incidental ingestion)	• Construction and remedial contractors can come into contact with soil if they complete ground intrusive work at the Site. • During remediation, remedial workers, trespassers, passersby, and utility workers could come into contact with contaminated soil contained in dust through inhalation, incidental ingestion and dermal contact. Implementation of the HASP, CAMP, and dust controls during the remedial action and any future ground intrusive activities will mitigate potential exposures. • It is expected, based on the RI soil quality results, that an unrestricted use cleanup can be achieved for the site. However, if necessary, future exposure to remaining contamination following remediation, if any, will be addressed for through the installation of a site cover system.
Ingestion of groundwater	• Groundwater is not and will not be used for drinking water, as any future buildings proposed on the Site will be connected to the public water supply.
Direct contact with groundwater (and incidental ingestion)	• Remedial workers, trespassers, and utility workers could come into contact with groundwater through dermal contact and incidental ingestion during ground intrusive work. • Proper PPE and personal hygiene measures, as defined in the HASP, will be required to prevent dermal contact and the potential for incidental ingestion impacted groundwater during construction. • Future exposure to Site groundwater will be eliminated by the presence of the buildings from the redevelopment that will cover the entire Site.
Inhalation of air (exposures related to soil vapor intrusion)	• Remedial workers, trespassers, and utility workers may be exposed to soil vapor during ground intrusive activities beneath all buildings. • Exposures to workers and passersby during the remedial action and future ground intrusive activities will be reduced or eliminated through implementation of the HASP, CAMP, and odor/vapor controls during construction.

Summary of Selected Remedial Actions

The elements of the selected Track 1 Unrestricted Use Remedy are as follows:

1. Installation of support of excavation (SOE) to reach the proposed remedial excavation depths to meet Track 1 and prevent damage to adjacent offsite structures, including the NYCT subway tunnel and NYCDEP sewers. Since the remedial excavation depth is deeper than the redevelopment depth along the southern BCP Site boundary, additional SOE will be required to meet these depths.
2. Excavation and offsite disposal of approximately 8,500 in-place cubic yards (CY) of soil (i.e., all soil exceeding UUSCOs) over the entire Site to depths up to 22 ft bls to meet UUSCOs. The limits and approximate depths of remedial excavation are shown on **Figure 7**.
3. Dewatering, in compliance with city, state, and federal laws and regulations required to reach the remedial excavation depths. Extracted groundwater will either be containerized for offsite licensed or permitted disposal or will be treated on-Site as necessary and discharged to the municipal sewer system under a permit from New York City Department of Environmental Protection (NYCDEP), if applicable.
4. Collection and analysis of excavation bottom endpoint samples at a frequency of at least one per 900 square feet to evaluate the performance of the remedy with respect to attainment of Track 1 SCOs at the remedial excavation depth and to properly document the remaining onsite soil quality.
5. Collection and analysis of excavation sidewall endpoint samples at a frequency of one per 30 linear feet (and at least one per sidewall) at the portion of the Site proposed to be excavated to 22 ft bls (where the proposed remedial excavation depth is deeper than the proposed redevelopment depth). Sidewall samples are not required where excavations extend to the BCP site boundary or at other internal boundaries between endpoint sample grids, as there is no soil remaining on-Site.
6. Clean fill meeting the UUSCOs will be brought in to replace the excavated soil and establish the designed grades at the Site, if required.
7. A soil vapor intrusion evaluation will be completed based on the previously collected soil vapor data collected onsite. The evaluation will be summarized in the FER and include a desktop review of all onsite analytical data relative to the future uses of the property. Soil vapor intrusion is not a concern for the Site due to the relatively low concentrations observed during the RI, which for the most part indicated that no further action would be required based on the NYSDOH matrices. Only one of the nine RI samples indicated the potential need for monitoring or mitigation for just two compounds (ethylbenzene and m,p-xylene) and there were no exceedances of UUSCOs/PGWSCOs in soil or AWQSGVs in groundwater for these compounds. Additionally, between remedial and redevelopment excavation, all soil will be removed down to or several below the water table, a robust waterproofing membrane will be included as part of the building design and active vapor mitigation measures are not required.

Remedial activities will be performed at the Site in accordance with this NYSDEC-approved RAWP and the Department-issued Decision Document. All deviations from the RAWP and/or Decision Document will be promptly reported to NYSDEC for approval and fully explained in the FER.

1. Introduction

Roux Environmental Engineering and Geology, D.P.C. (Roux), on behalf of LMXD INNOQ B1 LLC and STEINWAY 1 OWNER LLC (collectively referred to as the Volunteer), has prepared this Remedial Action Work Plan (RAWP) for the property located at 35-18 Steinway Street, Astoria, Queens, New York (Site), identified as a portion of New York City Tax Block 668, Lot 5. An application to subdivide Lot 5 into two lots has been filed with the City of New York and the tentative lot assigned to the Site is Lot 6. A Change of Use notification will be filed with NYSDEC regarding this tax lot change.

On November 25, 2025, the Volunteer executed a Brownfield Cleanup Agreement (BCA) with the New York State Department of Environmental Conservation (NYSDEC) to investigate and remediate the Site under the NYSDEC Brownfield Cleanup Program (BCP). On January 22, 2026, a BCA Amendment was executed to add STEINWAY 1 OWNER LLC as a Volunteer. The Site is identified under the NYSDEC BCP as Former Bordens Farm Products site control No. C241294. Application of Unrestricted Use Soil Cleanup Objectives (UUSCOs), Restricted Residential Soil Cleanup Objectives (RRSCOs), and Protection of Groundwater Soil Cleanup Objectives (PGWSCOs) as defined in 6 New York Codes, Rules, and Regulations (6 NYCRR) Part 375-6-8(b) Environmental Remediation Programs (including revisions adopted on December 31, 2025) are proposed for the Site.

Currently, the Site consists of an asphalt-paved parking lot associated with an adjacent existing commercial building. The Site is located in an area zoned as M1-4/R9 and M1-4/R7-3. The site and the surrounding area are within the special purpose district MX-24, which permits side-by-side residential and non-residential uses. The Site is bounded by the intersection of 35th Avenue and 38th Street to the north, beyond which are commercial establishments including Uno Pizzeria, Applebee's Grill & Bar, Panera Bread, The Yoga Room, Riviera Gentleman's Club, and Metropolitan Lumber. To the south, the Site is bordered by a P.C. Richard & Son appliance store, with multi-family residential buildings beyond. Steinway Street lies to the east, across which are New York City (NYC), Playground 35, a vacant commercial building, and the Luxury of Queens car dealership. The NYC Transit Authority (NYCTA) M/R Subway runs beneath Steinway Street. To the west, the Site is bounded by 38th Street, beyond which are the UA Kaufman Astoria Cinemas and a film and TV production studio (**Figure 1**).

A Track 1 Unrestricted Use remedy and application of Unrestricted Use Soil Cleanup Objectives (UUSCOs) as defined in 6 New York Codes, Rules, and Regulations (6NYCRR) Part 375-6-8(b) Environmental Remediation Programs is proposed for the Site.

The Remedial Investigation Report (RIR), submitted under separate cover, summarizes the findings of previous investigations on-Site. The Remedial Investigation (RI), detailed in the RIR and this RAWP determined the nature and extent of contamination at the Site, characterized environmental media, qualitatively assessed the potential exposure of receptors to Site contaminants, and developed any other additional data necessary to support the development of a RAWP. Sections 2 through 6 of this RAWP are identical to those same sections in the RIR, except that several of the appendices are not included in this RAWP and can be found in the RIR to limit the file size. The RI for this Site did not identify fish and wildlife resources.

All work summarized in the RIR was completed in accordance with the NYSDEC -approved Remedial Investigation Work Plan (RIWP) for the Site dated April 28, 2025 and approved on November 17, 2025, the NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation (DER-10, May 2010), the

Sampling, Analysis, and Assessment of PFAS under NYSDEC's Part 375 Remedial Programs guidance (adopted on December 31, 2026) document dated April 2023 (NYSDEC April 2023 PFAS Guidance), and/or the New York State Department of Health's (NYSDOH's) Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York, October 2006 and Revised February 2024 (NYSDOH Guidance).

This RAWP provides an evaluation of a Track 1 Unrestricted Use Remedial Action Alternative, a Track 2 Restricted Residential Use Remedial Action Alternative and a Track 4 Restricted Residential Use Remedial Action Alternative, their associated costs, green and sustainable remediation evaluation and the recommended and preferred remedy. The remedy described in this document is consistent with the procedures defined in DER-10 and complies with all applicable standards, criteria, and guidance. The remedy described in this document also complies with all applicable Federal, State and local laws, regulations and requirements.

1.1 RAWP Organization

This RAWP contains the following sections:

- Section 2 – Describes the Site, its history, and results of previous environmental investigations;
- Section 3 – Describes the completed RI field work activities;
- Section 4 – Summarizes the RI laboratory analytical results;
- Section 5 – Provides a Conceptual Site Model (CSM) explaining the occurrence of contaminant sources and their fate and transport at the Site in the context of the local Site stratigraphy and hydrogeology;
- Section 6 – Provides a qualitative exposure assessment that evaluates exposures to contaminated media including soil, groundwater, and soil vapor.
- Section 7 – Describes the Remedial Action Objectives (RAOs) for the Site;
- Section 8 – Describes the remedial action plan for the Site;
- Section 9 – Describes the remedial action program for the Site;
- Section 10 – Describes removal of impacted material from the Site;
- Section 11 – Describes the contamination that will remain on-Site following the implementation of the remedy if Track 1 is not achieved where proposed;
- Section 12 – Indicates that Engineering Controls (ECs) are not required for the selected Remedy, but describes contingency EC that may be required if all or part of the Site does not meet Track 1 Unrestricted Use SCO;
- Section 13 – describes the criteria for completion of the remedy/termination of Institutional Controls ()/ECs if the Site does not meet Track 1 where proposed.
- Section 14 – Summarizes the ICs to be implemented at the Site following the implementation of the remedy if Track 1 is not achieved where proposed;
- Section 15 – Describes the components of the Final Engineering Report (FER); and
- Section 16 – Summarizes the schedule for the implementation of project elements described in this RAWP.

Tables, figures, plates, and appendices are provided, which summarize all RI investigation locations, analytical data, and results of sampling efforts as well as the proposed remedial areas.

1.2 Site Location and Description

The Site address is 35-18 Steinway Street, Astoria, Queens, New York (**Figure 1**).

Additional information regarding the Site is provided in the tables below:

Property Location	
Property Name:	Former Bordens Farm Products
Property Tax Identification and associated address:	35-18 Steinway Street
Property Neighborhood, City, County, State:	Astoria, Queens, Queens County, New York
Property Topographic Quadrangle:	USGS; 2019, Central Park, NY 7.5 Minute Topographic Quadrangle
Nearest Intersections:	Steinway Street and 35th Avenue; and 38th Street and 35th Avenue

Property Information	
Property Acreage:	0.739 acres (32,172 square feet)
Property Shape:	Polygon
Property Use:	An asphalt-paved parking lot associated with an adjacent existing commercial building
Improvements:	The Site has been a parking lot since 1984, and no buildings are currently present

1.3 Contemplated Redevelopment Plan

The anticipated redevelopment for the Site consists of an approximately 25% affordable housing mixed residential and commercial building with 27 floors and a cellar. The cellar of the building, which will be present across the entire Site, will include a parking garage, retail storage space and mechanical space. The first floor of the building will include retail space and the residential lobby. The second floor will include residences, amenity space, and a terrace. The third floor through the 27th floor will consist of residences. Additional amenity spaces are planned for the 10th floor and roof. The proposed redevelopment plans, including floor plans for the cellar and first floor of the proposed buildings, are included as **Appendix A**.

1.4 Description of Surrounding Property

The Site is located in the county of Queens, city and state of New York. The areas surrounding the Site are developed with commercial and residential properties. The Site is bounded by the intersection of 35th Avenue and 38th Street to the north, beyond which are commercial establishments including Uno Pizzeria, Applebee's Grill & Bar, Panera Bread, The Yoga Room, Riviera Gentleman's Club, and Metropolitan Lumber. To the south, the Site is bordered by a P.C. Richard & Son appliance store, with multi-family residential buildings beyond. Steinway Street lies to the east, across which are NYC Playground 35, a vacant commercial building, and the Luxury of Queens car dealership. The NYCTA M/R-train Subway runs beneath Steinway Street. To the west, the Site is bounded by 38th Street, beyond which are the UA Kaufman Astoria Cinemas and a film and TV production studio.

2. Site Background

The following sections provide pertinent background information, including the documented history of the Site, and the results of previous environmental investigation work conducted at the Site. As noted previously, the text of this section is identical to Section 2 in the RIR.

2.1 Historic Land Uses

Based on review of historical topographic maps, the Site was historically vacant land and was first developed between 1898 and 1915. From 1915 to 1930, residential dwellings and a milk pasteurizing facility operated by Bordens Farm Products Co. Inc. occupied some of the previously vacant lots. Over time Bordens Farm Products Co. Inc. included wagon areas, pasteurizing plants, bottle washing area, garages and offices. The Site remained in this configuration until the 1970s, when the buildings were demolished and the Site became vacant. The current parking lot was constructed in 1984.

2.2 Topography

The average elevation of the Site is approximately +39 feet above mean sea level (ft amsl) as shown in the United States Geological Survey (USGS) 7.2 Minute Series Topographic Map. The surface topography at the Site slopes gently to the northwest.

2.3 Wetland Areas and Surface Water Bodies

According to the National Wetlands Inventory, the Site is not located in or adjoining a wetland. According to Federal Emergency Management Agency (FEMA) Flood Maps, the Site is not located within the 100-year or 500-year flood zones.

2.4 Soil

Based on the previous investigations completed at the Site, historical fill material was encountered to depths of 4.5 to 7 feet below land surface (ft bls) throughout the Site. The historical fill material was comprised of soils with demolition debris (i.e., brick/concrete). Beneath the historical fill lies mostly fine to coarse sand with little to trace amounts of gravel. During the RI, the historical fill layer was encountered at depths ranging from 2 to 18 ft bls throughout the Site. The historic fill layer was observed to be thicker in the south/central portion of the Site where there appeared to be a former cellar that had been filled in with fill/demolition debris.

2.5 Hydrogeology

Based on the findings documented in the previous investigations, groundwater was encountered approximately 18.5 to 25 ft bls, but groundwater flow direction was not confirmed. Based on data collected during the RI, depth to groundwater ranged from 18.23 ft bls to 21.22 ft bls throughout the Site and flow was to the west.

2.6 Historic Environmental Reports

This section provides an overview of previous environmental-related activities completed at the Site, based on a review of readily available information and the following environmental reports (provided in **Appendix B of the RIR**). The following environmental reports were available for review:

ASTM Phase I ESA, prepared by EBI Consulting, dated September 22, 2017; and

BCP Eligibility Sampling, completed by Roux Environmental Engineering and Geology, D.P.C., November 4, 2024, and February 7, 2025.

Report of Geotechnical Investigation, JZN Engineering, PC., March 2025

2.6.1 ASTM Phase I ESA by EBI Consulting, Dated September 22, 2017

A Phase I ESA was completed for the entire Block 668, Lot 5 in accordance with ASTM E1527-13. No recognized environmental conditions (RECs) were identified for the Site. A former gas station operated in the 1930s on the southeastern portion of Lot 5. No records of UST removal or subsurface investigation were found, but the area has since been redeveloped and is fully capped.

2.6.2 NYSDEC BCP Eligibility Soil Sampling, performed by Roux, November 2024 and February 2025

Roux performed a subsurface soil investigation in November 2024. Five soil borings (SB-1 through SB-5) were advanced during the investigation of the Site. Roux returned to collect additional soil samples and groundwater grab samples from temporary wells MW-2 and MW-5 (at the same locations as SB-2 and SB-5) in February 2025.

A total of 11 soil samples and two grab groundwater samples were collected in laboratory-supplied containers and submitted for analysis of volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), metals, pesticides, and polychlorinated biphenyls (PCBs). Results for soil and groundwater are summarized below.

2.6.2.1 Previous Soil Results

Soil samples were compared to NYCRR Part 375 RRSCOs and PGWSCOs.

No VOCs, PCBs, or pesticides were detected above then-applicable RRSCOs or PGWSCOs in any of the 11 soil samples. Several SVOCs were detected above then-applicable RRSCOs and/or PGWSCOs in soil samples collected from the historical fill layer including benzo(a)anthracene (maximum of 5.2 milligrams per kilogram [mg/kg]), benzo(a)pyrene (maximum of 5.8 mg/kg), benzo(b)fluoranthene (maximum of 7.7 mg/kg), benzo(k)fluoranthene (maximum of 3 mg/kg), chrysene (maximum of 5 mg/kg), dibenz(a,h)anthracene (maximum of 0.78 mg/kg), and indeno(1,2,3 cd)pyrene (maximum of 3 mg/kg). One metal, cadmium (maximum of 5 mg/kg) was detected above the then-applicable RRSCO within one soil sample collected from the historical fill layer.

2.6.2.2 Historical Groundwater Sampling Results

Data from the two groundwater samples were compared to 6 NYCRR Part 703 Groundwater Quality Standards (AWQSGVs). No VOCs were detected above the AWQSGVs in either sample. One SVOC, benzo(a)pyrene (at 0.53 micrograms per liter [µg/L]), was detected above the AWQSGV within one groundwater sample. Metals were detected in total concentrations above the AWQSGVs in both groundwater samples including arsenic (maximum of 64.1 µg/L), barium (maximum of 3,330 µg/L), beryllium (maximum of 10.4 µg/L), cadmium (maximum of 25.2 µg/L), chromium (maximum of 982 µg/L), copper (maximum of 1,100 µg/L), iron (maximum of 730,000 µg/L), lead (maximum of 578 µg/L), magnesium (maximum of 668,000 µg/L), manganese (maximum of 21,000 µg/L), nickel (maximum of 854 µg/L), sodium (maximum of 183,000 µg/L), and thallium (maximum of 2.3 µg/L). Groundwater was not analyzed for dissolved metals.

2.6.3 Report of Geotechnical Investigation, JZN Engineering, PC., March 2025

JZN Engineering, PC., (JZN) performed a geotechnical subsurface soil investigation in February 2024. The geotechnical investigation included a total of 11 soil borings, two monitoring wells, and two in-situ infiltration tests. Geotechnical borings were drilled to depths ranging from approximately 53 to 101.2 ft bls. Historical fill materials were encountered and extended to depths ranging from approximately 5 to 11 ft bls. Native alluvial deposits consisting of sand with varying amounts of silt and gravel were encountered and extended to the boring termination depths. Groundwater was encountered at depths ranging from 20 to 25 ft bls. Bedrock was not encountered during the geotechnical investigation.

3. Remedial Investigation Field Activities

The following sections summarize the work completed by Roux and its subcontractors during the RI, which occurred between December 1, 2025, and December 22, 2025. The RI Scope of Work (SOW) was completed in accordance with the RIWP prepared by Roux, dated April 28, 2025 and approved by NYSDEC/NYSDOH on November 17, 2025 and associated project plans including the Health and Safety Plan (HASP), Community Air Monitoring Plan (CAMP), and Quality Assurance Project Plan (QAPP)/Field Sampling Plan (FSP). Deviations from the RIWP, including scope modifications, are noted in Section 3.10. All work was performed in accordance with NYSDEC DER-10 and the NYSDOH Guidance. As noted previously, the text of this section is identical to Section 3 in the RIR.

Based on the existing data for the Site, the following RI objectives were identified in the RIWP:

- Further delineate the nature and extent of potential impacts to soil;
- Further delineate the nature and extent of impacts to groundwater within the Site and the potential for migration onto or off the Site;
- Further evaluate the nature and extent of soil vapor quality within the Site and the potential for migration onto or off the Site; and
- Collect sufficient data to perform a qualitative human health exposure assessment (QHHEA) for on-Site and off-Site receptors.

The scope of the RI included the collection of characterization data so that, together with the historical data, the entire Site would be sufficiently characterized to support the development of the RAWP.

To accomplish this, the RI included the following scope of work:

- Advancement of nine soil borings between 20 and 30 ft bls;
- Laboratory analysis of 42 soil samples along with two quality assurance/quality control (QA/QC) samples;
- Installation of five permanent groundwater monitoring wells with the collection and laboratory analysis of five groundwater samples along with one QA/QC sample;
- Installation of nine soil vapor points and the collection and laboratory analysis of nine soil vapor samples along with one QA/QC sample;
- A survey of the groundwater monitoring wells;
- Collection of a comprehensive water level gauging round from the new permanent monitoring wells; and
- Implementation of CAMP.

All investigation activity was conducted in accordance with the applicable requirements of the NYSDEC DER-10. All samples collected from the soil and groundwater investigation described in detail below were analyzed for the Target Compound List (TCL)/Part 375 plus 30/ Target Analyte List (TAL) (TCL + 30/TAL) list of parameters including:

- TCL/Part 375 VOCs + 10 Tentatively identified compounds (TICs);
- TCL/Part 375 Base neutral acids (BNA)/SVOCs + 20 TICs;
- TCL/Part 375 Pesticides and Herbicides;

- TCL/Part 375 PCBs;
- TAL/Part 375 Metals (including trivalent chromium, hexavalent chromium);
- Total Cyanide; and
- Emerging Contaminants*

*The Emerging Contaminants list includes 1,4-Dioxane and the 40 Per- and Polyfluoroalkyl Substances (PFAS), which include the 40 PFAS compounds listed in the NYSDEC April 2023 PFAS Guidance.

Soil samples were also collected for geological logging in accordance with the United Soil Classification System (USCS) and for visual inspection (for evidence of contamination including staining, elevated PID detections, and/or odors).

All soil vapor air samples were analyzed using United States Environmental Protection Agency (USEPA) Method TO-15 for VOCs.

All investigation data was produced in accordance with NYSDEC Analytical Services Protocol (ASP) Category B deliverables and was reviewed and validated by an independent party in a Data Usability Summary Report (DUSR), prepared by Judy Harry of Data Validation Services, before being incorporated into the RIR for the Site. All data was submitted to NYSDEC in electronic format, in accordance with DER-10, and is detailed in Section 4.

The field activities completed during the RI are discussed in detail in the following subsections. **Figure 2** presents the locations of soil borings, permanent monitoring wells, and soil vapor points at the Site.

In addition, in situ waste characterization sampling was performed concurrently with the RI in order to inform decisions related to remedial and redevelopment excavation and waste disposal. The waste characterization sampling are included in **Appendix B.**

3.1 Site Reconnaissance

An inspection of the existing Site conditions was conducted in December 2025 to determine the final locations of soil borings and monitoring wells based on actual field conditions.

3.2 Utility Clearance

Utility clearance was completed using hand tools to soft dig to a depth of 5 ft bls to confirm that no subsurface utilities were present at these locations. All locations were determined to be clear of utilities.

3.3 Soil Borings and Soil Sampling Activities

Eastern Environmental Solutions Inc. (Eastern), under Roux oversight, completed the advancement of nine soil borings as part of the RI. Soil boring locations discussed below are presented on **Figure 2**.

During the RI scope of work detailed in the RIWP, nine soil borings (RSB-1 through RSB-9) were completed. Soil samples were collected by hand in all locations for utility clearance from 0 to 5 ft bls as discussed above. The remaining soil samples were collected utilizing a GeoProbe® Direct-Push Drill Rig.

Soil samples were collected continuously from land surface to a minimum of 20 ft bls at all boring locations. During installation of the soil borings, lithology was recorded, and soil was inspected for evidence (visual or

olfactory) of contamination and field screened continuously for VOCs using a PID with a 10.6 electron Volt (eV) lamp. Soil boring lithology logs are provided in **Appendix C**.

The table below describes all sampling locations and final sample depths.

Boring Designation	Total Boring Depth (ft bls)	Actual Sample Depths (ft bls)	Rationale/Description
RSB-1	25	0-2	Shallow soil sample
		2-4	Deepest 2 ft fill interval
		4-6	2 ft interval below fill/native soil interface
		20-22	2 ft interval beneath planned excavation depth
RSB-2	25	0-2	Shallow soil sample
		1-3	Deepest 2 ft fill interval
		3-5	2 ft interval below fill/native soil interface
		20-22	2 ft interval beneath planned excavation depth
RSB-3	25	0-2	Shallow soil sample
		2-4	Deepest 2 ft fill interval
		4-6	2 ft interval below fill/native soil interface
		20-22	2 ft interval beneath planned excavation depth
RSB-4	25	0-2	Shallow soil sample
		2-4	Deepest 2 ft fill interval
		4-6	2 ft interval below fill/native soil interface
		20-22	2 ft interval beneath planned excavation depth
RSB-5	25	0-2	Shallow soil sample
		2-4	Deepest 2 ft fill interval
		4-6	2 ft interval below fill/native soil interface
		6-8	Additional sample to delineate observed impacts[1]
		8-10	Additional sample to delineate observed impacts[1]
		20-22	2 ft interval beneath planned excavation depth
RSB-6	25	0-2	Shallow soil sample/Deepest 2 ft fill interval
		2-4	2 ft interval below fill/native soil interface
		4-6	Additional sample to delineate observed impacts[1]
		6-8	Additional sample to delineate observed impacts[1]
		20-22	2 ft interval beneath planned excavation depth
RSB-7	30	0-2	Shallow soil sample

[1] In addition to the samples outlined in the RIWP, soil samples were collected and held at the laboratory from two additional intervals below the soil sample collected below the fill/native soil interface. The depth of these samples varied depending on the depth of fill at each location. The samples were held at the laboratory pending the results of the sample above. If an exceedance of UUSCOs, RRSCOs or PGWSCOs was observed, the next additional sample was run. This deviation from the RIWP is described in section 3.10.

Boring Designation	Total Boring Depth (ft bls)	Actual Sample Depths (ft bls)	Rationale/Description
		2-4	Deepest 2 ft fill interval
		4-6	2 ft interval below fill/native soil interface
		6-8	Additional sample to delineate observed impacts[1]
		8-10	Additional sample to delineate observed impacts[1]
		25-27	2 ft interval beneath planned excavation depth
RSB-8	30	0-2	Shallow soil sample
		1-3	Deepest 2 ft fill interval
		3-5	2 ft interval below fill/native soil interface
		5-7	Additional sample to delineate observed impacts[1]
		25-27	2 ft interval beneath planned excavation depth
RSB-9	25	0-2	Shallow soil sample
		16-18	Deepest 2 ft fill interval
		18-20	2 ft interval below fill/native soil interface
		22-24	2 ft interval beneath planned excavation depth

All soil samples were analyzed by Eurofins TestAmerica of Edison, NJ (NYSDOH National Environmental Laboratory Approval Program [NELAP] and ELAP #11452) for each of the parameters noted above. Analytical data were reported using Category B data deliverables (**Appendix D of the RIR**). A summary of data usability is described in Section 4.2.4 if the RIAR and the DUSR is included in **Appendix E of the RIR.**

3.4 Monitoring Well Installation

To characterize Site groundwater flow and quality conditions and to evaluate for potential off-Site migration, Eastern installed five permanent groundwater monitoring wells at selected soil boring locations as shown on **Figure 2**.

The permanent monitoring wells were constructed of 2-inch diameter Schedule 40 polyvinyl chloride (PVC) casing with 2-inch diameter, 20-slot (0.020 inches) Schedule 40 PVC screen flush-threaded onto the PVC casing.

At all permanent monitoring well locations, the casing was placed down the open hole and a sand filter pack of #2 Morie sand was placed around the screen to approximately 2 ft above the top of screen. The annulus above the filter pack was sealed with a two-foot hydrated bentonite seal. Surface completion of each monitoring well consisted of a PVC stickup secured with a locking J-plug protected by a flush mount manhole. All newly constructed permanent monitoring wells were developed using a submersible pump to equilibrate monitoring well water levels with the surrounding formation. A submersible pump was lowered into the well and groundwater was withdrawn until the well was dry or the water ran visibly clear.

All permanent monitoring wells were surveyed by Mega Engineering and Land Surveying, P.C. (Mega), a New York State licensed surveyor, on December 22, 2025, to obtain horizontal and vertical survey

coordinates. The depth to groundwater in each monitoring well was measured using an electronic water level meter and a groundwater contour map was developed using the survey data (**Figure 3**).

3.5 Groundwater Gauging and Sampling

Roux conducted a water-level gauging round on December 18, 2025, to evaluate Site-wide groundwater elevations and groundwater flow. A summary of the water-level gauging data is provided as **Table 1**. Groundwater levels from newly installed monitoring wells were collected with an electronic oil/water interface probe capable of measuring fluid elevation with an accuracy of 0.01 ft. All groundwater level measurements were collected on the same day to provide a snapshot of the Site-wide conditions. A figure presenting monitoring well locations is provided as **Figure 2**.

Groundwater from permanent monitoring wells was sampled on December 18 and December 22, 2025. Groundwater samples were collected using the low-flow methods described in the USEPA guidance document titled "Ground Water Sampling Procedure, Low Stress (Low Flow) Purging and Sampling" (USEPA, 2010). During purging, a water quality meter was used to monitor water quality indicator parameters such as pH, dissolved oxygen, conductivity, temperature, turbidity, and oxidation reduction potential (ORP). The field parameters were recorded on monitoring well sampling field data sheets which are included as **Appendix F of the RIR.** All NYSDEC protocols for sampling Emerging Contaminants, as described in the approved QAPP/FSP, were followed. No anomalies were noted and the field parameters measured during purging appear to be consistent with values expected to occur in the natural environment.

One round of groundwater samples was collected from the monitoring wells and analyzed for:

- TCL + 30/TAL/Part 375 (filtered and unfiltered metals [including trivalent chromium, hexavalent chromium], VOCs, SVOCs, PCBs, pesticides, herbicides, total cyanide) and Emerging Contaminants.

All groundwater samples were analyzed by Eurofins TestAmerica of Edison, NJ and were reported using Category B data deliverables. A DUSR was prepared by Judy Harry of Data Validation Services, an independent data validator. A summary of data usability is described in Section 4.2.4 and the DUSR is presented in **Appendix E of the RIR**.

3.6 Soil Vapor Point Installation and Sampling

Nine soil vapor points were installed by Eastern using a Geoprobe®. At each location, a six-inch long, stainless steel, sample screen was attached to Teflon-lined polyethylene sample tubing and installed at approximately 6 ft bls. A sand pack of #2 Morie sand was added to 6-inches above the top of the screen. An approximately one-foot-thick layer of bentonite was added to the top of the sand, and the remainder of the boring annulus was filled with clean sand. The borehole was sealed off from ambient air using a bentonite seal at the surface. Boring logs for the soil vapor points are included as **Appendix C**.

All soil vapor samples were collected on December 18 and December 22, 2025, using pre-cleaned (batch certified) 6-liter summa canisters with regulators calibrated to collect samples over an 8-hour period and analyzed using USEPA Method TO15 for VOCs. A helium tracer gas test was performed on each vapor point prior to sampling in accordance with the procedures outlined in the NYSDOH Guidance. Soil vapor field sampling forms are included as **Appendix G of the RIR**.

All soil vapor samples were analyzed by Eurofins TestAmerica of Burlington, VT (NYDOH NELAP and ELAP #10391) for VOCs using USEPA Method TO-15. Samples were reported using Category B data deliverables. A DUSR was prepared, and a summary of data usability is described in Section 4.2.4 and the DUSR is presented in **Appendix E of the RIR**. Soil vapor point locations are shown on **Figure 2**.

3.7 Surveying Activities

All RI permanent monitoring wells, soil borings and soil vapor sample locations were surveyed to obtain horizontal and vertical coordinates, as shown on **Figure 2**. All RI survey activities were conducted by Roux's subcontractor, Mega, a NYS-licensed surveying firm, on December 22, 2025. Horizontal coordinates were based upon New York State Plane Coordinate System North American Datum of 1983 (NAD 83) in US Survey Feet. Vertical elevations were measured for top-of-casing (measuring point) and grade elevations at permanent monitoring well locations referenced to North American Vertical Datum of 1988 (NAVD 88). Grade elevations were surveyed for soil borings and soil vapor sampling locations. Monitoring well survey data was used to calculate water-level elevations for each monitoring well.

3.8 Community Air Monitoring Program

Roux implemented a CAMP during the entire subsurface investigation to monitor the potential for off-site migration of VOCs and particulates from the Site and protect potential off-Site receptors. CAMP was conducted from December 1 through 18, 2025, when weather permitted during intrusive activities. The CAMP included the use of two air monitoring stations (one [1] upwind and one [1] downwind), each equipped with one PID and one particulate meter. No exceedances of VOCs or particulates were observed, and there were no required actions taken to mitigate dust or VOC levels at the Site. CAMP and Daily reports sent to NYSDEC during implementation of the RI are provided in **Appendix H of the RIR**.

3.9 Summary of Deviations from the Remedial Investigation Work Plan

The following section discusses deviations from the RIWP.

Environmental Sampling Locations and Depths

Final locations of soil borings, monitoring wells, and soil vapor points were based on the locations proposed in the RIWP; however, the final locations were adjusted based on conditions encountered during the subsurface investigation and are shown on **Figure 2**.

Additional Vertical Delineation Samples

As described in Section 3.4, in addition to the samples outlined in the RIWP, soil samples were collected and held at the laboratory from two additional intervals below the soil sample collected below the fill/native soil interface. The depth of these samples varied depending on the depth of fill at each location. The samples were held at the laboratory pending the results of the sample above. If an exceedance of UUSCOs, RRSCOs or PGWSCOs was observed, the next additional sample was run. At some locations, none of these additional samples were run since all SCOs were met at the original sample depth, at some locations one sample was run and at some locations two samples were run. The results of all samples run are described in Section 4. Due to running several of these additional vertical delineation samples, the total number of RI samples increased to 42. Collection of a third duplicate sample was inadvertently omitted, however, the DUSR did not indicate this was a significant issue.

3.10 Investigation Derived Waste and In Situ Waste Characterization Sampling

All soil and water generated during well installation, development, and sampling activities was containerized in 55-gallon drums, labelled and staged in a drum storage area at the Site for disposal at an approved facility. Twelve drums of soil and three drums of groundwater were generated. One composite waste characterization sample for soil (grab sample for VOCs) and one composite waste characterization sample for water (grab sample for VOCs) were collected and analyzed for parameters required by the proposed waste disposal facility. Analytical results for these samples are provided in **Appendix I of the RIR.** A DUSR is not required for these samples. Drums are secured within the Site awaiting disposal as soon as practical.

In situ waste characterization sampling was performed concurrently with the RI in order to inform decisions related to remedial and redevelopment excavation and waste disposal. The waste characterization sampling is described herein and is included in **Appendix B**.

3.11 Green and Sustainable Remediation Initiative

Green remediation principles and techniques were implemented to the extent feasible in the implementation of the RI according to DER-31 and revised Part 375 that was adopted on December 31, 2025. The major Green and Sustainable Remediation components were as follows:

- Reducing direct and indirect greenhouse gases, and other emissions;
- Increasing energy efficiency and minimizing use of non-renewable energy;
- Conserving and efficiently managing resources and materials; and
- Reducing waste, increasing recycling, and increasing reuse of materials that would otherwise be considered a waste.

To reduce emissions, drilling staff carpooled when traveling to and from the Site. Also, submission of this RIR to the NYSDEC will occur electronically to eliminate the use of paper and printer ink. Green and sustainable practices per DER-31 will continue to be tracked throughout all parts of the remediation process.

4. Remedial Investigation Results

The following section provides a summary of the geological and hydrogeological findings, and the soil, groundwater, and soil vapor quality data that were generated by Roux during the RI. Tables with all the RI data generated by Roux are provided in **Tables 2 through 14**. . As noted previously, the text of this section is identical to Section 4 in the RIR.

4.1 Geological and Hydrogeological Conditions

The following sections provide a description of the geological and hydrogeological findings of the Site as determined by performance of the RI and previous investigations at the Site. A hydrogeologic investigation was conducted to evaluate the subsurface conditions that could influence the nature and extent, possible migration, and remediation of contamination at the Site.

4.1.1 Local Geology and Stratigraphy

The grade at the Site slopes downward to the south to the Site boundary. The elevation of the Site ranged from approximately 38 to 42 ft NAVD 88 based on available survey data.

Based on the investigations completed on-Site to date, the historical fill at the Site consists of fine- to coarse-grained sand and various amounts of fine- to coarse- gravel, brick, asphalt, glass, and concrete, which is typical of historical fill material found in urban environment. The depth to the bottom of the historical fill layer ranged to depths of 2 to 18 ft bls across the Site. The historic fill layer was observed to be thicker in the south/central portion of the Site where there appeared to be a former cellar that had been filled in with fill/demolition debris. It should be noted that refusal was encountered at several of the waste characterization borings in this portion of the Site between 12 and 17 feet below grade, with fill material extending to those refusal depths across this area. This historical fill material overlies deeper native deposits consisting of mostly fine to coarse sands with varying amounts of gravel, silt, and clay. Bedrock was not encountered during the RI but is anticipated to be greater than 100 ft bls based on measurements from nearby sites.

4.1.2 Site Hydrogeologic Setting

According to water-level data collected on December 18, 2025 **(Table 1),** the elevation of the water table surface at the Site ranged from 19.96 ft NAVD 88 at monitoring well RMW-3 in the western portion of the Site to 20.32 ft NAVD 88 at monitoring well RMW-2 in the eastern portion of the Site. Groundwater was measured at depths from 18.23 ft bls to 21.22 ft bls throughout the Site. A groundwater flow map for December 18, 2025, is provided in **Figure 3** and it shows that the flow is generally to the west.

4.2 Remedial Investigation Sample Results

The following sections summarize soil, groundwater, and soil vapor quality data that was generated by Roux during the RI sampling event. Data tables showing the sample data generated during this event are provided in **Tables 2 through 14**.

4.2.1 Soil Quality

A total of 42 soil samples and two field duplicate soil samples were collected from nine soil boring locations and submitted for laboratory analysis. Site-wide analytical soil data was compared to the following NYSDEC

Subpart 375-6.8(a-b) SCOs (in effect as of December 31, 2025) as noted in the RIWP to evaluate soil quality and to determine contamination in soil, if present:

- NYSDEC UUSCOs;
- NYSDEC RRSCOs; and
- NYSDEC PGWSCOs.

Laboratory analytical data generated for soil is summarized in **Tables 2 through 7**. Soil boring locations with soil sample exceedances of the NYSDEC Subpart 375-6.8(a-b) SCOs are shown on **Figure 4**.

A summary of soil quality results is provided in the sections below.

4.2.1.1 Volatile Organic Compounds in Soil

A summary of the VOC exceedances in the soil samples analyzed is provided below:

VOC Exceedances of SCOs in Soil

Analyte	NYSDEC UUSCO (mg/kg)	Detections above NYSDEC UUSCOs	NYSDEC RRSCOs (mg/kg)	Detections above NYSDEC RRSCOs	NYSDEC PGW SCOs (mg/kg)	Detections above NYSDEC PGWSCOs	Range in Concentration Above NYSDEC SCOs (mg/kg)	Soil Sample with Maximum Detection
Acetone	0.03	3	100	0	0.03	3	0.033J+ - 0.049J+	RSB-3 (4-6)

J+ – Estimated value, high bias

Acetone was the only VOC in exceedance of the UUSCOs and PGWSOCs in soil.

4.2.1.2 Semivolatile Organic Compounds in Soil

A summary of the SVOC exceedances in the soil samples analyzed is provided below:

SVOC Exceedances of SCOs in Soil

Analyte	NYSDEC UUSCO (mg/kg)	Detections above NYSDEC UUSCOs	NYSDEC RRSCOs (mg/kg)	Detections above NYSDEC RRSCOs	NYSDEC PGW SCOs (mg/kg)	Detections above NYSDEC PGWSCOs	Range in Concentration Above NYSDEC SCOs (mg/kg)	Soil Sample with Maximum Detection
Benzo[a]anthracene	1	2	1.4	2	1	2	10 - 17	RSB-4 (0-2)
Benzo[a]pyrene	1	2	1	2	22	0	8.8 – 14	RSB-4 (0-2)
Benzo[b]fluoranthene	1	3	1.4	2	2.1	2	1.1 – 19	RSB-4 (0-2)
Benzo[g,h,i]perylene	0.64	2	4.9	1	1000	0	4.6 - 5.5J-	RSB-4 (0-2)
Benzo[k]fluoranthene	0.8	2	4.9	0	2	2	3.6 – 4.6J-	RSB-4 (0-2)
Chrysene	1	2	4.9	2	1	2	9.5 – 16	RSB-4 (0-2)
Dibenz[a,h]anthracene	0.33	2	0.33	2	1000	0	1.4 – 1.7J-	RSB-4 (0-2)
Indeno[1,2,3-cd]pyrene	0.5	3	1.4	2	6.6	0	0.53 – 6.3J-	RSB-4 (0-2)
Phenanthrene	1.1	2	4.9	2	1000	0	15 - 22	RSB-4 (0-2)

J- – Estimated Value, low bias

The SVOCs, mostly polycyclic aromatic hydrocarbons (PAHs), detected in shallow soils throughout the Site are indicative of historical fill.

4.2.1.3 Metals in Soil

A summary of the Metals exceedances in the soil samples analyzed is provided below:

Metal Exceedances of SCOs in Soil

Analyte	NYSDEC Unrestricted Use SCO (mg/kg)	Detections above NYSDEC Unrestricted Use SCOs	NYSDEC Restricted Residential SCOs (mg/kg)	Detections above NYSDEC Restricted Residential SCOs	NYSDEC Protection of Groundwater SCOs (mg/kg)	Detections above NYSDEC Protection of Groundwater SCOs	Range in Concentration Above NYSDEC SCOs (mg/kg)	Soil Sample with Maximum Detection
Cadmium	2.5	1	2.5	1	7.5	0	2.9	RSB-9 (20-22)
Trivalent Chromium	30	1	180	1	--	--	549	RSB-9 (0-2)
Total Chromium	30	1	180	1	--	--	549	RSB-9 (0-2)
Copper	50	4	280	1	1,720	1	60.9 – 9,320	RSB-9 (0-2)
Lead	63	15	400	1	450	1	70.4J – 1,290	RSB-7 (2-4)
Mercury	0.18	2	0.3	1	0.73	1	0.19 – 0.79	RSB-1 (2-4)
Nickel	30	1	320	0	130	1	302	RSB-9 (0-2)
Zinc	109	10	6,600	0	2,480	0	117 – 813	RXSB-9 (20-22)

-- No SCO available

The metals detected in soil throughout the Site are indicative of historical fill.

4.2.1.4 Polychlorinated Biphenyls in Soil

A summary of the PCB exceedances in the soil samples analyzed is provided below:

PCB Exceedances of SCOs in Soil

Analyte	NYSDEC UUSCO (mg/kg)	Detections above NYSDEC UUSCOs	NYSDEC RRSCOs (mg/kg)	Detections above NYSDEC RRSCOs	NYSDEC PGW SCOs (mg/kg)	Detections above NYSDEC PGWSCOs	Range in Concentration Above NYSDEC SCOs (mg/kg)	Soil Sample with Maximum Detection
Total PCBs	0.1	2	1	0	3.2	0	0.14 - 0.25J	RSB-4 (2-4)

J – Estimated value

Total PCBs were only detected above the UUSCO at one boring location (RSB-4) within shallow fill intervals.

4.2.1.5 Pesticides and Herbicides in Soil

A summary of the Pesticide exceedances in the soil samples analyzed is provided below:

Pesticide Exceedance of SCOs in Soil

Analyte	NYSDEC UUSCO (mg/kg)	Detections above NYSDEC UUSCOs	NYSDEC RRSCOs (mg/kg)	Detections above NYSDEC RRSCOs	NYSDEC PGW SCOs (mg/kg)	Detections above NYSDEC PGWSCOs	Range in Concentration Above NYSDEC SCOs (mg/kg)	Soil Sample with Maximum Detection
P,P'-DDE	0.0033	1	3.4	0	9.3	0	0.0055JT	RSB-8 (0-2)

J – Estimated value
T- Indicates that a quality control parameter has exceeded laboratory limits

P,P'-DDE was only detected above the UUSCO at one boring location, RSB-8, within the shallowest fill interval. There were no herbicides detected above the relevant SCOs.

4.2.1.6 PFAS in Soil

A summary of the PFAS exceedances of the soil cleanup guidance in the soil samples analyzed is provided below.

PFAS Exceedances in Soil

Analyte	NYSDEC Unrestricted Use Soil Guidance Value (µg/kg)	Detections above NYSDEC Unrestricted Use Soil Guidance Values	NYSDEC Restricted Residential Soil Guidance Value (µg/kg)	Detections above NYSDEC Restricted Residential Soil Guidance Values	NYSDEC Protection of Groundwater Soil Guidance Value (µg/kg)	Detections above NYSDEC Protection of Groundwater Soil Guidance Values	Range in Concentration Above NYSDEC Soil Guidance Values (µg/kg)*	Soil Sample with Maximum Detection
Perfluorooctanesulfonic Acid (PFOS)	0.88	1	44	0	1	0	0.9	RSB-6 (2-4)

* NYSDEC has published soil guidance values (not SCOs) for two PFAS compounds Perfluorooctanoic acid (PFOA) and Perfluorooctanesulfonic acid (PFOS). These guidance values will be used to evaluate concentrations of these two compounds. The other PFAS compounds do not have SCOs or guidance values.

PFOS was only detected above the guidance values at one boring location (RSB-6) within a shallow fill interval.

4.2.2 Groundwater Sampling Results

A total of five groundwater samples and one field duplicate sample were collected from five permanent groundwater monitoring wells during the RI. The analytical groundwater data was compared to NYSDEC AWQSGVs for Class GA groundwater as noted in the RIWP to evaluate groundwater quality and to determine the contamination in groundwater, if present. However, it should be noted that the groundwater beneath the Site is not currently used as a drinking water source and will not be used in the future.

Field parameters measured during groundwater sampling purging activities are provided on field datasheets included in **Appendix G of the RIR** and discussed in Section 3.6. The field parameter data were reviewed to evaluate any potential anomalies in general groundwater chemistry that could potentially be influencing the groundwater sampling results. No anomalies were noted and the field parameters measured during purging appear to be consistent with values expected to occur in an urban setting.

Analytes that exceeded NYSDEC PGWSCOs in Site-wide soil were compared to analyte detections in Site-wide groundwater to assess whether, and to what extent, constituents detected in soil are impacting groundwater quality. As discussed in Section 4.2.1, several VOCs, SVOCs, and metals were detected in soil at concentrations exceeding NYSDEC PGWSCOs, however, none of the same constituents were detected in groundwater above AWQSGVs therefore they are not considered sources of contamination to groundwater.

Laboratory analytical data generated for groundwater is summarized in **Tables 8 through 13**. Monitoring well locations with groundwater sample exceedances of AWQSGVs are shown on **Figure 5**.

A summary of groundwater quality results is provided in the below sections.

4.2.2.1 Volatile Organic Compounds in Groundwater

VOCs were not detected above the AWQSGVs in any groundwater samples.

4.2.2.2 Semivolatile Organic Compounds in Groundwater

SVOCs were not detected above the AWQSGVs in any groundwater samples.

4.2.2.3 Metals in Groundwater

A summary of the metals exceedances in the groundwater samples analyzed is provided below:

Metals Exceedances of AWQSGVs in Groundwater

Analyte	NYSDEC AWQSGVs (µg/L)	Total Detections above NYSDEC AWQSGVs	Total Range in Concentration Above NYSDEC AWQSGVs (µg/L)	Dissolved Detections above NYSDEC AWQSGVs	Dissolved Range in Concentration Above NYSDEC AWQSGVs (µg/L)	Sample with Maximum Detection
Iron	300	1	634	0	--	RMW-1
Magnesium	35,000	1	37,500	1	36,400	RMW-1
Manganese	300	1	1,160	1	1,080	RMW-1
Sodium	20,000	6	78,700 – 146,000	6	75,100 – 140,000	RMW-5

The four metals detected exceeding the AWQSGVs (iron, magnesium, manganese, and sodium) are considered naturally occurring.

4.2.2.4 Polychlorinated Biphenyls in Groundwater

PCBs were not detected in any groundwater samples.

4.2.2.5 Pesticides and Herbicides in Groundwater

Pesticides and herbicides were not detected in any groundwater samples.

4.2.2.6 PFAS in Groundwater

A summary of the PFOS and PFOA exceedances are provided in the below table:

PFAS Detections in Groundwater (in nanograms per liter [ng/L]

Analyte	NYSDEC AWQSGVs (ng/L)	Detections Above NYSDEC MCLs	Detection Range (ng/L)	Groundwater Sample with Maximum Detection
Perfluorooctanesulfonic Acid (PFOS)	2.7	6	9.88 – 86.7	RMW-1
Perfluorooctanoic Acid (PFOA)	6.7	6	17.4 – 34.4	RMW-1

There is no documented use of PFAS at the Site or known historical Site use that would indicate the past use of these compounds, and there are no exceedances of PGWSCOs of PFAS in soil. The levels of PFAS are consistent with background concentrations throughout the New York City area.

4.2.3 Soil Vapor Sampling Results

A total of nine soil vapor samples and one field duplicate soil vapor sample were collected during the RI and submitted for laboratory analysis. Laboratory analytical data generated for soil vapor is summarized in **Table 14**. Soil vapor point locations with soil vapor detections are shown on **Figure 6**. A summary of soil vapor quality results is provided in the below sections.

Analytical data for VOCs indicates there were detections of 31 different VOCs across the Site, including petroleum related and chlorinated VOCs.

Analyte	Detections	Range in Concentrations (µg/m^3)	Sample with Maximum Detection
1,1,2-Trichlo-1,2,2-trifluoroethane	7	0.49J – 0.64J	RSV-6
1,2,4-Trimethylbenzene	2	0.7J – 2.2J	RSV-4
1,2-Dichlorotetrafluoroethane	2	1.6 – 2.6J	RSV-7
1,4-Dioxane	3	0.31J – 1.7J	RSV-9
2,2,4-Trimethylpentane	8	0.68J – 110D	RSV-1
2-Hexanone	2	0.62J – 3.7J	RSV-4
4-Ethyltoluene	3	0.65J – 2.4J	RSV-4
Acetone	10	32 – 210D	RSV-9
Benzene	9	0.54J – 2.8	RSV-8
Butane	5	2.2J – 25	RSV-9
Carbon Disulfide	7	0.51J – 2.9J	RSV-5
Carbon Tetrachloride	1	0.56	RSV-9
Chloroform	10	0.4J – 9.3J	RSV-4
Cyclohexane	7	0.32J – 7.3	RSV-9
Dichlorodifluoromethane	10	2.4J – 5.2J	RSV-7
Ethylbenzene	7	3.3J – 69	RSV-8
Isopropanol	5	3.9J – 10J	RSV-8
Isopropylbenzene (Cumene)	1	0.64J	RSV-4
m,p-Xylene	9	2.2J – 200	RSV-8
Methyl Ethyl Ketone (2-Butanone)	8	1.6 - 13	RSV-9
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	2	0.61J – 0.86J	RSV-4
Methylene Chloride	1	4.1	RSV-8
n-Heptane	7	1.1 – 3.7	RSV-9
n-Hexane	9	0.95J – 38	RSV-2
n-Propylbenzene	1	0.62J	RSV-4
o-Xylene (1,2,-Dimethylbenzene)	8	2 - 38	RSV-8
Tert-Butyl Alcohol	8	7.8J – 42	RSV-9
Tetrachloroethylene (PCE)	4	1.2 – 20	RSV-9

Analyte	Detections	Range in Concentrations (µg/m^3)	Sample with Maximum Detection
Toluene	10	1.9 – 19	RSV-1
Trichloroethylene (TCE)	3	0.95 – 4.1J	RSV-3
Trichlorofluoromethane	9	1.4 – 2.5	RSV-2

-- No SCO available
J – Estimated Value
D – Concentration of analyte was quantified from diluted analysis.

The following compounds are discussed because of their presence in the NYSDOH Guidance. Matrix A provides guidance relative to TCE, cis-1,2-dichloroethene (cis-1,2-DCE), 1,1-dichloroethene (1,1-DCE) and carbon tetrachloride. Matrix B provides guidance relative to PCE, 1,1,1-trichloroethane (TCA), and methylene chloride. Matrix C provides guidance to vinyl chloride. Matrix D provides guidance to benzene, ethylbenzene, naphthalene, cyclohexane, isooctane (2,2,4-trimethylpentane), 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, and o-xylene. Matrix E provides guidance to m,p-xylene, heptane, and hexane. Matrix F provides guidance to toluene. Indoor air samples were not collected as part of the RI. Although a direct comparison cannot be made to the NYSDOH Matrices without indoor air samples, only m,p-xylene and ethylbenzene fall in the monitor or mitigate sections of the matrices. A summary of the detections is provided below.

Matrix A Compounds

- TCE was detected in three soil vapor samples, ranging in concentration from 0.95 to 4.1J µg/m3, with a maximum detection in soil vapor sample RSV-3;
- cis-1,2-DCE was not detected in any soil vapor samples;
- 1,1-DCE was not detected in any soil vapor samples; and,
- Carbon tetrachloride was detected in one soil vapor sample, RSV-9, at a concentration of 0.56 µg/m3.

Matrix B Compounds

- PCE was detected in four soil vapor samples, ranging in concentration from 1.2 to 20 µg/m^3, with a maximum detection in soil vapor sample RSV-9;
- TCA was not detected in any soil vapor samples; and,
- Methylene chloride was detected in one soil vapor sample, RSV-8, at a concentration of 4.1 µg/m3.

Matrix C Compound

- Vinyl chloride was not detected in any soil vapor samples.

Matrix D Compound

- Benzene was detected in nine soil vapor samples, ranging in concentration from 0.54J to 2.8 µg/m^3, with a maximum detection in soil vapor sample RSV-8;
- Ethylbenzene was detected in seven soil vapor samples, ranging in concentration from 3.3J to 69 µg/m3, with a maximum detection in soil vapor sample RSV-8;
- Naphthalene was not detected in any soil vapor samples;
- Cyclohexane was detected in seven soil vapor samples, ranging in concentration from 0.32J to 7.3 µg/m3, with a maximum detection in soil vapor sample RSV-9;

- Isooctane was not detected in any soil vapor samples;
- 1,2,4-trimethylbenzene was detected in two soil vapor samples, ranging in concentration from 0.7J to 2.2J µg/m3, with a maximum detection in soil vapor sample RSV-4;
- 1,3,5-trimethylbenzene was not detected in any soil vapor samples; and,
- o-xylene was detected in eight soil vapor samples, ranging in concentration from 2 to 38 µg/m3, with a maximum detection in soil vapor sample RSV-8.

Matrix E Compound

- m,p-xylene was detected in nine soil vapor samples, ranging in concentration from 2.2J to 200 µg/m3, with a maximum detection in soil vapor sample RSV-8;
- Heptane was detected in seven soil vapor samples, ranging in concentration from 1.1 to 3.7 µg/m3, with a maximum detection in soil vapor sample RSV-9; and
- Hexane was detected in nine soil vapor samples, ranging in concentration from 0.95J to 38 µg/m3, with a maximum detection in soil vapor sample RSV-2.

Matrix F Compound

- Toluene was detected in ten soil vapor samples, ranging in concentration from 1.9 to 19 µg/m^3, with a maximum detection in soil vapor sample RSV-1.

4.2.4 Data Usability Summary and Field Duplicate Results

Data validation was performed on all data collected during the RI to determine whether the data, as presented, meets the Site-specific criteria for data quality and data use. Data qualifiers are included on the data tables. The laboratory reported the results for data in ASP Category B deliverable packages, which are provided as **Appendix E of the RIR**. An electronic data deliverable (EDD) in the required NYSDEC format was provided by the laboratory and has been uploaded to the NYSDEC Equis database. All DUSRs prepared in accordance with Appendix 2B of DER-10 are provided in **Appendix F of the RIR**.

5. Conceptual Site Model

The following section explains the occurrence of contaminants and their fate and transport at the Site in the context of the local Site stratigraphy and hydrogeology. . As noted previously, the text of this section is identical to Section 5 in the RIR.

Based on the soil, groundwater, and soil vapor results discussed in Section 4.2, soil is impacted at the Site, but groundwater and soil vapor are not significantly impacted. The spatial distribution of contaminants of potential concern in various media is shown in **Figures 4 through 6**.

The historical fill at the Site consists of sand and various amounts of gravel, brick, asphalt, glass, and concrete, which is typical of historical fill material found in urban environment. The depth to the bottom of the historical fill layer ranged to depths of 2 to 18 ft bls across the Site. This historical fill material overlies deeper native deposits consisting of mostly fine to coarse sands and gravel with varying amounts of sand, silt, and clay.

As discussed in Section 4.2.1 and based on the Site-wide detections and exceedances of NYSDEC SCOs (and/or guidance values for PFOS and PFOA), shallow soil throughout the Site is primarily impacted with SVOCs and metals likely due to historical fill materials. At most soil boring locations, a sample interval was found within six feet beneath the historical fill and native soil interface to have no exceedances of NYSDEC SCOs. As such, the impacted historical fill material is not a source of contamination in deeper native soils.

As discussed in Section 4.2.2, groundwater concentrations of metals and PFAS exceeded the NYSDEC AWQSGVs. The metals detected exceeding the AWQSGVs (iron, magnesium, manganese, and sodium) are considered naturally occurring and are not considered contaminants of concern at the Site. There is no documented use of PFAS at the Site and known historical Site uses do not indicate the past use of these compounds. The one exceedance of PFAS in shallow soils did not exceed the PGWSCO, so PFAS in soil is not considered a source for the PFAS impact in groundwater and PFAS are not considered contaminants of concern in groundwater for the Site.

As discussed in Section 4.2.3, and based on the Site-wide detections, petroleum-related and chlorinated VOCs were detected in soil vapor at the Site at relatively low levels. Petroleum-related and chlorinated VOC concentrations are likely due to background levels of these compounds present in urban areas and are not considered contaminants of concern for the Site. Although a direct comparison cannot be made to the NYSDOH Matrices without indoor air samples, only ethylbenzene and m,p-xylene could fall in the monitor or mitigate sections of the matrices. The remaining analyte concentrations would fall in the no further action of the matrices.

6. Qualitative Exposure Assessment

As described in Appendix 3B of DER-10, "*The overall purpose of the Qualitative Human Health Exposure Assessment (or the exposure assessment) is to evaluate and document how people might be exposed to site related contaminants, and to identify and characterize the potentially exposed population(s) now and under the reasonably anticipated future use of the site.*" The following section details the Qualitative Human Health Exposure Assessment based on data collected during the RI and discussed in earlier sections. . As noted previously, the text of this section is identical to Section 6 in the RIR.

6.1 Soil Exposure

As described above in Section 4.2.1, soil samples collected during the RI indicated the presence of VOCs, metals, SVOCs, PCBs, and pesticides at concentrations above the NYSDEC Subpart 375-6.8 (a-b) SCOs for unrestricted and/or restricted residential use and PFAS at concentrations above the NYSDEC Soil Guidance Values. An individual could be exposed to these contaminants through direct contact with Site soil during ground intrusive work at the Site. Direct contact without the use of proper personal protective equipment (PPE) and personal hygiene measures could lead to dermal contact and incidental ingestion of these compounds. The Site will be fully fenced during construction activities, and access will be controlled. Potential contact with Site soil is restricted to remedial and construction contract workers at the Site performing ground intrusive activities in addition to trespassers and passersby (through potential particulate matter in the air). The general public will not be exposed to direct contact with Site soil. A CAMP and dust control measures (as needed) will be implemented during intrusive activities to minimize the potential for offsite exposures from soil/dust/vapor leaving the Site.

6.2 Groundwater Exposure

As described above in Section 4.2.2, groundwater samples collected during the RI indicated that naturally occurring metals and PFOS/PFOA are present at concentrations above the NYSDEC AWQSGVs. Groundwater is not used for drinking or other potable purposes (the area is connected to the public water supply), and there is no direct contact with or ingestion of groundwater by the general public. Furthermore, no public water supply wells are located in the area surrounding the Site.

Individuals who perform intrusive work (i.e., utility construction and/or repair), perform groundwater sampling or remedial activities such as dewatering during excavation may come into contact with groundwater. Proper PPE and personal hygiene measures will be required to prevent dermal contact and the potential for incidental ingestion of these compounds.

6.3 Soil Vapor Exposure

As described above in Section 4.2.3, soil vapor samples collected during the RI indicate the presence of petroleum-related and chlorinated VOCs throughout the Site at relatively low levels. Individuals who perform ground intrusive work and passersby during the remedial action may be exposed to soil vapor. A CAMP and odor/vapor control measures (as needed) will be implemented during intrusive activities to minimize the potential for offsite exposures from vapors leaving the Site during the remedial action.

6.4 Exposure Assessment Summary

The following table summarizes the exposure assessment.

Environmental Media and Exposure Route	Human Exposure Assessment
Direct contact with subsurface soils (and incidental ingestion)	• Construction and remedial contractors can come into contact with soil if they complete ground intrusive work at the Site. • During remediation, remedial workers, trespassers, passersby, and utility workers could come into contact with contaminated soil contained in dust through inhalation, incidental ingestion and dermal contact. Implementation of the HASP, CAMP, and dust controls during the remedial action and any future ground intrusive activities will mitigate potential exposures. • It is expected, based on the RI soil quality results, that an unrestricted use cleanup can be achieved for the site. However, if necessary, future exposure to remaining contamination following remediation, if any, will be addressed for through the installation of a site cover system.
Ingestion of groundwater	• Groundwater is not and will not be used for drinking water, as any future buildings proposed on the Site will be connected to the public water supply.
Direct contact with groundwater (and incidental ingestion)	• Remedial workers, trespassers, and utility workers could come into contact with groundwater through dermal contact and incidental ingestion during ground intrusive work. • Proper PPE and personal hygiene measures, as defined in the HASP, will be required to prevent dermal contact and the potential for incidental ingestion impacted groundwater during construction. • Future exposure to Site groundwater will be eliminated by the presence of the buildings from the redevelopment that will cover the entire Site.
Inhalation of air (exposures related to soil vapor intrusion)	• Remedial workers, trespassers, and utility workers may be exposed to soil vapor during ground intrusive activities beneath all buildings. • Exposures to workers and passersby during the remedial action and future ground intrusive activities will be reduced or eliminated through implementation of the HASP, CAMP, and odor/vapor controls during construction.

7.0 Remedial Action Objectives

Based on the results of the RI, the following Remedial Action Objectives (RAOs) have been identified for this Site.

7.1 Soil

RAOs for Public Health Protection

- Prevent ingestion/direct contact with contaminated soil.
- Prevent inhalation of, or exposure to, contaminants volatilizing from contaminated soil.

RAOs for Environmental Protection

- Prevent migration of contaminants that would result in groundwater or surface water contamination.

7.2 Groundwater

RAOs for Public Health Protection

- Prevent ingestion of groundwater containing contaminant levels exceeding drinking water standards.

7.3 Soil Vapor

- Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into buildings at the Site.

8. Description of Remedial Action Plan

The following is a detailed description of the alternatives analysis and remedy selection process to address impacted media on the Site.

This section of the RAWP was prepared in accordance with Subpart 375 – 3.8(f), Subpart 375 – 1.8(f), and Section 4.3 of NYSDEC DER10 Technical Guidance for Site Investigation and Remediation (DER10). Three remedial alternatives were evaluated, as follows:

- One alternative (Remedial Alternative 1) that will achieve an Unrestricted Use cleanup relative to all onsite soil (Track 1), as shown on **Figure 7**, without the use of ICs or ECs;
- One alternative (Remedial Alternative 2) that will achieve a Track 2 Restricted Residential Use cleanup for the Site, as shown on **Figure 8**, with the use of ICs only; and
- One alternative (Remedial Alternative 3) that will achieve a Track 4 Restricted Residential Use cleanup, coupled with the use of ICs and ECs, as shown on **Figures 9A, 9B and 9C**.

A detailed description of the alternatives is provided below.

*Remedial Alternative 1: Track 1 Unrestricted Use Cleanup (**Figure 7**):*

1. Installation of support of excavation (SOE) to reach the proposed remedial excavation depths to meet Track 1 and prevent damage to adjacent offsite structures, including the NYCT subway tunnel and NYCDEP sewers. Since the remedial excavation depth is deeper than the redevelopment depth along the southern BCP Site boundary, additional SOE will be required to meet these depths.
2. Excavation and offsite disposal of approximately 8,500 in-place cubic yards (CY) of soil (i.e., all soil exceeding UUSCOs) over the entire Site to depths up to 22 ft bls to meet UUSCOs. The limits and approximate depths of remedial excavation are shown on **Figure 7**.
3. Dewatering, in compliance with city, state, and federal laws and regulations required to reach the remedial excavation depths. Extracted groundwater will either be containerized for offsite licensed or permitted disposal or will be treated on-Site as necessary and discharged to the municipal sewer system under a permit from New York City Department of Environmental Protection (NYCDEP), if applicable.
4. Collection and analysis of excavation bottom endpoint samples at a frequency of at least one per 900 square feet to evaluate the performance of the remedy with respect to attainment of Track 1 SCOs at the remedial excavation depth and to properly document the remaining onsite soil quality.
5. Collection and analysis of excavation sidewall endpoint samples at a frequency of one per 30 linear feet (and at least one per sidewall) at the portion of the Site proposed to be excavated to 22 ft bls (where the proposed remedial excavation depth is deeper than the proposed redevelopment depth). Sidewall samples are not required where excavations extend to the BCP site boundary or at other internal boundaries between endpoint sample grids, as there is no soil remaining on-Site.
6. Clean fill (approximately 260 cy) meeting the UUSCOs will be brought in to replace the excavated soil and establish the designed grades at the Site, if required.
7. A soil vapor intrusion evaluation will be completed based on the previously collected soil vapor data collected onsite. The evaluation will be summarized in the FER and include a desktop review of all onsite analytical data relative to the future uses of the property. Soil vapor intrusion is not a concern for the Site due to the relatively low concentrations observed during the RI, which for the most part indicated that no further action would be required based on the NYSDOH matrices. Only one of the nine RI samples indicated the potential need for monitoring or mitigation for just two compounds (ethylbenzene and m,p-xylene) and there were no exceedances of UUSCOs/PGWSCOs in soil or AWQSGVs in groundwater for these compounds. Additionally, between remedial and redevelopment excavation, all soil will be removed down to or several below the water table, a robust

waterproofing membrane will be included as part of the building design and active vapor mitigation measures are not required.

*Remedial Alternative 2: Track 2 Restricted Residential Use Cleanup (**Figure 8**):*

1. Installation of support of excavation (SOE) to reach the proposed remedial excavation depths to meet Track 2 RRSCOs and prevent damage to adjacent offsite structures, including the NYCT subway tunnel and NYCDEP sewers.
2. Excavation and offsite disposal of approximately 4,150 in-place CY of soil (i.e., all soil exceeding RRSCOs) from certain areas of the Site with exceedances of RRSCOs to depths up to 15 ft bls. The limits and approximate depths of remedial excavation are shown on **Figure 8**.
3. Dewatering, in compliance with city, state, and federal laws and regulations required to reach the remedial excavation depths. Extracted groundwater will either be containerized for offsite licensed or permitted disposal or will be treated on-Site as necessary and discharged to the municipal sewer system under a permit from NYCDEP, if applicable.
4. Collection and analysis of excavation bottom endpoint samples at a frequency of at least one per 900 square feet to evaluate the performance of the remedy with respect to attainment of Track 2 RRSCOs at the remedial excavation depth and to properly document the remaining onsite soil quality. Sidewall sampling is not required since excavation extends to the BCP Site boundary around the perimeter of the Site and no internal sidewalls will remain, as the proposed remedial excavation depth is shallower than the proposed redevelopment depth across the Site.
5. Clean fill meeting the lower of PGWSCOs or RRSCOs will be imported to replace the excavated soil and establish the designed grades at the Site, if required.
6. A soil vapor intrusion evaluation will be completed based on the previously collected soil vapor data collected onsite. The evaluation will be summarized in the FER and include a desktop review of all onsite analytical data relative to the future uses of the property. Soil vapor intrusion is not a concern for the Site due to the relatively low concentrations observed during the RI, which for the most part indicated that no further action would be required based on the NYSDOH matrices. Only one of the nine RI samples indicated the potential need for monitoring or mitigation for just two compounds (ethylbenzene and m,p-xylene) and there were no exceedances of UUSCOs/PGWSCOs in soil or AWQSGVs in groundwater for these compounds. Additionally, between remedial and redevelopment excavation, all soil will be removed down to or several below the water table, a robust waterproofing membrane will be included as part of the building design and active vapor mitigation measures are not required.
7. Imposition of an IC in the form of an Environmental Easement to ensure proper Site use and to prevent future exposure to any residual contamination remaining in these areas.
    - requires the remedial party or Site owner to complete and submit to the NYSDEC a periodic certification of ICs and ECs in accordance with Part 375-1.8 (h)(3);
    - allows the continued use and development of the controlled property for restricted residential (or less restrictive uses) as defined by Part 375-1.8(g), although land use is subject to local zoning laws;
    - restricts the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by the NYSDOH or Article 141 of the New York City Department of Health (NYCDOH) code (groundwater restriction applies to the entire Site); and
    - requires compliance with the Department approved Site Management Plan (SMP).
8. Preparation of an SMP that includes the following:
    - an IC Plan that identifies all use restrictions for the Site and details the steps and media-specific requirements necessary to ensure the following ICs remain in place and effective:
        - ICs: The Environmental Easement discussed above.

*Remedial Alternative 3 - Track 4 Restricted Residential Use Cleanup (**Figures 9A, 9B and 9C**):*

1. Excavation and offsite disposal of a total of approximately 1,200 in-place CY of soil down to 2 ft bls in selected areas with exceedances of RRSCOs as shown on **Figure 9A**.
2. Collection and analysis of post-excavation documentation bottom endpoint samples at a frequency of at least one per 900 square feet to document the remaining onsite soil quality.
3. Installation of a Site cover system to allow for restricted residential use of the Site over areas of the site with exceedances of RRSCOs (**Figure 9B**). The Site cover system will be comprised of concrete pavers or other hardscapes, concrete covered sidewalks/walkways, building slab, and landscaped areas (with a minimum of two feet of cover), see **Figure 9C**. The Site cover system will be underlain by a demarcation consisting of the underside of the concrete pavers or other hardscapes, concrete covered sidewalks/walkways, building slab or orange snow fence material, filter fabric or approved equivalent.
4. Backfill and compaction of soil meeting the lower of PGWSCOs or RRSCOs, as necessary.
5. A soil vapor intrusion evaluation will be completed based on the previously collected soil vapor data collected onsite. The evaluation will be summarized in the FER and include a desktop review of all onsite analytical data relative to the future uses of the property. Soil vapor intrusion is not a concern for the Site due to the relatively low concentrations observed during the RI, which for the most part indicated that no further action would be required based on the NYSDOH matrices. Only one of the nine RI samples indicated the potential need for monitoring or mitigation for just two compounds (ethylbenzene and m,p-xylene) and there were no exceedances of UUSCOs/PGWSCOs in soil or AWQSGVs in groundwater for these compounds. Additionally, between remedial and redevelopment excavation, all soil will be removed down to or several below the water table, a robust waterproofing membrane will be included as part of the building design and active vapor mitigation measures are not required.
6. Imposition of an IC in the form of an Environmental Easement to ensure proper Site use and to prevent future exposure to any residual contamination remaining in these areas.
    - requires the remedial party or Site owner to complete and submit to the NYSDEC a periodic certification of ICs and ECs in accordance with Part 375-1.8 (h)(3);
    - allows the continued use and development of the controlled property for restricted residential (or less restrictive uses) as defined by Part 375-1.8(g), although land use is subject to local zoning laws;
    - restricts the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by the NYSDOH or Article 141 of the NYCDOH code (groundwater restriction applies to the entire Site); and
    - requires compliance with the Department approved SMP.

    Preparation of a SMP, which includes the following:
7. an IC and EC Plan that identifies all use restrictions and ECs for the Site and details the steps and media-specific requirements necessary to ensure the following ICs and/or ECs remain in place and effective:
    - ICs: The Environmental Easement discussed above; and
    - ECs: The Site Cover System described above.
        - a Monitoring Plan to assess the performance and effectiveness of the remedy, including, if required, monitoring for vapor intrusion for any buildings constructed on the Site.

8.1 Evaluation of Remedial Alternatives

The goal of the remedy selection process under the BCP is to select a remedy that is protective of human health and the environment taking into consideration the current, intended, and reasonably anticipated future use of the property. Each remedial alternative is evaluated based on the factors listed below:

- Protection of human health and the environment;
- Compliance with standards, criteria, and guidelines (SCGs);
- Short-term effectiveness and impacts;
- Long-term effectiveness and permanence;
- Reduction of toxicity, mobility, or volume of contaminated material;
- Implementability;
- Cost effectiveness;
- Community Acceptance;
- Land use; and
- Green and Sustainable Remediation (including climate resiliency).

SCGs applicable to the Site remediation are described briefly below:

- 6 NYCRR Part 375-6 Soil Cleanup Objectives (SCOs) – The UUSCOs, RRSCOs, and PGWSCOs listed in the regulations were used to evaluate soils, delineate areas with impacts, and specify cleanup objectives (adopted December 31, 2025);
- New York State Groundwater Quality Standards – 6 NYCRR Part 703 – 6 NYCRR Subpart 703; the standards listed in the regulations were used to evaluate groundwater quality, delineate areas with impacts, and specify cleanup objectives;
- NYSDEC Ambient Water Quality Standards and Guidance Values – TOGS 1.1.1 – the standards listed in the guidance were used to evaluate groundwater quality, delineate areas with impacts, and specify cleanup objectives (TOGS 1.1.1 incorporates the same standards as listed in 6 NYCRR Part 703 for the constituents of concern at the Site);
- NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation – May 2010 (or later version if available) – the proposed remedial alternatives were developed in accordance with the abovementioned document;
- NYSDEC DER-31 Green Remediation – August 2010 and Revised January 2011 – The proposed remedial alternatives were developed in accordance with the abovementioned document;
- NYSDOH Generic Community Air Monitoring Plan - will be required for all ground intrusive activities, and the abovementioned document was used to prepare the CAMP;
- NYS Waste Transporter Permits – 6 NYCRR Part 364 – As the remedial alternatives include excavation and disposal of soil, the abovementioned regulations apply;
- NYS Solid Waste Management Requirements – 6 NYCRR Part 360 and Part 364 – As the remedial alternatives include excavation and disposal of soil, the abovementioned regulations apply;
- NYSDEC guidance regarding PFAS dated April 2023; and
- NYSDOH Guidance October 2006 Guidance for Evaluating Soil Vapor Intrusion in the State of New York and Updated 2017 and 2024, was used to develop the soil vapor sampling program.

8.1.1 Overall Protection of Human Health and the Environment

This criterion is an evaluation of the ability of each alternative or the remedy to protect public health and the environment.

Remedial Alternative 1, Track 1 will be protective of human health and the environment by removing soil at the Site that exceeds the UUSCOs and backfilling the area with material meeting the UUSCOs (as necessary), thus eliminating the potential for human and environmental exposure to contaminated soil/fill once construction is complete. Groundwater is not significantly impacted, and as such, groundwater does not require remediation. Although soil vapor is not significantly impacted, a soil vapor intrusion evaluation will be completed as part of the remedy.

Remedial Alternative 2, Track 2 will be protective of human health and the environment by excavating and removing soil above the RRSCOs to a maximum depth of 15 ft bls (shallower if RRSCOs are met above that). ICs, including an SMP and Environmental Easement, will ensure long-term management of use restrictions. Groundwater is not significantly impacted and does not require remediation. Although soil vapor is not significantly impacted, a soil vapor intrusion evaluation will be completed as part of the remedy.

Remedial Alternative 3, Track 4 will be protective of human health and the environment by employing ICs and ECs including a Site cover system (comprised of concrete pavers or other hardscapes, concrete covered sidewalks/walkways, building slab, and landscaped areas with a minimum of two feet of cover) to prevent exposure to remaining contaminated media following excavation as part of the redevelopment. Although soil vapor is not significantly impacted, a soil vapor intrusion evaluation will be completed as part of the remedy.

For all alternatives, during Site remediation (e.g., excavation of soil, etc.) and other construction activities, workers may be exposed to impacted soil and soil vapor. Potential worker exposure during remediation activities will be mitigated through the implementation of the HASP, which includes the CAMP, and required worker training. Potential environmental exposures will be mitigated by ECs implemented during remedial construction (i.e., dust suppression, odor control and traffic control). The SMP will include ICs (Remedial Alternative 2, Track 2 and Alternative 3, Track 4) and ECs (Remedial Alternative 3, Track 4) to be implemented during future ground intrusive work to protect the workers and public from remaining contamination onsite.

8.1.2 Standards, Criteria, and Guidance

The remedy must conform to officially promulgated standards and criteria that are directly applicable or that are relevant and appropriate. The selection of a remedy must also take into consideration guidance as appropriate.

Remedial Alternative 1 will achieve compliance with the UUSCOs for all onsite areas. The handling and management of contaminated materials will be in compliance with the applicable SCGs. The excavation will be backfilled as necessary, with material meeting the Track 1 UUSCOs presented in the Part 375 Regulations.

Remedial Alternative 2 will achieve compliance with the RRSCOs for all onsite areas to a maximum depth of 15 ft bls. The handling and management of contaminated materials will be in compliance with the applicable SCGs. The excavation will be backfilled as necessary, with material meeting the lower of PGWSCOs and RRSCOs presented in the Part 375 Regulations.

Remedial Alternative 3 will achieve compliance with the Track 4 remedy because no exposed impacted soil will be present after remedial construction through the use of a Site cover system (comprised of concrete pavers or other hardscapes, concrete covered sidewalks/walkways, building slab, and landscaped areas with a minimum of two feet of cover). The Site cover system will prevent direct contact with remaining onsite soil. The handling and management of contaminated materials will be in compliance with the applicable SCGs. The excavation will be backfilled as necessary, with material meeting the lower of PGWSCOs and RRSCOs presented in the Part 375 Regulations.

8.1.3 Long-Term Effectiveness and Performance

This criterion is an evaluation of the long-term effectiveness and permanence of an alternative or remedy after implementation.

Remedial Alternative 1 would achieve long term effectiveness by providing a permanent cleanup of onsite contamination through removal of all soil exceeding the UUSCOs. Although temporary dewatering will be required to facilitate deep excavation, no groundwater remediation or long-term groundwater monitoring is proposed. Upon completion of the Track 1 remedy, no ECs or ICs will be required, other than a prohibition on groundwater use, and the remedy would meet RAOs without the need for long term stewardship. As all contaminated soil would be removed, the remedy would provide a permanent and reliable long-term solution.

Remedial Alternative 2 would achieve long term effectiveness by removing all impacted soil exceeding RRSCOs to a maximum depth of 15 ft bls. Although temporary dewatering will be required to facilitate deep excavation, no groundwater remediation or long-term groundwater monitoring is proposed. ICs including a SMP and Environmental Easement will ensure long-term management of use restrictions. The SMP will ensure long-term effectiveness of all ICs by requiring periodic inspection and certification that these controls and restrictions continue to be in place and are functioning as intended.

Remedial Alternative 3 would achieve long term effectiveness by removing all impacted soil above RRSCOs within the top 2 ft bls with the use of ICs and ECs. A Site Cover System will be installed as an EC to prevent exposure to remaining soils with exceedances of RRSCOs. ICs including a SMP and Environmental Easement will ensure long-term management of use restrictions for the Site. The SMP will ensure long term protectiveness will be maintained through ECs and ICs, including an Environmental Easement and Site Management Plan that will require periodic inspection, certification, and maintenance of the Site Cover System and restrictions on groundwater use.

8.1.4 Reduction in Toxicity, Mobility, or Volume of Contamination through Treatment

This criterion is an evaluation of the ability of an alternative or remedy to reduce the toxicity, mobility, and volume of Site contamination. Preference should be given to remedies that permanently or significantly reduce the toxicity, mobility, or volume of the contamination at the Site. The following is the hierarchy of source removal and control measures, ranked from most preferable to least preferable:

- Removal and/or treatment;
- Containment;
- Elimination of exposure; and
- Treatment of source at the point of exposure.

Remedial alternatives that use treatment or removal to eliminate contaminants at a Site, reduce the total mass of toxic contaminants, cause irreversible reduction in contaminants mobility, or reduce the total volume of contaminated media are preferable.

Remedial Alternative 1 would permanently eliminate the toxicity, mobility, and volume of contaminants within the Site by removing all soil with concentrations that exceeded the UUSCOs.

Remedial Alternative 2 would permanently eliminate toxicity, mobility, and volume of contaminants above RRSCOs to a maximum depth of 15 ft bls. ICs, including an SMP and Environmental Easement, would prevent future exposure to any residual contamination and provide for long-term Site management.

Remedial Alternative 3 would eliminate toxicity, mobility, and volume of contaminants above RRSCOs within the top 2 ft bls. ECs, including a Site Cover System, and ICs, including an SMP and Environmental Easement, would prevent future exposure to any residual contamination and provide for long-term Site management. Residual contaminated soil would be contained beneath a Site Cover System, comprised of concrete pavers or other hardscapes, concrete covered sidewalks/walkways, building slab, and landscaped areas with a minimum of two feet of cover, which would isolate contamination and eliminate exposure pathways. Although affected soil would remain in place, long term containment, visual demarcation, and ICs would effectively reduce mobility and limit exposure to contaminants.

8.1.5 Short-Term Impacts and Effectiveness

This criterion is an evaluation of the potential short-term adverse environmental impacts and human exposures during the construction and/or implementation of an alternative or remedy.

Remedial Alternatives 1 poses minimal health and environmental risks during implementation. The remedy implementation time is relatively short and the potential adverse impacts to the community and workers (e.g., increased traffic or exposure to contaminants during soil excavation and transportation) can be mitigated with ECs (e.g., dust, odor and traffic controls). Other potential risks include material handling, electrical shock, general trip hazards, and noise. These potential impacts are addressed in the Site-specific HASP and CAMP and the Soil/Materials Management Plan (SoMP), which detail monitoring during the remedial construction and describe ECs to be implemented as necessary (e.g., dust suppression and traffic control).

Remedial Alternatives 2 and 3 also pose minimal health and environmental risks during implementation. The remedy implementation time is shorter for both alternatives than Remedial Alternative 1 and the potential adverse impacts to the community and workers (e.g., increased traffic or exposure to contaminants during soil excavation and transportation) can be mitigated with ECs (i.e., dust, odor and traffic controls). Other potential risks include material handling, electrical shock, general trip hazards, and noise. These potential impacts are addressed in the Site-specific HASP and CAMP and the SoMP, which detail monitoring during the remedial construction and describe ECs to be implemented as necessary (e.g., dust suppression and traffic control).

8.1.6 Implementability

This criterion is an evaluation of the technical and administrative feasibility of implementing an alternative or remedy.

The techniques, materials and equipment to implement all three remedial alternatives are readily available and have been proven effective in remediating the contaminants associated with the Site. Standard materials, services, and well-established technologies will be implemented. There are no specific difficulties associated with any of the activities proposed, which utilize standard construction methods.

8.1.7 Cost Effectiveness

This criterion is an evaluation of the overall cost effectiveness of an alternative or remedy.

The total cost for **Remedial Alternative 1** is estimated to be approximately $8,349,000 (no monitoring and reporting is required). The cost estimate details for Remedial Alternative 1 are provided in **Table 15**.

The total cost for Remedial **Alternative 2** is estimated to be approximately $5,493,700 with approximately $10,000/year for annual inspections and reporting in accordance with the SMP. The cost estimate details for Remedial Alternative 2 are provided in **Table 16**.

The total cost for Remedial **Alternative 3** is estimated to be approximately $4,584,700 with approximately $10,000/year for annual inspections and reporting in accordance with the SMP. The cost estimate details for Remedial Alternative 3 are provided in **Table 17**.

The costs associated with Remedial Alternative 1 are higher than Remedial Alternatives 2 and 3 due to the additional SOE, excavation, backfill materials, and offsite disposal that will be required to achieve Track 1 UUSCOs throughout the Site. However, there would be no long-term costs. Remedial Alternatives 2 and 3 include long-term costs associated with implementation of the SMP, which will likely be required to continue in perpetuity for the controlled Site.

8.1.8 Community Acceptance

This criterion is evaluated after the public review of the remedy selection process as part of the final NYSDEC selection/approval of a remedy for a site.

1. Any public comment relative to these criteria will be considered by NYSDEC after the close of the public comment period.
2. Documentation of the public comments received is to be consistent with the citizen participation plan identified for a remedial program in accordance with applicable DEC policy.

Although a full evaluation of this criterion cannot be made until after the public comment period is complete, it is expected that all alternatives will be equally as acceptable to the community because the Site will be remediated sufficiently for the planned residential use.

8.1.9 Land Use

This criterion is an evaluation of the current, intended, and reasonably anticipated future use of the Site and its surroundings, as it relates to an alternative or remedy, when unrestricted levels would not be achieved.

This evaluation has considered reasonably anticipated future uses of the Site and considers:

- Current use and historical and/or recent development patterns;
- Applicable zoning laws and maps;

- NYS Department of State's Brownfield Opportunity Areas (BOA) pursuant to section 970-r of the general municipal law;
- Applicable land use plans;
- Proximity to real property currently used for residential use, and to commercial, industrial, agricultural, and/or recreational areas;
- Environmental justice impacts, federal or state land use designations;
- Population growth patterns and projections;
- Accessibility to existing infrastructure;
- Proximity of the site to important cultural resources and natural resources, potential vulnerability of groundwater to contamination that might emanate from the site;
- Proximity to flood plains;
- Geography and geology; and
- Current ICs applicable to the Site.

All Remedial Alternatives are compatible with land use and zoning.

8.1.10 Green and Sustainable Remediation

Green and sustainable remediation practices are evaluated for the implementation of each remedial alternative or remedy. Each remedial alternative includes the excavation and offsite disposal of onsite soil exceeding the appropriate SCO and the collection of confirmation and/or documentation endpoint samples. The Track 4 Restricted Residential remedy includes a Site Cover System. The magnitude of water consumption, greenhouse gas emissions, renewable and non-renewable energy use, waste generation, and material use would be similar, differing slightly in the amount of greenhouse gas emissions, renewable and non-renewable energy use and waste generation. The Track 1 Unrestricted Use cleanup, which includes excavation and disposal of approximately 8,500 CY of soil, will produce the most greenhouse gas emissions and waste compared to Track 2 Restricted Residential Use cleanup and Track 4 Restricted Residential Use cleanup. The Track 4 Restricted Residential Use cleanup produces less greenhouse gas emissions and waste than the Track 1, while the Track 2 Restricted Residential Use Cleanup results in the least greenhouse gas emissions and waste generated. The Track 2 and Track 4 Restricted Residential Use cleanups produce less greenhouse gas emissions and waste than the Track 1 Unrestricted Use cleanup due to the reduced anticipated soil disposal volumes and duration to achieve the cleanup objective. The Track 2 and 4 Restricted Residential Use cleanup require no dewatering. None of the remedial alternatives include groundwater treatment or a vapor mitigation system that would require long-term energy use, maintenance, or monitoring. **Appendix D** includes tables and charts generated using Spreadsheets for Environmental Footprint Analyses SEFA for all three alternatives. The following is a summary of the estimated materials and waste produced, water used on-Site, energy used and air emissions for each of the remedial alternatives. It should be noted that only the remedial elements of the work were evaluated in this section, not the redevelopment, as it remains the same for all three remedial alternatives.

Core Elements	Metric	Unit of Measure	Track 1	Track 2	Track 4
Materials and Waste	Refined materials used on-site	Tons	0.0	0.0	0.0
	% of refined materials from recycled or reused material	%			
	Unrefined materials used on-site	Tons	333.672	73.672	1,273.672

Core Elements	Metric	Unit of Measure	Track 1	Track 2	Track 4
	% of unrefined materials from recycled or reused material	%	22.1%	100.0%	5.8%
	On-site hazardous waste disposed of off-site	Tons	0.0	0.0	0.0
	On-site non-hazardous waste disposed of off-site	Tons	12,750.0	6,225.5	1.725.0
	Recycled or reused waste	Tons	0.0	0.0	0.0
	% of total potential waste recycled or reused	%	0.0%	0.0%	0.0%
Water (used on-site)	Public water use	Millions of gallons (MG)	0.0	0.0	0.0
	Groundwater use	MG	0.3	0.0	0.0
	Surface water use	MG	0.0	0.0	0.0
	Reclaimed water use	MG	0.0	0.0	0.0
	Storm water use	MG	0.0	0.0	0.0
	User-defined water resource #1	MG	0.0	0.0	0.0
	User-defined water resource #2	MG	0.0	0.0	0.0
	Wastewater generated	MG	0.0	0.0	0.0
Energy	Total energy used (on-site and off-site)	Millions of British thermal units (MMBtu)	7,719.1	5,054.4	10,566.2
	Energy voluntarily derived from renewable resources	NA			
	On-site renewable energy generation or use + on-site biodiesel use + biodiesel and other renewable resource use for transportation	MMBtu	0.0	0.0	0.0
	Voluntary purchase of renewable electricity	Megawatt hours (MWh)	0.0	0.0	0.0
	Voluntary purchase of RECs	MWh	0.0	0.0	0.0
	On-site grid electricity use	MWh	0.000	0.000	0.000
Air	On-site NOx, SOx, and PM emissions	Pounds	3,462.5	2,348.3	1,791.2
	On-site HAP emissions	Pounds	1.2	0.8	0.6
	Total NOx, SOx, and PM emissions	Pounds	12,152.1	6,983.2	13,754.1
	Total NOx emissions	Pounds	5,661.9	3,550.6	5,549.4
	Total SOx emissions	Pounds	1,446.5	863.9	5,460.5
	Total PM emissions	Pounds	5,043.7	2,568.8	2,744.3
	Total HAP emissions	Pounds	84.5	53.7	492.1
	Total greenhouse gas emissions	Tons CO2e*	645.9	434.0	632.1

* Total greenhouse gases emissions (in carbon dioxide equivalents of global warming potential [CO2e]) include consideration of CO2, CH4, and N2O (nitrous oxide) emissions.

8.2 Selection of the Preferred Remedy

The Preferred Remedy for the Site, Remedial Alternative 1 Track 1 Unrestricted Use cleanup, was selected for implementation since it meets each of the evaluation criteria. In summary, the Preferred Remedy for the Site:

- Is protective of public health and the environment;
- Removes all soil with concentrations exceeding the UUSCOs across the entire Site;
- Provides the highest level of long-term effectiveness and permanence through removal of all soil exceeding UUSCOs across the entire Site;
- Reduces the toxicity, mobility, or volume of impacted material through removal of all soil exceeding UUSCOs across the entire Site;
- Is readily implemented;
- Should be acceptable to the community;
- Is compatible with land use; and
- Results in a reasonable level of GHG emissions similar to Remedial Alternative 2, but achieves a more protective cleanup.

The proposed remedial action for the Site (Remedial Action), presented in the following section, is consistent with the Preferred Remedy and the Track 1 Unrestricted Use scenario described in the Part 375 Regulations.

8.2.1 Zoning

The Site is located in an area zoned as M1-4/R9 and M1-4/R7-3. The site and the surrounding area are within the special purpose district MX-24, which permits side-by-side residential and non-residential uses. The construction of a 27-story mixed-use development is consistent with the current property zoning.

8.2.2 Applicable Comprehensive Community Master Plans or Land Use Plans

The site is within the Innovation QNS rezoning area, a major state and city priority for new housing.

The Site is slated for redevelopment into 560 rental apartments, 140 of which will be permanently affordable at an average of 60% Area Median Income (AMI). The building will be 27 stories in height and will include a ground floor retail and underground parking space for P.C. Richard, who currently operates a standalone store served by the surface parking lot.

By including replacement space for PC Richard, this project unlocks the development of an additional approximately 1,400 housing units, including at least ~350 permanently affordable units, on adjacent parcels. This project is among the first and largest projects proceeding under the new 485-x tax abatement, a critical program supporting multifamily housing production citywide.

8.2.3 Surrounding Property Use

A description of the surrounding property use is provided in Section 1.4.

8.2.4 Citizen Participation

Citizen participation has been and will continue to be pursued throughout the remedial process in accordance with the draft Citizen Participation Plan (CPP) for the Site (**Appendix E**), which was submitted to NYSDEC

on December 15, 2025, and resubmitted on January 8, 2026. Once the final version is approved by NYSDEC, it will replace the version in **Appendix E.**

8.2.5 Environmental Justice and Disadvantaged Community

According to the NYSDEC ArcGIS Webmap of Potential Environmental Justice Area, the Site is included as part of the Potential Environmental Justice Areas (PEJAs)s. As such, fact sheets will be translated to Spanish, Chinese, and Hindi to ensure that residents are informed of remedial activities at the Site. In addition, it is located in a Disadvantaged Community (DAC), which means a community "that bear[s] the burdens of negative public health effects, environmental pollution, impacts of climate change, and possess[es] certain socioeconomic criteria, or comprise[s] high-concentrations of low- and moderate-income households identified pursuant to section 75-0111" of the Environmental Conservation Law (ECL). ECL § 75-0101.5. Since the construction process will include safety measures to protect the public, such as a CAMP, and the redevelopment plan will include ECs if required, it is not expected to contribute to any disproportionate burden on the community in which the Site is located.

8.2.6 Land Use Designations

There are no federal or state land use designations related to the Site.

8.2.7 Population Growth Patterns

According to population growth patterns and projections, a potential future redevelopment of the Site into a mixed-use building that provides affordable/market rate residential housing, retail and parking, will be supportive of the growing community.

8.2.8 Accessibility to Existing Infrastructure

The Site's location is accessible to existing infrastructure.

8.2.9 Proximity to Cultural Resources

There are no cultural resources, including federal or state historic or heritage sites or Native American religious sites within ½ mile of the Site.

8.2.10 Proximity to Natural Resources

The Site is not located in, or adjacent to, regulated wetlands. The closest surface water body is Dutch Kills/Newtown Creek, located approximately 6,000 feet to the southwest

8.2.11 Groundwater Vulnerability

There are no known wellhead protection areas or specifically designated groundwater recharge areas in the vicinity of the Site. Groundwater flows to the west. Groundwater is not used as a source of drinking water.

8.2.12 Proximity to Floodplains

The Site is not located within the 100-year flood zone according to online Federal Emergency Management Act (FEMA) maps.

8.2.13 Current Institutional Controls

There are currently no ICs on the property.

8.3 Summary of Selected Remedial Actions

The elements of the Track 1 Unrestricted Use/ remedy (Figure 7) are:

1. Installation of support of excavation (SOE) to reach the proposed remedial excavation depths to meet Track 1 and prevent damage to adjacent offsite structures, including the NYCT subway tunnel and NYCDEP sewers. Since the remedial excavation depth is deeper than the redevelopment depth along the southern BCP Site boundary, additional SOE will be required to meet these depths.
2. Excavation and offsite disposal of approximately 8,500 in-place cubic yards (CY) of soil (i.e., all soil exceeding UUSCOs) over the entire Site to depths up to 22 ft bls to meet UUSCOs. The limits and approximate depths of remedial excavation are shown on **Figure 7**.
3. Dewatering, in compliance with city, state, and federal laws and regulations required to reach the remedial excavation depths. Extracted groundwater will either be containerized for offsite licensed or permitted disposal or will be treated on-Site as necessary and discharged to the municipal sewer system under a permit from New York City Department of Environmental Protection (NYCDEP), if applicable.
4. Collection and analysis of excavation bottom endpoint samples at a frequency of at least one per 900 square feet to evaluate the performance of the remedy with respect to attainment of Track 1 SCOs at the remedial excavation depth and to properly document the remaining onsite soil quality.
5. Collection and analysis of excavation sidewall endpoint samples at a frequency of one per 30 linear feet (and at least one per sidewall) at the portion of the Site proposed to be excavated to 22 ft bls (where the proposed remedial excavation depth is deeper than the proposed redevelopment depth). Sidewall samples are not required where excavations extend to the BCP site boundary or at other internal boundaries between endpoint sample grids, as there is no soil remaining on-Site.
6. Clean fill meeting the UUSCOs will be brought in to replace the excavated soil and establish the designed grades at the Site, if required.
7. A soil vapor intrusion evaluation will be completed based on the previously collected soil vapor data collected onsite. The evaluation will be summarized in the FER and include a desktop review of all onsite analytical data relative to the future uses of the property. Soil vapor intrusion is not a concern for the Site due to the relatively low concentrations observed during the RI, which for the most part indicated that no further action would be required based on the NYSDOH matrices. Only one of the nine RI samples indicated the potential need for monitoring or mitigation for just two compounds (ethylbenzene and m,p-xylene) and there were no exceedances of UUSCOs/PGWSCOs in soil or AWQSGVs in groundwater for these compounds. Additionally, between remedial and redevelopment excavation, all soil will be removed down to or several below the water table, a robust waterproofing membrane will be included as part of the building design and active vapor mitigation measures are not required.

Remedial activities will be performed at the Site in accordance with this NYSDEC-approved RAWP and the Department-issued Decision Document. All deviations from the RAWP and/or Decision Document will be promptly reported to NYSDEC for approval and fully explained in the FER.

9. Remedial Action Program

9.1 Governing Documents

9.1.1 Standards, Criteria, and Guidance (SCGs)

The following standards, criteria, and guidance will be consulted and adhered to throughout the Remedial Action as applicable:

- 6 NYCRR Part 364 – NYS Waste Transporter Permits
- 6 NYCRR Part 360 – NYS Solid Waste Management Requirements
- 6 NYCRR Part 371 – Identification and Listing of Hazardous Wastes
- 6 NYCRR Part 372 – Hazardous Waste Manifest System and Related Standards for Generators, Transporters and Facilities
- 6 NYCRR Part 375 – Environmental Remediation Programs (as amended December 31, 2025)
- 6 NYCRR Part 376 – Land Disposal Restrictions
- 29 CFR Part 1910.120 – Hazardous Waste Operations and Emergency Response
- CP-43 – Commissioner Policy on Groundwater Monitoring Well Decommissioning (December 2009)
- CP-49 – Climate Change and DEC Action (2022)
- CP-51 – Soil Cleanup Guidance (2010)
- DER-2 – Making Changes to Selected Remedies (April 2008)
- DER-10 – Technical Guidance for Site Investigation and Remediation (2010)
- DER-13 – Strategy for Evaluating Soil Vapor Intrusion at Remedial Sites in New York (2006)
- DER-23 – Citizen Participation Handbook for Remedial Programs (2010)
- DER-31 – Green Remediation (2010, Revised 2011)
- DER-32 – Brownfield Cleanup Program Applications and Agreements (2017)
- DER-33 – Guide to Drafting and Recording Institutional Controls (2010)
- TAGM 3028 – "Contained In" Criteria for Environmental Media: Soil Action Levels (August 1997)
- TOGS 1.1.1 – Ambient Water Quality Standards & Guidance Values and Groundwater Effluent Limitations (1998, Addenda 2000, 2004 and 2023)
- New York State Standards and Specifications for Erosion and Sediment Control (2016)
- New York State Department of Health (NYSDOH) Generic Community Air Monitoring Plan
- NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York (2006, Updated 2017 and 2024)
- New York State Climate Act (2019)
- NYSDEC Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (2023)

9.1.2 Green and Sustainable Remediation and Climate Resiliency

Green remediation principles and techniques will be implemented to the extent feasible in the design, implementation, and site management of the remedy as per DER-31. The major Green and Sustainable Remediation components are as follows:

- Considering the environmental impacts of treatment technologies and remedy stewardship over the long term;
- Reducing direct and indirect greenhouse gases, and other emissions;
- Increasing energy efficiency and minimizing use of non-renewable energy;
- Conserving and efficiently managing resources and materials;
- Reducing waste, increasing recycling, and increasing reuse of materials that would otherwise be considered a waste;
- Maximizing habitat value and creating habitat when possible, including maximizing the planting of trees, shrubs, and other carbon dioxide sinks in redevelopment;
- Fostering green and healthy communities and working landscapes that balance ecological, economic, and social goals;
- Integrating the remedy with the end use where possible and encouraging green and sustainable re-development; and
- Additionally, to incorporate green and sustainable remediation principles and techniques to the extent feasible in the future development at this site, any future onsite buildings shall be constructed, at a minimum, to meet the 2020 Energy Conservation Construction Code of New York (or most recent edition) to improve energy efficiency as an element of construction.

To evaluate the remedy with respect to green and sustainable remediation principles as part of the remedial design program, water consumption, greenhouse gas emissions, renewable and non-renewable energy use, waste reduction and material use estimation, and goals for the project related to these green and sustainable remediation metrics, as well as goals for minimizing community impacts, protecting habitats and natural and cultural resources, and promoting environmental justice, will be incorporated into the remedial design program, as appropriate.

The proposed redevelopment to be completed alongside the remediation will include a newly constructed building that will not utilize fossil fuel-powered boiler(s) for the Heating, Ventilation, and Air Conditioning (HVAC) systems. The newly constructed building will utilize electricity for both heating, ventilation and air conditioning (HVAC) and hot water and will result in no Site emissions. The proposed redevelopment and remediation of the Site will not have an adverse impact on any existing natural resources.

The Site is located within an urbanized area of Astoria. The Volunteer will be pursuing Leadership in Energy and Environment (LEED) Gold certification from the United States Green Building Council for the building. In addition, the building will include 3,481 square feet of green roof and a detention tank to control stormwater runoff.

To further incorporate green remediation principles and techniques to the extent feasible in the future development at this Site, any future onsite buildings will include, at a minimum, a 20-mil vapor barrier/waterproofing membrane on the foundation to improve energy efficiency as an element of construction.

Additionally, the American Society for Testing and Materials (ASTM) Standard Guide for Greener Cleanups will be taken into consideration during remediation implementation to minimize total energy use, air pollutants and greenhouse gas emissions, water use and impacts to water resources, recycling of materials and waste, and promote the protection of land and ecosystems.

In the FER, a Best Management Practices (BMPs) assessment and an environmental footprint analysis will be completed using an accepted environmental footprint analysis calculator such as SEFA (Spreadsheets for Environmental Footprint Analysis, USEPA), SiteWise™ (available in the Sustainable Remediation Forum [SURF] library), or a similar NYSDEC accepted tool. Further, progress with respect to green and sustainable remediation metrics will be tracked during implementation of the remedial action and reported in the FER, including a comparison to the goals established during the remedial design program.

9.1.3 Site Specific Health & Safety Plan (HASP)

The Site-specific HASP, including CAMP, is included in **Appendix F**. All remedial work performed under this plan will be in full compliance with governmental requirements, including Site and worker safety requirements mandated by the Federal Occupational Safety and Health Administration (OSHA).

The Volunteer and associated parties preparing the remedial documents submitted to the State and those performing the construction work, are completely responsible for the preparation of an appropriate HASP and for the performance of work according to that plan and applicable laws.

The HASP and requirements defined in this RAWP pertain to all remedial and invasive work performed at the Site until the issuance of a Certificate of Completion.

The Roux Site Safety Officer (SSO) will be determined prior to implementation of the remedial action. A resume will be provided to NYSDEC prior to the start of remedial construction.

Though unlikely to be required during implementation of the Remedial Action, confined space entry will comply with all OSHA requirements to address the potential risk posed by combustible and toxic gasses.

9.1.4 Quality Assurance Project Plan (QAPP)/Field Sampling Plan (FSP)

The QAPP/FSP (**Appendix G**) includes all procedures to be followed for sampling and analysis during the remedial action. The QAPP/FSP includes all requirements outlined in DER-10 Section 2.4.

9.1.5 Construction Quality Assurance Plan (CQAP)

QA/QC procedures for all construction activities associated with implementation of the remedial action construction are established in the Construction Quality Assurance Plan (CQAP), which is included in this section of the RAWP. The CQAP describes the Site-specific construction QA/QC measures that will be performed during remediation that will be implemented at the Site during implementation of the RAWP. The CQAP includes a program for construction observation and testing to verify performance of the remedial construction in accordance with the RAWP.

In general, the work to be addressed by this CQAP consists of the excavation and proper management/disposal of impacted soils.

9.1.5.1 Organization/Personnel

The implementation of the remedial action construction will be sequenced based on construction requirements, environmental considerations, and logistic limitations posed by the proximity of adjacent active retail store. The project team is comprised of the Volunteer (LMXD INNOQ B1 LLC and STEINWAY 1 OWNER LLC), contractors, and consultants specializing in one or more critical aspects of the project. It is understood by the project team that close coordination and proper sequencing of all activities occurring on the Site will be crucial to the success of the remediation. The project team and associated responsibilities are as follows. If changes are made to the project team, the CQAP will be amended.

Company	Project Role	Name (title)	Contact Info (email or phone)
LMXD INNOQ B1 LLC and STEINWAY 1 OWNER LLC	Volunteer	Katherine Kelman (Project Manager)	kkelman@lmxd.com (646-527-7224)
Congress Builders LLC	General Contractor/ Remedial Contractor	TBD	TBD
Roux	Environmental Consultant		
		Noelle Clarke, P.E. (Remedial Engineer)	nclarke@rouxinc.com (631) 232-2600
		Jack Rusk (Project Manager)	jrusk@rouxinc.com (631) 232-2600
		TBD (Field Team Leader)	(631) 232-2600
		David Kaiser (Quality Assurance Officer)	dkaiser@rouxinc.com (631) 232-2600
Montrose Surveying Co., LLP	Surveying Firm	Sona Peshtimaldjian (Manager)	sona@montrosesurveying.com (718) 849-0600
Eurofins TestAmerica	Environmental Laboratory	Melissa Haas (Project Manager)	melissa.hass@eurofins.net (203) 308-0880

9.1.5.2 LMXD INNOQ B1 LLC and STEINWAY 1 OWNER LLC (Volunteer) – Site Redevelopment and Regulatory Interaction

Katherine Kelman and Jay Martin, Redevelopment Project Manager

As LMXD INNOQ B1 LLC and STEINWAY 1 OWNER LLC's Project Managers for the Site will coordinate communications with regulatory agencies and will provide general oversight of all aspects of the remediation. LMXD INNOQ B1 LLC and STEINWAY 1 OWNER LLC will be responsible for the review and submission of all documents, reports, correspondence, etc., required by the RAWP and/or the BCA with the NYSDEC.

LMXD INNOQ B1 LLC and STEINWAY 1 OWNER LLC's Project Managers will be responsible for community notifications and addressing concerns with the adjacent property owners and local community on all remediation-related issues. LMXD INNOQ B1 LLC and STEINWAY 1 OWNER LLC will be immediately notified by the on-Site team of any complaints or concerns regarding the work raised by the adjacent property owners and or the general public.

9.1.5.3 General Contractor/Remedial Contractor – Congress Builders LLC

TBD - Project Manager

The General Contractor/Remedial Contractor will be responsible for the quality assurance of all of the tasks being implemented. The General Contractor will confirm that all components of the Site activities are conducted according to the requirements of the RAWP. The General Contractor will be responsible for verifying that the daily Site construction activities are in compliance with all of the safety requirements and regulations governing the Site activity; however, each subcontractor is responsible for the health and safety of their own personnel. The General Contractor will be responsible for managing the transportation and disposal of any contaminated waste and materials generated during the construction, including:

- Fill/Soil;
- Contaminated Concrete, Bricks or Other Construction Debris;
- Personal Protective Equipment and Other Miscellaneous Debris (If Any); and
- Construction Wastewater (If any).

The Remedial Contractor is responsible for the excavation and disposal of portions of the Site to the required depths, construction and demolition debris and all other contaminated wastes generated, transportation and disposal of non-contaminated construction and demolition debris (if any), and decontamination of equipment. The primary environmental obligations of the Remedial Contractor include safely managing all excavated materials, preventing the contaminated Site soils from being tracked off-Site, dust/odor control and decontamination equipment, as necessary.

9.1.5.4 Roux Environmental Engineering and Geology, D.P.C. – RAWP and Environmental Monitoring Compliance

Noelle Clarke, P.E. – Remedial Engineer
Jack Rusk –Project Manager
David Kaiser – Quality Assurance Officer
TBD – Field Manager/Site Safety Officer (SSO)

Roux will coordinate all Site activities being implemented to achieve the remedial objectives defined in the RAWP. Roux will provide continual review of all quality control measures implemented by the contractors to ensure compliance with the Site's remedial objectives and the Site-specific HASP. As such, Roux will provide oversight services for the duration of the remedial activities.

Roux will implement the Site-specific CAMP in accordance with the HASP. CAMP monitoring data will be reported daily to the SSO and will be maintained on-Site. Action level exceedances will be reported to the SSO, the Volunteer and General Contractor project managers and appropriate communication (with NYSDEC and NYSDOH) and action taken. All CAMP monitoring records will be included in the FER that will be submitted to the NYSDEC and NYSDOH and will include all of the CAMP data collected, daily monitoring station location maps, and copies of the action limit reports (if any). If an action limit report is generated, the NYSDEC and NYSDOH will be notified within 24 hours of the exceedance. A brief summary of CAMP activities, including any action limit reports generated, will be provided in the daily report.

The Quality Assurance Officer is responsible for conducting reviews, inspections, and audits to ensure the data collection is conducted in accordance with the QAPP/FSP. The Quality Assurance Officer reports to the Project Manager and makes independent recommendations to the field team.

All on-Site quality control persons identified in the CQAP will provide daily briefings and/or reports to Roux on-Site personnel, identifying the tasks completed, the remedial measures achieved, and any other issues of concern. Additionally, Ms. Noelle M. Clarke, the "Remedial Engineer," a professional engineer licensed in the State of New York, will be responsible for certifying that the remediation construction was completed in substantial conformance with the approved RAWP and/or any NYSDEC-approved field changes.

9.1.5.5 Environmental Laboratory

The need for an environmental laboratory is specific to soil end-point sampling and clean backfill sampling. The potential also exists for chemical-specific air sampling and analysis, though not currently planned. Eurofins TestAmerica will be utilized for all remediation construction-related analytical requirements. Eurofins TestAmerica is a NYSDOH ELAP certified laboratory. All results will be reported in electronic format deliverables prepared in accordance with NYSDEC requirements. Formal laboratory qualifications and QA/QC information packages for Eurofins TestAmerica and any other analytical laboratories proposed for the project will be submitted to the NYSDEC or disposal facilities, if requested.

9.1.5.6 TBD – Surveying Firm

Personnel to Be Determined, Construction Quality Control

A NYS-licensed surveying firm, will be contracted to provide lines, grades, boundaries, benchmarks, topographic surveys, as-built drawings, and any other survey work required for the proper execution and documentation of the work as required by the RAWP.

9.1.5.7 Waste Disposal Facilities

Waste from the Site will be transported to appropriately permitted waste disposal facilities. The waste disposal facilities selected for this project will be determined once the bidding process is completed.

If any is generated, non-impacted construction debris will be transported to a registered construction and demolition disposal facility.

9.1.5.8 Waste Transporter and Disposal Facility Qualifications

A qualifications package for each vendor contracted to transport waste from the Site to the designated soil disposal facilities and each designated disposal facility will be submitted to NYSDEC. The package will include the following:

- Proof of insurance and all current necessary waste transport permits for the waste type(s) being transported.
- Letters of commitment from all waste haulers and from all transfer, treatment, storage and disposal facilities to be used for the project. The letters of commitment shall specifically identify the types and quantities of waste that the facility will be able to accept, the permit numbers for all facilities at which the waste will be accepted and all waste characterization requirements, if additional to waste characterization samples already collected. In the event that a facility (such as a privately-owned treatment works) is prohibited from issuing a letter of commitment without a sample of the waste, a conditional-type letter will be acceptable. Such a conditional letter shall specifically state what types and quantities of waste the facility will accept.
    - For each waste hauler:
        - Name and federal and state identification numbers, as applicable;
        - Address;

        - Name of responsible contact for the hauler;
        - Telephone number for the contact;
        - List of types and sizes of all transport vehicles and equipment to be used;
        - A description of proposed transportation route, method and procedures for hauling waste material, including type of vehicles that will be used for each type of waste; and
        - Copies of any and all necessary permits and authorizations for each type of waste transported.
    - For each transfer, treatment, storage and disposal facility, the Contractor shall submit the following information:
        - Facility name and federal and state identification numbers;
        - Facility location;
        - Name of responsible contact for the facility;
        - Telephone number for contact;
        - Signed letter of agreement to accept waste;
        - Unit of measure utilized at facility for costing purposes; and
        - Copies of all permits, licenses, letters of approval, and other authorizations to operate, held by the proposed facility as they pertain to receipt, and management of waste derived from this Contract.

9.1.5.9 Construction Quality Control Testing

Implementation of quality control testing and measurement will be performed by the contractors conducting the specific Site tasks.

Qualifications of all independent environmental testing firms and laboratories will be submitted to Roux and the Volunteer for approval prior to any quality control testing and/or lab analysis as an obligation of this CQAP.

Specific task-driven testing/certification obligations as they relate to environmental aspects of the project are as follows:

- A New York State-licensed surveyor will conduct all of the necessary measurements and provide associated documentation to verify that the excavation limits are achieved.
- Waste characterization was completed concurrently with the RI. The *in situ* characterization sampling and analysis performed will allow the excavated impacted soils to be direct-loaded for waste transport and disposal, to the extent practicable. Waste characterization analysis parameters and frequency for any additional samples were determined by the waste disposal facility's acceptance requirements. Results of the waste characterization program completed to date at the Site will be provided to the disposal facility for review, along with data generated during the SRI.
- The CAMP requires continuous real-time monitoring of VOCs and particulates during all intrusive Site activities. This monitoring equipment will be inspected periodically throughout each day to check and manually record the concentrations of VOCs and particulates and to ensure that the equipment is working properly. The equipment will be repaired, recalibrated, or replaced, as necessary. The periodic measurements will be used to identify any potential risks of off-Site migration. This monitoring data will be collected and logged for review daily by Roux and made available for regulatory agency review. Action Limit Reports will be completed to document any and all action level exceedances and will be submitted to NYSDEC and NYSDOH, as defined in the CAMP.
- All testing data will be managed in accordance with the above requirements and will be included in the FER to be prepared by Roux upon completion of all remedial objectives defined in the RAWP.

9.1.5.10 Project Coordination

During implementation of the remedial action construction, progress meetings/conference calls will be conducted periodically to assess the progress of the work, overall progress to date, quality control requirements, environmental and construction health and safety requirements, and future progress expectations. Those in attendance will include representatives from the Volunteer, the General Contractor, Roux and other subcontractors, as necessary. This will provide the opportunity for all Site tasks to be integrated and discussed collectively and provide for coordination of all Site activities to maintain the overall construction schedule. Routine task meetings will also be conducted on an as-needed basis to insure proper communication between the contractors, tradesman, and supervisory personnel.

9.1.6 Soil/Materials Management Plan (SoMP)

Section 10.4 of this RAWP provides the SoMP to be implemented during the Remedial Action.

9.1.7 Stormwater Pollution Prevention Plan (SWPPP)

A SWPPP is required for the remedial action since the area of disturbance will be more than 20,000 square feet. A SWPPP has been prepared and approved by the NYCDEP in December 2025. A copy of the SWPPP is included in **Appendix H**.

9.1.8 Contractors Site Operations Plan (SOP)

The Remedial Engineer will review all plans and submittals for this remedial project (including those listed above and contractor and sub-contractor document submittals) and will confirm that they are in compliance with this RAWP. The Remedial Engineer is responsible to ensure that all later document submittals for this remedial project, including contractor and sub-contractor document submittals, are in compliance with this RAWP. All remedial documents will be submitted to NYSDEC and NYSDOH in a timely manner and prior to the start of work.

9.1.9 Citizen Participation Plan

No changes will be made to approved Fact Sheets authorized for release by NYSDEC without written consent of the NYSDEC. No other information, such as brochures and flyers, will be included with the Fact Sheet mailing. Fact sheets will be provided in English, Spanish, Chinese and Hindi. Fact sheets will be sent electronically by the NYSDEC project manager.

A certification of mailing will be sent by the Volunteer or its designated representative to the NYSDEC project manager following the distribution of all Fact Sheets and notices that includes: (1) certification that the Fact Sheets were mailed, (2) the date they were mailed; (3) a copy of the Fact Sheet; (4) a list of recipients (contact list); and (5) a statement that the repository was inspected on (specific date) and that it contained all of applicable project documents.

The draft Citizen Participation Plan for this project is attached in **Appendix E** and is pending NYSDEC approval.

Document repositories have been established at the following locations and contain all applicable project documents:

Queens Public Library at Broadway
40-20 Broadway
Astoria, NY 11103
Tel: 718-821-4770
lkierkosz@queenslibrary.org

Borough of Queens, Community Board 1
45-02 Ditmars Blvd., LL Suite 1025
Astoria, NY 11105
Tel: 718-786-3335
qn01@cb.nyc.gov

In addition, an electronic repository can be accessed via DECInfo Locator at the following link: https://extapps.dec.ny.gov/data/DecDocs/C241294/.

9.2 General Remedial Construction Information

9.2.1 Project Organization

The General Contractor for the Site is Congress Builders LLC of Larchmont, New York. The Remedial Contractor has not been selected to date. Once established, a listing of key personnel involved in the Remedial Action will be provided to the NYSDEC. A copy of professional profiles for the Project Principal/Remedial Engineer and Project Manager for Roux and the data validator are presented in **Appendix I**.

9.2.2 Remedial Engineer

The Remedial Engineer for this project will be Noelle Clarke, P. E. The Remedial Engineer is a registered professional engineer licensed by the State of New York. The Remedial Engineer will have primary direct responsibility for implementation of the remedial program for the project. The Remedial Engineer will certify in the FER that the remedial activities were observed by qualified environmental professionals under her supervision and that the remediation requirements set forth in the RAWP and any other relevant provisions of Environmental Conservation Law (ECL) 27-1419 have been achieved in full conformance with that Plan. Other Remedial Engineer certification requirements are listed later in this RAWP.

The Remedial Engineer will coordinate the work of other contractors and subcontractors involved in all aspects of remedial construction, including soil excavation, stockpiling, characterization, removal and disposal, air monitoring, emergency spill response services, import of back fill material, and management of waste transport and disposal. The Remedial Engineer will be responsible for all appropriate communication with NYSDEC and NYSDOH.

The Remedial Engineer will review all pre-remedial plans submitted by contractors for compliance with this RAWP and will certify compliance in the FER.

The Remedial Engineer will provide the certifications listed in the FER.

9.2.3 Remedial Action Construction Schedule

A schedule for the major elements of the remedial construction and portions of the redevelopment construction is presented in Section 16.

9.2.4 Work Hours

The hours for operation of remedial construction will conform to the New York City Department of Buildings construction code requirements or according to specific variances issued by that agency. NYSDEC will be notified by the Volunteer of any variances issued by the Department of Buildings. NYSDEC reserves the right to deny alternate remedial construction hours.

9.2.5 Site Security

Security for the work, equipment, materials, supplies, facilities, personnel, and incidentals will be provided throughout the performance of the work at the Site. The Site will be fully fenced with construction fencing conforming to New York City Department of Buildings requirements. This fencing will be maintained throughout the remedial construction work. Temporary fencing and barricades will be used to delineate and secure areas of ongoing remediation activities. Site security personnel will be employed as needed.

9.2.6 Traffic Control

All construction work will occur between 7 A.M. and 6 P.M. from Monday to Friday. The contractors may work longer hours and/or weekends, as permitted by the proper authorities. If work beyond these hours or on weekends is required, the proper authorities will be notified. Disturbances to the local community will be minimized to the extent practical.

For any trucking required, the proposed truck routes for ingress and egress to the Site are shown in **Figure 10**.

All trucks loaded with Site materials will exit the vicinity of the Site using only these approved truck routes. These are the most appropriate routes and take into account: (a) limiting transport through residential areas and past sensitive sites; (b) use of city mapped truck routes; (c) prohibiting offsite queuing of trucks entering the facility, to the extent practicable; (d) limiting total distance to major highways; (e) promoting safety in access to highways; and (f) overall safety in transport.

Trucks will be prohibited from stopping and idling in the neighborhood outside the project Site.

The contractors operating on the Site will be responsible for providing all necessary personnel and materials (i.e., traffic lanes, safety cones, etc.) to control traffic entering and exiting the Site and for coordinating traffic control measures with the New York City Police Department, as necessary. Contractors operating on the Site shall be responsible for all applicable New York city Department of Transportation (NYCDOT) traffic control and notification requirements and incorporating those elements into this Traffic Control Plan.

9.2.7 Contingency Plan

The Contingency Plan is described in Section 10.4.11.

9.2.8 Worker Training and Monitoring

All excavation work will be performed in accordance with the Site-specific HASP and CAMP. Removal of impacted soil will be performed by qualified contractors and trained personnel (Minimum 24HR OSHA Hazardous Waste Operations and Emergency Response [HAZWOPER]). In the unlikely event that a UST is found and removal of any such UST is required, work will be performed by a qualified contractor and trained personnel (Minimum 40HR OSHA HAZWOPER) in accordance with DER-10, NYSDEC PBS regulations and NYC Fire Department regulations.

9.2.9 Agency Approvals

The Volunteer will address all State Environmental Quality Review Act (SEQRA) requirements for this Site, as appropriate for the future redevelopment. All permits or government approvals required for remedial construction have been, or will be, obtained prior to the start of remedial construction.

The planned end use for the Site is in conformance with the zoning for the property as determined by New York City Department of Planning. A Certificate of Completion will not be issued for the project unless conformance with zoning designation is demonstrated.

A complete list of all local, regional and national governmental permits, certificates, or other approvals or authorizations required to perform the remedial work is attached in **Table 18**. This list includes a citation of the law, statute or code to be complied with, the originating agency, and a contact name and phone number in that agency. This list will be updated in the FER.

9.2.10 NYSDEC BCP Signage

A BCP project sign is not required for this Site.

9.2.11 Pre-construction Meeting with NYSDEC

A project kick-off meeting will be conducted with the Volunteer, Roux, NYSDEC, the General Contractor, and the selected Remedial Contractor prior to the commencement of any intrusive remedial activities proposed in this RAWP.

9.2.12 Emergency Contact Information

The Site-specific HASP (**Appendix F**) defines the specific project contacts for use by NYSDEC and NYSDOH in the case of a day or night emergency. Since the Remedial Contractor has not yet been selected, the emergency contact list will be prepared prior to the start of work and the HASP will be updated.

9.2.13 Remedial Action Costs

The total cost for Remedial Alternative 1 is estimated to be $8,349,000 with no annual operation, maintenance and reporting costs. An itemized and detailed summary of estimated costs for all remedial activity is attached as Table 15.

9.3 Site Preparation

9.3.1 Mobilization

Mobilization

The soil contractors shall supply any labor and materials required for the removal and disposal of contaminated soil. Mobilization and Site preparation activities include:

1. Mobilization of equipment to the work area.
2. Installation/maintenance of the perimeter construction fencing, temporary fencing and traffic barricades to delineate the work zone and act as a work Site security measure. Security personnel will be onsite as needed.
3. Implementation of erosion and sediment control measures in accordance with the New York Guidelines for Urban Erosion and Sediment Control and the SWPPP.
4. Set-up of stabilized construction entrance(s) and decontamination facilities.

9.3.2 Monitoring Well/Vapor Probe Decommissioning

Existing groundwater monitoring wells will be properly decommissioned in accordance with NYSDEC Commissioners Policy CP-43. The only exception to this is if the full length of the well is to be excavated during remediation.

Similarly, existing soil vapor probes will be fully removed during remediation.

9.3.3 Erosion and Sedimentation Controls

Soil erosion and sediment control measures for management of stormwater will be installed in accordance with the New York Guidelines for Urban Erosion and Sediment Control. As necessary, straw bales and/or silt fence will be placed by the remedial contractor at locations surrounding excavation areas, within the perimeter fencing, to control storm water runoff and surface water from entering or exiting the excavation. These control measures will be installed prior to initiating the soil excavation. Catch basin inlets immediately adjacent to the work area will be protected to prevent disturbed soil from entering.

Implementation of erosion and sediment controls will be in conformance with requirements presented in the New York State Guidelines for Urban Erosion and Sediment Control and the SWPPP. Construction water will be managed in accordance with the SoMP described in Section 10.4.7.

9.3.4 Stabilized Construction Entrance(s)

Stabilized construction entrances will be installed at all points of vehicle ingress and egress to the Site. The truck wash/decontamination pad (see Section 9.3.8) and the stone-based stabilized construction entrance(s) will be continuous so that trucks do not get re-contaminated prior to departure from the Site.

Any soil spilled on the sidewalk or street immediately adjacent to the Site will be promptly removed and the street will be cleaned.

9.3.5 Utility Marker and Easements Layout

The Volunteer and its contractors are solely responsible for the identification of utilities that might be affected by work under the RAWP and implementation of all required, appropriate, or necessary health and safety measures during performance of work under this RAWP. The Volunteer and its contractors are solely

responsible for safe execution of all invasive and other work performed under this RAWP. The Volunteer and its contractors must obtain any local, State or Federal permits or approvals pertinent to such work that may be required to perform work under this RAWP. Approval of this RAWP by NYSDEC does not constitute satisfaction of these requirements.

The presence of utilities and easements on the Site has been investigated by the Remedial Engineer. It has been determined that no risk or impediment to the planned work under this RAWP is posed by utilities or easements on the Site.

9.3.6 Structural Stability/Support of Excavation (SOE)

Appropriate management of structural stability of on-Site or off-Site structures during on-Site activities that include excavation is the sole responsibility of the Volunteer and its contractors. SOE has been designed as a critical part of the remedy to reach the required remedial and redevelopment excavation depths. The Volunteer and its contractors are solely responsible for safe execution of all invasive and other work performed under this RAWP. The Volunteer and its contractors must obtain any local, State or Federal permits or approvals that may be required to perform work under this RAWP. Further, the Volunteer and its contractors are solely responsible for the implementation of all required, appropriate, or necessary health and safety measures during performance of work under the approved RAWP.

9.3.7 Equipment and Material Staging

An equipment and materials staging area will be established in a designated area onsite.

9.3.8 Decontamination Area

A temporary decontamination pad/truck wash will be constructed to decontaminate trucks and other vehicles/equipment leaving the Site. The decontamination pad will be sized to accommodate the largest construction vehicle used and located prior to the stabilized construction egress. The decontamination pad may be integrated with the stabilized construction entrance. Dry decontamination will be employed to the extent practical, within a designated area of the Site. All liquid decontamination material will be collected and properly disposed of offsite or treated using an onsite treatment system prior to discharge to the New York City sewer system under a permit obtained from New York City Department of Environmental Protection(NYCDEP). The truck decontamination area/construction entrance will be adequately sloped toward the interior of the Site to prevent offsite tracking of soils.

9.3.9 Site Fencing

The Site will be fully enclosed with NYCDOB-approved construction fencing, which will be maintained during remedial construction. Security personnel will be provided, as necessary.

The fences and gates will be closed and locked when there is no activity on the Site and any breaks or gaps will be repaired immediately.

9.3.10 Demobilization

Demobilization from the Site will include:

- Removal and restoration of off-Site equipment and materials storage areas;
- Removal of all temporary fencing and barricades;

- Restoration of disturbed access areas to pre-remediation conditions, as appropriate;
- Removal of sediment and erosion control measures and disposal of materials in accordance with acceptable rules and regulations;
- Equipment decontamination, as required; and
- General refuse disposal.

9.4 Reporting

All daily and monthly Reports will be included in the FER.

9.4.1 Daily Reports

Daily reports will be submitted to NYSDEC and NYSDOH Project Managers by noon of each day following the reporting period and will include:

- An update of progress made during the reporting day;
- Locations of work and quantities of material imported and exported from the Site;
- References to alpha-numeric map for Site activities;
- A summary of any and all complaints with relevant details (names, phone numbers);
- A summary of CAMP results, including excursions;
- An explanation of notable Site conditions;
- A look ahead portion which describes immediate future work; and
- Photos of site activity.

Daily reports are not intended to be the mode of communication for notification to the NYSDEC of emergencies (accident, spill), requests for changes to the RAWP or other sensitive or time critical information. However, such conditions must also be included in the daily reports. Emergency conditions and changes to the RAWP will be addressed directly to NYSDEC Project Manager via personal communication.

These reports will include a summary of air sampling results, odor and dust problems and corrective actions, and all complaints received from the public.

A Site map for use in identifying locations described in reports submitted to NYSDEC is attached on **Figure 2**.

The NYSDEC assigned project number will appear on all reports.

9.4.2 Monthly Reports

Monthly reports will be submitted to NYSDEC and NYSDOH Project Managers by the 10th of the month following the end of the month of the reporting period and will include:

- Activities relative to the Site during the previous reporting period and those anticipated for the next reporting period, including a quantitative presentation of work performed (i.e., tons of material exported and imported, etc.);
- Description of approved activity modifications, including changes of work scope and/or schedule;
- Sampling results received following internal data review and validation, as applicable; and

- An update of the remedial schedule including the percentage of project completion, unresolved delays encountered or anticipated that may affect the future schedule, and efforts made to mitigate such delays.

9.4.3 Other Reporting

Photographs will be taken of all remedial activities and submitted to NYSDEC in digital (JPEG) format. Photos will illustrate all remedial program elements and will be of acceptable quality. Representative photos of the Site prior to any Remedial Actions will be provided. Representative photos will be provided of each contaminant source, source area and Site structures before, during and after remediation. Photos will be included in the daily reports as needed, and a comprehensive collection of photos will be included in the FER. Progress with respect to green and sustainable remediation metrics will be tracked during implementation of the remedial action and reported in the FER, including a comparison to the goals established during the remedial program. Regular updates to the metrics used (SEFA, SiteWise™ or otherwise approved method) should be included.

The Climate Screening process and results will be documented in the form of a completed checklist and brief letter report. If the Climate Screening results indicate that a Climate Vulnerability Assessment (CVA) is necessary, a complete CVA Report will be developed. The CVA Report will be included as an Appendix or Attachment in the FER and/or submitted as a standalone report.

Job-Site record keeping for all remedial work will be appropriately documented. These records will be maintained onsite at all times during the project and be available for inspection by NYSDEC and NYSDOH staff.

9.4.4 Complaint Management Plan

If an odor or dust complaint is received, the following procedure will be implemented:

1. Work in the affected area will be halted, and the source of odors/dust will be identified.
2. NYSDEC, NYSDOH, and the Volunteer will be notified of the complaint.
3. Nuisance odors, if any, will be abated through covering/containerizing excavated materials, backfilling open excavations in a timely manner; and/or using a foam unit or other appropriate measures.
4. As described in NYSDEC DER10, **Appendix 1B – Fugitive Dust and Particulate Monitoring**, nuisance dust, if any, will be abated through applying water on haul roads; wetting equipment and excavation faces; spraying water on buckets during excavation and dumping; hauling materials in properly tarped or watertight containers; restricting vehicle speeds to 10 mph; covering excavated areas and material after excavation activity ceases; and reducing the excavation size and/or number of excavations.
5. Work will resume in the affected area when the nuisance odors/dust have been abated, as determined by the Roux on-Site personnel.

9.4.5 Deviations from the Remedial Action Work Plan

Deviations from the RAWP will be reported to NYSDEC for approval and fully explained in the FER.

10. Remedial Action: Material Removal from Site

10.1 Soil Cleanup Objectives

The SCOs for this Site are listed in **Table 19**. The SCOs for this Site are UUSCOs for the proposed Track 1 Cleanup. If any part of the Site does not meet Track 1, the SCOs for the Track 2 or Track 4 Restricted Residential Use Cleanup will be the RRSCOs. In addition, for the Track 2 or Track 4 scenario, any backfill used on-Site will meet the lower of RRSCOs or PGWSCOS. Soil and materials management onsite and offsite will be conducted in accordance with the SoMP as described below.

Tables 2 through 7 present all soil samples that exceed the SCOs proposed for this Remedial Action. **Figure 4** shows all soil samples that exceed the SCOs proposed for this Remedial Action.

10.2 Remedial Performance Evaluation (Post Excavation Endpoint Sampling)

Endpoint sampling and reporting will be conducted in accordance with DER-10 and the QAPP/FSP and is discussed in the sections below.

A confirmation sample means a sample taken during the course of a remedial action to determine whether cleanup requirements have been achieved or whether further remediation is required. A documentation sample means a sample taken after remedial action is complete to document the level of contamination remaining. Since remedial excavation will be extended up to 22 ft bls in order to achieve the Track 1 Unrestricted Use Cleanup, only confirmation samples will be collected as part of the Remedial Action. However, if the remedy reverts to a Track 2 or Track 4, documentation samples will be collected as appropriate.

10.2.1 Endpoint Sampling Frequency

Bottom Sampling

Bottom confirmation sampling will be conducted at a frequency of at least one sample per approximately 900 square feet of excavation area (47 samples total). The frequency of bottom sampling proposed for this alternative is consistent with the guidance provided in NYSDEC DER-10 5.4.

Confirmation samples will be analyzed for the full suite of parameters (VOCs, SVOCs, metals, pesticides/herbicides, PCBs and Emerging Contaminants). In the event that Track 1 SCOs are not achieved in the areas shown on **Figure 7**, the remedy may default to a Track 2 or Track 4 restricted residential use cleanup in those areas.

A total of 47 bottom confirmation samples (BCS), identified as BCS-01 through BCS-47, will be collected at the Site as described in **Table 20**. Samples will be distributed throughout the Site and will be biased toward impacts, if any are observed.

Sidewall Sampling

It should be noted that the majority of the Site will be excavated to at least the depth of the deepest remedial excavation for redevelopment, with some areas extending deeper for elevator pits. The only exception is in the areas identified as requiring excavation to 22 ft bls. In these areas, the redevelopment excavation is approximately 20 ft bls. Therefore, there will be no soil remaining onsite at the remedial excavation depths

around the perimeter of the Site and there will be no internal sidewalls between the majority grids since no soil will remain, except in the area with proposed excavation to 22 ft bls. Therefore, eight internal sidewall samples will be collected around this area from 20-22 ft bls. If the sidewall samples exceed UUSCOs, remedial excavation will extend to the next grid and additional sidewall samples will be collected.

10.2.2 Methodology

Endpoint samples will be collected in accordance with DER-10 Section 5.4(b). Each sample will be inspected for visual evidence of contamination (i.e., staining, presence of petroleum or odors) and field screened for VOCs using a PID. Soil samples to be submitted for analysis will be placed in a laboratory sample jar, placed in an iced cooler and transported to the laboratory.

10.2.3 Reporting of Results

The laboratory will report analytical results for endpoint samples in analytical service protocol (ASP) Category B deliverable packages. An Electronic Data Deliverable (EDD) in the required NYSDEC format will also be provided by the laboratory.

All endpoint sample data generated for the Remedial Action will be logged in a database and organized to facilitate data review and evaluation. The electronic dataset will include the data flags provided in accordance with USEPA Laboratory Data Validation Functional Guidelines for Evaluating Organic Analysis and Inorganic Analyses, as well as additional comments of the data review for ASP analyses. The data flags include such items as: 1) concentration below required detection limit; 2) estimated concentration due to poor recovery below required detection limit; 3) estimated concentration due to poor spike recovery; and 4) concentration of chemical also found in laboratory blank.

10.2.4 QA/QC

QA/QC samples serve as checks on both the sampling and measurement systems and assist in determining the overall data quality with regard to representation, accuracy, and precision. The QAPP/FSP, included as **Appendix G** to this RAWP, describes QA/QC procedures and sampling for the project.

10.2.5 DUSR and EDDs

A DUSR will be prepared to evaluate the endpoint samples by a party independent from the laboratory performing the analysis in accordance with Appendix 2B of DER-10. The QAPP/FSP, included as **Appendix G** to this RAWP, describes the DUSR to be prepared for the project.

10.2.6 Reporting of Endpoint Data in FER

Chemical laboratories used for all endpoint sample results will be NYSDOH Environmental Laboratory Approval Program (ELAP) certified. The FER will provide a tabular and map summary of all endpoint sample results and exceedances of SCOs.

10.3 Estimated Material Removal Quantities

The proposed remedial action includes remedial excavation to a maximum depth of 22 ft bls and offsite disposal of a total of approximately 8,500 in-place CY of soil across the Site to achieve a Track 1 Unrestricted Use cleanup. The proposed excavation depths are shown on **Figure 7.** It should be noted that in the south/central portion of the Site, the estimated excavation depths are based on a combination of the existing

RI soil quality results and the observation of urban fill to depths of 19 ft bls during the waste characterization sampling. In addition, refusal was encountered at several locations during the waste characterization sampling and there was fill present down to the refusal depth. The bottom confirmation endpoint samples will be used to determine the final excavation depths. If UUSCOs are exceeded in any endpoint sample, excavation will continue another two feet in that grid (taking into account any practical limitations including needing to extend support of excavation) and a new sample will be collected. This process will continue until either UUSCOS are met or the practical limitations of the excavation are reached, at which point the remedy in that area will revert to a Track 2 or Track 4 Restricted Residential cleanup, depending on depth and the sample results.

As part of the RI field implementation, Roux completed waste characterization sampling for all soil proposed for excavation and offsite disposal. Based on the waste characterization analytical results, the soil/fill to be disposed of offsite was characterized to be non-hazardous.

10.4 Soil/Materials Management Plan

The following sections provide the SoMP to be implemented during the Remedial Action.

10.4.1 Soil Screening Methods

Visual, olfactory, and PID soil screening and assessment will be performed by a qualified environmental professional or experienced field scientist under the direction of the Remedial Engineer during all remedial and development excavations into known or potentially contaminated material. Soil screening will be performed regardless of when the invasive work is done and will include all excavation and invasive work performed during the remedy, prior to issuance of the Certificate of Completion (COC).

All primary contaminant sources (including but not limited to tanks and hotspots) identified during Site Characterization, RI, and Remedial Action will be surveyed by a surveyor licensed to practice in the State of New York. This information will be provided on maps in the FER.

Resumes will be provided for all personnel responsible for field screening (i.e., those representing the Remedial Engineer) of invasive work for unknown contaminant sources during remediation and development work.

10.4.2 Stockpile Methods

Although direct loading of trucks will be performed to the extent practical, stockpiles, if any, will be inspected at a minimum once each week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by NYSDEC. At a minimum, a storm event should be considered a rainfall of three inches or greater in 12 hours.

Stockpiles, if any, will always be kept covered with appropriately anchored tarps when not actively used. Stockpiles will be routinely inspected, and damaged tarp covers will be promptly replaced.

Soil stockpiles, if any, will be continuously encircled with silt fences or straw bales. Straw bales will be used as needed near catch basins and other discharge points.

Water will be available onsite at suitable supply and pressure for use in dust control.

10.4.3 Materials Excavation and Load Out

A qualified environmental professional as defined in 6 NYCRR Part 375, a PE (Remedial Engineer) who is licensed and registered in New York State, or a qualified person who directly reports to a PE (Remedial Engineer) who is licensed and registered in New York State will oversee all invasive work and the excavation and load-out of all excavated material.

The presence of utilities and easements on the Site has been investigated by the Remedial Engineer. It has been determined that no risk or impediment to the planned work under this RAWP is posed by utilities or easements on the Site.

Loaded vehicles leaving the Site will be appropriately lined, tarped, securely covered, manifested, and placarded in accordance with appropriate Federal, State, local, and NYSDOT requirements (and all other applicable transportation requirements).

Vehicles leaving the Site will not be overloaded. The Remedial Engineer's representative will make reasonable efforts to ensure that vehicles are not loaded beyond their NYSDOT weight rating and that all material is secured beneath the truck bed cover.

A truck wash will be operated onsite. The qualified environmental professional, the Remedial Engineer or a qualified individual that is a direct report to the Remedial Engineer will be responsible for ensuring that all outbound trucks will be washed at the truck wash before leaving the Site until the remedial construction is complete.

Locations where vehicles enter or exit the Site shall be inspected daily for evidence of offsite sediment tracking.

The Remedial Engineer, qualified environmental professional, or a qualified individual that is a direct report to the Remedial Engineer will be responsible for ensuring that all egress points for truck and equipment transport from the Site will be clean of dirt and other materials derived from the Site during Site remediation and development. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to Site derived materials.

The Volunteer and associated parties preparing the remedial documents submitted to the State, and parties performing this work, are completely responsible for the safe performance of all invasive work, the structural integrity of excavations, and for structures that may be affected by excavations (such as building foundations and bridge footings).

The Remedial Engineer will ensure that Site development activities will not interfere with, or otherwise impair or compromise, remedial activities proposed in this RAWP.

Development-related grading cuts and fills will not be performed without NYSDEC approval and will not interfere with, or otherwise impair or compromise, the performance of remediation required by this plan.

Mechanical processing of historical fill and contaminated soil onsite is prohibited, unless NYSDEC has specifically approved onsite processing.

All primary contaminant sources (including but not limited to tanks and hotspots) identified during Site Characterization, RI, and Remedial Action will be surveyed by a surveyor licensed to practice in the State of New York. The survey information will be shown on maps to be reported in the FER.

10.4.4 Materials Transport Offsite

All transport of materials will be performed by licensed haulers in accordance with appropriate local, State, and Federal regulations, including 6 NYCRR Part 364. Haulers will be appropriately licensed and trucks properly placarded.

All trucks loaded with Site materials will exit the vicinity of the Site using only these approved truck routes.

Proposed in-bound and out-bound truck routes to the Site are shown in **Figure 10**. This is the most appropriate route and takes into account: (a) limiting transport through residential areas and past sensitive sites; (b) use of city mapped truck routes; (c) prohibiting offsite queuing of trucks entering the facility; (d) limiting total distance to major highways; (e) promoting safety in access to highways; and (f) overall safety in transport.

Trucks will be prohibited from stopping and idling in the neighborhood outside the project Site.

Egress points for truck and equipment transport from the Site will be kept clean of dirt and other materials during Site remediation and development.

Queuing of trucks will be performed onsite in order to minimize offsite disturbance. Offsite queuing will be prohibited.

Material transported by trucks exiting the Site will be secured with tight-fitting covers. Loose-fitting canvas or mesh truck covers will be prohibited. If loads contain wet material capable of producing free liquid, truck liners will be used.

All trucks will be washed prior to leaving the Site. Truck wash waters will be collected and disposed of offsite in an appropriate manner.

10.4.5 Materials Disposal Offsite

The disposal locations will be determined prior to implementation of the remedial action and will be reported to the NYSDEC Project Manager.

The total remedial quantity of material expected to be disposed offsite is approximately 8,500 in-place CY of soil exceeding UUSCOs down to 22 ft bls across the Site.

All soil/fill/solid waste excavated and removed from the Site will be treated as contaminated and regulated material and will be disposed in accordance with all local, State (including 6NYCRR Part 360) and Federal regulations. If disposal of soil/fill from this Site is proposed for unregulated disposal (i.e., clean soil removed for development purposes), a formal request with an associated plan will be made to NYSDEC's Project Manager. Unregulated off-Site management of materials from this Site is prohibited without formal NYSDEC approval.

Material that does not meet Track 1 UUSCOs is prohibited from being taken to a New York State recycling facility (6NYCRR Part 360-15 Registration Facility).

The following documentation will be obtained and reported by the Remedial Engineer for each disposal location used in this project to fully demonstrate and document that the disposal of material derived from the Site conforms with all applicable laws: (1) a completed disposal facility application for each receiving facility describing the material to be disposed and requesting formal written acceptance of the material. This application will state that material to be disposed is contaminated material generated at an environmental remediation Site in New York State. The application will provide the project identity. The application will include as an attachment a summary of all chemical data for the material being transported (including Site Characterization data); and (2) a letter from all receiving facilities stating it is in receipt of the correspondence (above) and is approved to accept the material. These documents will be included in the FER.

Historical fill and contaminated soils from the Site are prohibited from being disposed at Part 360-15 Registration Facilities (also known as Soil Recycling Facilities).

Soils that are contaminated but non-hazardous and are being removed from the Site are considered by the Division of Materials Management (DMM) in NYSDEC to be Construction and Demolition (C/D) materials with contamination not typical of virgin soils. These soils may be sent to a permitted Part 360 landfill. They may be sent to a permitted C/D processing facility without permit modifications only upon prior notification of NYSDEC Region 2 DMM. This material is prohibited from being sent or redirected to a Part 360-15 Registration Facility. In this case, as dictated by DMM, special procedures will include, at a minimum, a letter to the C/D facility that provides a detailed explanation that the material is derived from a DER remediation Site, that the soil material is contaminated and that it must not be redirected to on-Site or off-Site Soil Recycling Facilities. The letter will provide the project identity and the name and phone number of the Remedial Engineer. The letter will include as an attachment a summary of all chemical data for the material being transported.

The Final Engineering Report will include an accounting of the destination of all material removed from the Site during this Remedial Action, including excavated soil, contaminated soil, urban fill, solid waste, non-regulated material, and fluids. Documentation associated with disposal of all material must also include records and approvals for receipt of the material. This information will also be presented in a tabular form in the FER.

A Bill of Lading system or equivalent will be used for off-Site movement of non-hazardous wastes and contaminated soils. This information will be reported in the Final Engineering Report.

Appropriately licensed haulers will be used for material removed from this Site and will be in full compliance with all applicable local, State and Federal regulations.

Waste characterization was performed for off-Site disposal in a manner suitable to a variety of common receiving facilities and their applicable permits. Sampling and analytical methods, sampling frequency, and analytical results will be reported in the FER. All data available for soil/material to be disposed at a given facility must be submitted to the disposal facility with suitable explanation prior to shipment and receipt.

10.4.6 Materials Reuse Onsite

Although not planned, onsite soil may be reused for backfill. In the event this occurs, chemical criteria for onsite reuse of material has been approved by NYSDEC. These criteria are listed in **Table 19**. The Remedial Engineer will ensure that procedures defined for materials reuse in this RAWP are followed and that unacceptable material will not remain onsite.

A “Request to Import/Reuse Fill Material” form will be filed with the NYSDEC project manager for review and approval prior to material reuse on the site. A copy of the form is presented in **Appendix J**.

Concrete crushing or processing onsite is prohibited, unless NYSDEC has specifically approved onsite processing and reuse of acceptable demolition material.

Organic matter (wood, roots, stumps, etc.) or other solid waste is prohibited for reuse onsite.

Contaminated onsite material, including contaminated fill material and contaminated soil, removed for grading or other purposes will not be reused within a cover soil layer (if required), within landscaping berms, or as backfill for subsurface utility lines.

10.4.7 Fluids Management

Construction wastewater will be generated from dewatering to reach proposed excavation depths, personnel/equipment decontamination and run-off/run-on in bermed soil stockpile and excavation areas. The wastewater will be sampled and submitted for analysis for disposal/discharge characterization. Based on the laboratory analytical results, the construction wastewater will be discharged (after treatment, if necessary) to the public sewer system, if approved in writing by the NYCDEP.

All liquids to be removed from the Site, including dewatering fluids, will be handled, transported and disposed in accordance with applicable local, State, and Federal regulations. Liquids discharged into the New York City sewer system will be addressed through approval by NYCDEP.

Dewatered fluids will not be recharged back to the land surface or subsurface of the Site.

Discharge of water generated during remedial construction to surface waters will not take place.

10.4.8 Demarcation (Contingency)

Engineering Controls are not currently required for the Track 1 Unrestricted Use cleanup, however, should any part of the Site default to a Track 4 Restricted Residential Use cleanup, a land survey will be completed by a New York State licensed surveyor to define the top elevation of residual contaminated soils in the Track 4 Remedial area(s). A physical demarcation layer, consisting of the underside of the impervious surface systems (concrete or pavers), and orange snow fence or a geotextile layer, or equivalent, in landscaped areas will provide a visual reference. This demarcation layer will constitute the top of the ‘Residuals Management Zone,’ the zone that requires adherence to special conditions for disturbance of contaminated residual soils defined in the SMP. The survey will measure the grade covered by the demarcation layer before the placement of cover soils, pavement and sub-soils, structures, or other materials. This survey and the demarcation layer placed on this grade surface will constitute the physical and written record of the upper surface of the ‘Residuals Management Zone’ in the SMP. A map showing the survey results will be included in the FER and the SMP, if applicable.

10.4.9 Backfill from Offsite Sources

Approximately 260 cy of backfill meeting UUSCOs will be required to backfill the excavation areas to 22 ft bls that are deeper than the redevelopment depth. All materials proposed for import onto the Site will be approved by the Remedial Engineer and will be in compliance with provisions in this RAWP prior to receipt at the Site. Clean fill meeting the requirements of 6 NYCRR Part 375-6.7(d) and DER-10, section 5.4(e) will

be brought in to replace the excavated soil and establish the designed grades at the Site. Any backfill requiring sampling will be analyzed for the full suite of Part 375 parameters and Emerging Contaminants.

Solid waste, material from industrial sites, spill sites, other environmental remediation sites or other potentially contaminated sites will not be imported to the Site. Material from other environmental remediation sites will not be imported to the Site without prior approval of NYSDEC.

The FER will include the following certification by the Remedial Engineer: *"I certify that all import of soils from offsite, including source evaluation, approval and sampling, has been performed in a manner that is consistent with the methodology defined in the Remedial Action Work Plan."*

All imported soil will meet NYSDEC approved backfill or cover soil quality objectives for this Site listed in **Table 19**. These NYSDEC approved backfill or cover soil quality objectives for proposed Track 1 Unrestricted Use cleanup are the UUSCOs. If any part of the Site does not meet Track 1, the SCOs for the Track 2 or Track 4 Restricted Residential Use Cleanup will be the RRSCOs. In addition, for the Track 2 or Track 4 scenario, any backfill used on-Site will meet the lower of RRSCOs or PGWSCOS. Non-compliant soil will not be imported onto the Site without prior approval by NYSDEC. Nothing in the approved RAWP or its approval by NYSDEC should be construed as an approval for this purpose.

A "Request to Import/Reuse Fill Material" form will be filed with the NYSDEC project manager for review and approval prior to import to the site. A copy of the form is presented in **Appendix J**.

10.4.10 Stormwater Pollution Prevention

A SWPPP is required for the remedial action since the area of disturbance will be more than 20,000 square feet. A SWPPP has been prepared and approved by the NYCDEP in December 2025. A copy of the SWPPP is included in **Appendix H**.

10.4.11 Contingency Plan

In the unlikely event that underground tanks or other previously unidentified contaminant sources are found during onsite remedial excavation, sampling will be performed on product, sediment and surrounding soils, etc. Chemical analytical work will be for full suite of parameters (VOCs, SVOCs, metals, pesticides, PCBs, and Emerging Contaminants), or a more limited list as approved by NYSDEC. Analyses will not be otherwise limited without NYSDEC approval. Discovery of underground storage tanks will be handled in accordance with NYSDEC DER-10, Section 5.5.

Identification of unknown or unexpected contaminated media identified by screening during invasive Site work will be promptly communicated by phone to NYSDEC's Project Manager. These findings will also be included in daily and monthly reports and in the FER.

10.4.11.1 Extreme Storm Preparedness and Response Contingency Plan

Damage from flooding or storm surge can include dislocation of soil and stockpiled materials, dislocation of site structures and construction materials and equipment, and dislocation of SOE structures. Damage from wind during an extreme storm event can create unsafe or unstable structures, damage safety structures and cause downed power lines creating dangerous site conditions and loss of power. In the event of emergency conditions caused by an extreme storm event, the Volunteer will undertake the following steps for site preparedness prior to the event and response after the event.

10.4.11.1.1 Storm Preparedness

Preparations in advance of an extreme storm event will include the following: containerized hazardous materials and fuels will be removed from the property; loose materials will be secured to prevent dislocation and blowing by wind or water; heavy equipment such as excavators and generators will be removed from excavated areas, trenches and depressions on the property to high ground or removed from the property; an inventory of the property with photographs will be performed to establish conditions for the site and equipment prior to the event; stockpile covers for soil and fill will be secured by adding weights such as sandbags for added security and worn or ripped stockpile covers will be replaced with competent covers; stockpiled hazardous wastes will be removed from the property; stormwater management systems will be inspected and fortified, including, as necessary: clean and reposition silt fences, straw bales; clean storm sewer filters and traps; and secure and protect pumps and hosing.

10.4.11.1.2 Storm Response

At the conclusion of an extreme storm event, as soon as it is safe to access the property, a complete inspection of the property will be performed. A site inspection report will be submitted to NYSDEC at the completion of site inspection and after the site security is assessed. Site conditions will be compared to the inventory of site conditions and material performed prior to the storm event and significant differences will be noted. Damage from storm conditions that result in acute public safety threats, such as downed power lines or imminent collapse of buildings, structures or equipment will be reported to public safety authorities via appropriate means such as calling 911.

Petroleum spills will be reported to NYSDEC within two hours of identification and consistent with State regulations. Public safety structures, such as construction security fences will be repaired promptly to eliminate public safety threats. Debris will be collected and removed.

Dewatering will be performed in compliance with existing laws and regulations and consistent with emergency notifications, if any, from proper authorities. Eroded areas of soil including unsafe slopes will be stabilized and fortified. Dislocated materials will be collected and appropriately managed. SOE structure will be inspected and fortified as necessary. Impacted stockpiles will be contained and damaged stockpile covers will be replaced. Stormwater control systems and structures will be inspected and maintained as necessary.

If soil or fill materials are discharged off site to adjacent properties, property owners and NYSDEC will be notified, and corrective measure plan designed to remove and clean dislocated material will be submitted to NYSDEC and implemented following approval by NYSDEC and granting of site access by the property owner. Impacted offsite areas may require characterization based on site conditions, at the discretion of NYSDEC.

If onsite petroleum spills are identified, a qualified environmental professional will determine the nature and extent of the spill and report to NYSDEC's spill hotline at (800) 457-7362 within statutory defined timelines. If the source of the spill is ongoing and can be identified, it should be stopped if this can be done safely. Potential hazards will be addressed immediately, consistent with guidance issued by NYSDEC.

10.4.11.1.3 Storm Response Reporting

A site inspection report will be submitted to NYSDEC at the completion of site inspection. Site conditions will be compared to the inventory of site conditions and material performed prior to the storm event and significant

differences will be noted. The site inspection report will be sent to the NYSDEC project manager and will include the site name, address, tax block and lot, site primary and alternate contact name and phone number.

Damage and soil release assessment will include: whether the project had stockpiles; whether stockpiles were damaged; photographs of damage and notice of plan for repair; report of whether soil from the site was dislocated and whether any of the soil left the site; estimates of the volume of soil that left the site, nature of impact, and photographs; description of erosion damage; description of equipment damage; description of damage to the remedial program or the construction program, such as damage to the SOE; presence of onsite or offsite exposure pathways caused by the storm; presence of petroleum or other spills and status of spill reporting to NYSDEC; description of corrective actions; schedule for corrective actions.

This report should be completed and submitted to NYSDEC project manager with photographs within 24 hours of the time of safe entry to the property after the storm event.

10.4.12 Community Air Monitoring Plan

CAMP will be conducted during any intrusive activities until the Track 1 Unrestricted Use cleanup remedial excavation is complete to a maximum depth of 22 ft bls. The CAMP is included as an appendix within the HASP in **Appendix F**. A map showing the location of mobile sampling stations will be provided in each daily CAMP report.

Exceedances observed in the CAMP will be reported to NYSDEC and NYSDOH Project Managers and included in the daily report.

10.4.13 Odor, Dust and Nuisance Control Plan

The FER will include the following certification by the Remedial Engineer: *"I certify that all invasive work during the remediation and all invasive development work were conducted in accordance with dust and odor suppression methodology defined in the Remedial Action Work Plan."*

10.4.13.1 Odor Control Plan

This odor control plan is capable of controlling emissions of nuisance odors offsite. Specific odor control methods to be used on a routine basis will include limiting open excavation areas and covering excavated soil (i.e., with polyethylene sheeting or in covered roll off containers). If nuisance odors are identified, work will be halted, and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. NYSDEC and NYSDOH will be notified of all odor events and of all other complaints about the project. Implementation of all odor controls, including the halt of work, will be the responsibility of the Volunteer's Remedial Engineer, who is responsible for certifying the FER.

All necessary means will be employed to prevent on- and offsite nuisances. At a minimum, procedures will include: (a) limiting the area of open excavations; (b) shrouding open excavations with tarps and other covers; and (c) using foams to cover exposed odorous soils. If odors develop and cannot be otherwise controlled, additional means to eliminate odor nuisances will include: (d) use of chemical odorants in spray or misting systems; and (e) use of staff to monitor odors in surrounding neighborhoods.

Where odor nuisances have developed during remedial work and cannot be corrected, or where the release of nuisance odors cannot otherwise be avoided due to onsite conditions or close proximity to sensitive

receptors, odor control will be achieved by sheltering excavation and handling areas under tented containment structures equipped with appropriate air venting/filtering systems.

10.4.13.2 Dust Control Plan

A dust suppression plan that addresses dust management during invasive on-Site work, will include, at a minimum, the items listed below and will comply with NYSDEC DER-10 Appendix 1B – Fugitive Dust and Particulate Monitoring:

- Dust suppression will be achieved through applying water on haul roads; wetting equipment and excavation faces; spraying water on buckets during excavation and dumping; hauling materials in properly tarped or watertight containers; restricting vehicle speeds to 10 mph; covering excavated areas and material after excavation activity ceases; and reducing the excavation size and/or number of excavations.
- Clearing and grubbing will be done in stages to limit the area of exposed, unvegetated soils vulnerable to dust production.
- Gravel will be used on roadways to limit dust generation.

10.4.13.3 Other Nuisances

A plan for rodent control will be developed and utilized by the contractor prior to and during Site clearing and Site grubbing, and during all remedial work.

A plan will be developed and utilized by the contractor for all remedial work and will conform, at a minimum, to NYCDEP noise control standards.

11. Residual Contamination to Remain Onsite

The goal of the remedial action for this Site is a Track 1 Unrestricted Use cleanup and therefore ECs/ICs are not required to protect human health and the environment.

Should any part of the Site default to a Track 4 Restricted Residential Use cleanup ECs would be required to protect human health and the environment in those areas. In the case of a Track 2 Restricted Residential cleanup, long-term management of ICs and of residual contamination would be executed under a Site-specific SMP that will be developed and included in the FER. In the case of a Track 4 Restricted Residential cleanup, long-term management of EC/ICs and of residual contamination would be executed under a Site-specific SMP that will be developed and included in the FER. If needed, the FER will report remaining contamination on the Site in tabular and map form.

12. Engineering Controls

As a Track 1 Unrestricted Use remedy (with a fall back to Track 2 Restricted Residential Use if Track 1 is not met) is planned for the Site, Engineering Controls are not required.

However, should any part of the Site default to a Track 4 Restricted Residential Use cleanup, an EC in the form of a Site cover system would be completed in the those area(s) as part of this RAWP. The Site cover system would be comprised of concrete pavers or other hardscapes, concrete covered sidewalks/walkways, building slab, and landscaped areas with a minimum of two feet of cover in the Track 4 Remedial Area(s). The Site cover system would be underlain by a demarcation layer consisting of the underside of the concrete pavers or other hardscapes, concrete covered sidewalks/walkways, building slab or orange snow fence material, and filter fabric or approved equivalent to provide a visual reference above residual contamination. Clean stone or soil used for the cover system would be in compliance with procedures defined for material import in the SoMP and will meet NYSDEC-approved cover soil quality objectives for this Site.

A map showing the aerial distribution of each of the cover types to be built at the Site is included in Figure 9A. A diagram showing the design detail for each cover type is shown in Figure 9B.

An Excavation Plan would be included in the Site Management Plan and would outline the procedures to be followed if the site cover system and underlying residual contamination are disturbed after the Remedial Action is complete.

The components of the site cover system would be documented in the FER. Maintenance of this site cover system would be described in the SMP.

13. Criteria for Completion of Remediation/Termination of Remedial Systems

The selected remedy is a Track 1 Unrestricted Use cleanup and therefore no ECs are required. The remediation will be considered complete once excavation and offsite disposal of soil exceeding UUSCOs to a maximum depth of 22 ft bls and the collection of post-excavation confirmation soil samples is complete.

A soil vapor intrusion evaluation will be completed based on the soil vapor data previously collected onsite. The evaluation will be summarized in the FER and include a desktop review of all onsite analytical data relative to the future uses of the property. Soil vapor intrusion is not a concern for the Site due to the relatively low concentrations observed during the RI, which for the most part indicated that no further action would be required based on the NYSDOH matrices. Only one of the nine RI samples indicated the potential need for monitoring or mitigation for just two compounds (ethylbenzene and m,p-xylene) and there were no exceedances of UUSCOs/PGWSCOs in soil or AWQSGVs in groundwater for these compounds. Additionally, between remedial and redevelopment excavation, all soil will be removed down to or several below the water table, a robust waterproofing membrane will be included as part of the building design and active vapor mitigation measures are not required.

If any part of the Site defaults to a Track 4 Restricted Residential cleanup, the Site cover system would be an EC, and the quality and integrity of this EC would be inspected at defined, regular intervals in perpetuity, and would be maintained as described in the SMP.

14. Institutional Controls

The selected remedy is a Track 1 Unrestricted Use cleanup and therefore no ICs are required.

Should any part of the Site default to a Track 2 or Track 4 Restricted Residential Use cleanup, that part of the Site would have soils exceeding RRSCOs remaining in place. In the event the Site defaults to a Track 4 Restricted Residential Use cleanup, ECs have been incorporated into the Remedial Action to render the Site remedy protective of public health and the environment. If the remedy defaults to either Track 2 or Track 4 Restricted Residential cleanup, elements have been designed to ensure continual and proper management of soils that exceed RRSCOs in perpetuity: an Environmental Easement and a SMP.

A Site-specific Environmental Easement would be recorded with Queens County to provide an enforceable means of ensuring the continual and proper management of soils that exceed RRSCOs and protection of public health and the environment. It would require the grantor of the Environmental Easement and the grantor's successors and assigns to adhere to all ECs/ICs placed on this Site by this NYSDEC-approved remedy. ICs provide restrictions onsite usage and mandate operation, maintenance, and reporting measures for all ECs and ICs. The SMP would describe appropriate methods and procedures to ensure compliance with all ECs and ICs that are required by the Environmental Easement. Once the SMP has been approved by the NYSDEC, compliance with the SMP would be required by the grantor of the Environmental Easement and grantor's successors and assigns.

14.1 Environmental Easement

An Environmental Easement, as defined in Article 71 Title 36 of the Environmental Conservation Law, is required when soils exceeding RRSCOs are left onsite after the Remedial Action is complete. As part of this Remedial Action, for any portion of the Site that achieved a Track 2 or Track 4 Restricted Residential cleanup, an Environmental Easement approved by NYSDEC would be filed and recorded with the Queens County Clerk. If this occurs, the Environmental Easement would be submitted as part of the FER.

The Environmental Easement would render the Site a Controlled Property. The Environmental Easement:

1. requires the remedial party or Site owner to complete and submit to the NYSDEC a periodic certification of ICs and ECs in accordance with Part 375-1.8 (h)(3);
2. allows the use and development of the controlled property for restricted residential, commercial, or industrial use as defined by Part 375-1.8(g), although land use is subject to local zoning laws; and
3. requires compliance with the Department approved SMP.

The Environmental Easement must be recorded with the Queens County Clerk before the Certificate of Completion can be issued by NYSDEC. In the event the Site defaults to a Track 2 or Track 4 Restricted Residential Use cleanup, a series of ICs would be required under this remedy to implement, maintain and monitor the ECs. These ICs are requirements or restrictions placed on the Site that are listed in and required by the Environmental Easement. ICs can, generally, be subdivided between controls that support ECs, and those that place general restrictions onsite usage or other requirements. ICs in both of these groups are closely integrated with the SMP, which provides all of the methods and procedures to be followed to comply with this remedy.

The ICs that support ECs are:

- Compliance with the Environmental Easement by the Grantee and the Grantee's successors and adherence of all elements of the SMP is required;
- All ECs must be operated and maintained as specified in this SMP;
- All ECs on the Controlled Property must be inspected and certified at a frequency and in a manner defined in the SMP;
- Data and information pertinent to Site Management for the Controlled Property must be reported at the frequency and in a manner defined in the SMP; and
- ECs may not be discontinued without an amendment or extinguishment of the Environmental Easement.

Adherence to these ICs for the Site would be mandated by the Environmental Easement and will be implemented under the SMP (discussed in the next section). The Controlled Property (Site) would also have a series of ICs in the form of Site restrictions and requirements. The Site restrictions that would apply to the Controlled Property are:

- Vegetable gardens and farming on the Controlled Property are prohibited, with the exception of raised planters;
- Use of groundwater underlying the Controlled Property is prohibited without treatment rendering it safe for intended purpose;
- All future activities on the Controlled Property that will disturb soil that exceed RRSCOs are prohibited unless they are conducted in accordance with the soil management provisions in the SMP;
- The Controlled Property may be used restricted residential use only, provided the long-term ECs and ICs included in the SMP are employed; and
- The Controlled Property may not be used for a higher level of use without an amendment or extinguishment of this Environmental Easement.
- Grantor agrees to submit to NYSDEC a written statement that certifies, under penalty of perjury, that: (1) controls employed at the Controlled Property are unchanged from the previous certification or that any changes to the controls were approved by the NYSDEC; and (2) nothing has occurred that impairs the ability of the controls to protect public health and environment or that constitute a violation or failure to comply with the SMP. NYSDEC retains the right to access such Controlled Property at any time in order to evaluate the continued maintenance of any and all controls. This certification shall be submitted annually, or an alternate period of time that NYSDEC may allow. This annual statement must be certified by an expert that the NYSDEC finds acceptable.

14.2 Site Management Plan

If Track 1 UUSCOs are not met across the Site, Site management for the Controlled Property is the last phase of remediation and begins with the approval of the FER and issuance of the COC for the Remedial Action. Site Management would be conducted as described below. The SMP would be a complete and independent document. Site Management continues in perpetuity or until released in writing by NYSDEC. The property owner is responsible to ensure all Site Management responsibilities defined in the Environmental Easement and the SMP are performed. The SMP should include methods to incorporate and track green and sustainable remediation. Measures should be taken to maintain a cost-effective, protective remedy that remains conscientious of the Site's environmental footprint. At a minimum, the following should be assessed: waste generation, energy usage, emissions, and water usage.

The SMP is intended to provide a detailed description of the procedures required to manage remaining contamination left in place at the Controlled Property following completion of the Remedial Action in accordance with the BCA with the NYSDEC. This includes: (1) development, implementation, and management of all ECs and ICs; and (2) submittal of Site Management Reports, performance of inspections and certification of results, and demonstration of proper communication of Site information to NYSDEC.

The SMP would include the following:

a. an IC and EC Plan that identifies all use restrictions and details the steps and media-specific requirements necessary to ensure the following ICs and/or ECs remain in place and effective:
    i. ICs: The Environmental Easement discussed in Section 14.1.
    ii. Soil Management Plan: This plan includes, but may not be limited to:
        - an Excavation Plan that details the provisions for management of future excavations in areas of remaining contamination;
        - descriptions of the provisions of the environmental easement including any land use and groundwater use restrictions;
        - a provision for evaluation of the potential for soil vapor intrusion for any future buildings on the Site, including provision for implementing actions recommended to address exposures related to soil vapor intrusion;
        - maintaining Site access controls and Department notification; and
        - the steps necessary for the periodic reviews and certification of the ICs and/or ECs.
b. A Monitoring Plan to assess the performance and effectiveness of the remedy, including, if necessary, monitoring for vapor intrusion for any buildings constructed on the Site.

Site management activities, reporting, and EC/IC certification would be scheduled on a certification period basis. The certification period would be annually. The first certification would be due 16 months after issuance of the COC and annually (or at another frequency as approved by NYSDEC) thereafter.

No exclusions for handling of remaining contaminated soils would be provided in SMP. All handling of remaining contaminated material would be subject to provisions contained in the SMP.

15. Final Engineering Report

A FER will be submitted to NYSDEC following implementation of the Remedial Action defined in this RAWP. The FER provides documentation that the remedial work required under this RAWP has been completed and has been performed in compliance with this plan. The FER will provide a comprehensive account of the locations and characteristics of all material removed from the Site including the surveyed map(s) of all sources. The FER will include as-built drawings for all constructed elements, certifications, manifests, and bills of lading. The FER will provide a description of the changes in the Remedial Action from the elements provided in the RAWP. The FER will provide a tabular summary of all performance evaluation sampling results and all material characterization results and other sampling and chemical analysis performed as part of the Remedial Action. The FER will provide test results demonstrating that all mitigation and remedial systems are functioning properly. The FER will be prepared in conformance with DER-10, Section 5.8.

The FER will include written and photographic documentation of all remedial work performed under this remedy.

The FER will provide a thorough summary of all residual contamination left on the Site after the remedy is complete. Residual contamination includes all contamination that exceeds the Track 1 Unrestricted Use SCO in 6 NYCRR Part 375-6. A table that shows exceedances from Track 1 Unrestricted SCOs for all soil/fill remaining at the Site after the Remedial Action and a map that shows the location and summarizes exceedances from Track 1 Unrestricted SCOs for all soil/fill remaining at the Site after the Remedial Action will be included in the FER.

The FER will provide a thorough summary of all residual contamination that exceeds the SCOs defined for the Site in the RAWP and must provide an explanation for why the material was not removed as part of the Remedial Action. A table that shows residual contamination in excess of Site SCOs and a map that shows residual contamination in excess of Site SCOs will be included in the FER.

The FER will include an accounting of the destination of all material removed from the Site, including excavated contaminated soil, historic fill, solid waste, hazardous waste, non-regulated material, and fluids. Documentation associated with disposal of all material must also include records and approvals for receipt of the material. It will provide an accounting of the origin and chemical quality of all material imported onto the Site.

The FER must include a discussion of the green remediation practices/technologies employed throughout the remedial program. A final footprint analysis using a DER accepted model, and any tracking methods used through the construction including restoration activities. Before approval of a FER and issuance of a COC, all project reports must be submitted in digital form on electronic media (PDF).

Where determined to be necessary by NYSDEC, a Financial Assurance Plan will be required to ensure the sufficiency of revenue to perform long-term operations, maintenance and monitoring tasks defined in the Site Management Plan and Environmental Easement. This determination will be made by NYSDEC in the context of the FER review.

The FER will include an itemized tabular description of actual costs incurred during all aspects of the Remedial Action.

15.1 Certifications

The certification of the Final Engineering Report will be as presented in the most current FER template with no changes or modifications. The FER will be prepared, stamped and signed by a NYS licensed and registered P.E. authorized in accordance with article 145 of the education law to practice the profession of engineering.

16. Schedule

A schedule for the proposed Remedial Action is presented below.

Timeframe	Description
April 2025	Submit BCP Application and RIWP
November 2025	Execute BCA
November 2025	NYSDEC Approves RIWP
December 2025	Submit CPP (Revision submitted in January 2026)
December 2025	Remedial Investigation Implementation
January 2026	Submit RIR and RAWP
June to September 2026	Implement Approved RAWP
June 2026	Submit Environmental Easement (in case Track 1 is not achieved)
August 2026	Submit Draft SMP (in case Track 1 is not achieved)
October 2026	Submit Draft FER and Approvable SMP
November 2026	Submit Approvable Final Engineering Report and Record Easement (if required)
December 2026	Receive Certificate of Completion

TABLES

1. Groundwater Gauging Data
2. Summary of VOCs in Soil Samples
3. Summary of SVOCs in Soil Samples
4. Summary of Metals in Soil Samples
5. Summary of PCBs in Soil Samples
6. Summary of Pesticides and Herbicides in Soil Samples
7. Summary of PFAS in Soil Samples
8. Summary of VOCs in Groundwater Samples
9. Summary of SVOCs in Groundwater Samples
10. Summary of Metals in Groundwater Samples
11. Summary of PCBs in Groundwater Samples
12. Summary of Pesticides and Herbicides in Groundwater Samples
13. Summary of Per- and Polyfluoroalkyl Substances in Groundwater
14. Summary of VOCs in Soil Vapor
15. Remedial Alternative 1 Remedial Cost Estimate
16. Remedial Alternative 2 Remedial Cost Estimate
17. Remedial Alternative 3 Remedial Cost Estimate
18. List of Required Permits
19. Remedial Soil Cleanup Objectives
20. List of Documentation Endpoint Samples

Table 1. Summary of Groundwater Gauging Data, 35-18 Steinway Street, Astoria, Queens, New York

Monitoring Well Identification	Gauging Date	Land Surface Elevation (ft NAVD 88)	Top of PVC Riser Elevation (ft NAVD 88)	Depth to Water (ft btoc)	Water Table Elevation (ft NAVD 88)
RMW-1	12/18/2025	38.70	38.47	18.23	20.24
RMW-2	12/18/2025	40.74	39.79	19.47	20.32
RMW-3	12/18/2025	39.28	38.96	19.00	19.96
RMW-4	12/18/2025	41.5	41.3	21.22	20.08
RMW-5	12/18/2025	40.64	39.72	19.47	20.25

Notes:
All monitoring well casings installed within flush-mount manways.
ft= feet
NAVD 88= North American Vertical Datum of 1988
btoc= below top of casing

Notes Utilized Throughout Tables	
Soil Tables	
J -	Estimated value
U -	The analyte was analyzed for, but was not detected above the level of the associated reported quantitation limit
B -	The analyte was found in an associated blank as well as in the sample
H -	Sample was prepped or analyzed beyond the specified holding time
T -	Indicates that a quality control parameter has exceeded laboratory limits
P -	Concentration difference between the primary and confirmation column >40%. The lower result is reported
ft bls -	Feet below land surface
FD -	Duplicate sample
mg/kg -	Milligrams per kilogram
µg/kg -	Micrograms per kilogram
NYSDEC -	New York State Department of Environmental Conservation
SCO -	Soil Cleanup Objectives
--	No SCO available
Bold data indicates that parameter was detected above the NYSDEC Part 375 Unrestricted Use SCO	
Shaded data indicates that parameter was detected above the NYSDEC Part 375 Residential SCO	
Red data indicates that parameter was detected above the NYSDEC Part 375 Restricted Residential SCO	
Groundwater Tables	
J -	Estimated Value
U -	The analyte was analyzed for, but was not detected above the level of the associated reported quantitation limit
EMPC -	The results do not meet all criteria for a confirmed identification. The quantitative value represents the Estimated Maximum Possible Concentration of the analyte in the sample
FD -	Duplicate
µg/L -	Micrograms per liter
NYSDEC -	New York State Department of Environmental Conservation
AWQSGVs -	Ambient Water-Quality Standards and Guidance Values
--	No NYSDEC AWQSGV available
Bold data indicates that parameter was detected above the NYSDEC AWQSGVs	
Soil Vapor/Ambient Air	
J -	Estimated value
U -	The analyte was analyzed for, but was not detected above the level of the associated reported quantitation limit
D -	Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte
FD -	Duplicate sample
ug/m3 -	Micrograms per cubic meter
Bold data indicates that parameter was detected	

Table 2. Summary of Volatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-1	RSB-1	RSB-1	RSB-1
				Sample Date:	12/01/2025	12/01/2025	12/01/2025	12/02/2025
				Sample Depth (ft bls):	0 - 2	2 - 4	4 - 6	20 - 22
				Normal Sample or Field Duplicate:	N	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
1,1,1-Trichloroethane (TCA)	0.68	100	0.68	MG/KG	0.00027 U	0.00032 U	0.00022 U	0.00024 U
1,1,2,2-Tetrachloroethane	--	--	--	MG/KG	0.00061 U	0.00072 U	0.0005 U	0.00053 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	MG/KG	0.00035 UT	0.00042 UT	0.00029 UT	0.00031 U
1,1,2-Trichloroethane	--	--	--	MG/KG	0.00071 U	0.00083 U	0.00057 U	0.00061 U
1,1-Dichloroethane	0.27	47	0.27	MG/KG	0.0007 U	0.00082 U	0.00057 U	0.00061 U
1,1-Dichloroethene	0.24	0.98	0.33	MG/KG	0.00026 U	0.00031 U	0.00021 U	0.00023 U
1,2,3-Trichlorobenzene	--	--	--	MG/KG	0.00087 U	0.001 U	0.0007 U	0.00075 U
1,2,4-Trichlorobenzene	--	--	--	MG/KG	0.00042 U	0.00049 U	0.00034 U	0.00036 U
1,2,4-Trimethylbenzene	5.9	100	5.9	MG/KG	0.00029 U	0.00034 U	0.00023 U	0.00025 U
1,2-Dibromo-3-Chloropropane	--	--	--	MG/KG	0.00054 U	0.00064 U	0.00044 U	0.00047 U
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	MG/KG	0.00059 U	0.0007 U	0.00048 U	0.00051 U
1,2-Dichlorobenzene	1.1	100	1.1	MG/KG	0.00042 U	0.0005 U	0.00034 U	0.00037 U
1,2-Dichloroethane	0.02	5.8	0.02	MG/KG	0.00035 U	0.00041 U	0.00028 U	0.0003 U
1,2-Dichloropropane	--	--	--	MG/KG	0.0005 U	0.00058 U	0.0004 U	0.00043 U
1,3,5-Trimethylbenzene (Mesitylene)	3.1	100	3.1	MG/KG	0.00037 U	0.00043 U	0.0003 U	0.00032 U
1,3-Dichlorobenzene	2.6	38	2.6	MG/KG	0.00043 U	0.0005 U	0.00035 U	0.00037 U
1,4-Dichlorobenzene	1.8	24	1.8	MG/KG	0.00061 U	0.00072 U	0.00049 U	0.00053 U
2-Hexanone	--	--	--	MG/KG	0.002 U	0.0024 U	0.0016 U	0.0017 U
Acetone	**0.03**	100	0.03	MG/KG	0.014 J+	0.022 J+	0.014 J+	0.012 J+
Benzene	0.06	3.7	0.06	MG/KG	0.00067 U	0.00078 U	0.00054 U	0.00058 U
Bromochloromethane	--	--	--	MG/KG	0.0007 U	0.00082 U	0.00057 U	0.00061 U
Bromodichloromethane	--	--	--	MG/KG	0.0003 U	0.00035 U	0.00024 U	0.00026 U
Bromoform	--	--	--	MG/KG	0.0005 U	0.00059 U	0.00041 U	0.00043 U
Bromomethane	--	--	--	MG/KG	0.0012 U	0.0014 U	0.00095 U	0.001 U
Carbon Disulfide	--	--	--	MG/KG	0.00031 U	0.00037 U	0.00025 U	0.00027 U
Carbon Tetrachloride	0.76	7.1	0.76	MG/KG	0.00045 U	0.00053 U	0.00037 U	0.00039 U
Chlorobenzene	4.5	100	4.5	MG/KG	0.0006 U	0.0007 U	0.00048 U	0.00052 U
Chloroethane	--	--	--	MG/KG	0.00061 U	0.00072 U	0.0005 U	0.00053 U
Chloroform	0.37	24	0.37	MG/KG	0.0011 U	0.0013 U	0.00093 U	0.00099 U
Chloromethane	--	--	--	MG/KG	0.00051 U	0.0006 U	0.00041 U	0.00044 U
Cis-1,2-Dichloroethylene	0.19	41	0.19	MG/KG	0.00042 U	0.00049 U	0.00034 U	0.00036 U
Cis-1,3-Dichloropropene	--	--	--	MG/KG	0.00032 U	0.00038 U	0.00026 U	0.00028 U

Table 2. Summary of Volatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	RSB-1	RSB-1	RSB-1	RSB-1
Sample Designation:					RSB-1	RSB-1	RSB-1	RSB-1
Sample Date:					12/01/2025	12/01/2025	12/01/2025	12/02/2025
Sample Depth (ft bls):					0 - 2	2 - 4	4 - 6	20 - 22
Normal Sample or Field Duplicate:					N	N	N	N
Cyclohexane	--	--	--	MG/KG	0.00026 U	0.00031 U	0.00021 U	0.00023 U
Dibromochloromethane	--	--	--	MG/KG	0.00063 U	0.00074 U	0.00051 U	0.00055 U
Dichlorodifluoromethane	--	--	--	MG/KG	0.0004 U	0.00047 U	0.00032 U	0.00034 U
Ethylbenzene	1	76	1	MG/KG	0.00055 U	0.00065 U	0.00045 U	0.00048 U
Isopropylbenzene (Cumene)	--	--	--	MG/KG	0.00033 U	0.00039 U	0.00027 U	0.00029 U
m,p-Xylene	0.26	100	1.2	MG/KG	0.0005 U	0.00058 U	0.0004 U	0.00043 U
Methyl Acetate	--	--	--	MG/KG	0.0051 U	0.0059 U	0.0041 U	0.0044 U
Methyl Ethyl Ketone (2-Butanone)	0.1	100	0.1	MG/KG	0.00043 U	0.00051 U	0.00035 U	0.0029 J
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	MG/KG	0.0018 U	0.0021 U	0.0015 U	0.0016 U
Methylcyclohexane	--	--	--	MG/KG	0.00059 U	0.00069 U	0.00048 U	0.00051 U
Methylene Chloride	0.05	81	0.05	MG/KG	0.0013 U	0.0016 U	0.0011 U	0.0012 U
N-Butylbenzene	18	100	18	MG/KG	0.00035 U	0.00041 U	0.00028 U	0.0003 U
N-Propylbenzene	5	100	5	MG/KG	0.00053 U	0.00062 U	0.00043 U	0.00046 U
O-Xylene (1,2-Dimethylbenzene)	0.26	100	1.2	MG/KG	0.00054 U	0.00064 U	0.00044 U	0.00047 U
Sec-Butylbenzene	25	100	25	MG/KG	0.00034 U	0.0004 U	0.00027 U	0.00029 U
Styrene	--	--	--	MG/KG	0.00033 U	0.00038 U	0.00026 U	0.00028 U
T-Butylbenzene	11	100	11	MG/KG	0.00032 U	0.00038 U	0.00026 U	0.00028 U
Tert-Butyl Methyl Ether	0.1	100	0.1	MG/KG	0.0006 U	0.00071 U	0.00049 U	0.00052 U
Tetrachloroethylene (PCE)	1.3	18	1.3	MG/KG	0.00036 U	0.00042 U	0.00029 U	0.00031 U
Toluene	0.7	100	0.7	MG/KG	0.00028 U	0.00032 U	0.00022 U	0.00024 U
Trans-1,2-Dichloroethene	0.19	100	0.19	MG/KG	0.00029 U	0.00034 U	0.00023 U	0.00025 U
Trans-1,3-Dichloropropene	--	--	--	MG/KG	0.00031 U	0.00037 U	0.00025 U	0.00027 U
Trichloroethylene (TCE)	0.47	6.4	0.47	MG/KG	0.00038 U	0.00044 U	0.00031 U	0.00033 U
Trichlorofluoromethane	--	--	--	MG/KG	0.00048 U	0.00056 U	0.00039 U	0.00041 U
Vinyl Chloride	0.03	0.48	0.03	MG/KG	0.00064 U	0.00075 U	0.00052 U	0.00056 U
Xylenes	0.26	100	1.2	MG/KG	0.0002 U	0.00024 U	0.00017 U	0.00018 U

Table 2. Summary of Volatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

			Sample Designation:		RSB-2	RSB-2	RSB-2	RSB-2
			Sample Date:		12/01/2025	12/01/2025	12/01/2025	12/01/2025
			Sample Depth (ft bls):		0 - 2	1 - 3	1 - 3	3 - 5
			Normal Sample or Field Duplicate:		N	N	FD	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
1,1,1-Trichloroethane (TCA)	0.68	100	0.68	MG/KG	0.00027 U	0.00024 U	0.00023 U	0.00023 U
1,1,2,2-Tetrachloroethane	--	--	--	MG/KG	0.00061 U	0.00053 U	0.00051 U	0.00051 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	MG/KG	0.00035 UT	0.00031 UT	0.0003 UT	0.0003 UT
1,1,2-Trichloroethane	--	--	--	MG/KG	0.00071 U	0.00061 U	0.00059 U	0.00059 U
1,1-Dichloroethane	0.27	47	0.27	MG/KG	0.0007 U	0.00061 U	0.00059 U	0.00059 U
1,1-Dichloroethene	0.24	0.98	0.33	MG/KG	0.00026 U	0.00023 U	0.00022 U	0.00022 U
1,2,3-Trichlorobenzene	--	--	--	MG/KG	0.00087 U	0.00075 U	0.00073 U	0.00073 U
1,2,4-Trichlorobenzene	--	--	--	MG/KG	0.00042 U	0.00036 U	0.00035 U	0.00035 U
1,2,4-Trimethylbenzene	5.9	100	5.9	MG/KG	0.00029 U	0.00025 U	0.00024 U	0.00024 U
1,2-Dibromo-3-Chloropropane	--	--	--	MG/KG	0.00054 U	0.00047 U	0.00045 U	0.00045 U
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	MG/KG	0.00059 U	0.00051 U	0.0005 U	0.0005 U
1,2-Dichlorobenzene	1.1	100	1.1	MG/KG	0.00042 U	0.00037 U	0.00035 U	0.00036 U
1,2-Dichloroethane	0.02	5.8	0.02	MG/KG	0.00035 U	0.0003 U	0.00029 U	0.00029 U
1,2-Dichloropropane	--	--	--	MG/KG	0.0005 U	0.00043 U	0.00042 U	0.00042 U
1,3,5-Trimethylbenzene (Mesitylene)	3.1	100	3.1	MG/KG	0.00037 U	0.00032 U	0.00031 U	0.00031 U
1,3-Dichlorobenzene	2.6	38	2.6	MG/KG	0.00043 U	0.00037 U	0.00036 U	0.00036 U
1,4-Dichlorobenzene	1.8	24	1.8	MG/KG	0.00061 U	0.00053 U	0.00051 U	0.00051 U
2-Hexanone	--	--	--	MG/KG	0.002 U	0.0017 U	0.0017 U	0.0017 U
Acetone	**0.03**	100	0.03	MG/KG	0.026 J+	0.011 J+	0.024 J+	**0.042 J+**
Benzene	0.06	3.7	0.06	MG/KG	0.00067 U	0.00058 U	0.00056 U	0.00056 U
Bromochloromethane	--	--	--	MG/KG	0.0007 U	0.00061 U	0.00059 U	0.00059 U
Bromodichloromethane	--	--	--	MG/KG	0.0003 U	0.00026 U	0.00025 U	0.00025 U
Bromoform	--	--	--	MG/KG	0.0005 U	0.00043 U	0.00042 U	0.00042 U
Bromomethane	--	--	--	MG/KG	0.0012 U	0.001 U	0.00098 U	0.00099 U
Carbon Disulfide	--	--	--	MG/KG	0.00031 U	0.00027 U	0.00026 U	0.00026 U
Carbon Tetrachloride	0.76	7.1	0.76	MG/KG	0.00045 U	0.00039 U	0.00038 U	0.00038 U
Chlorobenzene	4.5	100	4.5	MG/KG	0.0006 U	0.00052 U	0.0005 U	0.0005 U
Chloroethane	--	--	--	MG/KG	0.00061 U	0.00053 U	0.00051 U	0.00051 U
Chloroform	0.37	24	0.37	MG/KG	0.0011 U	0.00099 U	0.00095 U	0.00096 U
Chloromethane	--	--	--	MG/KG	0.00051 U	0.00044 U	0.00043 U	0.00043 U
Cis-1,2-Dichloroethylene	0.19	41	0.19	MG/KG	0.00042 U	0.00036 U	0.00035 U	0.00035 U
Cis-1,3-Dichloropropene	--	--	--	MG/KG	0.00032 U	0.00028 U	0.00027 U	0.00027 U

Table 2. Summary of Volatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	RSB-2	RSB-2	RSB-2	RSB-2
Sample Designation:					RSB-2	RSB-2	RSB-2	RSB-2
Sample Date:					12/01/2025	12/01/2025	12/01/2025	12/01/2025
Sample Depth (ft bls):					0 - 2	1 - 3	1 - 3	3 - 5
Normal Sample or Field Duplicate:					N	N	FD	N
Cyclohexane	--	--	--	MG/KG	0.00026 U	0.00022 U	0.00022 U	0.00022 U
Dibromochloromethane	--	--	--	MG/KG	0.00063 U	0.00055 U	0.00053 U	0.00053 U
Dichlorodifluoromethane	--	--	--	MG/KG	0.0004 U	0.00034 U	0.00033 U	0.00033 U
Ethylbenzene	1	76	1	MG/KG	0.00055 U	0.00048 U	0.00046 U	0.00046 U
Isopropylbenzene (Cumene)	--	--	--	MG/KG	0.00033 U	0.00029 U	0.00028 U	0.00028 U
m,p-Xylene	0.26	100	1.2	MG/KG	0.0005 U	0.00043 U	0.00042 U	0.00042 U
Methyl Acetate	--	--	--	MG/KG	0.005 U	0.0044 U	0.0042 U	0.0042 U
Methyl Ethyl Ketone (2-Butanone)	0.1	100	0.1	MG/KG	0.00043 U	0.00037 U	0.00036 U	0.00036 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	MG/KG	0.0018 U	0.0016 U	0.0015 U	0.0015 U
Methylcyclohexane	--	--	--	MG/KG	0.00059 U	0.00051 U	0.00049 U	0.00049 U
Methylene Chloride	0.05	81	0.05	MG/KG	0.0013 U	0.0012 U	0.0011 U	0.0011 U
N-Butylbenzene	18	100	18	MG/KG	0.00035 U	0.0003 U	0.00029 U	0.00029 U
N-Propylbenzene	5	100	5	MG/KG	0.00053 U	0.00046 U	0.00044 U	0.00044 U
O-Xylene (1,2-Dimethylbenzene)	0.26	100	1.2	MG/KG	0.00054 U	0.00047 U	0.00045 U	0.00045 U
Sec-Butylbenzene	25	100	25	MG/KG	0.00034 U	0.00029 U	0.00028 U	0.00028 U
Styrene	--	--	--	MG/KG	0.00033 U	0.00028 U	0.00027 U	0.00027 U
T-Butylbenzene	11	100	11	MG/KG	0.00032 U	0.00028 U	0.00027 U	0.00027 U
Tert-Butyl Methyl Ether	0.1	100	0.1	MG/KG	0.0006 U	0.00052 U	0.0005 U	0.0005 U
Tetrachloroethylene (PCE)	1.3	18	1.3	MG/KG	0.00036 U	0.00031 U	0.0003 U	0.0003 U
Toluene	0.7	100	0.7	MG/KG	0.00027 U	0.00024 U	0.00023 U	0.00023 U
Trans-1,2-Dichloroethene	0.19	100	0.19	MG/KG	0.00029 U	0.00025 U	0.00024 U	0.00024 U
Trans-1,3-Dichloropropene	--	--	--	MG/KG	0.00031 U	0.00027 U	0.00026 U	0.00026 U
Trichloroethylene (TCE)	0.47	6.4	0.47	MG/KG	0.00038 U	0.00033 U	0.00032 U	0.00032 U
Trichlorofluoromethane	--	--	--	MG/KG	0.00048 U	0.00041 U	0.0004 U	0.0004 U
Vinyl Chloride	0.03	0.48	0.03	MG/KG	0.00064 U	0.00055 U	0.00054 U	0.00054 U
Xylenes	0.26	100	1.2	MG/KG	0.0002 U	0.00018 U	0.00017 U	0.00017 U

Table 2. Summary of Volatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

			Sample Designation:		RSB-2	RSB-3	RSB-3	RSB-3
			Sample Date:		12/02/2025	12/01/2025	12/01/2025	12/01/2025
			Sample Depth (ft bls):		20 - 22	0 - 2	2 - 4	4 - 6
			Normal Sample or Field Duplicate:		N	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
1,1,1-Trichloroethane (TCA)	0.68	100	0.68	MG/KG	0.00027 U	0.00024 U	0.00024 U	0.00021 U
1,1,2,2-Tetrachloroethane	--	--	--	MG/KG	0.00061 U	0.00053 U	0.00054 U	0.00047 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	MG/KG	0.00035 U	0.00031 UT	0.00031 UT	0.00027 UT
1,1,2-Trichloroethane	--	--	--	MG/KG	0.00071 U	0.00061 U	0.00062 U	0.00055 U
1,1-Dichloroethane	0.27	47	0.27	MG/KG	0.0007 U	0.00061 U	0.00061 U	0.00054 U
1,1-Dichloroethene	0.24	0.98	0.33	MG/KG	0.00026 U	0.00023 U	0.00023 U	0.0002 U
1,2,3-Trichlorobenzene	--	--	--	MG/KG	0.00087 U	0.00075 U	0.00076 U	0.00067 U
1,2,4-Trichlorobenzene	--	--	--	MG/KG	0.00042 U	0.00036 U	0.00037 U	0.00032 U
1,2,4-Trimethylbenzene	5.9	100	5.9	MG/KG	0.00029 U	0.00025 U	0.00025 U	0.00022 U
1,2-Dibromo-3-Chloropropane	--	--	--	MG/KG	0.00054 U	0.00047 U	0.00047 U	0.00042 U
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	MG/KG	0.00059 U	0.00051 U	0.00052 U	0.00046 U
1,2-Dichlorobenzene	1.1	100	1.1	MG/KG	0.00042 U	0.00037 U	0.00037 U	0.00033 U
1,2-Dichloroethane	0.02	5.8	0.02	MG/KG	0.00035 U	0.0003 U	0.0003 U	0.00027 U
1,2-Dichloropropane	--	--	--	MG/KG	0.0005 U	0.00043 U	0.00043 U	0.00038 U
1,3,5-Trimethylbenzene (Mesitylene)	3.1	100	3.1	MG/KG	0.00037 U	0.00032 U	0.00032 U	0.00029 U
1,3-Dichlorobenzene	2.6	38	2.6	MG/KG	0.00043 U	0.00037 U	0.00038 U	0.00033 U
1,4-Dichlorobenzene	1.8	24	1.8	MG/KG	0.00061 U	0.00053 U	0.00053 U	0.00047 U
2-Hexanone	--	--	--	MG/KG	0.002 U	0.0017 U	0.0018 U	0.0016 U
Acetone	**0.03**	100	0.03	MG/KG	0.0083 J+	0.026 J+	**0.033 J+**	**0.049 J+**
Benzene	0.06	3.7	0.06	MG/KG	0.00067 U	0.00058 U	0.00058 U	0.00051 U
Bromochloromethane	--	--	--	MG/KG	0.0007 U	0.00061 U	0.00061 U	0.00054 U
Bromodichloromethane	--	--	--	MG/KG	0.0003 U	0.00026 U	0.00026 U	0.00023 U
Bromoform	--	--	--	MG/KG	0.0005 U	0.00043 U	0.00044 U	0.00039 U
Bromomethane	--	--	--	MG/KG	0.0012 U	0.001 U	0.001 U	0.00091 U
Carbon Disulfide	--	--	--	MG/KG	0.00031 U	0.00027 U	0.00027 U	0.00024 U
Carbon Tetrachloride	0.76	7.1	0.76	MG/KG	0.00046 U	0.00039 U	0.0004 U	0.00035 U
Chlorobenzene	4.5	100	4.5	MG/KG	0.0006 U	0.00052 U	0.00052 U	0.00046 U
Chloroethane	--	--	--	MG/KG	0.00061 U	0.00053 U	0.00054 U	0.00047 U
Chloroform	0.37	24	0.37	MG/KG	0.0011 U	0.00099 U	0.001 U	0.00088 U
Chloromethane	--	--	--	MG/KG	0.00051 U	0.00044 U	0.00045 U	0.00039 U
Cis-1,2-Dichloroethylene	0.19	41	0.19	MG/KG	0.00042 U	0.00036 U	0.00037 U	0.00032 U
Cis-1,3-Dichloropropene	--	--	--	MG/KG	0.00032 U	0.00028 U	0.00028 U	0.00025 U

Table 2. Summary of Volatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-2	RSB-3	RSB-3	RSB-3
				Sample Date:	12/02/2025	12/01/2025	12/01/2025	12/01/2025
				Sample Depth (ft bls):	20 - 22	0 - 2	2 - 4	4 - 6
				Normal Sample or Field Duplicate:	N	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
Cyclohexane	--	--	--	MG/KG	0.00026 U	0.00023 U	0.00023 U	0.0002 U
Dibromochloromethane	--	--	--	MG/KG	0.00063 U	0.00055 U	0.00055 U	0.00049 U
Dichlorodifluoromethane	--	--	--	MG/KG	0.0004 U	0.00034 U	0.00035 U	0.00031 U
Ethylbenzene	1	76	1	MG/KG	0.00055 U	0.00048 U	0.00048 U	0.00042 U
Isopropylbenzene (Cumene)	--	--	--	MG/KG	0.00034 U	0.00029 U	0.00029 U	0.00026 U
m,p-Xylene	0.26	100	1.2	MG/KG	0.0005 U	0.00043 U	0.00043 U	0.00038 U
Methyl Acetate	--	--	--	MG/KG	0.0051 U	0.0044 U	0.0044 U	0.0039 U
Methyl Ethyl Ketone (2-Butanone)	0.1	100	0.1	MG/KG	0.00043 U	0.00037 U	0.00038 U	0.00033 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	MG/KG	0.0018 U	0.0016 U	0.0016 U	0.0014 U
Methylcyclohexane	--	--	--	MG/KG	0.00059 U	0.00051 U	0.00051 U	0.00045 U
Methylene Chloride	0.05	81	0.05	MG/KG	0.0013 U	0.0012 U	0.0012 U	0.001 U
N-Butylbenzene	18	100	18	MG/KG	0.00035 U	0.0003 U	0.0003 U	0.00027 U
N-Propylbenzene	5	100	5	MG/KG	0.00053 U	0.00046 U	0.00046 U	0.00041 U
O-Xylene (1,2-Dimethylbenzene)	0.26	100	1.2	MG/KG	0.00054 U	0.00047 U	0.00047 U	0.00042 U
Sec-Butylbenzene	25	100	25	MG/KG	0.00034 U	0.00029 U	0.0003 U	0.00026 U
Styrene	--	--	--	MG/KG	0.00033 U	0.00028 U	0.00029 U	0.00025 U
T-Butylbenzene	11	100	11	MG/KG	0.00032 U	0.00028 U	0.00028 U	0.00025 U
Tert-Butyl Methyl Ether	0.1	100	0.1	MG/KG	0.0006 U	0.00052 U	0.00053 U	0.00046 U
Tetrachloroethylene (PCE)	1.3	18	1.3	MG/KG	0.00036 U	0.00031 U	0.00031 U	0.00028 U
Toluene	0.7	100	0.7	MG/KG	0.00028 U	0.00024 U	0.00024 U	0.00021 U
Trans-1,2-Dichloroethene	0.19	100	0.19	MG/KG	0.00029 U	0.00025 U	0.00025 U	0.00022 U
Trans-1,3-Dichloropropene	--	--	--	MG/KG	0.00031 U	0.00027 U	0.00027 U	0.00024 U
Trichloroethylene (TCE)	0.47	6.4	0.47	MG/KG	0.00038 U	0.00033 U	0.00033 U	0.00029 U
Trichlorofluoromethane	--	--	--	MG/KG	0.00048 U	0.00041 U	0.00042 U	0.00037 U
Vinyl Chloride	0.03	0.48	0.03	MG/KG	0.00064 U	0.00056 U	0.00056 U	0.0005 U
Xylenes	0.26	100	1.2	MG/KG	0.0002 U	0.00018 U	0.00018 U	0.00016 U

Table 2. Summary of Volatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

			Sample Designation:		RSB-3	RSB-4	RSB-4	RSB-4
			Sample Date:		12/02/2025	12/03/2025	12/03/2025	12/03/2025
			Sample Depth (ft bls):		20 - 22	0 - 2	2 - 4	4 - 6
			Normal Sample or Field Duplicate:		N	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
1,1,1-Trichloroethane (TCA)	0.68	100	0.68	MG/KG	0.00023 U	0.00028 U	0.00029 U	0.00024 U
1,1,2,2-Tetrachloroethane	--	--	--	MG/KG	0.00052 U	0.00064 UJ	0.00065 U	0.00054 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	MG/KG	0.0003 U	0.00037 U	0.00038 U	0.00031 U
1,1,2-Trichloroethane	--	--	--	MG/KG	0.00059 U	0.00073 UJ	0.00075 U	0.00062 U
1,1-Dichloroethane	0.27	47	0.27	MG/KG	0.00059 U	0.00073 U	0.00074 U	0.00062 U
1,1-Dichloroethene	0.24	0.98	0.33	MG/KG	0.00022 U	0.00027 U	0.00028 U	0.00023 U
1,2,3-Trichlorobenzene	--	--	--	MG/KG	0.00073 U	0.0009 UJ	0.00092 U	0.00076 U
1,2,4-Trichlorobenzene	--	--	--	MG/KG	0.00035 U	0.00044 UJ	0.00045 U	0.00037 U
1,2,4-Trimethylbenzene	5.9	100	5.9	MG/KG	0.00024 U	0.0003 UJ	0.00031 U	0.00025 U
1,2-Dibromo-3-Chloropropane	--	--	--	MG/KG	0.00046 U	0.00056 UJ	0.00057 U	0.00048 U
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	MG/KG	0.0005 U	0.00061 UJ	0.00063 U	0.00052 U
1,2-Dichlorobenzene	1.1	100	1.1	MG/KG	0.00036 U	0.00044 UJ	0.00045 U	0.00037 U
1,2-Dichloroethane	0.02	5.8	0.02	MG/KG	0.00029 U	0.00036 U	0.00037 U	0.00031 U
1,2-Dichloropropane	--	--	--	MG/KG	0.00042 U	0.00051 U	0.00053 U	0.00044 U
1,3,5-Trimethylbenzene (Mesitylene)	3.1	100	3.1	MG/KG	0.00031 U	0.00038 UJ	0.00039 U	0.00032 U
1,3-Dichlorobenzene	2.6	38	2.6	MG/KG	0.00036 U	0.00044 UJ	0.00046 U	0.00038 U
1,4-Dichlorobenzene	1.8	24	1.8	MG/KG	0.00051 U	0.00063 UJ	0.00065 U	0.00054 U
2-Hexanone	--	--	--	MG/KG	0.0017 U	0.0021 U	0.0021 U	0.0018 U
Acetone	**0.03**	100	0.03	MG/KG	0.015 J+	0.016 J+	0.024 J+	0.0059 U
Benzene	0.06	3.7	0.06	MG/KG	0.00056 U	0.00069 U	0.00071 U	0.00059 U
Bromochloromethane	--	--	--	MG/KG	0.00059 U	0.00073 U	0.00074 U	0.00062 U
Bromodichloromethane	--	--	--	MG/KG	0.00025 U	0.00031 U	0.00032 U	0.00027 U
Bromoform	--	--	--	MG/KG	0.00042 U	0.00052 U	0.00053 U	0.00044 U
Bromomethane	--	--	--	MG/KG	0.00099 U	0.0012 U	0.0012 U	0.001 U
Carbon Disulfide	--	--	--	MG/KG	0.00026 U	0.00032 U	0.00033 U	0.00027 U
Carbon Tetrachloride	0.76	7.1	0.76	MG/KG	0.00038 U	0.00047 U	0.00048 U	0.0004 U
Chlorobenzene	4.5	100	4.5	MG/KG	0.0005 U	0.00062 U	0.00063 U	0.00052 U
Chloroethane	--	--	--	MG/KG	0.00052 U	0.00064 U	0.00065 U	0.00054 U
Chloroform	0.37	24	0.37	MG/KG	0.00096 U	0.0012 U	0.0012 U	0.001 U
Chloromethane	--	--	--	MG/KG	0.00043 U	0.00053 UT	0.00054 U	0.00045 U
Cis-1,2-Dichloroethylene	0.19	41	0.19	MG/KG	0.00035 U	0.00044 U	0.00045 U	0.00037 U
Cis-1,3-Dichloropropene	--	--	--	MG/KG	0.00027 U	0.00033 U	0.00034 U	0.00028 U

Table 2. Summary of Volatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	RSB-3	RSB-4	RSB-4	RSB-4
Sample Designation:					RSB-3	RSB-4	RSB-4	RSB-4
Sample Date:					12/02/2025	12/03/2025	12/03/2025	12/03/2025
Sample Depth (ft bls):					20 - 22	0 - 2	2 - 4	4 - 6
Normal Sample or Field Duplicate:					N	N	N	N
Cyclohexane	--	--	--	MG/KG	0.00022 U	0.00027 U	0.00028 U	0.00023 U
Dibromochloromethane	--	--	--	MG/KG	0.00053 U	0.00065 U	0.00067 U	0.00055 U
Dichlorodifluoromethane	--	--	--	MG/KG	0.00033 U	0.00041 U	0.00042 U	0.00035 U
Ethylbenzene	1	76	1	MG/KG	0.00046 U	0.00057 U	0.00058 U	0.00048 U
Isopropylbenzene (Cumene)	--	--	--	MG/KG	0.00028 U	0.00035 U	0.00036 U	0.00029 U
m,p-Xylene	0.26	100	1.2	MG/KG	0.00042 U	0.00051 U	0.00053 U	0.00044 U
Methyl Acetate	--	--	--	MG/KG	0.0043 U	0.0052 U	0.0054 U	0.0044 U
Methyl Ethyl Ketone (2-Butanone)	0.1	100	0.1	MG/KG	0.00036 U	0.00045 U	0.00046 U	0.00038 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	MG/KG	0.0015 U	0.0019 U	0.0019 U	0.0016 U
Methylcyclohexane	--	--	--	MG/KG	0.00049 U	0.00061 U	0.00062 U	0.00052 U
Methylene Chloride	0.05	81	0.05	MG/KG	0.0011 U	0.0014 U	0.0014 U	0.0012 U
N-Butylbenzene	18	100	18	MG/KG	0.00029 U	0.00036 UJ	0.00037 U	0.0003 U
N-Propylbenzene	5	100	5	MG/KG	0.00044 U	0.00055 UJ	0.00056 U	0.00046 U
O-Xylene (1,2-Dimethylbenzene)	0.26	100	1.2	MG/KG	0.00046 U	0.00056 U	0.00057 U	0.00048 U
Sec-Butylbenzene	25	100	25	MG/KG	0.00028 U	0.00035 UJ	0.00036 U	0.0003 U
Styrene	--	--	--	MG/KG	0.00027 U	0.00034 U	0.00035 U	0.00029 U
T-Butylbenzene	11	100	11	MG/KG	0.00027 U	0.00034 UJ	0.00034 U	0.00029 U
Tert-Butyl Methyl Ether	0.1	100	0.1	MG/KG	0.00051 U	0.00062 U	0.00064 U	0.00053 U
Tetrachloroethylene (PCE)	1.3	18	1.3	MG/KG	0.0003 U	0.00037 U	0.00038 U	0.00031 U
Toluene	0.7	100	0.7	MG/KG	0.00023 U	0.00028 U	0.00056 J	0.00024 U
Trans-1,2-Dichloroethene	0.19	100	0.19	MG/KG	0.00024 U	0.0003 U	0.00031 U	0.00025 U
Trans-1,3-Dichloropropene	--	--	--	MG/KG	0.00026 U	0.00032 U	0.00033 U	0.00027 U
Trichloroethylene (TCE)	0.47	6.4	0.47	MG/KG	0.00032 U	0.00039 U	0.0004 U	0.00033 U
Trichlorofluoromethane	--	--	--	MG/KG	0.0004 U	0.00049 U	0.00051 U	0.00042 U
Vinyl Chloride	0.03	0.48	0.03	MG/KG	0.00054 U	0.00066 U	0.00068 U	0.00056 U
Xylenes	0.26	100	1.2	MG/KG	0.00017 U	0.00021 U	0.00022 U	0.00018 U

Table 2. Summary of Volatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	RSB-4	RSB-5	RSB-5	RSB-5
Sample Designation:					RSB-4	RSB-5	RSB-5	RSB-5
Sample Date:					12/03/2025	12/01/2025	12/01/2025	12/01/2025
Sample Depth (ft bls):					20 - 22	0 - 2	2 - 4	4 - 6
Normal Sample or Field Duplicate:					N	N	N	N
1,1,1-Trichloroethane (TCA)	0.68	100	0.68	MG/KG	0.00021 U	0.00024 U	0.00022 U	0.00022 U
1,1,2,2-Tetrachloroethane	--	--	--	MG/KG	0.00048 U	0.00054 U	0.0005 U	0.00049 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	MG/KG	0.00028 U	0.00031 UT	0.00029 UT	0.00029 UT
1,1,2-Trichloroethane	--	--	--	MG/KG	0.00055 U	0.00062 U	0.00057 U	0.00057 U
1,1-Dichloroethane	0.27	47	0.27	MG/KG	0.00055 U	0.00061 U	0.00057 U	0.00057 U
1,1-Dichloroethene	0.24	0.98	0.33	MG/KG	0.00021 U	0.00023 U	0.00021 U	0.00021 U
1,2,3-Trichlorobenzene	--	--	--	MG/KG	0.00068 U	0.00076 U	0.0007 U	0.0007 U
1,2,4-Trichlorobenzene	--	--	--	MG/KG	0.00033 U	0.00037 U	0.00034 U	0.00034 U
1,2,4-Trimethylbenzene	5.9	100	5.9	MG/KG	0.00023 U	0.00025 U	0.00023 U	0.00023 U
1,2-Dibromo-3-Chloropropane	--	--	--	MG/KG	0.00042 U	0.00047 U	0.00044 U	0.00044 U
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	MG/KG	0.00046 U	0.00052 U	0.00048 U	0.00048 U
1,2-Dichlorobenzene	1.1	100	1.1	MG/KG	0.00033 U	0.00037 U	0.00034 U	0.00034 U
1,2-Dichloroethane	0.02	5.8	0.02	MG/KG	0.00027 U	0.0003 U	0.00028 U	0.00028 U
1,2-Dichloropropane	--	--	--	MG/KG	0.00039 U	0.00044 U	0.0004 U	0.0004 U
1,3,5-Trimethylbenzene (Mesitylene)	3.1	100	3.1	MG/KG	0.00029 U	0.00032 U	0.0003 U	0.0003 U
1,3-Dichlorobenzene	2.6	38	2.6	MG/KG	0.00033 U	0.00038 U	0.00035 U	0.00035 U
1,4-Dichlorobenzene	1.8	24	1.8	MG/KG	0.00048 U	0.00053 U	0.0005 U	0.00049 U
2-Hexanone	--	--	--	MG/KG	0.0016 U	0.0018 U	0.0016 U	0.0016 U
Acetone	**0.03**	100	0.03	MG/KG	0.013 J+	0.021 J+	0.029 J+	0.016 J+
Benzene	0.06	3.7	0.06	MG/KG	0.00052 U	0.00058 U	0.00054 U	0.00054 U
Bromochloromethane	--	--	--	MG/KG	0.00055 U	0.00061 U	0.00057 U	0.00056 U
Bromodichloromethane	--	--	--	MG/KG	0.00024 U	0.00026 U	0.00025 U	0.00024 U
Bromoform	--	--	--	MG/KG	0.00039 U	0.00044 U	0.00041 U	0.0004 U
Bromomethane	--	--	--	MG/KG	0.00092 U	0.001 U	0.00095 U	0.00095 U
Carbon Disulfide	--	--	--	MG/KG	0.00024 U	0.00027 U	0.00025 U	0.00025 U
Carbon Tetrachloride	0.76	7.1	0.76	MG/KG	0.00035 U	0.0004 U	0.00037 U	0.00037 U
Chlorobenzene	4.5	100	4.5	MG/KG	0.00046 U	0.00052 U	0.00048 U	0.00048 U
Chloroethane	--	--	--	MG/KG	0.00048 U	0.00054 U	0.0005 U	0.00049 U
Chloroform	0.37	24	0.37	MG/KG	0.00089 U	0.001 U	0.00093 U	0.00092 U
Chloromethane	--	--	--	MG/KG	0.0004 U	0.00045 U	0.00041 U	0.00041 U
Cis-1,2-Dichloroethylene	0.19	41	0.19	MG/KG	0.00033 U	0.00037 U	0.00034 U	0.00034 U
Cis-1,3-Dichloropropene	--	--	--	MG/KG	0.00025 U	0.00028 U	0.00026 U	0.00026 U

Table 2. Summary of Volatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-4	RSB-5	RSB-5	RSB-5
				Sample Date:	12/03/2025	12/01/2025	12/01/2025	12/01/2025
				Sample Depth (ft bls):	20 - 22	0 - 2	2 - 4	4 - 6
				Normal Sample or Field Duplicate:	N	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
Cyclohexane	--	--	--	MG/KG	0.0002 U	0.00023 U	0.00021 U	0.00021 U
Dibromochloromethane	--	--	--	MG/KG	0.00049 U	0.00055 U	0.00051 U	0.00051 U
Dichlorodifluoromethane	--	--	--	MG/KG	0.00031 U	0.00035 U	0.00032 U	0.00032 U
Ethylbenzene	1	76	1	MG/KG	0.00043 U	0.00048 U	0.00045 U	0.00044 U
Isopropylbenzene (Cumene)	--	--	--	MG/KG	0.00026 U	0.00029 U	0.00027 U	0.00027 U
m,p-Xylene	0.26	100	1.2	MG/KG	0.00039 U	0.00044 U	0.0004 U	0.0004 U
Methyl Acetate	--	--	--	MG/KG	0.0039 U	0.0044 U	0.0041 U	0.0041 U
Methyl Ethyl Ketone (2-Butanone)	0.1	100	0.1	MG/KG	0.0031 J	0.00038 U	0.00035 U	0.00035 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	MG/KG	0.0014 U	0.0016 U	0.0015 U	0.0015 U
Methylcyclohexane	--	--	--	MG/KG	0.00046 U	0.00051 U	0.00048 U	0.00047 U
Methylene Chloride	0.05	81	0.05	MG/KG	0.001 U	0.0012 U	0.0011 U	0.0011 U
N-Butylbenzene	18	100	18	MG/KG	0.00027 U	0.0003 U	0.00028 U	0.00028 U
N-Propylbenzene	5	100	5	MG/KG	0.00041 U	0.00046 U	0.00043 U	0.00043 U
O-Xylene (1,2-Dimethylbenzene)	0.26	100	1.2	MG/KG	0.00042 U	0.00047 U	0.00044 U	0.00044 U
Sec-Butylbenzene	25	100	25	MG/KG	0.00026 U	0.0003 U	0.00027 U	0.00027 U
Styrene	--	--	--	MG/KG	0.00025 U	0.00029 U	0.00027 U	0.00026 U
T-Butylbenzene	11	100	11	MG/KG	0.00025 U	0.00028 U	0.00026 U	0.00026 U
Tert-Butyl Methyl Ether	0.1	100	0.1	MG/KG	0.00047 U	0.00053 U	0.00049 U	0.00049 U
Tetrachloroethylene (PCE)	1.3	18	1.3	MG/KG	0.00028 U	0.00099 J	0.00029 U	0.00029 U
Toluene	0.7	100	0.7	MG/KG	0.00021 U	0.00024 U	0.00022 U	0.00022 U
Trans-1,2-Dichloroethene	0.19	100	0.19	MG/KG	0.00023 U	0.00025 U	0.00023 U	0.00023 U
Trans-1,3-Dichloropropene	--	--	--	MG/KG	0.00024 U	0.00027 U	0.00025 U	0.00025 U
Trichloroethylene (TCE)	0.47	6.4	0.47	MG/KG	0.00029 U	0.00033 U	0.00031 U	0.0003 U
Trichlorofluoromethane	--	--	--	MG/KG	0.00037 U	0.00042 U	0.00039 U	0.00038 U
Vinyl Chloride	0.03	0.48	0.03	MG/KG	0.0005 U	0.00056 U	0.00052 U	0.00052 U
Xylenes	0.26	100	1.2	MG/KG	0.00016 U	0.00018 U	0.00017 U	0.00016 U

Table 2. Summary of Volatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

			Sample Designation:		RSB-5	RSB-5	RSB-5	RSB-6
			Sample Date:		12/02/2025	12/02/2025	12/15/2025	12/12/2025
			Sample Depth (ft bls):		6 - 8	20 - 22	8 - 10	0 - 2
			Normal Sample or Field Duplicate:		N	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
1,1,1-Trichloroethane (TCA)	0.68	100	0.68	MG/KG	0.00031 UJ	0.0002 U	0.00022 U	0.00025 U
1,1,2,2-Tetrachloroethane	--	--	--	MG/KG	0.0007 UJ	0.00045 U	0.0005 U	0.00055 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	MG/KG	0.0004 UJ	0.00026 U	0.00029 U	0.00032 U
1,1,2-Trichloroethane	--	--	--	MG/KG	0.0008 UJ	0.00052 U	0.00058 U	0.00064 U
1,1-Dichloroethane	0.27	47	0.27	MG/KG	0.0008 UJ	0.00051 U	0.00057 U	0.00063 U
1,1-Dichloroethene	0.24	0.98	0.33	MG/KG	0.0003 UJ	0.00019 U	0.00022 U	0.00024 U
1,2,3-Trichlorobenzene	--	--	--	MG/KG	0.00099 UJ	0.00063 U	0.00071 U	0.00078 U
1,2,4-Trichlorobenzene	--	--	--	MG/KG	0.00048 UJ	0.00031 U	0.00034 U	0.00038 U
1,2,4-Trimethylbenzene	5.9	100	5.9	MG/KG	0.00033 UJ	0.00021 U	0.00024 U	0.00026 U
1,2-Dibromo-3-Chloropropane	--	--	--	MG/KG	0.00061 UJ	0.00039 U	0.00044 U	0.00049 U
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	MG/KG	0.00067 UJ	0.00043 U	0.00048 U	0.00053 U
1,2-Dichlorobenzene	1.1	100	1.1	MG/KG	0.00048 UJ	0.00031 U	0.00035 U	0.00038 U
1,2-Dichloroethane	0.02	5.8	0.02	MG/KG	0.0004 UJ	0.00025 U	0.00028 U	0.00031 U
1,2-Dichloropropane	--	--	--	MG/KG	0.00057 UJ	0.00036 U	0.00041 U	0.00045 U
1,3,5-Trimethylbenzene (Mesitylene)	3.1	100	3.1	MG/KG	0.00042 UJ	0.00027 U	0.0003 U	0.00033 U
1,3-Dichlorobenzene	2.6	38	2.6	MG/KG	0.00049 UJ	0.00031 U	0.00035 U	0.00039 U
1,4-Dichlorobenzene	1.8	24	1.8	MG/KG	0.00069 UJ	0.00044 U	0.0005 U	0.00055 U
2-Hexanone	--	--	--	MG/KG	0.0023 UJ	0.0015 U	0.0016 U	0.0018 U
Acetone	**0.03**	100	0.03	MG/KG	0.0076 UJ	0.014 J+	0.0055 U	0.0079 J+
Benzene	0.06	3.7	0.06	MG/KG	0.00076 UJ	0.00049 U	0.00054 U	0.0006 U
Bromochloromethane	--	--	--	MG/KG	0.0008 UJ	0.00051 U	0.00057 U	0.00063 U
Bromodichloromethane	--	--	--	MG/KG	0.00034 UJ	0.00022 U	0.00025 U	0.00027 U
Bromoform	--	--	--	MG/KG	0.00057 UJ	0.00036 U	0.00041 U	0.00045 U
Bromomethane	--	--	--	MG/KG	0.0013 UJ	0.00086 U	0.00096 U	0.0011 U
Carbon Disulfide	--	--	--	MG/KG	0.00036 UJ	0.00023 U	0.00025 U	0.00028 U
Carbon Tetrachloride	0.76	7.1	0.76	MG/KG	0.00052 UJ	0.00033 U	0.00037 U	0.00041 U
Chlorobenzene	4.5	100	4.5	MG/KG	0.00068 UJ	0.00043 U	0.00049 U	0.00054 U
Chloroethane	--	--	--	MG/KG	0.0007 UJ	0.00045 U	0.0005 U	0.00055 U
Chloroform	0.37	24	0.37	MG/KG	0.0013 UJ	0.00083 U	0.00093 U	0.001 U
Chloromethane	--	--	--	MG/KG	0.00058 UJ	0.00037 U	0.00042 U	0.00046 U
Cis-1,2-Dichloroethylene	0.19	41	0.19	MG/KG	0.00048 UJ	0.00031 U	0.00034 U	0.00038 U
Cis-1,3-Dichloropropene	--	--	--	MG/KG	0.00036 UJ	0.00023 U	0.00026 U	0.00029 U

Table 2. Summary of Volatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-5	RSB-5	RSB-5	RSB-6
				Sample Date:	12/02/2025	12/02/2025	12/15/2025	12/12/2025
				Sample Depth (ft bls):	6 - 8	20 - 22	8 - 10	0 - 2
				Normal Sample or Field Duplicate:	N	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
Cyclohexane	--	--	--	MG/KG	0.0003 UJ	0.00019 U	0.00021 U	0.00023 U
Dibromochloromethane	--	--	--	MG/KG	0.00072 UJ	0.00046 U	0.00051 U	0.00057 U
Dichlorodifluoromethane	--	--	--	MG/KG	0.00045 UJ	0.00029 U	0.00032 U	0.00036 U
Ethylbenzene	1	76	1	MG/KG	0.00063 UJ	0.0004 U	0.00045 U	0.0005 U
Isopropylbenzene (Cumene)	--	--	--	MG/KG	0.00038 UJ	0.00024 U	0.00027 U	0.0003 U
m,p-Xylene	0.26	100	1.2	MG/KG	0.00057 UJ	0.00036 U	0.00041 U	0.00045 U
Methyl Acetate	--	--	--	MG/KG	0.0057 UJ	0.0037 U	0.0041 U	0.0046 U
Methyl Ethyl Ketone (2-Butanone)	0.1	100	0.1	MG/KG	0.00049 UJ	0.0026 J	0.00035 U	0.00039 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	MG/KG	0.0021 UJ	0.0013 U	0.0015 U	0.0016 U
Methylcyclohexane	--	--	--	MG/KG	0.00067 UJ	0.00043 U	0.00048 U	0.00053 U
Methylene Chloride	0.05	81	0.05	MG/KG	0.0015 UJ	0.00098 U	0.0011 U	0.0012 U
N-Butylbenzene	18	100	18	MG/KG	0.00039 UJ	0.00025 U	0.00028 U	0.00031 U
N-Propylbenzene	5	100	5	MG/KG	0.0006 UJ	0.00038 U	0.00043 U	0.00048 U
O-Xylene (1,2-Dimethylbenzene)	0.26	100	1.2	MG/KG	0.00062 UJ	0.0004 U	0.00044 U	0.00049 U
Sec-Butylbenzene	25	100	25	MG/KG	0.00038 UJ	0.00025 U	0.00028 U	0.00031 U
Styrene	--	--	--	MG/KG	0.00037 UJ	0.00024 U	0.00027 U	0.00029 U
T-Butylbenzene	11	100	11	MG/KG	0.00037 UJ	0.00024 U	0.00026 U	0.00029 U
Tert-Butyl Methyl Ether	0.1	100	0.1	MG/KG	0.00068 UJ	0.00044 U	0.00049 U	0.00054 U
Tetrachloroethylene (PCE)	1.3	18	1.3	MG/KG	0.00041 UJ	0.00026 U	0.00029 U	0.00032 U
Toluene	0.7	100	0.7	MG/KG	0.00031 UJ	0.0002 U	0.00022 U	0.00025 U
Trans-1,2-Dichloroethene	0.19	100	0.19	MG/KG	0.00033 UJ	0.00021 U	0.00024 U	0.00026 U
Trans-1,3-Dichloropropene	--	--	--	MG/KG	0.00036 UJ	0.00023 U	0.00025 U	0.00028 U
Trichloroethylene (TCE)	0.47	6.4	0.47	MG/KG	0.00043 UJ	0.00028 U	0.00031 U	0.00034 U
Trichlorofluoromethane	--	--	--	MG/KG	0.00054 UJ	0.00035 U	0.00039 U	0.00043 U
Vinyl Chloride	0.03	0.48	0.03	MG/KG	0.00073 UJ	0.00047 U	0.00052 U	0.00058 U
Xylenes	0.26	100	1.2	MG/KG	0.00035 J-	0.00015 U	0.00017 U	0.00018 U

Table 2. Summary of Volatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-6	RSB-6	RSB-6	RSB-6
				Sample Date:	12/12/2025	12/12/2025	12/16/2025	12/16/2025
				Sample Depth (ft bls):	2 - 4	4 - 6	6 - 8	20 - 22
				Normal Sample or Field Duplicate:	N	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
1,1,1-Trichloroethane (TCA)	0.68	100	0.68	MG/KG	0.00021 U	0.00026 U	0.00025 U	0.00025 U
1,1,2,2-Tetrachloroethane	--	--	--	MG/KG	0.00048 U	0.00057 U	0.00057 U	0.00057 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	MG/KG	0.00027 U	0.00033 U	0.00033 U	0.00033 U
1,1,2-Trichloroethane	--	--	--	MG/KG	0.00055 U	0.00066 U	0.00065 U	0.00065 U
1,1-Dichloroethane	0.27	47	0.27	MG/KG	0.00054 U	0.00066 U	0.00065 U	0.00065 U
1,1-Dichloroethene	0.24	0.98	0.33	MG/KG	0.0002 U	0.00025 U	0.00025 U	0.00024 U
1,2,3-Trichlorobenzene	--	--	--	MG/KG	0.00067 U	0.00081 U	0.0008 U	0.0008 U
1,2,4-Trichlorobenzene	--	--	--	MG/KG	0.00033 U	0.00039 U	0.00039 U	0.00039 U
1,2,4-Trimethylbenzene	5.9	100	5.9	MG/KG	0.00022 U	0.00027 U	0.00027 U	0.00027 U
1,2-Dibromo-3-Chloropropane	--	--	--	MG/KG	0.00042 U	0.00051 U	0.0005 U	0.0005 U
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	MG/KG	0.00046 U	0.00055 U	0.00055 U	0.00055 U
1,2-Dichlorobenzene	1.1	100	1.1	MG/KG	0.00033 U	0.0004 U	0.00039 U	0.00039 U
1,2-Dichloroethane	0.02	5.8	0.02	MG/KG	0.00027 U	0.00032 U	0.00032 U	0.00032 U
1,2-Dichloropropane	--	--	--	MG/KG	0.00038 U	0.00046 U	0.00046 U	0.00046 U
1,3,5-Trimethylbenzene (Mesitylene)	3.1	100	3.1	MG/KG	0.00029 U	0.00034 U	0.00034 U	0.00034 U
1,3-Dichlorobenzene	2.6	38	2.6	MG/KG	0.00033 U	0.0004 U	0.0004 U	0.0004 U
1,4-Dichlorobenzene	1.8	24	1.8	MG/KG	0.00047 U	0.00057 U	0.00057 U	0.00057 U
2-Hexanone	--	--	--	MG/KG	0.0016 U	0.0019 U	0.0019 U	0.0019 U
Acetone	**0.03**	100	0.03	MG/KG	0.0071 J+	0.0063 U	0.0062 U	0.0062 U
Benzene	0.06	3.7	0.06	MG/KG	0.00052 U	0.00062 U	0.00062 U	0.00062 U
Bromochloromethane	--	--	--	MG/KG	0.00054 U	0.00065 U	0.00065 U	0.00065 U
Bromodichloromethane	--	--	--	MG/KG	0.00023 U	0.00028 U	0.00028 U	0.00028 U
Bromoform	--	--	--	MG/KG	0.00039 U	0.00047 U	0.00046 U	0.00046 U
Bromomethane	--	--	--	MG/KG	0.00091 U	0.0011 U	0.0011 U	0.0011 U
Carbon Disulfide	--	--	--	MG/KG	0.00024 U	0.00029 U	0.00029 U	0.00029 U
Carbon Tetrachloride	0.76	7.1	0.76	MG/KG	0.00035 U	0.00042 U	0.00042 U	0.00042 U
Chlorobenzene	4.5	100	4.5	MG/KG	0.00046 U	0.00056 U	0.00055 U	0.00055 U
Chloroethane	--	--	--	MG/KG	0.00048 U	0.00057 U	0.00057 U	0.00057 U
Chloroform	0.37	24	0.37	MG/KG	0.00088 U	0.0011 U	0.0011 U	0.0011 U
Chloromethane	--	--	--	MG/KG	0.0004 U	0.00048 U	0.00047 U	0.00047 U
Cis-1,2-Dichloroethylene	0.19	41	0.19	MG/KG	0.00033 U	0.00039 U	0.00039 U	0.00039 U
Cis-1,3-Dichloropropene	--	--	--	MG/KG	0.00025 U	0.0003 U	0.0003 U	0.0003 U

Table 2. Summary of Volatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-6	RSB-6	RSB-6	RSB-6
				Sample Date:	12/12/2025	12/12/2025	12/16/2025	12/16/2025
				Sample Depth (ft bls):	2 - 4	4 - 6	6 - 8	20 - 22
				Normal Sample or Field Duplicate:	N	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
Cyclohexane	--	--	--	MG/KG	0.0002 U	0.00024 U	0.00024 U	0.00024 U
Dibromochloromethane	--	--	--	MG/KG	0.00049 U	0.00059 U	0.00059 U	0.00058 U
Dichlorodifluoromethane	--	--	--	MG/KG	0.00031 U	0.00037 U	0.00037 UT	0.00037 U
Ethylbenzene	1	76	1	MG/KG	0.00043 U	0.00051 U	0.00051 U	0.00051 U
Isopropylbenzene (Cumene)	--	--	--	MG/KG	0.00026 U	0.00031 U	0.00031 U	0.00031 U
m,p-Xylene	0.26	100	1.2	MG/KG	0.00038 U	0.00046 U	0.00046 U	0.00046 U
Methyl Acetate	--	--	--	MG/KG	0.0039 U	0.0047 U	0.0047 U	0.0047 U
Methyl Ethyl Ketone (2-Butanone)	0.1	100	0.1	MG/KG	0.00033 U	0.0004 U	0.0004 U	0.0004 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	MG/KG	0.0014 U	0.0017 U	0.0017 U	0.0017 U
Methylcyclohexane	--	--	--	MG/KG	0.00045 U	0.00055 U	0.00054 U	0.00054 U
Methylene Chloride	0.05	81	0.05	MG/KG	0.001 U	0.0013 U	0.0012 U	0.0012 U
N-Butylbenzene	18	100	18	MG/KG	0.00027 U	0.00032 U	0.00032 U	0.00032 U
N-Propylbenzene	5	100	5	MG/KG	0.00041 U	0.00049 U	0.00049 U	0.00049 U
O-Xylene (1,2-Dimethylbenzene)	0.26	100	1.2	MG/KG	0.00042 U	0.00051 U	0.0005 U	0.0005 U
Sec-Butylbenzene	25	100	25	MG/KG	0.00026 U	0.00032 U	0.00031 U	0.00031 U
Styrene	--	--	--	MG/KG	0.00025 U	0.00031 U	0.0003 U	0.0003 U
T-Butylbenzene	11	100	11	MG/KG	0.00025 U	0.0003 U	0.0003 U	0.0003 U
Tert-Butyl Methyl Ether	0.1	100	0.1	MG/KG	0.00047 U	0.00056 U	0.00056 U	0.00056 U
Tetrachloroethylene (PCE)	1.3	18	1.3	MG/KG	0.00028 U	0.00033 U	0.00033 U	0.00033 U
Toluene	0.7	100	0.7	MG/KG	0.00021 U	0.00026 U	0.00025 U	0.00025 U
Trans-1,2-Dichloroethene	0.19	100	0.19	MG/KG	0.00022 U	0.00027 U	0.00027 U	0.00027 U
Trans-1,3-Dichloropropene	--	--	--	MG/KG	0.00024 U	0.00029 U	0.00029 U	0.00029 U
Trichloroethylene (TCE)	0.47	6.4	0.47	MG/KG	0.00029 U	0.00035 U	0.00035 U	0.00035 U
Trichlorofluoromethane	--	--	--	MG/KG	0.00037 U	0.00045 U	0.00044 U	0.00044 U
Vinyl Chloride	0.03	0.48	0.03	MG/KG	0.0005 U	0.0006 U	0.00059 U	0.00059 U
Xylenes	0.26	100	1.2	MG/KG	0.00016 U	0.00019 U	0.00019 U	0.00019 U

Table 2. Summary of Volatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

			Sample Designation:		RSB-7	RSB-7	RSB-7	RSB-7
			Sample Date:		12/08/2025	12/08/2025	12/08/2025	12/16/2025
			Sample Depth (ft bls):		0 - 2	2 - 4	4 - 6	6 - 8
			Normal Sample or Field Duplicate:		N	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
1,1,1-Trichloroethane (TCA)	0.68	100	0.68	MG/KG	0.00028 U	0.00025 U	0.00025 U	0.00024 U
1,1,2,2-Tetrachloroethane	--	--	--	MG/KG	0.00063 U	0.00056 U	0.00055 U	0.00054 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	MG/KG	0.00036 UT	0.00032 UT	0.00032 UT	0.00031 U
1,1,2-Trichloroethane	--	--	--	MG/KG	0.00072 U	0.00064 U	0.00064 U	0.00062 U
1,1-Dichloroethane	0.27	47	0.27	MG/KG	0.00072 U	0.00064 U	0.00063 U	0.00062 U
1,1-Dichloroethene	0.24	0.98	0.33	MG/KG	0.00027 UT	0.00024 UT	0.00024 UT	0.00023 U
1,2,3-Trichlorobenzene	--	--	--	MG/KG	0.00089 U	0.00079 U	0.00078 U	0.00076 U
1,2,4-Trichlorobenzene	--	--	--	MG/KG	0.00043 U	0.00038 U	0.00038 U	0.00037 U
1,2,4-Trimethylbenzene	5.9	100	5.9	MG/KG	0.0003 U	0.00026 U	0.00026 U	0.00025 U
1,2-Dibromo-3-Chloropropane	--	--	--	MG/KG	0.00055 U	0.00049 U	0.00049 U	0.00048 U
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	MG/KG	0.00061 U	0.00054 U	0.00054 U	0.00052 U
1,2-Dichlorobenzene	1.1	100	1.1	MG/KG	0.00044 U	0.00039 U	0.00038 U	0.00037 U
1,2-Dichloroethane	0.02	5.8	0.02	MG/KG	0.00036 U	0.00032 U	0.00031 U	0.00031 U
1,2-Dichloropropane	--	--	--	MG/KG	0.00051 U	0.00045 U	0.00045 U	0.00044 U
1,3,5-Trimethylbenzene (Mesitylene)	3.1	100	3.1	MG/KG	0.00038 U	0.00034 U	0.00033 U	0.00032 U
1,3-Dichlorobenzene	2.6	38	2.6	MG/KG	0.00044 U	0.00039 U	0.00039 U	0.00038 U
1,4-Dichlorobenzene	1.8	24	1.8	MG/KG	0.00063 U	0.00056 U	0.00055 U	0.00054 U
2-Hexanone	--	--	--	MG/KG	0.0021 U	0.0018 U	0.0018 U	0.0018 U
Acetone	**0.03**	100	0.03	MG/KG	0.007 J	0.02	0.0075	0.0059 U
Benzene	0.06	3.7	0.06	MG/KG	0.00068 U	0.00061 U	0.0006 U	0.00059 U
Bromochloromethane	--	--	--	MG/KG	0.00072 U	0.00064 U	0.00063 U	0.00062 U
Bromodichloromethane	--	--	--	MG/KG	0.00031 U	0.00028 U	0.00027 U	0.00027 U
Bromoform	--	--	--	MG/KG	0.00051 UT	0.00046 UT	0.00045 UT	0.00044 U
Bromomethane	--	--	--	MG/KG	0.0012 U	0.0011 U	0.0011 U	0.001 U
Carbon Disulfide	--	--	--	MG/KG	0.00032 U	0.00029 U	0.00028 U	0.00027 U
Carbon Tetrachloride	0.76	7.1	0.76	MG/KG	0.00047 U	0.00041 U	0.00041 U	0.0004 U
Chlorobenzene	4.5	100	4.5	MG/KG	0.00061 U	0.00054 U	0.00054 U	0.00052 U
Chloroethane	--	--	--	MG/KG	0.00063 U	0.00056 U	0.00055 U	0.00054 U
Chloroform	0.37	24	0.37	MG/KG	0.0012 U	0.001 U	0.001 U	0.001 U
Chloromethane	--	--	--	MG/KG	0.00052 U	0.00047 U	0.00046 U	0.00045 U
Cis-1,2-Dichloroethylene	0.19	41	0.19	MG/KG	0.00043 U	0.00038 U	0.00038 U	0.00037 U
Cis-1,3-Dichloropropene	--	--	--	MG/KG	0.00033 U	0.00029 U	0.00029 U	0.00028 U

Table 2. Summary of Volatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	RSB-7	RSB-7	RSB-7	RSB-7
Sample Designation:					RSB-7	RSB-7	RSB-7	RSB-7
Sample Date:					12/08/2025	12/08/2025	12/08/2025	12/16/2025
Sample Depth (ft bls):					0 - 2	2 - 4	4 - 6	6 - 8
Normal Sample or Field Duplicate:					N	N	N	N
Cyclohexane	--	--	--	MG/KG	0.00027 U	0.00024 U	0.00023 U	0.00023 U
Dibromochloromethane	--	--	--	MG/KG	0.00065 U	0.00058 U	0.00057 U	0.00055 U
Dichlorodifluoromethane	--	--	--	MG/KG	0.00041 U	0.00036 U	0.00036 U	0.00035 UT
Ethylbenzene	1	76	1	MG/KG	0.00056 U	0.0005 U	0.0005 U	0.00048 U
Isopropylbenzene (Cumene)	--	--	--	MG/KG	0.00034 U	0.00031 U	0.0003 U	0.00029 U
m,p-Xylene	0.26	100	1.2	MG/KG	0.00051 U	0.00045 U	0.00045 U	0.00044 U
Methyl Acetate	--	--	--	MG/KG	0.0052 U	0.0046 U	0.0046 U	0.0044 U
Methyl Ethyl Ketone (2-Butanone)	0.1	100	0.1	MG/KG	0.00044 U	0.00039 U	0.00039 U	0.00038 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	MG/KG	0.0019 U	0.0017 U	0.0017 U	0.0016 U
Methylcyclohexane	--	--	--	MG/KG	0.0006 U	0.00053 U	0.00053 U	0.00052 U
Methylene Chloride	0.05	81	0.05	MG/KG	0.0014 U	0.0012 U	0.0012 U	0.0012 U
N-Butylbenzene	18	100	18	MG/KG	0.00035 U	0.00032 U	0.00031 U	0.0003 U
N-Propylbenzene	5	100	5	MG/KG	0.00054 U	0.00048 U	0.00048 U	0.00046 U
O-Xylene (1,2-Dimethylbenzene)	0.26	100	1.2	MG/KG	0.00056 U	0.00049 U	0.00049 U	0.00048 U
Sec-Butylbenzene	25	100	25	MG/KG	0.00035 U	0.00031 U	0.00031 U	0.0003 U
Styrene	--	--	--	MG/KG	0.00034 U	0.0003 U	0.0003 U	0.00029 U
T-Butylbenzene	11	100	11	MG/KG	0.00033 U	0.0003 U	0.00029 U	0.00029 U
Tert-Butyl Methyl Ether	0.1	100	0.1	MG/KG	0.00062 U	0.00055 U	0.00054 U	0.00053 U
Tetrachloroethylene (PCE)	1.3	18	1.3	MG/KG	0.00037 U	0.00033 U	0.00032 U	0.00032 U
Toluene	0.7	100	0.7	MG/KG	0.00028 U	0.00025 U	0.00025 U	0.00024 U
Trans-1,2-Dichloroethene	0.19	100	0.19	MG/KG	0.0003 U	0.00026 U	0.00026 U	0.00025 U
Trans-1,3-Dichloropropene	--	--	--	MG/KG	0.00032 U	0.00029 U	0.00028 U	0.00027 U
Trichloroethylene (TCE)	0.47	6.4	0.47	MG/KG	0.00039 U	0.00034 U	0.00034 U	0.00033 U
Trichlorofluoromethane	--	--	--	MG/KG	0.00049 U	0.00044 U	0.00043 U	0.00042 U
Vinyl Chloride	0.03	0.48	0.03	MG/KG	0.00066 U	0.00059 U	0.00058 U	0.00056 U
Xylenes	0.26	100	1.2	MG/KG	0.00021 U	0.00019 U	0.00018 U	0.00018 U

Table 2. Summary of Volatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

			Sample Designation:		RSB-7	RSB-7	RSB-8	RSB-8
			Sample Date:		12/16/2025	12/16/2025	12/11/2025	12/11/2025
			Sample Depth (ft bls):		8 - 10	25 - 27	0 - 2	1 - 3
			Normal Sample or Field Duplicate:		N	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
1,1,1-Trichloroethane (TCA)	0.68	100	0.68	MG/KG	0.0003 UJ	0.00024 U	0.00025 U	0.00021 U
1,1,2,2-Tetrachloroethane	--	--	--	MG/KG	0.00066 UJ	0.00053 U	0.00056 U	0.00046 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	MG/KG	0.00038 UJ	0.00031 U	0.00033 U	0.00026 U
1,1,2-Trichloroethane	--	--	--	MG/KG	0.00076 UJ	0.00061 U	0.00065 U	0.00053 U
1,1-Dichloroethane	0.27	47	0.27	MG/KG	0.00076 UJ	0.00061 U	0.00065 U	0.00053 U
1,1-Dichloroethene	0.24	0.98	0.33	MG/KG	0.00029 UJ	0.00023 U	0.00024 U	0.0002 U
1,2,3-Trichlorobenzene	--	--	--	MG/KG	0.00094 UJ	0.00075 U	0.0008 UJ	0.00065 U
1,2,4-Trichlorobenzene	--	--	--	MG/KG	0.00045 UJ	0.00036 U	0.00039 UJ	0.00032 U
1,2,4-Trimethylbenzene	5.9	100	5.9	MG/KG	0.00031 UJ	0.00025 U	0.00035 J	0.00022 U
1,2-Dibromo-3-Chloropropane	--	--	--	MG/KG	0.00058 UJ	0.00047 U	0.0005 U	0.0004 U
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	MG/KG	0.00064 UJ	0.00051 U	0.00054 U	0.00044 U
1,2-Dichlorobenzene	1.1	100	1.1	MG/KG	0.00046 UJ	0.00037 U	0.00039 U	0.00032 U
1,2-Dichloroethane	0.02	5.8	0.02	MG/KG	0.00038 UJ	0.0003 U	0.00032 U	0.00026 U
1,2-Dichloropropane	--	--	--	MG/KG	0.00054 UJ	0.00043 U	0.00046 U	0.00037 U
1,3,5-Trimethylbenzene (Mesitylene)	3.1	100	3.1	MG/KG	0.0004 UJ	0.00032 U	0.00034 U	0.00028 U
1,3-Dichlorobenzene	2.6	38	2.6	MG/KG	0.00046 UJ	0.00037 U	0.00039 U	0.00032 U
1,4-Dichlorobenzene	1.8	24	1.8	MG/KG	0.00066 UJ	0.00053 U	0.00056 U	0.00046 U
2-Hexanone	--	--	--	MG/KG	0.0022 UJ	0.0017 U	0.0019 U	0.0015 U
Acetone	**0.03**	100	0.03	MG/KG	**0.11 J**	0.0058 U	0.016 J+	0.016 J+
Benzene	0.06	3.7	0.06	MG/KG	0.00072 UJ	0.00057 U	0.00061 U	0.0005 U
Bromochloromethane	--	--	--	MG/KG	0.00076 UJ	0.0006 U	0.00064 U	0.00052 U
Bromodichloromethane	--	--	--	MG/KG	0.00033 UJ	0.00026 U	0.00028 U	0.00023 U
Bromoform	--	--	--	MG/KG	0.00054 UJ	0.00043 U	0.00046 U	0.00037 U
Bromomethane	--	--	--	MG/KG	0.0013 UJ	0.001 U	0.0011 U	0.00088 U
Carbon Disulfide	--	--	--	MG/KG	0.00034 UJ	0.00027 U	0.00029 U	0.00023 U
Carbon Tetrachloride	0.76	7.1	0.76	MG/KG	0.00049 UJ	0.00039 U	0.00042 U	0.00034 U
Chlorobenzene	4.5	100	4.5	MG/KG	0.00064 UJ	0.00051 U	0.00055 U	0.00045 U
Chloroethane	--	--	--	MG/KG	0.00066 UJ	0.00053 U	0.00056 U	0.00046 U
Chloroform	0.37	24	0.37	MG/KG	0.0012 UJ	0.00098 U	0.001 U	0.00085 U
Chloromethane	--	--	--	MG/KG	0.00055 UJ	0.00044 U	0.00047 U	0.00038 U
Cis-1,2-Dichloroethylene	0.19	41	0.19	MG/KG	0.00045 UJ	0.00036 U	0.00039 U	0.00032 U
Cis-1,3-Dichloropropene	--	--	--	MG/KG	0.00035 UJ	0.00028 U	0.0003 U	0.00024 U

Table 2. Summary of Volatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	Sample Designation: RSB-7	RSB-7	RSB-8	RSB-8
					Sample Date: 12/16/2025	12/16/2025	12/11/2025	12/11/2025
					Sample Depth (ft bls): 8 - 10	25 - 27	0 - 2	1 - 3
					Normal Sample or Field Duplicate: N	N	N	N
Cyclohexane	--	--	--	MG/KG	0.00028 UJ	0.00022 U	0.00024 U	0.00019 U
Dibromochloromethane	--	--	--	MG/KG	0.00068 UJ	0.00054 U	0.00058 U	0.00047 U
Dichlorodifluoromethane	--	--	--	MG/KG	0.00043 UJ	0.00034 U	0.00037 UT	0.0003 UT
Ethylbenzene	1	76	1	MG/KG	0.00059 UJ	0.00047 U	0.00051 U	0.00041 U
Isopropylbenzene (Cumene)	--	--	--	MG/KG	0.00036 UJ	0.00029 U	0.00031 U	0.00025 U
m,p-Xylene	0.26	100	1.2	MG/KG	0.00054 UJ	0.00043 U	0.00046 U	0.00037 U
Methyl Acetate	--	--	--	MG/KG	0.0055 UJ	0.0044 U	0.0046 U	0.0038 U
Methyl Ethyl Ketone (2-Butanone)	0.1	100	0.1	MG/KG	0.00047 UJ	0.00037 U	0.0004 U	0.00032 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	MG/KG	0.002 UJ	0.0016 U	0.0017 U	0.0014 U
Methylcyclohexane	--	--	--	MG/KG	0.00063 UJ	0.00051 U	0.00054 U	0.00044 U
Methylene Chloride	0.05	81	0.05	MG/KG	0.0015 UJ	0.0012 U	0.0012 U	0.001 U
N-Butylbenzene	18	100	18	MG/KG	0.00037 UJ	0.0003 U	0.00032 UJ	0.00026 U
N-Propylbenzene	5	100	5	MG/KG	0.00057 UJ	0.00046 U	0.00049 U	0.0004 U
O-Xylene (1,2-Dimethylbenzene)	0.26	100	1.2	MG/KG	0.00058 UJ	0.00047 U	0.0005 U	0.00041 U
Sec-Butylbenzene	25	100	25	MG/KG	0.00037 UJ	0.00029 U	0.00031 UJ	0.00025 U
Styrene	--	--	--	MG/KG	0.00035 UJ	0.00028 U	0.0003 U	0.00024 U
T-Butylbenzene	11	100	11	MG/KG	0.00035 UJ	0.00028 U	0.0003 U	0.00024 U
Tert-Butyl Methyl Ether	0.1	100	0.1	MG/KG	0.00065 UJ	0.00052 U	0.00055 U	0.00045 U
Tetrachloroethylene (PCE)	1.3	18	1.3	MG/KG	0.00039 UJ	0.00031 U	0.00033 U	0.00027 U
Toluene	0.7	100	0.7	MG/KG	0.0003 UJ	0.00024 U	0.00039 J	0.00021 U
Trans-1,2-Dichloroethene	0.19	100	0.19	MG/KG	0.00031 UJ	0.00025 U	0.00027 U	0.00022 U
Trans-1,3-Dichloropropene	--	--	--	MG/KG	0.00034 UJ	0.00027 U	0.00029 U	0.00023 U
Trichloroethylene (TCE)	0.47	6.4	0.47	MG/KG	0.00041 UJ	0.00033 U	0.00035 U	0.00028 U
Trichlorofluoromethane	--	--	--	MG/KG	0.00051 UJ	0.00041 U	0.00044 U	0.00036 U
Vinyl Chloride	0.03	0.48	0.03	MG/KG	0.00069 UJ	0.00055 U	0.00059 U	0.00048 U
Xylenes	0.26	100	1.2	MG/KG	0.00022 UJ	0.00018 U	0.00019 U	0.00015 U

Table 2. Summary of Volatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

			Sample Designation:		RSB-8	RSB-8	RSB-8	RSB-8
			Sample Date:		12/11/2025	12/11/2025	12/15/2025	12/15/2025
			Sample Depth (ft bls):		1 - 3	3 - 5	5 - 7	25 - 27
			Normal Sample or Field Duplicate:		FD	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
1,1,1-Trichloroethane (TCA)	0.68	100	0.68	MG/KG	0.00023 U	0.00022 U	0.00026 U	0.00022 UT
1,1,2,2-Tetrachloroethane	--	--	--	MG/KG	0.00051 U	0.00049 U	0.00058 U	0.00049 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	MG/KG	0.00029 U	0.00028 U	0.00034 U	0.00028 UT
1,1,2-Trichloroethane	--	--	--	MG/KG	0.00058 U	0.00057 U	0.00067 U	0.00057 U
1,1-Dichloroethane	0.27	47	0.27	MG/KG	0.00058 U	0.00056 U	0.00067 U	0.00056 U
1,1-Dichloroethene	0.24	0.98	0.33	MG/KG	0.00022 U	0.00021 U	0.00025 U	0.00021 UT
1,2,3-Trichlorobenzene	--	--	--	MG/KG	0.00072 U	0.0007 U	0.00083 U	0.0007 U
1,2,4-Trichlorobenzene	--	--	--	MG/KG	0.00035 U	0.00034 U	0.0004 U	0.00034 U
1,2,4-Trimethylbenzene	5.9	100	5.9	MG/KG	0.00024 U	0.00023 U	0.00028 U	0.00023 U
1,2-Dibromo-3-Chloropropane	--	--	--	MG/KG	0.00045 U	0.00043 U	0.00051 U	0.00043 U
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	MG/KG	0.00049 U	0.00048 U	0.00056 U	0.00047 U
1,2-Dichlorobenzene	1.1	100	1.1	MG/KG	0.00035 U	0.00034 U	0.0004 U	0.00034 U
1,2-Dichloroethane	0.02	5.8	0.02	MG/KG	0.00029 U	0.00028 U	0.00033 U	0.00028 U
1,2-Dichloropropane	--	--	--	MG/KG	0.00041 U	0.0004 U	0.00047 U	0.0004 U
1,3,5-Trimethylbenzene (Mesitylene)	3.1	100	3.1	MG/KG	0.0003 U	0.0003 U	0.00035 U	0.0003 U
1,3-Dichlorobenzene	2.6	38	2.6	MG/KG	0.00035 U	0.00034 U	0.00041 U	0.00034 U
1,4-Dichlorobenzene	1.8	24	1.8	MG/KG	0.0005 U	0.00049 U	0.00058 U	0.00049 U
2-Hexanone	--	--	--	MG/KG	0.0017 U	0.0016 U	0.0019 U	0.0016 U
Acetone	**0.03**	100	0.03	MG/KG	0.014 J+	0.0064 J+	0.0064 U	0.017 J+
Benzene	0.06	3.7	0.06	MG/KG	0.00055 U	0.00054 U	0.00063 U	0.00053 U
Bromochloromethane	--	--	--	MG/KG	0.00058 U	0.00056 U	0.00067 U	0.00056 U
Bromodichloromethane	--	--	--	MG/KG	0.00025 U	0.00024 U	0.00029 U	0.00024 U
Bromoform	--	--	--	MG/KG	0.00041 U	0.0004 U	0.00048 U	0.0004 UT
Bromomethane	--	--	--	MG/KG	0.00097 U	0.00094 U	0.0011 U	0.00094 U
Carbon Disulfide	--	--	--	MG/KG	0.00026 U	0.00025 U	0.0003 U	0.00025 U
Carbon Tetrachloride	0.76	7.1	0.76	MG/KG	0.00038 U	0.00037 U	0.00043 U	0.00036 UT
Chlorobenzene	4.5	100	4.5	MG/KG	0.00049 U	0.00048 U	0.00057 U	0.00048 U
Chloroethane	--	--	--	MG/KG	0.00051 U	0.00049 U	0.00058 U	0.00049 U
Chloroform	0.37	24	0.37	MG/KG	0.00094 U	0.00092 U	0.0011 U	0.00091 U
Chloromethane	--	--	--	MG/KG	0.00042 U	0.00041 U	0.00049 U	0.00041 U
Cis-1,2-Dichloroethylene	0.19	41	0.19	MG/KG	0.00035 U	0.00034 U	0.0004 U	0.00034 U
Cis-1,3-Dichloropropene	--	--	--	MG/KG	0.00026 U	0.00026 U	0.00031 U	0.00026 U

Table 2. Summary of Volatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-8	RSB-8	RSB-8	RSB-8
				Sample Date:	12/11/2025	12/11/2025	12/15/2025	12/15/2025
				Sample Depth (ft bls):	1 - 3	3 - 5	5 - 7	25 - 27
				Normal Sample or Field Duplicate:	FD	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
Cyclohexane	--	--	--	MG/KG	0.00021 U	0.00021 U	0.00025 U	0.00021 U
Dibromochloromethane	--	--	--	MG/KG	0.00052 U	0.00051 U	0.0006 U	0.00051 UT
Dichlorodifluoromethane	--	--	--	MG/KG	0.00033 UT	0.00032 UT	0.00038 UT	0.00032 U
Ethylbenzene	1	76	1	MG/KG	0.00045 U	0.00044 U	0.00052 U	0.00044 U
Isopropylbenzene (Cumene)	--	--	--	MG/KG	0.00028 U	0.00027 U	0.00032 U	0.00027 U
m,p-Xylene	0.26	100	1.2	MG/KG	0.00041 U	0.0004 U	0.00047 U	0.0004 U
Methyl Acetate	--	--	--	MG/KG	0.0042 U	0.0041 U	0.0048 U	0.0041 U
Methyl Ethyl Ketone (2-Butanone)	0.1	100	0.1	MG/KG	0.00036 U	0.00035 U	0.00041 U	0.00035 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	MG/KG	0.0015 U	0.0015 U	0.0017 U	0.0015 U
Methylcyclohexane	--	--	--	MG/KG	0.00048 U	0.00047 U	0.00056 U	0.00047 UT
Methylene Chloride	0.05	81	0.05	MG/KG	0.0011 U	0.0011 U	0.0013 U	0.0011 U
N-Butylbenzene	18	100	18	MG/KG	0.00029 U	0.00028 U	0.00033 U	0.00028 U
N-Propylbenzene	5	100	5	MG/KG	0.00044 U	0.00042 U	0.0005 U	0.00042 U
O-Xylene (1,2-Dimethylbenzene)	0.26	100	1.2	MG/KG	0.00045 U	0.00044 U	0.00052 U	0.00043 U
Sec-Butylbenzene	25	100	25	MG/KG	0.00028 U	0.00027 U	0.00032 U	0.00027 U
Styrene	--	--	--	MG/KG	0.00027 U	0.00026 U	0.00031 U	0.00026 U
T-Butylbenzene	11	100	11	MG/KG	0.00027 U	0.00026 U	0.00031 U	0.00026 U
Tert-Butyl Methyl Ether	0.1	100	0.1	MG/KG	0.0005 U	0.00048 U	0.00057 U	0.00048 U
Tetrachloroethylene (PCE)	1.3	18	1.3	MG/KG	0.0003 U	0.00029 U	0.00034 U	0.00029 U
Toluene	0.7	100	0.7	MG/KG	0.00023 U	0.00022 U	0.00026 U	0.00022 U
Trans-1,2-Dichloroethene	0.19	100	0.19	MG/KG	0.00024 U	0.00023 U	0.00028 U	0.00023 UT
Trans-1,3-Dichloropropene	--	--	--	MG/KG	0.00026 U	0.00025 U	0.0003 U	0.00025 U
Trichloroethylene (TCE)	0.47	6.4	0.47	MG/KG	0.00031 U	0.0003 U	0.00036 U	0.0003 U
Trichlorofluoromethane	--	--	--	MG/KG	0.00039 U	0.00038 U	0.00045 U	0.00038 U
Vinyl Chloride	0.03	0.48	0.03	MG/KG	0.00053 U	0.00052 U	0.00061 U	0.00051 U
Xylenes	0.26	100	1.2	MG/KG	0.00017 U	0.00016 U	0.00019 U	0.00016 U

Table 2. Summary of Volatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

			Sample Designation:		RSB-9	RSB-9	RSB-9	RSB-9
			Sample Date:		12/15/2025	12/17/2025	12/17/2025	12/17/2025
			Sample Depth (ft bls):		0 - 2	16 - 18	20 - 22	22 - 24
			Normal Sample or Field Duplicate:		N	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
1,1,1-Trichloroethane (TCA)	0.68	100	0.68	MG/KG	0.00025 UT	0.00028 UT	0.00029 UT	0.00034 U
1,1,2,2-Tetrachloroethane	--	--	--	MG/KG	0.00057 U	0.00063 U	0.00065 U	0.00077 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	--	--	--	MG/KG	0.00033 UT	0.00036 UT	0.00037 UT	0.00045 UT
1,1,2-Trichloroethane	--	--	--	MG/KG	0.00065 U	0.00073 U	0.00075 U	0.00089 U
1,1-Dichloroethane	0.27	47	0.27	MG/KG	0.00065 U	0.00072 UT	0.00074 UT	0.00088 U
1,1-Dichloroethene	0.24	0.98	0.33	MG/KG	0.00024 UT	0.00027 UT	0.00028 UT	0.00033 UT
1,2,3-Trichlorobenzene	--	--	--	MG/KG	0.0008 U	0.00089 U	0.00092 U	0.0011 U
1,2,4-Trichlorobenzene	--	--	--	MG/KG	0.00039 U	0.00043 U	0.00045 U	0.00053 U
1,2,4-Trimethylbenzene	5.9	100	5.9	MG/KG	0.00027 U	0.0003 U	0.00031 U	0.00036 U
1,2-Dibromo-3-Chloropropane	--	--	--	MG/KG	0.0005 U	0.00056 UT	0.00057 UT	0.00068 U
1,2-Dibromoethane (Ethylene Dibromide)	--	--	--	MG/KG	0.00055 U	0.00061 U	0.00063 U	0.00075 U
1,2-Dichlorobenzene	1.1	100	1.1	MG/KG	0.00039 U	0.00044 U	0.00045 U	0.00053 U
1,2-Dichloroethane	0.02	5.8	0.02	MG/KG	0.00032 U	0.00036 U	0.00037 U	0.00044 U
1,2-Dichloropropane	--	--	--	MG/KG	0.00046 U	0.00051 U	0.00053 U	0.00063 U
1,3,5-Trimethylbenzene (Mesitylene)	3.1	100	3.1	MG/KG	0.00034 U	0.00038 U	0.00039 U	0.00046 U
1,3-Dichlorobenzene	2.6	38	2.6	MG/KG	0.0004 U	0.00044 U	0.00045 U	0.00054 U
1,4-Dichlorobenzene	1.8	24	1.8	MG/KG	0.00056 U	0.00063 U	0.00065 U	0.00077 U
2-Hexanone	--	--	--	MG/KG	0.0019 U	0.0021 U	0.0021 U	0.0025 U
Acetone	**0.03**	100	0.03	MG/KG	0.0062 U	0.017 J+	0.013 J+	0.0085 U
Benzene	0.06	3.7	0.06	MG/KG	0.00062 U	0.00069 U	0.00071 U	0.00084 U
Bromochloromethane	--	--	--	MG/KG	0.00065 U	0.00072 UT	0.00074 UT	0.00088 U
Bromodichloromethane	--	--	--	MG/KG	0.00028 U	0.00031 U	0.00032 U	0.00038 U
Bromoform	--	--	--	MG/KG	0.00046 UT	0.00052 UT	0.00053 UT	0.00063 UT
Bromomethane	--	--	--	MG/KG	0.0011 U	0.0012 U	0.0012 U	0.0015 U
Carbon Disulfide	--	--	--	MG/KG	0.00029 U	0.00032 UT	0.00033 UT	0.00039 U
Carbon Tetrachloride	0.76	7.1	0.76	MG/KG	0.00042 UT	0.00047 UT	0.00048 UT	0.00057 UT
Chlorobenzene	4.5	100	4.5	MG/KG	0.00055 U	0.00061 U	0.00063 U	0.00075 U
Chloroethane	--	--	--	MG/KG	0.00057 U	0.00063 U	0.00065 U	0.00077 U
Chloroform	0.37	24	0.37	MG/KG	0.0011 U	0.0012 U	0.0012 U	0.0014 U
Chloromethane	--	--	--	MG/KG	0.00047 U	0.00053 U	0.00054 U	0.00064 U
Cis-1,2-Dichloroethylene	0.19	41	0.19	MG/KG	0.00039 U	0.00043 UT	0.00045 UT	0.00053 U
Cis-1,3-Dichloropropene	--	--	--	MG/KG	0.0003 U	0.00033 U	0.00034 U	0.0004 U

Table 2. Summary of Volatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-9	RSB-9	RSB-9	RSB-9
				Sample Date:	12/15/2025	12/17/2025	12/17/2025	12/17/2025
				Sample Depth (ft bls):	0 - 2	16 - 18	20 - 22	22 - 24
				Normal Sample or Field Duplicate:	N	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
Cyclohexane	--	--	--	MG/KG	0.00024 U	0.00027 UT	0.00028 UT	0.00033 U
Dibromochloromethane	--	--	--	MG/KG	0.00058 UT	0.00065 UT	0.00067 UT	0.00079 U
Dichlorodifluoromethane	--	--	--	MG/KG	0.00037 U	0.00041 U	0.00042 U	0.0005 U
Ethylbenzene	1	76	1	MG/KG	0.00051 U	0.00057 U	0.00058 U	0.00069 U
Isopropylbenzene (Cumene)	--	--	--	MG/KG	0.00031 U	0.00035 U	0.00035 U	0.00042 U
m,p-Xylene	0.26	100	1.2	MG/KG	0.00046 U	0.00051 U	0.00053 U	0.00063 U
Methyl Acetate	--	--	--	MG/KG	0.0047 U	0.0052 UT	0.0054 UT	0.0064 UT
Methyl Ethyl Ketone (2-Butanone)	0.1	100	0.1	MG/KG	0.0004 U	0.00045 U	0.00046 U	0.00054 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	--	--	MG/KG	0.0017 U	0.0019 U	0.0019 U	0.0023 U
Methylcyclohexane	--	--	--	MG/KG	0.00054 UT	0.0006 UT	0.00062 UT	0.00074 U
Methylene Chloride	0.05	81	0.05	MG/KG	0.0012 U	0.0014 UT	0.0014 UT	0.0017 U
N-Butylbenzene	18	100	18	MG/KG	0.00032 U	0.00036 U	0.00037 U	0.00044 U
N-Propylbenzene	5	100	5	MG/KG	0.00049 U	0.00054 U	0.00056 U	0.00066 U
O-Xylene (1,2-Dimethylbenzene)	0.26	100	1.2	MG/KG	0.0005 U	0.00056 U	0.00057 U	0.00068 U
Sec-Butylbenzene	25	100	25	MG/KG	0.00031 U	0.00035 U	0.00036 U	0.00043 U
Styrene	--	--	--	MG/KG	0.0003 U	0.00034 U	0.00035 U	0.00041 U
T-Butylbenzene	11	100	11	MG/KG	0.0003 U	0.00033 U	0.00034 U	0.00041 UJ
Tert-Butyl Methyl Ether	0.1	100	0.1	MG/KG	0.00056 U	0.00062 U	0.00064 U	0.00076 U
Tetrachloroethylene (PCE)	1.3	18	1.3	MG/KG	0.00033 U	0.00037 UT	0.00038 UT	0.00045 U
Toluene	0.7	100	0.7	MG/KG	0.00025 U	0.00028 U	0.00029 U	0.00035 U
Trans-1,2-Dichloroethene	0.19	100	0.19	MG/KG	0.00027 UT	0.0003 UT	0.00031 UT	0.00036 U
Trans-1,3-Dichloropropene	--	--	--	MG/KG	0.00029 U	0.00032 U	0.00033 U	0.00039 UJ
Trichloroethylene (TCE)	0.47	6.4	0.47	MG/KG	0.00035 U	0.00039 UT	0.0004 UT	0.00048 U
Trichlorofluoromethane	--	--	--	MG/KG	0.00044 U	0.00049 U	0.00051 U	0.0006 U
Vinyl Chloride	0.03	0.48	0.03	MG/KG	0.00059 U	0.00066 U	0.00068 U	0.00081 U
Xylenes	0.26	100	1.2	MG/KG	0.00019 U	0.00021 U	0.00022 U	0.00026 U

Table 3. Summary of Semivolatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-1	RSB-1	RSB-1	RSB-1
				Sample Date:	12/01/2025	12/01/2025	12/01/2025	12/02/2025
				Sample Depth (ft bls):	0 - 2	2 - 4	4 - 6	20 - 22
				Normal Sample or Field Duplicate:	N	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
1,2,4,5-Tetrachlorobenzene	--	--	--	MG/KG	0.011 U	0.011 U	0.011 U	0.012 U
1,4-Dioxane (P-Dioxane)	0.1	5.7	0.1	MG/KG	0.03 U	0.031 U	0.032 U	0.033 U
2,3,4,6-Tetrachlorophenol	--	--	--	MG/KG	0.023 U	0.024 U	0.025 U	0.025 U
2,4,5-Trichlorophenol	--	--	--	MG/KG	0.035 U	0.037 U	0.037 U	0.038 U
2,4,6-Trichlorophenol	--	--	--	MG/KG	0.044 U	0.046 U	0.047 U	0.048 U
2,4-Dichlorophenol	--	--	--	MG/KG	0.022 U	0.023 U	0.023 U	0.024 U
2,4-Dimethylphenol	--	--	--	MG/KG	0.041 U	0.043 U	0.044 U	0.045 U
2,4-Dinitrophenol	--	--	--	MG/KG	0.17 U	0.18 U	0.18 U	0.18 U
2,4-Dinitrotoluene	--	--	--	MG/KG	0.037 U	0.039 U	0.039 U	0.04 U
2,6-Dinitrotoluene	--	--	--	MG/KG	0.025 U	0.026 U	0.026 U	0.027 U
2-Chloronaphthalene	--	--	--	MG/KG	0.044 U	0.046 U	0.047 U	0.048 U
2-Chlorophenol	--	--	--	MG/KG	0.012 U	0.013 U	0.013 U	0.013 U
2-Methylnaphthalene	--	--	--	MG/KG	0.0096 U	0.01 U	0.01 U	0.01 UT
2-Methylphenol (O-Cresol)	0.33	100	0.33	MG/KG	0.013 U	0.013 U	0.014 U	0.014 U
2-Nitroaniline	--	--	--	MG/KG	0.026 U	0.027 U	0.028 U	0.029 U
2-Nitrophenol	--	--	--	MG/KG	0.034 U	0.036 U	0.037 U	0.038 U
3,3'-Dichlorobenzidine	--	--	--	MG/KG	0.052 U	0.054 U	0.055 U	0.057 U
3-Nitroaniline	--	--	--	MG/KG	0.081 U	0.085 U	0.087 U	0.089 U
4,6-Dinitro-2-Methylphenol	--	--	--	MG/KG	0.14 U	0.15 U	0.15 U	0.15 U
4-Bromophenyl Phenyl Ether	--	--	--	MG/KG	0.014 U	0.014 U	0.014 U	0.015 U
4-Chloro-3-Methylphenol	--	--	--	MG/KG	0.019 U	0.02 U	0.02 U	0.021 U
4-Chloroaniline	--	--	--	MG/KG	0.061 U	0.064 U	0.065 U	0.067 U
4-Chlorophenyl Phenyl Ether	--	--	--	MG/KG	0.012 U	0.013 U	0.013 U	0.013 U
4-Methylphenol (P-Cresol)	0.33	100	0.33	MG/KG	0.021 U	0.022 U	0.023 U	0.023 U
4-Nitroaniline	--	--	--	MG/KG	0.087 U	0.091 U	0.093 U	0.095 U
4-Nitrophenol	--	--	--	MG/KG	0.056 U	0.059 U	0.06 U	0.061 U
Acenaphthene	20	100	98	MG/KG	0.0098 U	0.01 U	0.01 U	0.011 U
Acenaphthylene	100	100	365	MG/KG	0.0098 U	0.024 J	0.01 U	0.011 U
Acetophenone	--	--	--	MG/KG	0.017 U	0.018 U	0.018 U	0.018 U
Anthracene	100	100	1000	MG/KG	0.019 J	0.043 J	0.011 U	0.011 U
Atrazine	--	--	--	MG/KG	0.02 U	0.021 U	0.022 U	0.022 UT
Benzaldehyde	--	--	--	MG/KG	0.057 UJ	0.059 UJ	0.06 UJ	0.062 UJ

Table 3. Summary of Semivolatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

			Sample Designation:		RSB-1	RSB-1	RSB-1	RSB-1
			Sample Date:		12/01/2025	12/01/2025	12/01/2025	12/02/2025
			Sample Depth (ft bls):		0 - 2	2 - 4	4 - 6	20 - 22
			Normal Sample or Field Duplicate:		N	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
Benzo(A)Anthracene	**1**	1.4	1	MG/KG	0.13	0.16	0.028 U	0.028 U
Benzo(A)Pyrene	**1**	1	22	MG/KG	0.16	0.21	0.014 J	0.01 U
Benzo(B)Fluoranthene	**1**	1.4	2.1	MG/KG	0.18	0.24	0.016 J	0.0097 U
Benzo(G,H,I)Perylene	**0.64**	4.9	1000	MG/KG	0.12 J	0.19 J	0.011 U	0.011 U
Benzo(K)Fluoranthene	**0.8**	4.9	2	MG/KG	0.066	0.1	0.0072 U	0.0074 U
Benzyl Butyl Phthalate	--	--	--	MG/KG	0.016 U	0.017 U	0.017 U	0.018 U
Biphenyl (Diphenyl)	--	--	--	MG/KG	0.012 U	0.013 U	0.013 U	0.013 U
Bis(2-Chloroethoxy) Methane	--	--	--	MG/KG	0.063 U	0.066 U	0.068 U	0.069 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	MG/KG	0.012 U	0.013 U	0.013 U	0.013 U
Bis(2-Chloroisopropyl) Ether	--	--	--	MG/KG	0.02 U	0.022 U	0.022 U	0.022 U
Bis(2-Ethylhexyl) Phthalate	--	--	--	MG/KG	0.018 U	0.035 J	0.019 U	0.02 U
Caprolactam	--	--	--	MG/KG	0.053 U	0.056 U	0.057 U	0.058 UT
Carbazole	--	--	--	MG/KG	0.013 U	0.014 U	0.014 U	0.014 U
Chrysene	**1**	4.9	1	MG/KG	0.14 J	0.19 J	0.015 U	0.016 U
Cresols, M & P	0.33	100	0.33	MG/KG	0.021 U	0.022 U	0.023 U	0.023 U
Dibenz(A,H)Anthracene	**0.33**	0.33	1000	MG/KG	0.026 J	0.093	0.016 U	0.016 U
Dibenzofuran	2.1	18	110	MG/KG	0.011 U	0.012 U	0.012 U	0.013 U
Diethyl Phthalate	--	--	--	MG/KG	0.011 U	0.012 U	0.012 U	0.012 U
Dimethyl Phthalate	--	--	--	MG/KG	0.078 U	0.082 U	0.083 U	0.085 U
Di-N-Butyl Phthalate	--	--	--	MG/KG	0.013 U	0.014 U	0.014 U	0.014 U
Di-N-Octylphthalate	--	--	--	MG/KG	0.018 U	0.024 J	0.019 U	0.02 U
Fluoranthene	85	100	1000	MG/KG	0.16 J	0.22 J	0.018 J	0.013 U
Fluorene	30	100	386	MG/KG	0.01 U	0.011 U	0.011 U	0.011 U
Hexachlorobenzene	0.33	0.33	3.2	MG/KG	0.016 U	0.017 U	0.017 U	0.018 U
Hexachlorobutadiene	--	--	--	MG/KG	0.0073 U	0.0077 U	0.0078 U	0.008 U
Hexachlorocyclopentadiene	--	--	--	MG/KG	0.03 U	0.032 U	0.032 U	0.033 U
Hexachloroethane	--	--	--	MG/KG	0.012 U	0.012 U	0.013 U	0.013 U
Indeno(1,2,3-C,D)Pyrene	**0.5**	1.4	6.6	MG/KG	0.11	0.19	0.014 U	0.015 U
Isophorone	--	--	--	MG/KG	0.099 U	0.1 U	0.11 U	0.11 U
Naphthalene	12	100	12	MG/KG	0.0059 U	0.0062 U	0.0063 U	0.0065 U
Nitrobenzene	0.08	1.8	0.08	MG/KG	0.019 U	0.02 U	0.02 U	0.021 U
N-Nitrosodi-N-Propylamine	--	--	--	MG/KG	0.025 U	0.026 U	0.027 U	0.027 U

Table 3. Summary of Semivolatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-1	RSB-1	RSB-1	RSB-1
				Sample Date:	12/01/2025	12/01/2025	12/01/2025	12/02/2025
				Sample Depth (ft bls):	0 - 2	2 - 4	4 - 6	20 - 22
				Normal Sample or Field Duplicate:	N	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
N-Nitrosodiphenylamine	--	--	--	MG/KG	0.028 U	0.03 U	0.03 U	0.031 U
Pentachlorophenol	0.8	1.3	0.8	MG/KG	0.07 U	0.074 U	0.075 U	0.077 U
Phenanthrene	**1.1**	4.9	1000	MG/KG	0.066 J	0.13 J	0.015 U	0.015 U
Phenol	0.33	100	0.33	MG/KG	0.013 U	0.013 U	0.013 U	0.014 U
Pyrene	64	100	1000	MG/KG	0.23 J	0.24 J	0.02 J	0.0093 U

Table 3. Summary of Semivolatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	Sample Designation: RSB-2	RSB-2	RSB-2	RSB-2
					Sample Date: 12/01/2025	12/01/2025	12/01/2025	12/01/2025
					Sample Depth (ft bls): 0 - 2	1 - 3	1 - 3	3 - 5
					Normal Sample or Field Duplicate: N	N	FD	N
1,2,4,5-Tetrachlorobenzene	--	--	--	MG/KG	0.011 U	0.011 U	0.011 U	0.011 U
1,4-Dioxane (P-Dioxane)	0.1	5.7	0.1	MG/KG	0.031 U	0.031 U	0.031 U	0.03 U
2,3,4,6-Tetrachlorophenol	--	--	--	MG/KG	0.024 U	0.024 U	0.024 U	0.023 U
2,4,5-Trichlorophenol	--	--	--	MG/KG	0.036 U	0.037 U	0.037 U	0.035 U
2,4,6-Trichlorophenol	--	--	--	MG/KG	0.045 U	0.046 U	0.046 U	0.044 U
2,4-Dichlorophenol	--	--	--	MG/KG	0.023 U	0.023 U	0.023 U	0.022 U
2,4-Dimethylphenol	--	--	--	MG/KG	0.042 U	0.043 U	0.043 U	0.041 U
2,4-Dinitrophenol	--	--	--	MG/KG	0.17 U	0.18 U	0.18 U	0.17 U
2,4-Dinitrotoluene	--	--	--	MG/KG	0.038 U	0.039 U	0.039 U	0.037 U
2,6-Dinitrotoluene	--	--	--	MG/KG	0.026 U	0.026 U	0.026 U	0.025 U
2-Chloronaphthalene	--	--	--	MG/KG	0.045 U	0.046 U	0.046 U	0.044 U
2-Chlorophenol	--	--	--	MG/KG	0.013 U	0.013 U	0.013 U	0.012 U
2-Methylnaphthalene	--	--	--	MG/KG	0.0099 U	0.01 U	0.01 U	0.0096 U
2-Methylphenol (O-Cresol)	0.33	100	0.33	MG/KG	0.013 U	0.013 U	0.013 U	0.013 U
2-Nitroaniline	--	--	--	MG/KG	0.027 U	0.027 U	0.027 U	0.026 U
2-Nitrophenol	--	--	--	MG/KG	0.035 U	0.036 U	0.036 U	0.034 U
3,3'-Dichlorobenzidine	--	--	--	MG/KG	0.053 U	0.054 U	0.054 U	0.052 U
3-Nitroaniline	--	--	--	MG/KG	0.084 U	0.085 U	0.085 U	0.082 U
4,6-Dinitro-2-Methylphenol	--	--	--	MG/KG	0.14 U	0.15 U	0.15 U	0.14 U
4-Bromophenyl Phenyl Ether	--	--	--	MG/KG	0.014 U	0.014 U	0.014 U	0.014 U
4-Chloro-3-Methylphenol	--	--	--	MG/KG	0.02 U	0.02 U	0.02 U	0.019 U
4-Chloroaniline	--	--	--	MG/KG	0.063 U	0.064 U	0.064 U	0.061 U
4-Chlorophenyl Phenyl Ether	--	--	--	MG/KG	0.012 U	0.013 U	0.013 U	0.012 U
4-Methylphenol (P-Cresol)	0.33	100	0.33	MG/KG	0.022 U	0.022 U	0.022 U	0.021 U
4-Nitroaniline	--	--	--	MG/KG	0.09 U	0.091 U	0.091 U	0.087 U
4-Nitrophenol	--	--	--	MG/KG	0.058 U	0.059 U	0.059 U	0.056 U
Acenaphthene	20	100	98	MG/KG	0.01 U	0.01 U	0.015 J	0.0098 U
Acenaphthylene	100	100	365	MG/KG	0.01 U	0.01 U	0.01 U	0.0098 U
Acetophenone	--	--	--	MG/KG	0.017 U	0.018 U	0.018 U	0.017 U
Anthracene	100	100	1000	MG/KG	0.012 J	0.011 U	0.042 J	0.01 U
Atrazine	--	--	--	MG/KG	0.021 U	0.021 U	0.021 U	0.02 U
Benzaldehyde	--	--	--	MG/KG	0.058 UJ	0.059 UJ	0.06 UJ	0.057 UJ

Table 3. Summary of Semivolatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

			Sample Designation:		RSB-2	RSB-2	RSB-2	RSB-2
			Sample Date:		12/01/2025	12/01/2025	12/01/2025	12/01/2025
			Sample Depth (ft bls):		0 - 2	1 - 3	1 - 3	3 - 5
			Normal Sample or Field Duplicate:		N	N	FD	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
Benzo(A)Anthracene	**1**	1.4	1	MG/KG	0.096	0.042	0.13	0.026 U
Benzo(A)Pyrene	**1**	1	22	MG/KG	0.098	0.039	0.1	0.0092 U
Benzo(B)Fluoranthene	**1**	1.4	2.1	MG/KG	0.13	0.047	0.14	0.0089 U
Benzo(G,H,I)Perylene	**0.64**	4.9	1000	MG/KG	0.071 J	0.028 J	0.066 J	0.01 U
Benzo(K)Fluoranthene	**0.8**	4.9	2	MG/KG	0.043	0.019 J	0.055	0.0067 U
Benzyl Butyl Phthalate	--	--	--	MG/KG	0.017 U	0.017 U	0.017 U	0.016 U
Biphenyl (Diphenyl)	--	--	--	MG/KG	0.012 U	0.012 U	0.013 U	0.012 U
Bis(2-Chloroethoxy) Methane	--	--	--	MG/KG	0.065 U	0.066 U	0.066 U	0.064 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	MG/KG	0.012 U	0.013 U	0.013 U	0.012 U
Bis(2-Chloroisopropyl) Ether	--	--	--	MG/KG	0.021 U	0.021 U	0.022 U	0.021 U
Bis(2-Ethylhexyl) Phthalate	--	--	--	MG/KG	0.019 U	0.019 U	0.019 U	0.018 U
Caprolactam	--	--	--	MG/KG	0.055 U	0.056 U	0.056 U	0.054 U
Carbazole	--	--	--	MG/KG	0.013 U	0.014 U	0.02 J	0.013 U
Chrysene	**1**	4.9	1	MG/KG	0.091 J	0.035 J	0.12 J	0.014 U
Cresols, M & P	0.33	100	0.33	MG/KG	0.022 U	0.022 U	0.022 U	0.021 U
Dibenz(A,H)Anthracene	**0.33**	0.33	1000	MG/KG	0.016 J	0.016 U	0.016 U	0.015 U
Dibenzofuran	2.1	18	110	MG/KG	0.012 U	0.012 U	0.012 U	0.011 U
Diethyl Phthalate	--	--	--	MG/KG	0.011 U	0.012 U	0.012 U	0.011 U
Dimethyl Phthalate	--	--	--	MG/KG	0.08 U	0.082 U	0.082 U	0.078 U
Di-N-Butyl Phthalate	--	--	--	MG/KG	0.013 U	0.014 U	0.014 U	0.013 U
Di-N-Octylphthalate	--	--	--	MG/KG	0.019 U	0.019 U	0.019 U	0.018 U
Fluoranthene	85	100	1000	MG/KG	0.14 J	0.059 J	0.27 J	0.012 U
Fluorene	30	100	386	MG/KG	0.01 U	0.011 U	0.011 J	0.01 U
Hexachlorobenzene	0.33	0.33	3.2	MG/KG	0.017 U	0.017 U	0.017 U	0.016 U
Hexachlorobutadiene	--	--	--	MG/KG	0.0075 U	0.0076 U	0.0077 U	0.0073 U
Hexachlorocyclopentadiene	--	--	--	MG/KG	0.031 U	0.031 U	0.032 U	0.03 U
Hexachloroethane	--	--	--	MG/KG	0.012 U	0.012 U	0.012 U	0.012 U
Indeno(1,2,3-C,D)Pyrene	**0.5**	1.4	6.6	MG/KG	0.073	0.029 J	0.066	0.013 U
Isophorone	--	--	--	MG/KG	0.1 U	0.1 U	0.1 U	0.099 U
Naphthalene	12	100	12	MG/KG	0.0061 U	0.0062 U	0.0062 U	0.0059 U
Nitrobenzene	0.08	1.8	0.08	MG/KG	0.02 U	0.02 U	0.02 U	0.019 U
N-Nitrosodi-N-Propylamine	--	--	--	MG/KG	0.026 U	0.026 U	0.026 U	0.025 U

Table 3. Summary of Semivolatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-2	RSB-2	RSB-2	RSB-2
				Sample Date:	12/01/2025	12/01/2025	12/01/2025	12/01/2025
				Sample Depth (ft bls):	0 - 2	1 - 3	1 - 3	3 - 5
				Normal Sample or Field Duplicate:	N	N	FD	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
N-Nitrosodiphenylamine	--	--	--	MG/KG	0.029 U	0.03 U	0.03 U	0.028 U
Pentachlorophenol	0.8	1.3	0.8	MG/KG	0.072 U	0.074 U	0.074 U	0.07 U
Phenanthrene	**1.1**	4.9	1000	MG/KG	0.057 J	0.022 J	0.21 J	0.014 U
Phenol	0.33	100	0.33	MG/KG	0.013 U	0.013 U	0.013 U	0.013 U
Pyrene	64	100	1000	MG/KG	0.14 J	0.065 J	0.24 J	0.0086 U

Table 3. Summary of Semivolatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-2	RSB-3	RSB-3	RSB-3
				Sample Date:	12/02/2025	12/01/2025	12/01/2025	12/01/2025
				Sample Depth (ft bls):	20 - 22	0 - 2	2 - 4	4 - 6
				Normal Sample or Field Duplicate:	N	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
1,2,4,5-Tetrachlorobenzene	--	--	--	MG/KG	0.011 U	0.011 U	0.011 U	0.011 U
1,4-Dioxane (P-Dioxane)	0.1	5.7	0.1	MG/KG	0.03 U	0.031 U	0.031 U	0.03 U
2,3,4,6-Tetrachlorophenol	--	--	--	MG/KG	0.024 U	0.024 U	0.024 U	0.023 U
2,4,5-Trichlorophenol	--	--	--	MG/KG	0.035 U	0.036 U	0.036 U	0.035 U
2,4,6-Trichlorophenol	--	--	--	MG/KG	0.045 U	0.046 U	0.046 U	0.044 U
2,4-Dichlorophenol	--	--	--	MG/KG	0.022 U	0.023 U	0.023 U	0.022 U
2,4-Dimethylphenol	--	--	--	MG/KG	0.042 U	0.043 U	0.042 U	0.041 U
2,4-Dinitrophenol	--	--	--	MG/KG	0.17 U	0.18 U	0.17 U	0.17 U
2,4-Dinitrotoluene	--	--	--	MG/KG	0.037 U	0.038 U	0.038 U	0.037 U
2,6-Dinitrotoluene	--	--	--	MG/KG	0.025 U	0.026 U	0.026 U	0.025 U
2-Chloronaphthalene	--	--	--	MG/KG	0.045 U	0.046 U	0.046 U	0.044 U
2-Chlorophenol	--	--	--	MG/KG	0.012 U	0.013 U	0.013 U	0.012 U
2-Methylnaphthalene	--	--	--	MG/KG	0.0097 U	0.01 U	0.0099 U	0.0095 U
2-Methylphenol (O-Cresol)	0.33	100	0.33	MG/KG	0.013 U	0.013 U	0.013 U	0.013 U
2-Nitroaniline	--	--	--	MG/KG	0.027 U	0.027 U	0.027 U	0.026 U
2-Nitrophenol	--	--	--	MG/KG	0.035 U	0.036 U	0.036 U	0.034 U
3,3'-Dichlorobenzidine	--	--	--	MG/KG	0.053 U	0.054 U	0.054 U	0.051 U
3-Nitroaniline	--	--	--	MG/KG	0.083 U	0.085 U	0.084 U	0.081 U
4,6-Dinitro-2-Methylphenol	--	--	--	MG/KG	0.14 U	0.15 U	0.14 U	0.14 U
4-Bromophenyl Phenyl Ether	--	--	--	MG/KG	0.014 U	0.014 U	0.014 U	0.013 U
4-Chloro-3-Methylphenol	--	--	--	MG/KG	0.02 U	0.02 U	0.02 U	0.019 U
4-Chloroaniline	--	--	--	MG/KG	0.062 U	0.063 U	0.063 U	0.06 U
4-Chlorophenyl Phenyl Ether	--	--	--	MG/KG	0.012 U	0.013 U	0.013 U	0.012 U
4-Methylphenol (P-Cresol)	0.33	100	0.33	MG/KG	0.022 U	0.022 U	0.022 U	0.021 U
4-Nitroaniline	--	--	--	MG/KG	0.088 U	0.091 U	0.09 U	0.086 U
4-Nitrophenol	--	--	--	MG/KG	0.057 U	0.058 U	0.058 U	0.055 U
Acenaphthene	20	100	98	MG/KG	0.0099 U	0.019 J	0.043 J	0.016 J
Acenaphthylene	100	100	365	MG/KG	0.01 U	0.01 U	0.01 U	0.0097 U
Acetophenone	--	--	--	MG/KG	0.017 U	0.018 U	0.017 U	0.017 U
Anthracene	100	100	1000	MG/KG	0.011 U	0.05 J	0.13 J	0.027 J
Atrazine	--	--	--	MG/KG	0.02 U	0.021 U	0.021 U	0.02 U
Benzaldehyde	--	--	--	MG/KG	0.058 UJ	0.059 UJ	0.059 UJ	0.056 UJ

Table 3. Summary of Semivolatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-2	RSB-3	RSB-3	RSB-3
				Sample Date:	12/02/2025	12/01/2025	12/01/2025	12/01/2025
				Sample Depth (ft bls):	20 - 22	0 - 2	2 - 4	4 - 6
				Normal Sample or Field Duplicate:	N	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
Benzo(A)Anthracene	**1**	1.4	1	MG/KG	0.026 U	0.27	0.32	0.068
Benzo(A)Pyrene	**1**	1	22	MG/KG	0.0093 U	0.25	0.23	0.054
Benzo(B)Fluoranthene	**1**	1.4	2.1	MG/KG	0.009 U	0.32	0.31	0.078
Benzo(G,H,I)Perylene	**0.64**	4.9	1000	MG/KG	0.01 U	0.15 J	0.12 J	0.032 J
Benzo(K)Fluoranthene	**0.8**	4.9	2	MG/KG	0.0068 U	0.12	0.13	0.031 J
Benzyl Butyl Phthalate	--	--	--	MG/KG	0.016 U	0.017 U	0.017 U	0.016 U
Biphenyl (Diphenyl)	--	--	--	MG/KG	0.012 U	0.012 U	0.012 U	0.012 U
Bis(2-Chloroethoxy) Methane	--	--	--	MG/KG	0.064 U	0.066 U	0.065 U	0.063 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	MG/KG	0.012 U	0.012 U	0.012 U	0.012 U
Bis(2-Chloroisopropyl) Ether	--	--	--	MG/KG	0.021 U	0.021 U	0.021 U	0.02 U
Bis(2-Ethylhexyl) Phthalate	--	--	--	MG/KG	0.018 U	0.019 U	0.019 U	0.018 U
Caprolactam	--	--	--	MG/KG	0.054 U	0.056 U	0.055 U	0.053 U
Carbazole	--	--	--	MG/KG	0.013 U	0.014 U	0.043 J	0.014 J
Chrysene	**1**	4.9	1	MG/KG	0.015 U	0.24 J	0.3 J	0.06 J
Cresols, M & P	0.33	100	0.33	MG/KG	0.022 U	0.022 U	0.022 U	0.021 U
Dibenz(A,H)Anthracene	**0.33**	0.33	1000	MG/KG	0.015 U	0.039	0.036	0.015 U
Dibenzofuran	2.1	18	110	MG/KG	0.012 U	0.012 U	0.026 J	0.011 U
Diethyl Phthalate	--	--	--	MG/KG	0.011 U	0.012 U	0.011 U	0.011 U
Dimethyl Phthalate	--	--	--	MG/KG	0.079 U	0.081 U	0.081 U	0.077 U
Di-N-Butyl Phthalate	--	--	--	MG/KG	0.013 U	0.013 U	0.013 U	0.013 U
Di-N-Octylphthalate	--	--	--	MG/KG	0.018 U	0.019 U	0.019 U	0.018 U
Fluoranthene	85	100	1000	MG/KG	0.012 U	0.45	0.72	0.12 J
Fluorene	30	100	386	MG/KG	0.01 U	0.014 J	0.04 J	0.015 J
Hexachlorobenzene	0.33	0.33	3.2	MG/KG	0.017 U	0.017 U	0.017 U	0.016 U
Hexachlorobutadiene	--	--	--	MG/KG	0.0074 U	0.0076 U	0.0075 U	0.0072 U
Hexachlorocyclopentadiene	--	--	--	MG/KG	0.031 U	0.031 U	0.031 U	0.03 U
Hexachloroethane	--	--	--	MG/KG	0.012 U	0.012 U	0.012 U	0.012 U
Indeno(1,2,3-C,D)Pyrene	**0.5**	1.4	6.6	MG/KG	0.014 U	0.16	0.13	0.039
Isophorone	--	--	--	MG/KG	0.1 U	0.1 U	0.1 U	0.098 U
Naphthalene	12	100	12	MG/KG	0.006 U	0.0062 U	0.0061 U	0.024 J
Nitrobenzene	0.08	1.8	0.08	MG/KG	0.019 U	0.02 U	0.02 U	0.019 U
N-Nitrosodi-N-Propylamine	--	--	--	MG/KG	0.025 U	0.026 U	0.026 U	0.025 U

Table 3. Summary of Semivolatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-2	RSB-3	RSB-3	RSB-3
				Sample Date:	12/02/2025	12/01/2025	12/01/2025	12/01/2025
				Sample Depth (ft bls):	20 - 22	0 - 2	2 - 4	4 - 6
				Normal Sample or Field Duplicate:	N	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
N-Nitrosodiphenylamine	--	--	--	MG/KG	0.029 U	0.029 U	0.029 U	0.028 U
Pentachlorophenol	0.8	1.3	0.8	MG/KG	0.071 U	0.073 U	0.073 U	0.07 U
Phenanthrene	**1.1**	4.9	1000	MG/KG	0.014 U	0.2 J	0.65	0.11 J
Phenol	0.33	100	0.33	MG/KG	0.013 U	0.013 U	0.013 U	0.013 U
Pyrene	64	100	1000	MG/KG	0.0087 U	0.46	0.64	0.12 J

Table 3. Summary of Semivolatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-3	RSB-4	RSB-4	RSB-4
				Sample Date:	12/02/2025	12/03/2025	12/03/2025	12/03/2025
				Sample Depth (ft bls):	20 - 22	0 - 2	2 - 4	4 - 6
				Normal Sample or Field Duplicate:	N	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
1,2,4,5-Tetrachlorobenzene	--	--	--	MG/KG	0.011 U	0.011 UJ	0.01 U	0.01 U
1,4-Dioxane (P-Dioxane)	0.1	5.7	0.1	MG/KG	0.031 U	0.032 UJ	0.029 U	0.029 U
2,3,4,6-Tetrachlorophenol	--	--	--	MG/KG	0.024 U	0.025 UJ	0.022 U	0.023 U
2,4,5-Trichlorophenol	--	--	--	MG/KG	0.036 U	0.037 UJ	0.034 U	0.034 U
2,4,6-Trichlorophenol	--	--	--	MG/KG	0.045 U	0.047 UJ	0.042 U	0.043 U
2,4-Dichlorophenol	--	--	--	MG/KG	0.023 U	0.024 UJ	0.021 U	0.021 U
2,4-Dimethylphenol	--	--	--	MG/KG	0.042 U	0.044 UJ	0.039 U	0.04 U
2,4-Dinitrophenol	--	--	--	MG/KG	0.17 U	0.18 UJ	0.16 U	0.16 U
2,4-Dinitrotoluene	--	--	--	MG/KG	0.038 U	0.039 UJ	0.035 U	0.036 U
2,6-Dinitrotoluene	--	--	--	MG/KG	0.025 U	0.027 UJ	0.024 U	0.024 U
2-Chloronaphthalene	--	--	--	MG/KG	0.045 U	0.047 UJ	0.042 U	0.043 U
2-Chlorophenol	--	--	--	MG/KG	0.013 U	0.013 UJ	0.012 U	0.012 U
2-Methylnaphthalene	--	--	--	MG/KG	0.0098 U	0.49 J-	1.1	0.0093 U
2-Methylphenol (O-Cresol)	0.33	100	0.33	MG/KG	0.013 U	0.014 UJ	0.012 U	0.012 U
2-Nitroaniline	--	--	--	MG/KG	0.027 U	0.028 UJ	0.025 U	0.025 U
2-Nitrophenol	--	--	--	MG/KG	0.035 U	0.037 UJ	0.033 U	0.033 U
3,3'-Dichlorobenzidine	--	--	--	MG/KG	0.053 U	0.055 UJ	0.05 U	0.05 U
3-Nitroaniline	--	--	--	MG/KG	0.083 U	0.087 UJ	0.078 U	0.079 U
4,6-Dinitro-2-Methylphenol	--	--	--	MG/KG	0.14 U	0.15 UJ	0.13 U	0.14 U
4-Bromophenyl Phenyl Ether	--	--	--	MG/KG	0.014 U	0.015 UJ	0.013 U	0.013 U
4-Chloro-3-Methylphenol	--	--	--	MG/KG	0.02 U	0.021 UJ	0.018 U	0.019 U
4-Chloroaniline	--	--	--	MG/KG	0.062 U	0.065 UJ	0.058 U	0.059 U
4-Chlorophenyl Phenyl Ether	--	--	--	MG/KG	0.012 U	0.013 UJ	0.012 U	0.012 U
4-Methylphenol (P-Cresol)	0.33	100	0.33	MG/KG	0.022 U	0.023 UJ	0.021 U	0.021 U
4-Nitroaniline	--	--	--	MG/KG	0.089 U	0.093 UJ	0.083 U	0.085 U
4-Nitrophenol	--	--	--	MG/KG	0.057 U	0.06 UJ	0.054 U	0.054 U
Acenaphthene	20	100	98	MG/KG	0.01 U	1.8 J-	2	0.0095 U
Acenaphthylene	100	100	365	MG/KG	0.01 U	0.17 J-	0.25 J	0.0095 U
Acetophenone	--	--	--	MG/KG	0.017 U	0.018 UJ	0.016 U	0.016 U
Anthracene	100	100	1000	MG/KG	0.011 U	3.8 J-	3.6	0.01 U
Atrazine	--	--	--	MG/KG	0.021 U	0.022 UJ	0.019 U	0.02 U
Benzaldehyde	--	--	--	MG/KG	0.058 UJ	0.061 UJ	0.054 UJ	0.055 UJ

Table 3. Summary of Semivolatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	Sample Designation: RSB-3	RSB-4	RSB-4	RSB-4
					Sample Date: 12/02/2025	12/03/2025	12/03/2025	12/03/2025
					Sample Depth (ft bls): 20 - 22	0 - 2	2 - 4	4 - 6
					Normal Sample or Field Duplicate: N	N	N	N
Benzo(A)Anthracene	**1**	1.4	1	MG/KG	0.026 U	**17**	**10**	0.025 U
Benzo(A)Pyrene	**1**	1	22	MG/KG	0.0094 U	**14**	**8.8**	0.015 J
Benzo(B)Fluoranthene	**1**	1.4	2.1	MG/KG	0.0091 U	**19**	**13**	0.017 J
Benzo(G,H,I)Perylene	**0.64**	4.9	1000	MG/KG	0.01 U	**5.5 J-**	**4.6**	0.01 J
Benzo(K)Fluoranthene	**0.8**	4.9	2	MG/KG	0.0069 U	**4.6 J-**	**3.6**	0.0065 U
Benzyl Butyl Phthalate	--	--	--	MG/KG	0.016 U	0.017 UJ	0.015 U	0.016 U
Biphenyl (Diphenyl)	--	--	--	MG/KG	0.012 U	0.13 J-	0.2 J	0.012 U
Bis(2-Chloroethoxy) Methane	--	--	--	MG/KG	0.065 U	0.068 UJ	0.061 U	0.062 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	MG/KG	0.012 U	0.013 UJ	0.011 U	0.012 U
Bis(2-Chloroisopropyl) Ether	--	--	--	MG/KG	0.021 U	0.022 UJ	0.02 U	0.02 U
Bis(2-Ethylhexyl) Phthalate	--	--	--	MG/KG	0.019 U	0.019 UJ	0.031 J	0.018 U
Caprolactam	--	--	--	MG/KG	0.055 U	0.057 UJ	0.051 U	0.052 U
Carbazole	--	--	--	MG/KG	0.013 U	1.4 J-	1.3	0.013 U
Chrysene	**1**	4.9	1	MG/KG	0.015 U	**16**	**9.5**	0.02 J
Cresols, M & P	0.33	100	0.33	MG/KG	0.022 U	0.023 UJ	0.021 U	0.021 U
Dibenz(A,H)Anthracene	**0.33**	0.33	1000	MG/KG	0.015 U	**1.7 J-**	**1.4**	0.014 U
Dibenzofuran	2.1	18	110	MG/KG	0.012 U	0.95 J-	1.2	0.011 U
Diethyl Phthalate	--	--	--	MG/KG	0.011 U	0.012 UJ	0.011 U	0.011 U
Dimethyl Phthalate	--	--	--	MG/KG	0.08 U	0.083 UJ	0.075 U	0.076 U
Di-N-Butyl Phthalate	--	--	--	MG/KG	0.013 U	0.014 UJ	0.012 U	0.013 U
Di-N-Octylphthalate	--	--	--	MG/KG	0.019 U	0.019 UJ	0.017 U	0.018 U
Fluoranthene	85	100	1000	MG/KG	0.012 U	34	20	0.032 J
Fluorene	30	100	386	MG/KG	0.01 U	1.6 J-	1.9	0.0097 U
Hexachlorobenzene	0.33	0.33	3.2	MG/KG	0.017 U	0.017 UJ	0.016 U	0.016 U
Hexachlorobutadiene	--	--	--	MG/KG	0.0075 U	0.0078 UJ	0.007 U	0.0071 U
Hexachlorocyclopentadiene	--	--	--	MG/KG	0.031 U	0.032 UJ	0.029 U	0.029 U
Hexachloroethane	--	--	--	MG/KG	0.012 U	0.013 UJ	0.011 U	0.011 U
Indeno(1,2,3-C,D)Pyrene	**0.5**	1.4	6.6	MG/KG	0.014 U	**6.3 J-**	**5.3**	0.013 U
Isophorone	--	--	--	MG/KG	0.1 U	0.11 UJ	0.095 U	0.096 U
Naphthalene	12	100	12	MG/KG	0.0061 U	0.9 J-	2.1	0.0058 U
Nitrobenzene	0.08	1.8	0.08	MG/KG	0.02 U	0.02 UJ	0.018 U	0.018 U
N-Nitrosodi-N-Propylamine	--	--	--	MG/KG	0.026 U	0.027 UJ	0.024 U	0.024 U

Table 3. Summary of Semivolatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-3	RSB-4	RSB-4	RSB-4
				Sample Date:	12/02/2025	12/03/2025	12/03/2025	12/03/2025
				Sample Depth (ft bls):	20 - 22	0 - 2	2 - 4	4 - 6
				Normal Sample or Field Duplicate:	N	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
N-Nitrosodiphenylamine	--	--	--	MG/KG	0.029 U	0.03 UJ	0.027 U	0.027 U
Pentachlorophenol	0.8	1.3	0.8	MG/KG	0.072 U	0.075 UJ	0.067 U	0.068 U
Phenanthrene	**1.1**	4.9	1000	MG/KG	0.014 U	**22**	**15**	0.014 J
Phenol	0.33	100	0.33	MG/KG	0.013 U	0.013 UJ	0.012 U	0.012 U
Pyrene	64	100	1000	MG/KG	0.0087 U	28	19	0.03 J

Table 3. Summary of Semivolatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-4	RSB-5	RSB-5	RSB-5
				Sample Date:	12/03/2025	12/01/2025	12/01/2025	12/01/2025
				Sample Depth (ft bls):	20 - 22	0 - 2	2 - 4	4 - 6
				Normal Sample or Field Duplicate:	N	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
1,2,4,5-Tetrachlorobenzene	--	--	--	MG/KG	0.011 U	0.011 U	0.011 U	0.011 U
1,4-Dioxane (P-Dioxane)	0.1	5.7	0.1	MG/KG	0.031 U	0.031 U	0.032 U	0.031 U
2,3,4,6-Tetrachlorophenol	--	--	--	MG/KG	0.024 U	0.024 U	0.025 U	0.024 U
2,4,5-Trichlorophenol	--	--	--	MG/KG	0.036 U	0.036 U	0.037 U	0.037 U
2,4,6-Trichlorophenol	--	--	--	MG/KG	0.046 U	0.046 U	0.047 U	0.046 U
2,4-Dichlorophenol	--	--	--	MG/KG	0.023 U	0.023 U	0.023 U	0.023 U
2,4-Dimethylphenol	--	--	--	MG/KG	0.042 U	0.042 U	0.044 U	0.043 U
2,4-Dinitrophenol	--	--	--	MG/KG	0.17 U	0.17 U	0.18 U	0.18 U
2,4-Dinitrotoluene	--	--	--	MG/KG	0.038 U	0.038 U	0.039 U	0.039 U
2,6-Dinitrotoluene	--	--	--	MG/KG	0.026 U	0.026 U	0.026 U	0.026 U
2-Chloronaphthalene	--	--	--	MG/KG	0.046 U	0.046 U	0.047 U	0.046 U
2-Chlorophenol	--	--	--	MG/KG	0.013 U	0.013 U	0.013 U	0.013 U
2-Methylnaphthalene	--	--	--	MG/KG	0.0099 U	0.0099 U	0.01 U	0.01 U
2-Methylphenol (O-Cresol)	0.33	100	0.33	MG/KG	0.013 U	0.013 U	0.014 U	0.013 U
2-Nitroaniline	--	--	--	MG/KG	0.027 U	0.027 U	0.028 U	0.027 U
2-Nitrophenol	--	--	--	MG/KG	0.035 U	0.036 U	0.037 U	0.036 U
3,3'-Dichlorobenzidine	--	--	--	MG/KG	0.054 U	0.054 U	0.055 U	0.054 U
3-Nitroaniline	--	--	--	MG/KG	0.084 U	0.084 U	0.087 U	0.086 U
4,6-Dinitro-2-Methylphenol	--	--	--	MG/KG	0.14 U	0.14 U	0.15 U	0.15 U
4-Bromophenyl Phenyl Ether	--	--	--	MG/KG	0.014 U	0.014 U	0.015 U	0.014 U
4-Chloro-3-Methylphenol	--	--	--	MG/KG	0.02 U	0.02 U	0.021 U	0.02 U
4-Chloroaniline	--	--	--	MG/KG	0.063 U	0.063 U	0.065 U	0.064 U
4-Chlorophenyl Phenyl Ether	--	--	--	MG/KG	0.013 U	0.013 U	0.013 U	0.013 U
4-Methylphenol (P-Cresol)	0.33	100	0.33	MG/KG	0.022 U	0.022 U	0.023 U	0.023 U
4-Nitroaniline	--	--	--	MG/KG	0.09 U	0.09 U	0.093 U	0.091 U
4-Nitrophenol	--	--	--	MG/KG	0.058 U	0.058 U	0.06 U	0.059 U
Acenaphthene	20	100	98	MG/KG	0.01 U	0.012 J	0.01 U	0.01 U
Acenaphthylene	100	100	365	MG/KG	0.01 U	0.01 U	0.01 U	0.01 U
Acetophenone	--	--	--	MG/KG	0.017 U	0.017 U	0.018 U	0.018 U
Anthracene	100	100	1000	MG/KG	0.011 U	0.033 J	0.018 J	0.011 U
Atrazine	--	--	--	MG/KG	0.021 U	0.021 U	0.022 U	0.021 U
Benzaldehyde	--	--	--	MG/KG	0.059 UJ	0.059 UJ	0.061 UJ	0.06 UJ

Table 3. Summary of Semivolatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-4	RSB-5	RSB-5	RSB-5
				Sample Date:	12/03/2025	12/01/2025	12/01/2025	12/01/2025
				Sample Depth (ft bls):	20 - 22	0 - 2	2 - 4	4 - 6
				Normal Sample or Field Duplicate:	N	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
Benzo(A)Anthracene	**1**	1.4	1	MG/KG	0.027 U	0.21	0.088	0.027 U
Benzo(A)Pyrene	**1**	1	22	MG/KG	0.0094 U	0.2	0.093	0.015 J
Benzo(B)Fluoranthene	**1**	1.4	2.1	MG/KG	0.0092 U	0.26	0.12	0.019 J
Benzo(G,H,I)Perylene	**0.64**	4.9	1000	MG/KG	0.01 U	0.13 J	0.06 J	0.012 J
Benzo(K)Fluoranthene	**0.8**	4.9	2	MG/KG	0.007 U	0.1	0.035 J	0.0071 U
Benzyl Butyl Phthalate	--	--	--	MG/KG	0.017 U	0.017 U	0.017 U	0.017 U
Biphenyl (Diphenyl)	--	--	--	MG/KG	0.012 U	0.012 U	0.013 U	0.013 U
Bis(2-Chloroethoxy) Methane	--	--	--	MG/KG	0.065 U	0.066 U	0.068 U	0.067 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	MG/KG	0.012 U	0.012 U	0.013 U	0.013 U
Bis(2-Chloroisopropyl) Ether	--	--	--	MG/KG	0.021 U	0.021 U	0.022 U	0.022 U
Bis(2-Ethylhexyl) Phthalate	--	--	--	MG/KG	0.019 U	0.15 J	0.019 U	0.019 U
Caprolactam	--	--	--	MG/KG	0.055 U	0.055 U	0.057 U	0.056 U
Carbazole	--	--	--	MG/KG	0.013 U	0.014 U	0.014 U	0.014 U
Chrysene	**1**	4.9	1	MG/KG	0.015 U	0.22 J	0.092 J	0.015 U
Cresols, M & P	0.33	100	0.33	MG/KG	0.022 U	0.022 U	0.023 U	0.022 U
Dibenz(A,H)Anthracene	**0.33**	0.33	1000	MG/KG	0.015 U	0.034 J	0.019 J	0.016 U
Dibenzofuran	2.1	18	110	MG/KG	0.012 U	0.012 U	0.012 U	0.012 U
Diethyl Phthalate	--	--	--	MG/KG	0.011 U	0.011 U	0.012 U	0.012 U
Dimethyl Phthalate	--	--	--	MG/KG	0.081 U	0.081 U	0.083 U	0.082 U
Di-N-Butyl Phthalate	--	--	--	MG/KG	0.013 U	0.013 U	0.014 U	0.014 U
Di-N-Octylphthalate	--	--	--	MG/KG	0.019 U	0.019 U	0.019 U	0.019 U
Fluoranthene	85	100	1000	MG/KG	0.012 U	0.29 J	0.17 J	0.021 J
Fluorene	30	100	386	MG/KG	0.01 U	0.01 U	0.011 U	0.011 U
Hexachlorobenzene	0.33	0.33	3.2	MG/KG	0.017 U	0.017 U	0.017 U	0.017 U
Hexachlorobutadiene	--	--	--	MG/KG	0.0075 U	0.0076 U	0.0078 U	0.0077 U
Hexachlorocyclopentadiene	--	--	--	MG/KG	0.031 U	0.031 U	0.032 U	0.032 U
Hexachloroethane	--	--	--	MG/KG	0.012 U	0.012 U	0.013 U	0.012 U
Indeno(1,2,3-C,D)Pyrene	**0.5**	1.4	6.6	MG/KG	0.014 U	0.13	0.064	0.014 U
Isophorone	--	--	--	MG/KG	0.1 U	0.1 U	0.11 U	0.1 U
Naphthalene	12	100	12	MG/KG	0.0061 U	0.0061 U	0.0063 U	0.0062 U
Nitrobenzene	0.08	1.8	0.08	MG/KG	0.02 U	0.02 U	0.02 U	0.02 U
N-Nitrosodi-N-Propylamine	--	--	--	MG/KG	0.026 U	0.026 U	0.027 U	0.026 U

Table 3. Summary of Semivolatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-4	RSB-5	RSB-5	RSB-5
				Sample Date:	12/03/2025	12/01/2025	12/01/2025	12/01/2025
				Sample Depth (ft bls):	20 - 22	0 - 2	2 - 4	4 - 6
				Normal Sample or Field Duplicate:	N	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
N-Nitrosodiphenylamine	--	--	--	MG/KG	0.029 U	0.029 U	0.03 U	0.03 U
Pentachlorophenol	0.8	1.3	0.8	MG/KG	0.073 U	0.073 U	0.075 U	0.074 U
Phenanthrene	**1.1**	4.9	1000	MG/KG	0.014 U	0.1 J	0.055 J	0.015 U
Phenol	0.33	100	0.33	MG/KG	0.013 U	0.013 U	0.013 U	0.013 U
Pyrene	64	100	1000	MG/KG	0.0088 U	0.39	0.18 J	0.018 J

Table 3. Summary of Semivolatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-5	RSB-5	RSB-5	RSB-6
				Sample Date:	12/02/2025	12/02/2025	12/15/2025	12/12/2025
				Sample Depth (ft bls):	6 - 8	20 - 22	8 - 10	0 - 2
				Normal Sample or Field Duplicate:	N	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
1,2,4,5-Tetrachlorobenzene	--	--	--	MG/KG	0.012 UJ	0.01 U	0.01 U	0.011 U
1,4-Dioxane (P-Dioxane)	0.1	5.7	0.1	MG/KG	0.034 UJ	0.029 U	0.029 U	0.031 U
2,3,4,6-Tetrachlorophenol	--	--	--	MG/KG	0.026 UJ	0.023 U	0.023 U	0.024 U
2,4,5-Trichlorophenol	--	--	--	MG/KG	0.04 UJ	0.034 U	0.034 U	0.036 U
2,4,6-Trichlorophenol	--	--	--	MG/KG	0.05 UJ	0.043 U	0.043 U	0.046 U
2,4-Dichlorophenol	--	--	--	MG/KG	0.025 UJ	0.022 U	0.022 U	0.023 U
2,4-Dimethylphenol	--	--	--	MG/KG	0.047 UJ	0.04 U	0.04 U	0.042 U
2,4-Dinitrophenol	--	--	--	MG/KG	0.19 UJ	0.16 U	0.16 U	0.17 U
2,4-Dinitrotoluene	--	--	--	MG/KG	0.042 UJ	0.036 U	0.036 U	0.038 U
2,6-Dinitrotoluene	--	--	--	MG/KG	0.028 UJ	0.024 U	0.024 U	0.026 U
2-Chloronaphthalene	--	--	--	MG/KG	0.05 UJ	0.043 U	0.043 U	0.046 U
2-Chlorophenol	--	--	--	MG/KG	0.014 UJ	0.012 U	0.012 U	0.013 U
2-Methylnaphthalene	--	--	--	MG/KG	0.011 UJ	0.0094 U	0.0094 U	0.011 J
2-Methylphenol (O-Cresol)	0.33	100	0.33	MG/KG	0.015 UJ	0.013 U	0.013 U	0.013 U
2-Nitroaniline	--	--	--	MG/KG	0.03 UJ	0.026 U	0.026 U	0.027 U
2-Nitrophenol	--	--	--	MG/KG	0.039 UJ	0.034 U	0.034 U	0.036 U
3,3'-Dichlorobenzidine	--	--	--	MG/KG	0.059 UJ	0.051 U	0.051 U	0.054 U
3-Nitroaniline	--	--	--	MG/KG	0.093 UJ	0.08 U	0.08 U	0.084 U
4,6-Dinitro-2-Methylphenol	--	--	--	MG/KG	0.16 UJ	0.14 U	0.14 U	0.14 U
4-Bromophenyl Phenyl Ether	--	--	--	MG/KG	0.015 UJ	0.013 U	0.013 U	0.014 U
4-Chloro-3-Methylphenol	--	--	--	MG/KG	0.022 UJ	0.019 U	0.019 U	0.02 U
4-Chloroaniline	--	--	--	MG/KG	0.069 UJ	0.06 U	0.06 U	0.063 U
4-Chlorophenyl Phenyl Ether	--	--	--	MG/KG	0.014 UJ	0.012 U	0.012 U	0.013 U
4-Methylphenol (P-Cresol)	0.33	100	0.33	MG/KG	0.024 UJ	0.021 U	0.021 U	0.022 U
4-Nitroaniline	--	--	--	MG/KG	0.099 UJ	0.085 U	0.085 U	0.09 U
4-Nitrophenol	--	--	--	MG/KG	0.064 UJ	0.055 U	0.055 U	0.058 U
Acenaphthene	20	100	98	MG/KG	0.011 UJ	0.0096 U	0.0096 U	0.053 J
Acenaphthylene	100	100	365	MG/KG	0.011 UJ	0.0096 U	0.0096 U	0.035 J
Acetophenone	--	--	--	MG/KG	0.019 UJ	0.016 U	0.016 U	0.017 U
Anthracene	100	100	1000	MG/KG	0.012 UJ	0.01 U	0.01 U	0.13 J
Atrazine	--	--	--	MG/KG	0.023 UJ	0.02 U	0.02 U	0.021 U
Benzaldehyde	--	--	--	MG/KG	0.065 UJ	0.055 UJ	0.055 UJ	0.059 UJ

Table 3. Summary of Semivolatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-5	RSB-5	RSB-5	RSB-6
				Sample Date:	12/02/2025	12/02/2025	12/15/2025	12/12/2025
				Sample Depth (ft bls):	6 - 8	20 - 22	8 - 10	0 - 2
				Normal Sample or Field Duplicate:	N	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
Benzo(A)Anthracene	**1**	1.4	1	MG/KG	0.029 UJ	0.025 U	0.025 U	0.79
Benzo(A)Pyrene	**1**	1	22	MG/KG	0.01 UJ	0.0095 J	0.0089 U	0.87
Benzo(B)Fluoranthene	**1**	1.4	2.1	MG/KG	0.01 UJ	0.013 J	0.0087 U	**1.1**
Benzo(G,H,I)Perylene	**0.64**	4.9	1000	MG/KG	0.012 UJ	0.0099 U	0.0099 U	0.47
Benzo(K)Fluoranthene	**0.8**	4.9	2	MG/KG	0.0077 UJ	0.0069 J	0.0066 U	0.42
Benzyl Butyl Phthalate	--	--	--	MG/KG	0.018 UJ	0.016 U	0.016 U	0.025 J
Biphenyl (Diphenyl)	--	--	--	MG/KG	0.014 UJ	0.012 U	0.012 U	0.012 U
Bis(2-Chloroethoxy) Methane	--	--	--	MG/KG	0.072 UJ	0.062 U	0.062 U	0.065 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	MG/KG	0.014 UJ	0.012 U	0.012 U	0.012 U
Bis(2-Chloroisopropyl) Ether	--	--	--	MG/KG	0.023 UJ	0.02 U	0.02 U	0.021 U
Bis(2-Ethylhexyl) Phthalate	--	--	--	MG/KG	0.021 UJ	0.018 U	0.018 U	0.075 J
Caprolactam	--	--	--	MG/KG	0.061 UJ	0.052 U	0.052 U	0.055 U
Carbazole	--	--	--	MG/KG	0.015 UJ	0.013 U	0.013 U	0.047 J
Chrysene	**1**	4.9	1	MG/KG	0.016 UJ	0.014 U	0.014 U	0.84
Cresols, M & P	0.33	100	0.33	MG/KG	0.024 UJ	0.021 U	0.021 U	0.022 U
Dibenz(A,H)Anthracene	**0.33**	0.33	1000	MG/KG	0.017 UJ	0.015 U	0.015 U	0.13
Dibenzofuran	2.1	18	110	MG/KG	0.013 UJ	0.011 U	0.011 U	0.017 J
Diethyl Phthalate	--	--	--	MG/KG	0.013 UJ	0.011 U	0.011 U	0.011 U
Dimethyl Phthalate	--	--	--	MG/KG	0.089 UJ	0.076 U	0.076 U	0.081 U
Di-N-Butyl Phthalate	--	--	--	MG/KG	0.015 UJ	0.013 U	0.013 U	0.013 U
Di-N-Octylphthalate	--	--	--	MG/KG	0.021 UJ	0.018 U	0.018 U	0.019 U
Fluoranthene	85	100	1000	MG/KG	0.014 UJ	0.024 J	0.012 U	1.3
Fluorene	30	100	386	MG/KG	0.011 UJ	0.0098 U	0.0098 U	0.028 J
Hexachlorobenzene	0.33	0.33	3.2	MG/KG	0.019 UJ	0.016 U	0.016 U	0.017 U
Hexachlorobutadiene	--	--	--	MG/KG	0.0083 UJ	0.0071 U	0.0071 U	0.0075 U
Hexachlorocyclopentadiene	--	--	--	MG/KG	0.034 UJ	0.029 U	0.029 U	0.031 U
Hexachloroethane	--	--	--	MG/KG	0.013 UJ	0.012 U	0.012 U	0.012 U
Indeno(1,2,3-C,D)Pyrene	**0.5**	1.4	6.6	MG/KG	0.015 UJ	0.029 J	0.013 U	**0.53**
Isophorone	--	--	--	MG/KG	0.11 UJ	0.097 U	0.097 U	0.1 U
Naphthalene	12	100	12	MG/KG	0.0067 UJ	0.0058 U	0.0058 U	0.014 J
Nitrobenzene	0.08	1.8	0.08	MG/KG	0.022 UJ	0.019 U	0.019 U	0.02 U
N-Nitrosodi-N-Propylamine	--	--	--	MG/KG	0.028 UJ	0.024 U	0.024 U	0.026 U

Table 3. Summary of Semivolatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-5	RSB-5	RSB-5	RSB-6
				Sample Date:	12/02/2025	12/02/2025	12/15/2025	12/12/2025
				Sample Depth (ft bls):	6 - 8	20 - 22	8 - 10	0 - 2
				Normal Sample or Field Duplicate:	N	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
N-Nitrosodiphenylamine	--	--	--	MG/KG	0.032 UJ	0.028 U	0.028 U	0.029 U
Pentachlorophenol	0.8	1.3	0.8	MG/KG	0.08 UJ	0.069 U	0.069 U	0.073 U
Phenanthrene	**1.1**	4.9	1000	MG/KG	0.016 UJ	0.02 J	0.014 U	0.55
Phenol	0.33	100	0.33	MG/KG	0.014 UJ	0.012 U	0.012 U	0.013 U
Pyrene	64	100	1000	MG/KG	0.0097 UJ	0.022 J	0.0083 U	1.2

Table 3. Summary of Semivolatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	RSB-6	RSB-6	RSB-6	RSB-6
Sample Designation:					RSB-6	RSB-6	RSB-6	RSB-6
Sample Date:					12/12/2025	12/12/2025	12/16/2025	12/16/2025
Sample Depth (ft bls):					2 - 4	4 - 6	6 - 8	20 - 22
Normal Sample or Field Duplicate:					N	N	N	N
1,2,4,5-Tetrachlorobenzene	--	--	--	MG/KG	0.011 U	0.012 U	0.011 U	0.012 U
1,4-Dioxane (P-Dioxane)	0.1	5.7	0.1	MG/KG	0.031 U	0.033 U	0.032 U	0.033 U
2,3,4,6-Tetrachlorophenol	--	--	--	MG/KG	0.024 U	0.025 U	0.025 U	0.025 U
2,4,5-Trichlorophenol	--	--	--	MG/KG	0.036 U	0.038 U	0.037 U	0.038 U
2,4,6-Trichlorophenol	--	--	--	MG/KG	0.045 U	0.048 U	0.047 U	0.048 U
2,4-Dichlorophenol	--	--	--	MG/KG	0.023 U	0.024 U	0.024 U	0.024 U
2,4-Dimethylphenol	--	--	--	MG/KG	0.042 U	0.045 U	0.044 U	0.045 U
2,4-Dinitrophenol	--	--	--	MG/KG	0.17 UJ	0.18 U	0.18 U	0.18 U
2,4-Dinitrotoluene	--	--	--	MG/KG	0.038 U	0.04 U	0.04 U	0.04 U
2,6-Dinitrotoluene	--	--	--	MG/KG	0.025 U	0.027 U	0.027 U	0.027 U
2-Chloronaphthalene	--	--	--	MG/KG	0.045 U	0.048 U	0.047 U	0.048 U
2-Chlorophenol	--	--	--	MG/KG	0.013 U	0.013 U	0.013 U	0.013 U
2-Methylnaphthalene	--	--	--	MG/KG	0.0099 U	0.01 U	0.01 U	0.01 U
2-Methylphenol (O-Cresol)	0.33	100	0.33	MG/KG	0.013 U	0.014 U	0.014 U	0.014 U
2-Nitroaniline	--	--	--	MG/KG	0.027 U	0.028 U	0.028 U	0.029 U
2-Nitrophenol	--	--	--	MG/KG	0.035 U	0.037 U	0.037 U	0.038 U
3,3'-Dichlorobenzidine	--	--	--	MG/KG	0.053 U	0.056 U	0.056 U	0.057 U
3-Nitroaniline	--	--	--	MG/KG	0.084 U	0.089 U	0.087 U	0.089 U
4,6-Dinitro-2-Methylphenol	--	--	--	MG/KG	0.14 UJ	0.15 U	0.15 U	0.15 U
4-Bromophenyl Phenyl Ether	--	--	--	MG/KG	0.014 U	0.015 U	0.015 U	0.015 U
4-Chloro-3-Methylphenol	--	--	--	MG/KG	0.02 U	0.021 U	0.021 U	0.021 U
4-Chloroaniline	--	--	--	MG/KG	0.063 U	0.066 U	0.065 U	0.066 U
4-Chlorophenyl Phenyl Ether	--	--	--	MG/KG	0.012 U	0.013 U	0.013 U	0.013 U
4-Methylphenol (P-Cresol)	0.33	100	0.33	MG/KG	0.022 U	0.023 U	0.023 U	0.023 U
4-Nitroaniline	--	--	--	MG/KG	0.089 U	0.095 U	0.093 U	0.095 U
4-Nitrophenol	--	--	--	MG/KG	0.057 U	0.061 U	0.06 U	0.061 U
Acenaphthene	20	100	98	MG/KG	0.01 U	0.011 U	0.01 U	0.011 U
Acenaphthylene	100	100	365	MG/KG	0.01 U	0.011 U	0.011 U	0.011 U
Acetophenone	--	--	--	MG/KG	0.017 U	0.018 U	0.018 U	0.018 U
Anthracene	100	100	1000	MG/KG	0.011 U	0.011 U	0.011 U	0.011 U
Atrazine	--	--	--	MG/KG	0.021 U	0.022 U	0.022 U	0.022 U
Benzaldehyde	--	--	--	MG/KG	0.058 UJ	0.062 UJ	0.061 UJ	0.062 UJ

Table 3. Summary of Semivolatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

			Sample Designation:		RSB-6	RSB-6	RSB-6	RSB-6
			Sample Date:		12/12/2025	12/12/2025	12/16/2025	12/16/2025
			Sample Depth (ft bls):		2 - 4	4 - 6	6 - 8	20 - 22
			Normal Sample or Field Duplicate:		N	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
Benzo(A)Anthracene	**1**	1.4	1	MG/KG	0.027 U	0.028 U	0.028 U	0.028 U
Benzo(A)Pyrene	**1**	1	22	MG/KG	0.0094 U	0.012 J	0.0098 U	0.01 U
Benzo(B)Fluoranthene	**1**	1.4	2.1	MG/KG	0.013 J	0.02 J	0.0095 U	0.0097 U
Benzo(G,H,I)Perylene	**0.64**	4.9	1000	MG/KG	0.01 U	0.011 U	0.011 U	0.011 U
Benzo(K)Fluoranthene	**0.8**	4.9	2	MG/KG	0.008 J	0.011 J	0.0072 U	0.0073 U
Benzyl Butyl Phthalate	--	--	--	MG/KG	0.017 U	0.018 U	0.021 J	0.018 U
Biphenyl (Diphenyl)	--	--	--	MG/KG	0.012 U	0.013 U	0.013 U	0.013 U
Bis(2-Chloroethoxy) Methane	--	--	--	MG/KG	0.065 U	0.069 U	0.068 U	0.069 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	MG/KG	0.012 U	0.013 U	0.013 U	0.013 U
Bis(2-Chloroisopropyl) Ether	--	--	--	MG/KG	0.021 U	0.022 U	0.022 U	0.022 U
Bis(2-Ethylhexyl) Phthalate	--	--	--	MG/KG	0.019 U	0.02 U	0.019 U	0.02 U
Caprolactam	--	--	--	MG/KG	0.055 U	0.058 U	0.057 U	0.058 U
Carbazole	--	--	--	MG/KG	0.013 U	0.014 U	0.014 U	0.014 U
Chrysene	**1**	4.9	1	MG/KG	0.015 U	0.016 U	0.015 U	0.016 U
Cresols, M & P	0.33	100	0.33	MG/KG	0.022 U	0.023 U	0.023 U	0.023 U
Dibenz(A,H)Anthracene	**0.33**	0.33	1000	MG/KG	0.015 U	0.016 U	0.016 U	0.016 U
Dibenzofuran	2.1	18	110	MG/KG	0.012 U	0.012 U	0.012 U	0.012 U
Diethyl Phthalate	--	--	--	MG/KG	0.011 U	0.012 U	0.012 U	0.012 U
Dimethyl Phthalate	--	--	--	MG/KG	0.08 U	0.085 U	0.084 U	0.085 U
Di-N-Butyl Phthalate	--	--	--	MG/KG	0.013 U	0.014 U	0.014 U	0.014 U
Di-N-Octylphthalate	--	--	--	MG/KG	0.019 U	0.02 U	0.019 U	0.02 U
Fluoranthene	85	100	1000	MG/KG	0.012 U	0.014 J	0.013 U	0.013 U
Fluorene	30	100	386	MG/KG	0.01 U	0.011 U	0.011 U	0.011 U
Hexachlorobenzene	0.33	0.33	3.2	MG/KG	0.017 U	0.018 U	0.017 U	0.018 U
Hexachlorobutadiene	--	--	--	MG/KG	0.0075 U	0.008 U	0.0078 U	0.008 U
Hexachlorocyclopentadiene	--	--	--	MG/KG	0.031 U	0.033 U	0.032 U	0.033 U
Hexachloroethane	--	--	--	MG/KG	0.012 U	0.013 U	0.013 U	0.013 U
Indeno(1,2,3-C,D)Pyrene	**0.5**	1.4	6.6	MG/KG	0.014 U	0.015 U	0.014 U	0.015 U
Isophorone	--	--	--	MG/KG	0.1 U	0.11 U	0.11 U	0.11 U
Naphthalene	12	100	12	MG/KG	0.0061 U	0.0065 U	0.0064 U	0.0065 U
Nitrobenzene	0.08	1.8	0.08	MG/KG	0.02 U	0.021 U	0.02 U	0.021 U
N-Nitrosodi-N-Propylamine	--	--	--	MG/KG	0.026 U	0.027 U	0.027 U	0.027 U

Table 3. Summary of Semivolatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-6	RSB-6	RSB-6	RSB-6
				Sample Date:	12/12/2025	12/12/2025	12/16/2025	12/16/2025
				Sample Depth (ft bls):	2 - 4	4 - 6	6 - 8	20 - 22
				Normal Sample or Field Duplicate:	N	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
N-Nitrosodiphenylamine	--	--	--	MG/KG	0.029 U	0.031 U	0.03 U	0.031 U
Pentachlorophenol	0.8	1.3	0.8	MG/KG	0.072 U	0.077 U	0.075 U	0.077 U
Phenanthrene	**1.1**	4.9	1000	MG/KG	0.014 U	0.015 U	0.015 U	0.015 U
Phenol	0.33	100	0.33	MG/KG	0.013 U	0.014 U	0.014 U	0.014 U
Pyrene	64	100	1000	MG/KG	0.0088 U	0.015 J	0.0091 U	0.0093 U

Table 3. Summary of Semivolatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	Sample Designation: RSB-7	RSB-7	RSB-7	RSB-7
					Sample Date: 12/08/2025	12/08/2025	12/08/2025	12/16/2025
					Sample Depth (ft bls): 0 - 2	2 - 4	4 - 6	6 - 8
					Normal Sample or Field Duplicate: N	N	N	N
1,2,4,5-Tetrachlorobenzene	--	--	--	MG/KG	0.011 U	0.011 U	0.011 U	0.011 U
1,4-Dioxane (P-Dioxane)	0.1	5.7	0.1	MG/KG	0.031 U	0.031 U	0.032 U	0.031 U
2,3,4,6-Tetrachlorophenol	--	--	--	MG/KG	0.024 U	0.024 U	0.025 U	0.024 U
2,4,5-Trichlorophenol	--	--	--	MG/KG	0.036 U	0.036 U	0.038 U	0.036 U
2,4,6-Trichlorophenol	--	--	--	MG/KG	0.046 U	0.046 U	0.047 U	0.045 U
2,4-Dichlorophenol	--	--	--	MG/KG	0.023 U	0.023 U	0.024 U	0.023 U
2,4-Dimethylphenol	--	--	--	MG/KG	0.042 U	0.043 U	0.044 U	0.042 U
2,4-Dinitrophenol	--	--	--	MG/KG	0.17 U	0.18 U	0.18 U	0.17 U
2,4-Dinitrotoluene	--	--	--	MG/KG	0.038 U	0.038 U	0.04 U	0.038 U
2,6-Dinitrotoluene	--	--	--	MG/KG	0.026 U	0.026 U	0.027 U	0.025 U
2-Chloronaphthalene	--	--	--	MG/KG	0.046 U	0.046 U	0.047 U	0.045 U
2-Chlorophenol	--	--	--	MG/KG	0.013 U	0.013 U	0.013 U	0.013 U
2-Methylnaphthalene	--	--	--	MG/KG	0.0099 U	0.01 U	0.01 U	0.0098 U
2-Methylphenol (O-Cresol)	0.33	100	0.33	MG/KG	0.013 U	0.013 U	0.014 U	0.013 U
2-Nitroaniline	--	--	--	MG/KG	0.027 U	0.027 U	0.028 U	0.027 U
2-Nitrophenol	--	--	--	MG/KG	0.036 U	0.036 U	0.037 U	0.035 U
3,3'-Dichlorobenzidine	--	--	--	MG/KG	0.054 U	0.054 U	0.056 U	0.053 U
3-Nitroaniline	--	--	--	MG/KG	0.084 U	0.085 U	0.087 U	0.083 U
4,6-Dinitro-2-Methylphenol	--	--	--	MG/KG	0.15 U	0.15 U	0.15 U	0.14 U
4-Bromophenyl Phenyl Ether	--	--	--	MG/KG	0.014 U	0.014 U	0.015 U	0.014 U
4-Chloro-3-Methylphenol	--	--	--	MG/KG	0.02 U	0.02 U	0.021 U	0.02 U
4-Chloroaniline	--	--	--	MG/KG	0.063 U	0.063 U	0.065 U	0.062 U
4-Chlorophenyl Phenyl Ether	--	--	--	MG/KG	0.013 U	0.013 U	0.013 U	0.012 U
4-Methylphenol (P-Cresol)	0.33	100	0.33	MG/KG	0.022 U	0.022 U	0.023 U	0.022 U
4-Nitroaniline	--	--	--	MG/KG	0.09 U	0.09 U	0.093 U	0.089 U
4-Nitrophenol	--	--	--	MG/KG	0.058 U	0.058 U	0.06 U	0.057 U
Acenaphthene	20	100	98	MG/KG	0.01 U	0.01 U	0.01 U	0.01 U
Acenaphthylene	100	100	365	MG/KG	0.01 U	0.01 U	0.011 U	0.012 J
Acetophenone	--	--	--	MG/KG	0.017 U	0.017 U	0.018 U	0.017 U
Anthracene	100	100	1000	MG/KG	0.016 J	0.017 J	0.011 U	0.03 J
Atrazine	--	--	--	MG/KG	0.021 U	0.021 U	0.022 U	0.021 U
Benzaldehyde	--	--	--	MG/KG	0.059 UJ	0.059 UJ	0.061 UJ	0.058 UJ

Table 3. Summary of Semivolatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-7	RSB-7	RSB-7	RSB-7
				Sample Date:	12/08/2025	12/08/2025	12/08/2025	12/16/2025
				Sample Depth (ft bls):	0 - 2	2 - 4	4 - 6	6 - 8
				Normal Sample or Field Duplicate:	N	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
Benzo(A)Anthracene	**1**	1.4	1	MG/KG	0.14	0.1	0.046	0.18
Benzo(A)Pyrene	**1**	1	22	MG/KG	0.13	0.091	0.043	0.22
Benzo(B)Fluoranthene	**1**	1.4	2.1	MG/KG	0.18	0.13	0.058	0.24
Benzo(G,H,I)Perylene	**0.64**	4.9	1000	MG/KG	0.081 J	0.066 J	0.03 J	0.15 J
Benzo(K)Fluoranthene	**0.8**	4.9	2	MG/KG	0.07	0.05	0.02 J	0.13
Benzyl Butyl Phthalate	--	--	--	MG/KG	0.017 U	0.017 U	0.017 U	0.016 U
Biphenyl (Diphenyl)	--	--	--	MG/KG	0.012 U	0.012 U	0.013 U	0.012 U
Bis(2-Chloroethoxy) Methane	--	--	--	MG/KG	0.066 U	0.066 U	0.068 U	0.065 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	MG/KG	0.012 U	0.012 U	0.013 U	0.012 U
Bis(2-Chloroisopropyl) Ether	--	--	--	MG/KG	0.021 U	0.021 U	0.022 U	0.021 U
Bis(2-Ethylhexyl) Phthalate	--	--	--	MG/KG	0.019 U	0.019 U	0.019 U	0.019 U
Caprolactam	--	--	--	MG/KG	0.055 U	0.055 U	0.057 U	0.055 U
Carbazole	--	--	--	MG/KG	0.014 U	0.014 U	0.014 U	0.013 U
Chrysene	**1**	4.9	1	MG/KG	0.13 J	0.088 J	0.041 J	0.22 J
Cresols, M & P	0.33	100	0.33	MG/KG	0.022 U	0.022 U	0.023 U	0.022 U
Dibenz(A,H)Anthracene	**0.33**	0.33	1000	MG/KG	0.021 J	0.018 J	0.016 U	0.028 J
Dibenzofuran	2.1	18	110	MG/KG	0.012 U	0.012 U	0.012 U	0.012 U
Diethyl Phthalate	--	--	--	MG/KG	0.011 U	0.011 U	0.012 U	0.011 U
Dimethyl Phthalate	--	--	--	MG/KG	0.081 U	0.081 U	0.084 U	0.08 U
Di-N-Butyl Phthalate	--	--	--	MG/KG	0.013 U	0.013 U	0.014 U	0.013 U
Di-N-Octylphthalate	--	--	--	MG/KG	0.019 U	0.019 U	0.019 U	0.019 U
Fluoranthene	85	100	1000	MG/KG	0.22 J	0.16 J	0.066 J	0.27 J
Fluorene	30	100	386	MG/KG	0.01 U	0.01 U	0.011 U	0.01 U
Hexachlorobenzene	0.33	0.33	3.2	MG/KG	0.017 U	0.017 U	0.017 U	0.017 U
Hexachlorobutadiene	--	--	--	MG/KG	0.0076 U	0.0076 U	0.0078 U	0.0075 U
Hexachlorocyclopentadiene	--	--	--	MG/KG	0.031 U	0.031 U	0.032 U	0.031 U
Hexachloroethane	--	--	--	MG/KG	0.012 U	0.012 U	0.013 U	0.012 U
Indeno(1,2,3-C,D)Pyrene	**0.5**	1.4	6.6	MG/KG	0.089	0.064	0.031 J	0.15
Isophorone	--	--	--	MG/KG	0.1 U	0.1 U	0.11 U	0.1 U
Naphthalene	12	100	12	MG/KG	0.0061 U	0.0062 U	0.0064 U	0.0061 U
Nitrobenzene	0.08	1.8	0.08	MG/KG	0.02 U	0.02 U	0.02 U	0.02 U
N-Nitrosodi-N-Propylamine	--	--	--	MG/KG	0.026 U	0.026 U	0.027 U	0.026 U

Table 3. Summary of Semivolatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-7	RSB-7	RSB-7	RSB-7
				Sample Date:	12/08/2025	12/08/2025	12/08/2025	12/16/2025
				Sample Depth (ft bls):	0 - 2	2 - 4	4 - 6	6 - 8
				Normal Sample or Field Duplicate:	N	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
N-Nitrosodiphenylamine	--	--	--	MG/KG	0.029 U	0.029 U	0.03 U	0.029 U
Pentachlorophenol	0.8	1.3	0.8	MG/KG	0.073 U	0.073 U	0.075 U	0.072 U
Phenanthrene	**1.1**	4.9	1000	MG/KG	0.079 J	0.064 J	0.021 J	0.1 J
Phenol	0.33	100	0.33	MG/KG	0.013 U	0.013 U	0.014 U	0.013 U
Pyrene	64	100	1000	MG/KG	0.0088 U	0.16 J	0.067 J	0.25 J

Table 3. Summary of Semivolatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	Sample Designation: RSB-7	RSB-7	RSB-8	RSB-8
					Sample Date: 12/16/2025	12/16/2025	12/11/2025	12/11/2025
					Sample Depth (ft bls): 8 - 10	25 - 27	0 - 2	1 - 3
					Normal Sample or Field Duplicate: N	N	N	N
1,2,4,5-Tetrachlorobenzene	--	--	--	MG/KG	0.01 UJ	0.011 U	0.011 U	0.01 U
1,4-Dioxane (P-Dioxane)	0.1	5.7	0.1	MG/KG	0.029 UJ	0.032 U	0.031 U	0.029 U
2,3,4,6-Tetrachlorophenol	--	--	--	MG/KG	0.023 UJ	0.025 U	0.024 U	0.023 U
2,4,5-Trichlorophenol	--	--	--	MG/KG	0.034 UJ	0.037 U	0.036 U	0.034 U
2,4,6-Trichlorophenol	--	--	--	MG/KG	0.043 UJ	0.047 U	0.045 U	0.043 U
2,4-Dichlorophenol	--	--	--	MG/KG	0.021 UJ	0.023 U	0.023 U	0.021 U
2,4-Dimethylphenol	--	--	--	MG/KG	0.04 UJ	0.044 U	0.042 U	0.04 U
2,4-Dinitrophenol	--	--	--	MG/KG	0.16 UJ	0.18 U	0.17 U	0.16 U
2,4-Dinitrotoluene	--	--	--	MG/KG	0.036 UJ	0.039 U	0.038 U	0.036 U
2,6-Dinitrotoluene	--	--	--	MG/KG	0.024 UJ	0.026 U	0.025 U	0.024 U
2-Chloronaphthalene	--	--	--	MG/KG	0.043 UJ	0.047 U	0.045 U	0.043 U
2-Chlorophenol	--	--	--	MG/KG	0.012 UJ	0.013 U	0.013 U	0.012 U
2-Methylnaphthalene	--	--	--	MG/KG	0.0094 UJ	0.01 U	0.055 J+	0.0093 UT
2-Methylphenol (O-Cresol)	0.33	100	0.33	MG/KG	0.012 UJ	0.014 U	0.013 U	0.012 U
2-Nitroaniline	--	--	--	MG/KG	0.026 UJ	0.028 U	0.027 U	0.025 U
2-Nitrophenol	--	--	--	MG/KG	0.034 UJ	0.037 U	0.035 U	0.033 U
3,3'-Dichlorobenzidine	--	--	--	MG/KG	0.051 UJ	0.055 U	0.053 U	0.05 U
3-Nitroaniline	--	--	--	MG/KG	0.079 UJ	0.087 U	0.083 U	0.079 U
4,6-Dinitro-2-Methylphenol	--	--	--	MG/KG	0.14 UJ	0.15 U	0.14 U	0.14 U
4-Bromophenyl Phenyl Ether	--	--	--	MG/KG	0.013 UJ	0.014 U	0.014 U	0.013 U
4-Chloro-3-Methylphenol	--	--	--	MG/KG	0.019 UJ	0.02 U	0.02 U	0.019 U
4-Chloroaniline	--	--	--	MG/KG	0.059 UJ	0.065 U	0.062 U	0.059 U
4-Chlorophenyl Phenyl Ether	--	--	--	MG/KG	0.012 UJ	0.013 U	0.012 U	0.012 U
4-Methylphenol (P-Cresol)	0.33	100	0.33	MG/KG	0.021 UJ	0.023 U	0.022 U	0.021 U
4-Nitroaniline	--	--	--	MG/KG	0.085 UJ	0.093 U	0.089 U	0.085 U
4-Nitrophenol	--	--	--	MG/KG	0.055 UJ	0.059 U	0.057 U	0.054 U
Acenaphthene	20	100	98	MG/KG	0.0095 UJ	0.01 U	0.017 J	0.0095 U
Acenaphthylene	100	100	365	MG/KG	0.0096 UJ	0.01 U	0.05 J	0.0095 U
Acetophenone	--	--	--	MG/KG	0.016 UJ	0.018 U	0.017 U	0.016 U
Anthracene	100	100	1000	MG/KG	0.01 UJ	0.011 U	0.074 J	0.013 J
Atrazine	--	--	--	MG/KG	0.02 UJ	0.021 U	0.021 UT	0.02 UT
Benzaldehyde	--	--	--	MG/KG	0.055 UJ	0.06 UJ	0.058 UJ	0.055 UJ

Table 3. Summary of Semivolatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

			Sample Designation:		RSB-7	RSB-7	RSB-8	RSB-8
			Sample Date:		12/16/2025	12/16/2025	12/11/2025	12/11/2025
			Sample Depth (ft bls):		8 - 10	25 - 27	0 - 2	1 - 3
			Normal Sample or Field Duplicate:		N	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
Benzo(A)Anthracene	**1**	1.4	1	MG/KG	0.025 UJ	0.027 U	0.27	0.048
Benzo(A)Pyrene	**1**	1	22	MG/KG	0.0089 UJ	0.0097 U	0.37	0.041
Benzo(B)Fluoranthene	**1**	1.4	2.1	MG/KG	0.0087 UJ	0.0094 U	0.48	0.057
Benzo(G,H,I)Perylene	**0.64**	4.9	1000	MG/KG	0.0099 UJ	0.011 U	0.23 J	0.029 J
Benzo(K)Fluoranthene	**0.8**	4.9	2	MG/KG	0.0066 UJ	0.0072 U	0.15	0.019 J
Benzyl Butyl Phthalate	--	--	--	MG/KG	0.016 UJ	0.017 U	0.016 U	0.016 U
Biphenyl (Diphenyl)	--	--	--	MG/KG	0.012 UJ	0.013 U	0.014 J	0.012 U
Bis(2-Chloroethoxy) Methane	--	--	--	MG/KG	0.062 UJ	0.067 U	0.065 U	0.062 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	MG/KG	0.012 UJ	0.013 U	0.012 U	0.012 U
Bis(2-Chloroisopropyl) Ether	--	--	--	MG/KG	0.02 UJ	0.022 U	0.021 U	0.02 U
Bis(2-Ethylhexyl) Phthalate	--	--	--	MG/KG	0.018 UJ	0.019 U	0.08 J	0.053 J
Caprolactam	--	--	--	MG/KG	0.052 UJ	0.057 U	0.055 U	0.052 U
Carbazole	--	--	--	MG/KG	0.013 UJ	0.014 U	0.02 J	0.013 U
Chrysene	**1**	4.9	1	MG/KG	0.014 UJ	0.015 U	0.3 J	0.055 J
Cresols, M & P	0.33	100	0.33	MG/KG	0.021 UJ	0.023 U	0.022 U	0.021 U
Dibenz(A,H)Anthracene	**0.33**	0.33	1000	MG/KG	0.014 UJ	0.016 U	0.051	0.014 U
Dibenzofuran	2.1	18	110	MG/KG	0.011 UJ	0.012 U	0.031 J	0.011 U
Diethyl Phthalate	--	--	--	MG/KG	0.011 UJ	0.012 U	0.011 U	0.011 U
Dimethyl Phthalate	--	--	--	MG/KG	0.076 UJ	0.083 U	0.08 U	0.076 U
Di-N-Butyl Phthalate	--	--	--	MG/KG	0.013 UJ	0.014 U	0.013 U	0.013 U
Di-N-Octylphthalate	--	--	--	MG/KG	0.018 UJ	0.019 U	0.019 UT	0.018 UT
Fluoranthene	85	100	1000	MG/KG	0.012 UJ	0.013 U	0.38	0.088 J
Fluorene	30	100	386	MG/KG	0.0098 UJ	0.011 U	0.028 J	0.0098 U
Hexachlorobenzene	0.33	0.33	3.2	MG/KG	0.016 UJ	0.017 U	0.017 U	0.016 U
Hexachlorobutadiene	--	--	--	MG/KG	0.0071 UJ	0.0078 U	0.0075 U	0.0071 U
Hexachlorocyclopentadiene	--	--	--	MG/KG	0.029 UJ	0.032 U	0.031 U	0.029 U
Hexachloroethane	--	--	--	MG/KG	0.011 UJ	0.013 U	0.012 U	0.011 U
Indeno(1,2,3-C,D)Pyrene	**0.5**	1.4	6.6	MG/KG	0.013 UJ	0.014 U	0.26	0.044
Isophorone	--	--	--	MG/KG	0.097 UJ	0.11 U	0.1 U	0.096 U
Naphthalene	12	100	12	MG/KG	0.0058 UJ	0.0063 U	0.081 J	0.0058 U
Nitrobenzene	0.08	1.8	0.08	MG/KG	0.019 UJ	0.02 U	0.019 U	0.019 U
N-Nitrosodi-N-Propylamine	--	--	--	MG/KG	0.024 UJ	0.027 U	0.026 U	0.024 U

Table 3. Summary of Semivolatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-7	RSB-7	RSB-8	RSB-8
				Sample Date:	12/16/2025	12/16/2025	12/11/2025	12/11/2025
				Sample Depth (ft bls):	8 - 10	25 - 27	0 - 2	1 - 3
				Normal Sample or Field Duplicate:	N	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
N-Nitrosodiphenylamine	--	--	--	MG/KG	0.028 UJ	0.03 U	0.029 U	0.027 U
Pentachlorophenol	0.8	1.3	0.8	MG/KG	0.069 UJ	0.075 U	0.072 U	0.068 U
Phenanthrene	**1.1**	4.9	1000	MG/KG	0.014 UJ	0.015 U	0.14 J	0.052 J
Phenol	0.33	100	0.33	MG/KG	0.012 UJ	0.013 U	0.013 U	0.012 U
Pyrene	64	100	1000	MG/KG	0.0083 UJ	0.0091 U	0.61	0.11 J

Table 3. Summary of Semivolatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-8	RSB-8	RSB-8	RSB-8
				Sample Date:	12/11/2025	12/11/2025	12/15/2025	12/15/2025
				Sample Depth (ft bls):	1 - 3	3 - 5	5 - 7	25 - 27
				Normal Sample or Field Duplicate:	FD	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
1,2,4,5-Tetrachlorobenzene	--	--	--	MG/KG	0.01 U	0.01 U	0.01 U	0.011 U
1,4-Dioxane (P-Dioxane)	0.1	5.7	0.1	MG/KG	0.029 U	0.029 U	0.029 U	0.03 U
2,3,4,6-Tetrachlorophenol	--	--	--	MG/KG	0.023 U	0.023 U	0.023 U	0.023 U
2,4,5-Trichlorophenol	--	--	--	MG/KG	0.034 U	0.034 U	0.034 U	0.035 U
2,4,6-Trichlorophenol	--	--	--	MG/KG	0.043 U	0.043 U	0.043 U	0.044 U
2,4-Dichlorophenol	--	--	--	MG/KG	0.022 U	0.022 U	0.022 U	0.022 U
2,4-Dimethylphenol	--	--	--	MG/KG	0.04 U	0.04 U	0.04 U	0.041 U
2,4-Dinitrophenol	--	--	--	MG/KG	0.17 U	0.16 U	0.16 U	0.17 U
2,4-Dinitrotoluene	--	--	--	MG/KG	0.036 U	0.036 U	0.036 U	0.037 U
2,6-Dinitrotoluene	--	--	--	MG/KG	0.024 U	0.024 U	0.024 U	0.025 U
2-Chloronaphthalene	--	--	--	MG/KG	0.043 U	0.043 U	0.043 U	0.044 U
2-Chlorophenol	--	--	--	MG/KG	0.012 U	0.012 U	0.012 U	0.012 U
2-Methylnaphthalene	--	--	--	MG/KG	0.0094 UT	0.0094 UT	0.0094 U	0.0097 U
2-Methylphenol (O-Cresol)	0.33	100	0.33	MG/KG	0.013 U	0.013 U	0.013 U	0.013 U
2-Nitroaniline	--	--	--	MG/KG	0.026 U	0.026 U	0.026 U	0.026 U
2-Nitrophenol	--	--	--	MG/KG	0.034 U	0.034 U	0.034 U	0.035 U
3,3'-Dichlorobenzidine	--	--	--	MG/KG	0.051 U	0.051 U	0.051 U	0.052 U
3-Nitroaniline	--	--	--	MG/KG	0.08 U	0.08 U	0.08 U	0.082 U
4,6-Dinitro-2-Methylphenol	--	--	--	MG/KG	0.14 U	0.14 U	0.14 U	0.14 U
4-Bromophenyl Phenyl Ether	--	--	--	MG/KG	0.013 U	0.013 U	0.013 U	0.014 U
4-Chloro-3-Methylphenol	--	--	--	MG/KG	0.019 U	0.019 U	0.019 U	0.019 U
4-Chloroaniline	--	--	--	MG/KG	0.06 U	0.06 U	0.06 U	0.061 U
4-Chlorophenyl Phenyl Ether	--	--	--	MG/KG	0.012 U	0.012 U	0.012 U	0.012 U
4-Methylphenol (P-Cresol)	0.33	100	0.33	MG/KG	0.021 U	0.021 U	0.021 U	0.022 U
4-Nitroaniline	--	--	--	MG/KG	0.085 U	0.085 U	0.085 U	0.088 U
4-Nitrophenol	--	--	--	MG/KG	0.055 U	0.055 U	0.055 U	0.056 U
Acenaphthene	20	100	98	MG/KG	0.0096 U	0.0096 U	0.0096 U	0.0098 U
Acenaphthylene	100	100	365	MG/KG	0.0096 U	0.0096 U	0.0096 U	0.0099 U
Acetophenone	--	--	--	MG/KG	0.017 U	0.016 U	0.016 U	0.017 U
Anthracene	100	100	1000	MG/KG	0.01 U	0.01 U	0.01 U	0.011 U
Atrazine	--	--	--	MG/KG	0.02 UT	0.02 UT	0.02 U	0.02 U
Benzaldehyde	--	--	--	MG/KG	0.056 UJ	0.055 UJ	0.055 UJ	0.057 UJ

Table 3. Summary of Semivolatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-8	RSB-8	RSB-8	RSB-8
				Sample Date:	12/11/2025	12/11/2025	12/15/2025	12/15/2025
				Sample Depth (ft bls):	1 - 3	3 - 5	5 - 7	25 - 27
				Normal Sample or Field Duplicate:	FD	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
Benzo(A)Anthracene	**1**	1.4	1	MG/KG	0.025 U	0.025 U	0.025 U	0.026 U
Benzo(A)Pyrene	**1**	1	22	MG/KG	0.0095 J	0.0089 U	0.0089 U	0.0092 U
Benzo(B)Fluoranthene	**1**	1.4	2.1	MG/KG	0.019 J	0.0089 J	0.0087 U	0.0089 U
Benzo(G,H,I)Perylene	**0.64**	4.9	1000	MG/KG	0.0099 U	0.0099 U	0.0099 U	0.01 U
Benzo(K)Fluoranthene	**0.8**	4.9	2	MG/KG	0.0066 U	0.0066 U	0.0066 U	0.0068 U
Benzyl Butyl Phthalate	--	--	--	MG/KG	0.016 U	0.016 U	0.016 U	0.016 U
Biphenyl (Diphenyl)	--	--	--	MG/KG	0.012 U	0.012 U	0.012 U	0.012 U
Bis(2-Chloroethoxy) Methane	--	--	--	MG/KG	0.062 U	0.062 U	0.062 U	0.064 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	MG/KG	0.012 U	0.012 U	0.012 U	0.012 U
Bis(2-Chloroisopropyl) Ether	--	--	--	MG/KG	0.02 U	0.02 U	0.02 U	0.021 U
Bis(2-Ethylhexyl) Phthalate	--	--	--	MG/KG	0.018 U	0.018 U	0.018 U	0.018 U
Caprolactam	--	--	--	MG/KG	0.052 U	0.052 U	0.052 U	0.054 U
Carbazole	--	--	--	MG/KG	0.013 U	0.013 U	0.013 U	0.013 U
Chrysene	**1**	4.9	1	MG/KG	0.014 U	0.014 U	0.014 U	0.014 U
Cresols, M & P	0.33	100	0.33	MG/KG	0.021 U	0.021 U	0.021 U	0.022 U
Dibenz(A,H)Anthracene	**0.33**	0.33	1000	MG/KG	0.015 U	0.015 U	0.015 U	0.015 U
Dibenzofuran	2.1	18	110	MG/KG	0.011 U	0.011 U	0.011 U	0.012 U
Diethyl Phthalate	--	--	--	MG/KG	0.011 U	0.011 U	0.011 U	0.011 U
Dimethyl Phthalate	--	--	--	MG/KG	0.076 U	0.076 U	0.076 U	0.078 U
Di-N-Butyl Phthalate	--	--	--	MG/KG	0.013 U	0.013 U	0.013 U	0.013 U
Di-N-Octylphthalate	--	--	--	MG/KG	0.018 UT	0.018 UT	0.018 U	0.018 U
Fluoranthene	85	100	1000	MG/KG	0.021 J	0.012 U	0.012 U	0.012 U
Fluorene	30	100	386	MG/KG	0.0098 U	0.0098 U	0.0098 U	0.01 U
Hexachlorobenzene	0.33	0.33	3.2	MG/KG	0.016 U	0.016 U	0.016 U	0.016 U
Hexachlorobutadiene	--	--	--	MG/KG	0.0072 U	0.0071 U	0.0071 U	0.0073 U
Hexachlorocyclopentadiene	--	--	--	MG/KG	0.03 U	0.029 U	0.029 U	0.03 U
Hexachloroethane	--	--	--	MG/KG	0.012 U	0.012 U	0.012 U	0.012 U
Indeno(1,2,3-C,D)Pyrene	**0.5**	1.4	6.6	MG/KG	0.022 J	0.013 U	0.013 U	0.013 U
Isophorone	--	--	--	MG/KG	0.097 U	0.097 U	0.097 U	0.1 U
Naphthalene	12	100	12	MG/KG	0.0058 U	0.0058 U	0.0058 U	0.006 U
Nitrobenzene	0.08	1.8	0.08	MG/KG	0.019 U	0.019 U	0.019 U	0.019 U
N-Nitrosodi-N-Propylamine	--	--	--	MG/KG	0.024 U	0.024 U	0.024 U	0.025 U

Table 3. Summary of Semivolatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-8	RSB-8	RSB-8	RSB-8
				Sample Date:	12/11/2025	12/11/2025	12/15/2025	12/15/2025
				Sample Depth (ft bls):	1 - 3	3 - 5	5 - 7	25 - 27
				Normal Sample or Field Duplicate:	FD	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
N-Nitrosodiphenylamine	--	--	--	MG/KG	0.028 U	0.028 U	0.028 U	0.028 U
Pentachlorophenol	0.8	1.3	0.8	MG/KG	0.069 U	0.069 U	0.069 U	0.071 U
Phenanthrene	**1.1**	4.9	1000	MG/KG	0.014 U	0.014 U	0.014 U	0.014 U
Phenol	0.33	100	0.33	MG/KG	0.012 U	0.012 U	0.012 U	0.013 U
Pyrene	64	100	1000	MG/KG	0.025 J	0.014 J	0.0083 U	0.0086 U

Table 3. Summary of Semivolatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	RSB-9 12/15/2025 0 - 2 N	RSB-9 12/17/2025 16 - 18 N	RSB-9 12/17/2025 20 - 22 N	RSB-9 12/17/2025 22 - 24 N
1,2,4,5-Tetrachlorobenzene	--	--	--	MG/KG	0.011 U	0.011 U	0.011 U	0.011 U
1,4-Dioxane (P-Dioxane)	0.1	5.7	0.1	MG/KG	0.03 U	0.032 U	0.032 U	0.032 U
2,3,4,6-Tetrachlorophenol	--	--	--	MG/KG	0.024 U	0.025 U	0.025 U	0.025 U
2,4,5-Trichlorophenol	--	--	--	MG/KG	0.035 U	0.037 U	0.037 U	0.037 U
2,4,6-Trichlorophenol	--	--	--	MG/KG	0.045 U	0.047 U	0.047 U	0.047 U
2,4-Dichlorophenol	--	--	--	MG/KG	0.022 U	0.023 U	0.023 U	0.023 U
2,4-Dimethylphenol	--	--	--	MG/KG	0.042 U	0.044 U	0.044 U	0.043 U
2,4-Dinitrophenol	--	--	--	MG/KG	0.17 U	0.18 U	0.18 U	0.18 U
2,4-Dinitrotoluene	--	--	--	MG/KG	0.037 U	0.039 U	0.039 U	0.039 U
2,6-Dinitrotoluene	--	--	--	MG/KG	0.025 U	0.026 U	0.026 U	0.026 U
2-Chloronaphthalene	--	--	--	MG/KG	0.045 U	0.047 U	0.047 U	0.047 U
2-Chlorophenol	--	--	--	MG/KG	0.012 U	0.013 U	0.013 U	0.013 U
2-Methylnaphthalene	--	--	--	MG/KG	0.0097 U	0.01 U	0.01 U	0.01 U
2-Methylphenol (O-Cresol)	0.33	100	0.33	MG/KG	0.013 U	0.014 U	0.014 U	0.014 U
2-Nitroaniline	--	--	--	MG/KG	0.027 U	0.028 U	0.028 U	0.028 U
2-Nitrophenol	--	--	--	MG/KG	0.035 U	0.037 U	0.037 U	0.036 U
3,3'-Dichlorobenzidine	--	--	--	MG/KG	0.053 U	0.055 U	0.055 U	0.055 U
3-Nitroaniline	--	--	--	MG/KG	0.083 U	0.087 U	0.087 U	0.086 U
4,6-Dinitro-2-Methylphenol	--	--	--	MG/KG	0.14 U	0.15 U	0.15 U	0.15 U
4-Bromophenyl Phenyl Ether	--	--	--	MG/KG	0.014 U	0.014 U	0.015 U	0.014 U
4-Chloro-3-Methylphenol	--	--	--	MG/KG	0.02 U	0.02 U	0.021 U	0.02 U
4-Chloroaniline	--	--	--	MG/KG	0.062 U	0.065 U	0.065 U	0.065 U
4-Chlorophenyl Phenyl Ether	--	--	--	MG/KG	0.012 U	0.013 U	0.013 U	0.013 U
4-Methylphenol (P-Cresol)	0.33	100	0.33	MG/KG	0.022 U	0.023 U	0.023 U	0.023 U
4-Nitroaniline	--	--	--	MG/KG	0.088 U	0.093 U	0.093 U	0.092 U
4-Nitrophenol	--	--	--	MG/KG	0.057 U	0.06 U	0.06 U	0.059 U
Acenaphthene	20	100	98	MG/KG	0.032 J	0.01 U	0.01 U	0.013 J
Acenaphthylene	100	100	365	MG/KG	0.01 U	0.011 J	0.01 U	0.01 U
Acetophenone	--	--	--	MG/KG	0.017 U	0.018 U	0.018 U	0.018 U
Anthracene	100	100	1000	MG/KG	0.077 J	0.016 J	0.033 J	0.052 J
Atrazine	--	--	--	MG/KG	0.02 U	0.022 U	0.022 U	0.021 U
Benzaldehyde	--	--	--	MG/KG	0.058 UJ	0.06 UJ	0.061 UJ	0.06 UJ

Table 3. Summary of Semivolatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

			Sample Designation:		RSB-9	RSB-9	RSB-9	RSB-9
			Sample Date:		12/15/2025	12/17/2025	12/17/2025	12/17/2025
			Sample Depth (ft bls):		0 - 2	16 - 18	20 - 22	22 - 24
			Normal Sample or Field Duplicate:		N	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
Benzo(A)Anthracene	**1**	1.4	1	MG/KG	0.54	0.1	0.12	0.1
Benzo(A)Pyrene	**1**	1	22	MG/KG	0.54	0.11	0.11	0.078
Benzo(B)Fluoranthene	**1**	1.4	2.1	MG/KG	0.63	0.19	0.14	0.11
Benzo(G,H,I)Perylene	**0.64**	4.9	1000	MG/KG	0.33 J	0.059 J	0.08 J	0.011 U
Benzo(K)Fluoranthene	**0.8**	4.9	2	MG/KG	0.33	0.0072 U	0.05	0.0071 U
Benzyl Butyl Phthalate	--	--	--	MG/KG	0.016 U	0.017 U	0.017 U	0.017 U
Biphenyl (Diphenyl)	--	--	--	MG/KG	0.012 U	0.013 U	0.013 U	0.013 U
Bis(2-Chloroethoxy) Methane	--	--	--	MG/KG	0.064 U	0.067 U	0.068 U	0.067 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	--	--	--	MG/KG	0.012 U	0.013 U	0.013 U	0.013 U
Bis(2-Chloroisopropyl) Ether	--	--	--	MG/KG	0.021 U	0.022 U	0.022 U	0.022 U
Bis(2-Ethylhexyl) Phthalate	--	--	--	MG/KG	0.018 U	0.019 U	0.019 U	0.019 U
Caprolactam	--	--	--	MG/KG	0.054 U	0.057 U	0.057 U	0.057 U
Carbazole	--	--	--	MG/KG	0.029 J	0.014 U	0.014 U	0.014 U
Chrysene	**1**	4.9	1	MG/KG	0.51	0.12 J	0.12 J	0.1 J
Cresols, M & P	0.33	100	0.33	MG/KG	0.022 U	0.023 U	0.023 U	0.023 U
Dibenz(A,H)Anthracene	**0.33**	0.33	1000	MG/KG	0.093	0.016 U	0.022 J	0.016 U
Dibenzofuran	2.1	18	110	MG/KG	0.012 J	0.012 U	0.012 U	0.013 J
Diethyl Phthalate	--	--	--	MG/KG	0.011 U	0.012 U	0.012 U	0.012 U
Dimethyl Phthalate	--	--	--	MG/KG	0.079 U	0.083 U	0.083 U	0.083 U
Di-N-Butyl Phthalate	--	--	--	MG/KG	0.013 U	0.014 U	0.014 U	0.014 U
Di-N-Octylphthalate	--	--	--	MG/KG	0.018 U	0.019 U	0.019 U	0.019 U
Fluoranthene	85	100	1000	MG/KG	0.97	0.17 J	0.23 J	0.26 J
Fluorene	30	100	386	MG/KG	0.021 J	0.011 U	0.011 U	0.012 J
Hexachlorobenzene	0.33	0.33	3.2	MG/KG	0.017 U	0.017 U	0.017 U	0.017 U
Hexachlorobutadiene	--	--	--	MG/KG	0.0074 U	0.0078 U	0.0078 U	0.0078 U
Hexachlorocyclopentadiene	--	--	--	MG/KG	0.031 U	0.032 U	0.032 U	0.032 U
Hexachloroethane	--	--	--	MG/KG	0.012 U	0.013 U	0.013 U	0.013 U
Indeno(1,2,3-C,D)Pyrene	**0.5**	1.4	6.6	MG/KG	0.35	0.056	0.084	0.041
Isophorone	--	--	--	MG/KG	0.1 U	0.11 U	0.11 U	0.11 U
Naphthalene	12	100	12	MG/KG	0.0061 J	0.0063 U	0.0063 U	0.0063 U
Nitrobenzene	0.08	1.8	0.08	MG/KG	0.019 U	0.02 U	0.02 U	0.02 U
N-Nitrosodi-N-Propylamine	--	--	--	MG/KG	0.025 U	0.027 U	0.027 U	0.026 U

Table 3. Summary of Semivolatile Organic Compounds in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-9	RSB-9	RSB-9	RSB-9
				Sample Date:	12/15/2025	12/17/2025	12/17/2025	12/17/2025
				Sample Depth (ft bls):	0 - 2	16 - 18	20 - 22	22 - 24
				Normal Sample or Field Duplicate:	N	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
N-Nitrosodiphenylamine	--	--	--	MG/KG	0.029 U	0.03 U	0.03 U	0.03 U
Pentachlorophenol	0.8	1.3	0.8	MG/KG	0.071 U	0.075 U	0.075 U	0.075 U
Phenanthrene	**1.1**	4.9	1000	MG/KG	0.37	0.051 J	0.16 J	0.25 J
Phenol	0.33	100	0.33	MG/KG	0.013 U	0.013 U	0.013 U	0.013 U
Pyrene	64	100	1000	MG/KG	0.87	0.16 J	0.18 J	0.18 J

Table 4. Summary of Metals in Soil, 35-18 Steinway Street, Astoria, Queens, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	RSB-1	RSB-1	RSB-1	RSB-1	RSB-2
Sample Designation:					RSB-1	RSB-1	RSB-1	RSB-1	RSB-2
Sample Date:					12/01/2025	12/01/2025	12/01/2025	12/02/2025	12/01/2025
Sample Depth (ft bls):					0 - 2	2 - 4	4 - 6	20 - 22	0 - 2
Normal Sample or Field Duplicate:					N	N	N	N	N
Aluminum	--	--	--	MG/KG	5030	5270	12400	2730	5850
Antimony	--	--	--	MG/KG	0.59 J	1.2	0.21 J	0.12 U	0.41 J
Arsenic	13	16	16	MG/KG	2.8	5	3.9	0.63 J	2.5
Barium	410	410	820	MG/KG	55	91.2	29.7	18.6	76.1
Beryllium	4.4	43	47	MG/KG	0.22 J	0.25 J	0.33 J	0.13 J	0.26 J
Cadmium	**2.5**	2.5	7.5	MG/KG	0.24 J	0.32 J	0.1 U	0.097 U	0.26 J
Calcium	--	--	--	MG/KG	21100	21000	978	25200	27900
Chromium III	**30**	110	--	MG/KG	11.8	13.6	23.1	7.4	15.7
Chromium, Hexavalent	1	1	19	MG/KG	0.38 U	0.4 U	0.41 U	0.42 U	0.38 U
Chromium, Total	**30**	110	--	MG/KG	11.8	13.6	23.1	7.4	15.7
Cobalt	--	--	--	MG/KG	3.8	4.3	7.2	3.1	4.6
Copper	**50**	280	1720	MG/KG	21.2	37.3	11.3	6.8	21.1
Cyanide	2.3	13	40	MG/KG	0.14 U	0.14 U	0.13 U	0.15 U	0.14 U
Iron	--	--	--	MG/KG	10400	11600	17200	7450	10700
Lead	**63**	400	450	MG/KG	**77.7**	**185**	11.4	2.2	**105**
Magnesium	--	--	--	MG/KG	5920	3580	2070	13400	2890
Manganese	1600	2000	2000	MG/KG	163	160	198	142	221
Mercury	**0.18**	0.3	0.73	MG/KG	0.14	**0.79**	0.04	0.0083 U	0.1
Nickel	**30**	320	130	MG/KG	9.2	10.6	12.3	7	15.1
Potassium	--	--	--	MG/KG	952	1190	795	547	1020
Selenium	3.9	110	4	MG/KG	0.21 J	0.47 J	0.35 J	0.11 U	0.22 J
Silver	2	110	8.3	MG/KG	0.072 U	0.11 J	0.079 U	0.076 U	0.072 U
Sodium	--	--	--	MG/KG	238	310	207	126	336
Thallium	--	--	--	MG/KG	0.076 J	0.16 J	0.099 J	0.047 J	0.078 J
Vanadium	--	--	--	MG/KG	22.1	20.9	31.3	14	18.1
Zinc	**109**	6600	2480	MG/KG	89.4	**117**	30.4	16.4	99.3

Table 4. Summary of Metals in Soil, 35-18 Steinway Street, Astoria, Queens, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	RSB-2	RSB-2	RSB-2	RSB-2	RSB-3
Sample Designation:					RSB-2	RSB-2	RSB-2	RSB-2	RSB-3
Sample Date:					12/01/2025	12/01/2025	12/01/2025	12/02/2025	12/01/2025
Sample Depth (ft bls):					1 - 3	1 - 3	3 - 5	20 - 22	0 - 2
Normal Sample or Field Duplicate:					N	FD	N	N	N
Aluminum	--	--	--	MG/KG	8360	8610	7680	4020	6660
Antimony	--	--	--	MG/KG	0.21 J	0.2 J	0.12 U	0.12 U	0.54 J
Arsenic	13	16	16	MG/KG	3.2	3.1	1.7	0.66 J	4.1
Barium	410	410	820	MG/KG	40.4	41.9	37.6	22.3	92.3
Beryllium	4.4	43	47	MG/KG	0.33	0.36	0.32	0.17 J	0.29 J
Cadmium	**2.5**	2.5	7.5	MG/KG	0.17 J	0.14 J	0.091 U	0.091 U	0.41
Calcium	--	--	--	MG/KG	7990	8310	2220	23400	15400
Chromium III	**30**	110	--	MG/KG	15.9	17.7	19.3	9.7	16.1
Chromium, Hexavalent	1	1	19	MG/KG	0.4 U	0.41 U	0.38 U	0.39 U	0.4 U
Chromium, Total	**30**	110	--	MG/KG	15.9	17.7	19.3	9.7	16.1
Cobalt	--	--	--	MG/KG	5.6	5.9	7.2	3.8	5
Copper	**50**	280	1720	MG/KG	15.1	21.1	28.4	8.7	28
Cyanide	2.3	13	40	MG/KG	0.13 U	0.12 U	0.12 U	0.12 U	0.14 U
Iron	--	--	--	MG/KG	14900	14700	16100	8940	13500
Lead	**63**	400	450	MG/KG	31.1	37.5	7.5	2.4	**97.9**
Magnesium	--	--	--	MG/KG	2710	2570	4010	14400	3620
Manganese	1600	2000	2000	MG/KG	236	242	324	150	266
Mercury	**0.18**	0.3	0.73	MG/KG	0.034	0.031	0.0095 J	0.0078 U	0.12
Nickel	**30**	320	130	MG/KG	10.9	12.1	14.5	8	12.5
Potassium	--	--	--	MG/KG	833	874	1690	762	1020 J
Selenium	3.9	110	4	MG/KG	0.19 J	0.28 J	0.11 J	0.1 U	0.19 J
Silver	2	110	8.3	MG/KG	0.074 U	0.075 U	0.072 U	0.072 U	0.082 J
Sodium	--	--	--	MG/KG	219	234	215	153	372
Thallium	--	--	--	MG/KG	0.084 J	0.083 J	0.1 J	0.068 J	0.11 J
Vanadium	--	--	--	MG/KG	23.7	22.8	38.6	14.5	30.4 J
Zinc	**109**	6600	2480	MG/KG	51.3 J	105 J	32.9	20.9	**136**

Table 4. Summary of Metals in Soil, 35-18 Steinway Street, Astoria, Queens, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	RSB-3	RSB-3	RSB-3	RSB-4	RSB-4
Sample Designation:					RSB-3	RSB-3	RSB-3	RSB-4	RSB-4
Sample Date:					12/01/2025	12/01/2025	12/02/2025	12/03/2025	12/03/2025
Sample Depth (ft bls):					2 - 4	4 - 6	20 - 22	0 - 2	2 - 4
Normal Sample or Field Duplicate:					N	N	N	N	N
Aluminum	--	--	--	MG/KG	5750	6300	3330	5920	6020
Antimony	--	--	--	MG/KG	0.63 J	0.33 J	0.12 U	1.7 J	1.4
Arsenic	13	16	16	MG/KG	2.8	2.6	0.98	4.7	3.3
Barium	410	410	820	MG/KG	88.8	40.3	25.9	249 J	283
Beryllium	4.4	43	47	MG/KG	0.26 J	0.27 J	0.23 J	0.25 J	0.31 J
Cadmium	**2.5**	2.5	7.5	MG/KG	0.48	0.12 J	0.094 U	1.5	1.4
Calcium	--	--	--	MG/KG	17700	4900	15800	35400	33200
Chromium III	**30**	110	--	MG/KG	13.2	15.3	8.3	15.6	12.9
Chromium, Hexavalent	1	1	19	MG/KG	0.4 U	0.37 U	0.39 U	0.41 U	0.72 J
Chromium, Total	**30**	110	--	MG/KG	13.2	15.3	8.3	15.6	13.6
Cobalt	--	--	--	MG/KG	4	4.8	4.1	4.5 J	3.8
Copper	**50**	280	1720	MG/KG	23.8	19.7	12.3	30 J	28.7
Cyanide	2.3	13	40	MG/KG	0.13 U	0.13 U	0.13 U	0.35	0.37
Iron	--	--	--	MG/KG	9830	12300	8790	14800	10400
Lead	**63**	400	450	MG/KG	**82.7**	34.3	10.1	**290**	**242**
Magnesium	--	--	--	MG/KG	3150	3640	10500	4160	4060
Manganese	1600	2000	2000	MG/KG	207	250	203	191 J	192
Mercury	**0.18**	0.3	0.73	MG/KG	0.078	0.046	0.0083 U	0.15	**0.19**
Nickel	**30**	320	130	MG/KG	9.3	10.6	7.8	10.7	9
Potassium	--	--	--	MG/KG	810	848	638	1200	1030
Selenium	3.9	110	4	MG/KG	0.13 J	0.19 J	0.11 U	0.14 U	0.12 U
Silver	2	110	8.3	MG/KG	0.076 U	0.069 U	0.074 U	0.099 U	0.081 U
Sodium	--	--	--	MG/KG	304	155	133	692	720
Thallium	--	--	--	MG/KG	0.079 J	0.096 J	0.1 J	0.079 J	0.076 J
Vanadium	--	--	--	MG/KG	16.8	19	13.3	17.9	17.5
Zinc	**109**	6600	2480	MG/KG	**159**	52.7	34.5	**601**	**485**

Table 4. Summary of Metals in Soil, 35-18 Steinway Street, Astoria, Queens, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	RSB-4	RSB-4	RSB-5	RSB-5	RSB-5
Sample Designation:					RSB-4	RSB-4	RSB-5	RSB-5	RSB-5
Sample Date:					12/03/2025	12/03/2025	12/01/2025	12/01/2025	12/01/2025
Sample Depth (ft bls):					4 - 6	20 - 22	0 - 2	2 - 4	4 - 6
Normal Sample or Field Duplicate:					N	N	N	N	N
Aluminum	--	--	--	MG/KG	6100	6610	6940	9700	9480
Antimony	--	--	--	MG/KG	0.13 U	0.14 U	0.43 J	0.72 J	0.41 J
Arsenic	13	16	16	MG/KG	2	0.66 J	2.6	4.4	3.5
Barium	410	410	820	MG/KG	29.5	46.1	73.4	53.2	39.4
Beryllium	4.4	43	47	MG/KG	0.25 J	0.27 J	0.29 J	0.4	0.38
Cadmium	**2.5**	2.5	7.5	MG/KG	0.1 U	0.1 U	0.27 J	0.16 J	0.1 J
Calcium	--	--	--	MG/KG	3020	20200	20100	4310	1210
Chromium III	**30**	110	--	MG/KG	12.1	17.6	15.1	17.3	16.6
Chromium, Hexavalent	1	1	19	MG/KG	0.37 U	0.4 U	0.39 U	0.41 U	0.4 U
Chromium, Total	**30**	110	--	MG/KG	12.1	17.6	15.1	17.3	16.6
Cobalt	--	--	--	MG/KG	4.7	6.1	4.9	5.9	5.3
Copper	**50**	280	1720	MG/KG	23.1	15.2	24.3	31.9	**63.2**
Cyanide	2.3	13	40	MG/KG	0.11 U	0.14 U	0.13 U	0.13 U	0.14 U
Iron	--	--	--	MG/KG	10100	12500	11900	15900	15700
Lead	**63**	400	450	MG/KG	17.9	3.2	**71.8**	**76**	38
Magnesium	--	--	--	MG/KG	3010	12200	3620	2370	2240
Manganese	1600	2000	2000	MG/KG	236	198	212	281	313
Mercury	**0.18**	0.3	0.73	MG/KG	0.024	0.013 J	0.11	0.086	0.046
Nickel	**30**	320	130	MG/KG	10.1	13	11.9	12.9	11.4
Potassium	--	--	--	MG/KG	1100	1980	1220	827	632
Selenium	3.9	110	4	MG/KG	0.12 U	0.12 U	0.1 U	0.11 U	0.11 U
Silver	2	110	8.3	MG/KG	0.082 U	0.083 U	0.073 U	0.089 J	0.075 U
Sodium	--	--	--	MG/KG	267	381	441	282	230
Thallium	--	--	--	MG/KG	0.091 J	0.14 J	0.086 J	0.1 J	0.1 J
Vanadium	--	--	--	MG/KG	15.5	22.2	20.5	23.3	21.6
Zinc	**109**	6600	2480	MG/KG	32.1	38.4	88.4	97.8	48.1

Table 4. Summary of Metals in Soil, 35-18 Steinway Street, Astoria, Queens, New York

			Sample Designation:		RSB-5	RSB-5	RSB-5	RSB-6	RSB-6
			Sample Date:		12/02/2025	12/02/2025	12/15/2025	12/12/2025	12/12/2025
			Sample Depth (ft bls):		6 - 8	20 - 22	8 - 10	0 - 2	2 - 4
			Normal Sample or Field Duplicate:		N	N	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units					
Aluminum	--	--	--	MG/KG	7140 J-	2520	3570	7190	7830
Antimony	--	--	--	MG/KG	0.16 UJ	0.12 U	0.14 U	0.2 J	0.16 UJ
Arsenic	13	16	16	MG/KG	2.7 J-	0.44 J	0.75 J	3.3	2.6
Barium	410	410	820	MG/KG	36.5 J-	15.1	17.1	81.5	25.8
Beryllium	4.4	43	47	MG/KG	0.29 J-	0.12 J	0.17 J	0.36 J	0.29 J
Cadmium	**2.5**	2.5	7.5	MG/KG	0.12 UJ	0.09 U	0.11 U	0.64	0.12 U
Calcium	--	--	--	MG/KG	821 J-	18500	851	19100	868
Chromium III	**30**	110	--	MG/KG	12.6 J-	10.3	8.9	15.5	16.5
Chromium, Hexavalent	1	1	19	MG/KG	0.42 UJ	0.37 U	0.38 U	0.4 U	0.39 U
Chromium, Total	**30**	110	--	MG/KG	12.6 J-	10.3	8.9	15.5	16.5 J
Cobalt	--	--	--	MG/KG	4.2 J-	2.2	3.2	5.7	4.6
Copper	**50**	280	1720	MG/KG	**131 J-**	6.6	10	45	10.9
Cyanide	2.3	13	40	MG/KG	0.13 UJ	0.11 U	0.11 U	0.14 U	0.12 U
Iron	--	--	--	MG/KG	10700 J-	5330	7220	11900	12200
Lead	**63**	400	450	MG/KG	**83.9 J-**	2.6	2.5	**126**	7.7 J
Magnesium	--	--	--	MG/KG	1910 J-	10100	1870	3170	2180
Manganese	1600	2000	2000	MG/KG	238 J-	132	226	210	214
Mercury	**0.18**	0.3	0.73	MG/KG	0.061 J-	0.0078 U	0.0077 U	0.12	0.013 J
Nickel	**30**	320	130	MG/KG	9.1 J-	5.5	8.6	14.9	11
Potassium	--	--	--	MG/KG	560 J-	407	662	1140	647
Selenium	3.9	110	4	MG/KG	0.17 J-	0.1 U	0.12 U	0.14 J	0.16 J
Silver	2	110	8.3	MG/KG	0.096 UJ	0.071 U	0.085 U	0.086 U	0.095 U
Sodium	--	--	--	MG/KG	156 J-	134	187	606	231
Thallium	--	--	--	MG/KG	0.068 J-	0.039 J	0.046 J	0.096 J	0.07 J
Vanadium	--	--	--	MG/KG	16.4 J-	8.4	11.2	21.3	19.2
Zinc	**109**	6600	2480	MG/KG	56.4 J-	13.5	17.8	**243**	24.4

Table 4. Summary of Metals in Soil, 35-18 Steinway Street, Astoria, Queens, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	RSB-6	RSB-6	RSB-6	RSB-7	RSB-7
Sample Designation:					RSB-6	RSB-6	RSB-6	RSB-7	RSB-7
Sample Date:					12/12/2025	12/16/2025	12/16/2025	12/08/2025	12/08/2025
Sample Depth (ft bls):					4 - 6	6 - 8	20 - 22	0 - 2	2 - 4
Normal Sample or Field Duplicate:					N	N	N	N	N
Aluminum	--	--	--	MG/KG	10400	9170	2870	6680	6200
Antimony	--	--	--	MG/KG	0.15 U	0.16 U	0.15 U	0.51 J	1.6
Arsenic	13	16	16	MG/KG	3.2	2.8	0.58 J	3.9	5.3
Barium	410	410	820	MG/KG	33.1	30.2	17.8	52.5	77.1
Beryllium	4.4	43	47	MG/KG	0.4 J	0.33 J	0.13 J	0.29 J	0.27 J
Cadmium	**2.5**	2.5	7.5	MG/KG	0.12 U	0.12 U	0.12 U	0.25 J	0.36 J
Calcium	--	--	--	MG/KG	2000	3220	27700	12000	12500
Chromium III	**30**	110	--	MG/KG	17.2	15.5	7.9	14	13.7
Chromium, Hexavalent	1	1	19	MG/KG	0.42 U	0.41 U	0.42 U	0.4 U	0.4 U
Chromium, Total	**30**	110	--	MG/KG	17.2	15.5	7.9	14	13.7
Cobalt	--	--	--	MG/KG	6.7	5.4	3.1	5.2	6.3
Copper	**50**	280	1720	MG/KG	11.8	11.8	7.9	32.8	**60.9**
Cyanide	2.3	13	40	MG/KG	0.12 U	0.14 U	0.15 U	0.14 U	0.14 U
Iron	--	--	--	MG/KG	15000	13600	7510	13700	12300
Lead	**63**	400	450	MG/KG	7.7	6	1.9	57.6	**1290**
Magnesium	--	--	--	MG/KG	2230	2320	14500	3690	4370
Manganese	1600	2000	2000	MG/KG	302	263	128	227	434
Mercury	**0.18**	0.3	0.73	MG/KG	0.018	0.016 J	0.0081 U	0.073	0.08
Nickel	**30**	320	130	MG/KG	12.5	11.8	6.7	14.6	14.1
Potassium	--	--	--	MG/KG	783	833	625	813	856
Selenium	3.9	110	4	MG/KG	0.25 J	0.17 J	0.14 U	0.27 J	0.38 J
Silver	2	110	8.3	MG/KG	0.094 U	0.095 U	0.094 U	0.075 U	0.41
Sodium	--	--	--	MG/KG	300	333	167	377	335
Thallium	--	--	--	MG/KG	0.093 J	0.083 J	0.044 J	0.095 J	0.19 J
Vanadium	--	--	--	MG/KG	21.6	20.2	12.7	21.2	23.4
Zinc	**109**	6600	2480	MG/KG	30.8	23.1	16.2	87.6	**117**

Table 4. Summary of Metals in Soil, 35-18 Steinway Street, Astoria, Queens, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	RSB-7	RSB-7	RSB-7	RSB-7	RSB-8
Sample Designation:					RSB-7	RSB-7	RSB-7	RSB-7	RSB-8
Sample Date:					12/08/2025	12/16/2025	12/16/2025	12/16/2025	12/11/2025
Sample Depth (ft bls):					4 - 6	6 - 8	8 - 10	25 - 27	0 - 2
Normal Sample or Field Duplicate:					N	N	N	N	N
Aluminum	--	--	--	MG/KG	11100	7870	3250 J-	3220	6160
Antimony	--	--	--	MG/KG	0.65 J	0.2 J	0.15 UJ	0.15 U	0.21 J
Arsenic	13	16	16	MG/KG	4.5	4	0.69 J-	0.41 J	3.8
Barium	410	410	820	MG/KG	50.9	56.7	26.8 J	21.8	56.7
Beryllium	4.4	43	47	MG/KG	0.42	0.37 J	0.14 J-	0.12 J	0.31 J
Cadmium	**2.5**	2.5	7.5	MG/KG	0.095 U	0.35 J	0.11 UJ	0.11 U	0.51 J
Calcium	--	--	--	MG/KG	1940	1890	848 J-	21300	24700 J
Chromium III	**30**	110	--	MG/KG	18.6	13.8	8.3 J-	7.6	15
Chromium, Hexavalent	1	1	19	MG/KG	0.41 U	0.39 U	0.38 UJ	0.4 U	0.39 U
Chromium, Total	**30**	110	--	MG/KG	18.6	13.8	8.3 J-	7.6	15 J
Cobalt	--	--	--	MG/KG	6.4	6.4	3.4 J-	3.1	5.4 J
Copper	**50**	280	1720	MG/KG	32.1 J	32.1	9.8 J-	8.5	33.5 J
Cyanide	2.3	13	40	MG/KG	0.13 U	0.17 J	0.13 UJ	0.15 U	0.13 U
Iron	--	--	--	MG/KG	17300	13300	7440 J-	6850	11600
Lead	**63**	400	450	MG/KG	**116**	57.3	2.3 J-	1.6	**70.4 J**
Magnesium	--	--	--	MG/KG	2620	2410	1480 J-	11300	8870 J
Manganese	1600	2000	2000	MG/KG	307	574	209 J-	135	181
Mercury	**0.18**	0.3	0.73	MG/KG	0.15	0.066	0.0076 J-	0.0089 U	0.16 J-
Nickel	**30**	320	130	MG/KG	13.4	10.8	7.2 J-	6.4	13.4 J
Potassium	--	--	--	MG/KG	808	863	538 J-	834	1310
Selenium	3.9	110	4	MG/KG	0.36 J	0.27 J	0.13 UJ	0.13 U	0.27 J
Silver	2	110	8.3	MG/KG	0.1 J	0.095 U	0.09 UJ	0.09 U	0.095 U
Sodium	--	--	--	MG/KG	385	262	142 J-	184	322
Thallium	--	--	--	MG/KG	0.11 J	0.13 J	0.061 J-	0.066 J	0.1 J
Vanadium	--	--	--	MG/KG	26.7	20.3	10.3 J-	11.5	25.1
Zinc	**109**	6600	2480	MG/KG	66.6	**177**	16.1 J-	15.7	105 J

Table 4. Summary of Metals in Soil, 35-18 Steinway Street, Astoria, Queens, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	Sample Designation: RSB-8	RSB-8	RSB-8	RSB-8	RSB-8
					Sample Date: 12/11/2025	12/11/2025	12/11/2025	12/15/2025	12/15/2025
					Sample Depth (ft bls): 1 - 3	1 - 3	3 - 5	5 - 7	25 - 27
					Normal Sample or Field Duplicate: N	FD	N	N	N
Aluminum	--	--	--	MG/KG	6380	7900	7230	3980	4100
Antimony	--	--	--	MG/KG	0.15 J	0.13 U	0.14 U	0.14 U	0.14 U
Arsenic	13	16	16	MG/KG	2.6	1.8	1.8	0.75 J	0.68 J
Barium	410	410	820	MG/KG	26 J	48.4	37.4	28.9	27.5
Beryllium	4.4	43	47	MG/KG	0.25 J	0.3 J	0.28 J	0.18 J	0.19 J
Cadmium	**2.5**	2.5	7.5	MG/KG	0.1 U	0.12 J	0.11 U	0.11 U	0.11 U
Calcium	--	--	--	MG/KG	9280 J	3090	3310	795	2490
Chromium III	**30**	110	--	MG/KG	12	17.1	14.9	10	12.4
Chromium, Hexavalent	1	1	19	MG/KG	0.37 U	0.37 U	0.38 U	0.37 U	0.66 J
Chromium, Total	**30**	110	--	MG/KG	12	17.1	14.9	10	13
Cobalt	--	--	--	MG/KG	3.9 J	7.4	6.3	3.8	4.4
Copper	**50**	280	1720	MG/KG	22.6	28.8	23.5	12.2	10.2
Cyanide	2.3	13	40	MG/KG	0.12 U	0.12 U	0.13 U	0.13 U	0.12 U
Iron	--	--	--	MG/KG	10000 J	14500	13000	8440	8990
Lead	**63**	400	450	MG/KG	18.7 J	10.4	8.9	2.6	2.5
Magnesium	--	--	--	MG/KG	2940	3550	3270	2070	3150
Manganese	1600	2000	2000	MG/KG	183 J	338	344	227	226
Mercury	**0.18**	0.3	0.73	MG/KG	0.032	0.022	0.02	0.0078 U	0.0084 U
Nickel	**30**	320	130	MG/KG	8.4 J	13	12.2	8.2	9.1
Potassium	--	--	--	MG/KG	688 J	1630	1410	1040	818
Selenium	3.9	110	4	MG/KG	0.2 J	0.19 J	0.16 J	0.12 U	0.12 U
Silver	2	110	8.3	MG/KG	0.08 U	0.081 U	0.084 U	0.083 U	0.087 U
Sodium	--	--	--	MG/KG	220	302	277	167	203
Thallium	--	--	--	MG/KG	0.08 J	0.12 J	0.13 J	0.072 J	0.064 J
Vanadium	--	--	--	MG/KG	19.9	27.9	25.6	15.2	15.8
Zinc	**109**	6600	2480	MG/KG	22.3	32.3	29.7	23.5	22.4

Table 4. Summary of Metals in Soil, 35-18 Steinway Street, Astoria, Queens, New York

			Sample Designation:		RSB-9	RSB-9	RSB-9	RSB-9
			Sample Date:		12/15/2025	12/17/2025	12/17/2025	12/17/2025
			Sample Depth (ft bls):		0 - 2	16 - 18	20 - 22	22 - 24
			Normal Sample or Field Duplicate:		N	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
Aluminum	--	--	--	MG/KG	6220	7740	8490	7960
Antimony	--	--	--	MG/KG	0.33 J	0.52 J	0.61 J	0.47 J
Arsenic	13	16	16	MG/KG	3.4	4	3.5	2.6
Barium	410	410	820	MG/KG	90.1	42.4	52.8	41.5
Beryllium	4.4	43	47	MG/KG	0.56	0.34	0.33 J	0.32 J
Cadmium	**2.5**	2.5	7.5	MG/KG	0.53	0.097 J	**2.9**	0.14 J
Calcium	--	--	--	MG/KG	30300	17400	21300	10300
Chromium III	**30**	110	--	MG/KG	**549**	14.4	15.3	15.5
Chromium, Hexavalent	1	1	19	MG/KG	0.39 U	0.4 U	0.4 U	0.4 U
Chromium, Total	**30**	110	--	MG/KG	**549**	14.4	15.3	15.5
Cobalt	--	--	--	MG/KG	12.7	5.4	5.3	5.6
Copper	**50**	280	1720	MG/KG	**9320**	16.9	21.9	19.1 J
Cyanide	2.3	13	40	MG/KG	0.26	0.14 U	0.14 U	0.15 U
Iron	--	--	--	MG/KG	14600	18000	15600	14400
Lead	**63**	400	450	MG/KG	**159**	32.2	53.1	46.6
Magnesium	--	--	--	MG/KG	4450	5370	6410	6340
Manganese	1600	2000	2000	MG/KG	255	247	237	259
Mercury	**0.18**	0.3	0.73	MG/KG	0.14 J-	0.022	0.039	0.043
Nickel	**30**	320	130	MG/KG	**302**	11.4	11.3	12.2 J
Potassium	--	--	--	MG/KG	1210	1190	1160	1360
Selenium	3.9	110	4	MG/KG	0.18 J	0.18 J	0.19 J	0.12 J
Silver	2	110	8.3	MG/KG	0.21 J	0.073 U	0.076 U	0.074 U
Sodium	--	--	--	MG/KG	718	365	415	265
Thallium	--	--	--	MG/KG	0.095 J	0.13 J	0.11 J	0.11 J
Vanadium	--	--	--	MG/KG	19.5	22.4	23.2	21.9
Zinc	**109**	6600	2480	MG/KG	**696**	64.4	**813**	62.6 J

Table 5. Summary of Polychlorinated Biphenyls in Soil, 35-18 Steinway Street, Astoria, Queens, New York

			Sample Designation:		RSB-1	RSB-1	RSB-1	RSB-1	RSB-2
			Sample Date:		12/01/2025	12/01/2025	12/01/2025	12/02/2025	12/01/2025
			Sample Depth (ft bls):		0 - 2	2 - 4	4 - 6	20 - 22	0 - 2
			Normal Sample or Field Duplicate:		N	N	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units					
PCB-1016 (Aroclor 1016)	--	--	--	MG/KG	0.018 U	0.019 U	0.02 U	0.02 U	0.019 U
PCB-1221 (Aroclor 1221)	--	--	--	MG/KG	0.018 U	0.019 U	0.02 U	0.02 U	0.019 U
PCB-1232 (Aroclor 1232)	--	--	--	MG/KG	0.018 U	0.019 U	0.02 U	0.02 U	0.019 U
PCB-1242 (Aroclor 1242)	--	--	--	MG/KG	0.018 U	0.019 U	0.02 U	0.02 U	0.019 U
PCB-1248 (Aroclor 1248)	--	--	--	MG/KG	0.018 U	0.019 U	0.02 U	0.02 U	0.019 U
PCB-1254 (Aroclor 1254)	--	--	--	MG/KG	0.018 U	0.019 U	0.02 U	0.02 U	0.019 U
PCB-1260 (Aroclor 1260)	--	--	--	MG/KG	0.018 U	0.019 U	0.02 U	0.02 U	0.019 U
PCB-1262 (Aroclor 1262)	--	--	--	MG/KG	0.018 U	0.019 U	0.02 U	0.02 U	0.019 U
PCB-1268 (Aroclor 1268)	--	--	--	MG/KG	0.018 U	0.019 U	0.02 U	0.02 U	0.019 U
Polychlorinated Biphenyl (PCBs)	**0.1**	1	3.2	MG/KG	0.018 U	0.019 U	0.02 U	0.02 U	0.019 U

Table 5. Summary of Polychlorinated Biphenyls in Soil, 35-18 Steinway Street, Astoria, Queens, New York

			Sample Designation:		RSB-2	RSB-2	RSB-2	RSB-2	RSB-3
			Sample Date:		12/01/2025	12/01/2025	12/01/2025	12/02/2025	12/01/2025
			Sample Depth (ft bls):		1 - 3	1 - 3	3 - 5	20 - 22	0 - 2
			Normal Sample or Field Duplicate:		N	FD	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units					
PCB-1016 (Aroclor 1016)	--	--	--	MG/KG	0.019 U	0.02 U	0.019 U	0.019 U	0.019 U
PCB-1221 (Aroclor 1221)	--	--	--	MG/KG	0.019 U	0.02 U	0.019 U	0.019 U	0.019 U
PCB-1232 (Aroclor 1232)	--	--	--	MG/KG	0.019 U	0.02 U	0.019 U	0.019 U	0.019 U
PCB-1242 (Aroclor 1242)	--	--	--	MG/KG	0.019 U	0.02 U	0.019 U	0.019 U	0.019 U
PCB-1248 (Aroclor 1248)	--	--	--	MG/KG	0.019 U	0.02 U	0.019 U	0.019 U	0.019 U
PCB-1254 (Aroclor 1254)	--	--	--	MG/KG	0.019 U	0.02 U	0.019 U	0.019 U	0.019 U
PCB-1260 (Aroclor 1260)	--	--	--	MG/KG	0.019 U	0.02 U	0.019 U	0.019 U	0.019 U
PCB-1262 (Aroclor 1262)	--	--	--	MG/KG	0.019 U	0.02 U	0.019 U	0.019 U	0.019 U
PCB-1268 (Aroclor 1268)	--	--	--	MG/KG	0.019 U	0.02 U	0.019 U	0.019 U	0.019 U
Polychlorinated Biphenyl (PCBs)	**0.1**	1	3.2	MG/KG	0.019 U	0.02 U	0.019 U	0.019 U	0.019 U

Table 5. Summary of Polychlorinated Biphenyls in Soil, 35-18 Steinway Street, Astoria, Queens, New York

			Sample Designation:		RSB-3	RSB-3	RSB-3	RSB-4	RSB-4
			Sample Date:		12/01/2025	12/01/2025	12/02/2025	12/03/2025	12/03/2025
			Sample Depth (ft bls):		2 - 4	4 - 6	20 - 22	0 - 2	2 - 4
			Normal Sample or Field Duplicate:		N	N	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units					
PCB-1016 (Aroclor 1016)	--	--	--	MG/KG	0.019 U	0.018 U	0.019 U	0.02 U	0.018 U
PCB-1221 (Aroclor 1221)	--	--	--	MG/KG	0.019 U	0.018 U	0.019 U	0.02 U	0.018 U
PCB-1232 (Aroclor 1232)	--	--	--	MG/KG	0.019 U	0.018 U	0.019 U	0.02 U	0.018 U
PCB-1242 (Aroclor 1242)	--	--	--	MG/KG	0.019 U	0.018 U	0.019 U	0.02 U	0.018 U
PCB-1248 (Aroclor 1248)	--	--	--	MG/KG	0.019 U	0.018 U	0.019 U	0.02 U	0.018 U
PCB-1254 (Aroclor 1254)	--	--	--	MG/KG	0.019 U	0.018 U	0.019 U	0.14	0.25 J
PCB-1260 (Aroclor 1260)	--	--	--	MG/KG	0.019 U	0.018 U	0.019 U	0.02 U	0.018 U
PCB-1262 (Aroclor 1262)	--	--	--	MG/KG	0.019 U	0.018 U	0.019 U	0.02 U	0.018 U
PCB-1268 (Aroclor 1268)	--	--	--	MG/KG	0.019 U	0.018 U	0.019 U	0.02 U	0.018 U
Polychlorinated Biphenyl (PCBs)	**0.1**	1	3.2	MG/KG	0.019 U	0.018 U	0.019 U	**0.14**	**0.25 J**

Table 5. Summary of Polychlorinated Biphenyls in Soil, 35-18 Steinway Street, Astoria, Queens, New York

			Sample Designation:		RSB-4	RSB-4	RSB-5	RSB-5	RSB-5
			Sample Date:		12/03/2025	12/03/2025	12/01/2025	12/01/2025	12/01/2025
			Sample Depth (ft bls):		4 - 6	20 - 22	0 - 2	2 - 4	4 - 6
			Normal Sample or Field Duplicate:		N	N	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units					
PCB-1016 (Aroclor 1016)	--	--	--	MG/KG	0.018 U	0.019 U	0.019 U	0.02 U	0.019 U
PCB-1221 (Aroclor 1221)	--	--	--	MG/KG	0.018 U	0.019 U	0.019 U	0.02 U	0.019 U
PCB-1232 (Aroclor 1232)	--	--	--	MG/KG	0.018 U	0.019 U	0.019 U	0.02 U	0.019 U
PCB-1242 (Aroclor 1242)	--	--	--	MG/KG	0.018 U	0.019 U	0.019 U	0.02 U	0.019 U
PCB-1248 (Aroclor 1248)	--	--	--	MG/KG	0.018 U	0.019 U	0.019 U	0.02 U	0.019 U
PCB-1254 (Aroclor 1254)	--	--	--	MG/KG	0.018 U	0.019 U	0.019 U	0.02 U	0.019 U
PCB-1260 (Aroclor 1260)	--	--	--	MG/KG	0.018 U	0.019 U	0.019 U	0.02 U	0.019 U
PCB-1262 (Aroclor 1262)	--	--	--	MG/KG	0.018 U	0.019 U	0.019 U	0.02 U	0.019 U
PCB-1268 (Aroclor 1268)	--	--	--	MG/KG	0.018 U	0.019 U	0.019 U	0.02 U	0.019 U
Polychlorinated Biphenyl (PCBs)	**0.1**	1	3.2	MG/KG	0.018 U	0.019 U	0.019 U	0.02 U	0.019 U

Table 5. Summary of Polychlorinated Biphenyls in Soil, 35-18 Steinway Street, Astoria, Queens, New York

			Sample Designation:		RSB-5	RSB-5	RSB-5	RSB-6	RSB-6
			Sample Date:		12/02/2025	12/02/2025	12/15/2025	12/12/2025	12/12/2025
			Sample Depth (ft bls):		6 - 8	20 - 22	8 - 10	0 - 2	2 - 4
			Normal Sample or Field Duplicate:		N	N	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units					
PCB-1016 (Aroclor 1016)	--	--	--	MG/KG	0.021 UJ	0.018 U	0.018 U	0.019 U	0.019 U
PCB-1221 (Aroclor 1221)	--	--	--	MG/KG	0.021 UJ	0.018 U	0.018 U	0.019 U	0.019 U
PCB-1232 (Aroclor 1232)	--	--	--	MG/KG	0.021 UJ	0.018 U	0.018 U	0.019 U	0.019 U
PCB-1242 (Aroclor 1242)	--	--	--	MG/KG	0.021 UJ	0.018 U	0.018 U	0.019 U	0.019 U
PCB-1248 (Aroclor 1248)	--	--	--	MG/KG	0.021 UJ	0.018 U	0.018 U	0.019 U	0.019 U
PCB-1254 (Aroclor 1254)	--	--	--	MG/KG	0.021 UJ	0.018 U	0.018 U	0.019 U	0.019 U
PCB-1260 (Aroclor 1260)	--	--	--	MG/KG	0.021 UJ	0.018 U	0.018 U	0.019 U	0.019 U
PCB-1262 (Aroclor 1262)	--	--	--	MG/KG	0.021 UJ	0.018 U	0.018 U	0.019 U	0.019 U
PCB-1268 (Aroclor 1268)	--	--	--	MG/KG	0.021 UJ	0.018 U	0.018 U	0.019 U	0.019 U
Polychlorinated Biphenyl (PCBs)	**0.1**	1	3.2	MG/KG	0.021 UJ	0.018 U	0.018 U	0.019 U	0.019 U

Table 5. Summary of Polychlorinated Biphenyls in Soil, 35-18 Steinway Street, Astoria, Queens, New York

			Sample Designation:		RSB-6	RSB-6	RSB-6	RSB-7	RSB-7
			Sample Date:		12/12/2025	12/16/2025	12/16/2025	12/08/2025	12/08/2025
			Sample Depth (ft bls):		4 - 6	6 - 8	20 - 22	0 - 2	2 - 4
			Normal Sample or Field Duplicate:		N	N	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units					
PCB-1016 (Aroclor 1016)	--	--	--	MG/KG	0.02 U	0.02 U	0.02 U	0.019 U	0.019 U
PCB-1221 (Aroclor 1221)	--	--	--	MG/KG	0.02 U	0.02 U	0.02 U	0.019 U	0.019 U
PCB-1232 (Aroclor 1232)	--	--	--	MG/KG	0.02 U	0.02 U	0.02 U	0.019 U	0.019 U
PCB-1242 (Aroclor 1242)	--	--	--	MG/KG	0.02 U	0.02 U	0.02 U	0.019 U	0.019 U
PCB-1248 (Aroclor 1248)	--	--	--	MG/KG	0.02 U	0.02 U	0.02 U	0.019 U	0.019 U
PCB-1254 (Aroclor 1254)	--	--	--	MG/KG	0.02 U	0.02 U	0.02 U	0.019 U	0.019 U
PCB-1260 (Aroclor 1260)	--	--	--	MG/KG	0.02 U	0.02 U	0.02 U	0.019 U	0.019 U
PCB-1262 (Aroclor 1262)	--	--	--	MG/KG	0.02 U	0.02 U	0.02 U	0.019 U	0.019 U
PCB-1268 (Aroclor 1268)	--	--	--	MG/KG	0.02 U	0.02 U	0.02 U	0.019 U	0.019 U
Polychlorinated Biphenyl (PCBs)	**0.1**	1	3.2	MG/KG	0.02 U	0.02 U	0.02 U	0.019 U	0.019 U

Table 5. Summary of Polychlorinated Biphenyls in Soil, 35-18 Steinway Street, Astoria, Queens, New York

			Sample Designation:		RSB-7	RSB-7	RSB-7	RSB-7	RSB-8
			Sample Date:		12/08/2025	12/16/2025	12/16/2025	12/16/2025	12/11/2025
			Sample Depth (ft bls):		4 - 6	6 - 8	8 - 10	25 - 27	0 - 2
			Normal Sample or Field Duplicate:		N	N	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units					
PCB-1016 (Aroclor 1016)	--	--	--	MG/KG	0.02 U	0.019 U	0.018 UJ	0.02 U	0.019 U
PCB-1221 (Aroclor 1221)	--	--	--	MG/KG	0.02 U	0.019 U	0.018 UJ	0.02 U	0.019 U
PCB-1232 (Aroclor 1232)	--	--	--	MG/KG	0.02 U	0.019 U	0.018 UJ	0.02 U	0.019 U
PCB-1242 (Aroclor 1242)	--	--	--	MG/KG	0.02 U	0.019 U	0.018 UJ	0.02 U	0.019 U
PCB-1248 (Aroclor 1248)	--	--	--	MG/KG	0.02 U	0.019 U	0.018 UJ	0.02 U	0.019 U
PCB-1254 (Aroclor 1254)	--	--	--	MG/KG	0.02 U	0.019 U	0.018 UJ	0.02 U	0.019 U
PCB-1260 (Aroclor 1260)	--	--	--	MG/KG	0.02 U	0.019 U	0.018 UJ	0.02 U	0.019 U
PCB-1262 (Aroclor 1262)	--	--	--	MG/KG	0.02 U	0.019 U	0.018 UJ	0.02 U	0.019 U
PCB-1268 (Aroclor 1268)	--	--	--	MG/KG	0.02 U	0.019 U	0.018 UJ	0.02 U	0.019 U
Polychlorinated Biphenyl (PCBs)	**0.1**	1	3.2	MG/KG	0.02 U	0.019 U	0.018 UJ	0.02 U	0.019 U

Table 5. Summary of Polychlorinated Biphenyls in Soil, 35-18 Steinway Street, Astoria, Queens, New York

			Sample Designation:		RSB-8	RSB-8	RSB-8	RSB-8	RSB-8
			Sample Date:		12/11/2025	12/11/2025	12/11/2025	12/15/2025	12/15/2025
			Sample Depth (ft bls):		1 - 3	1 - 3	3 - 5	5 - 7	25 - 27
			Normal Sample or Field Duplicate:		N	FD	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units					
PCB-1016 (Aroclor 1016)	--	--	--	MG/KG	0.018 U	0.018 U	0.018 U	0.018 U	0.019 U
PCB-1221 (Aroclor 1221)	--	--	--	MG/KG	0.018 U	0.018 U	0.018 U	0.018 U	0.019 U
PCB-1232 (Aroclor 1232)	--	--	--	MG/KG	0.018 U	0.018 U	0.018 U	0.018 U	0.019 U
PCB-1242 (Aroclor 1242)	--	--	--	MG/KG	0.018 U	0.018 U	0.018 U	0.018 U	0.019 U
PCB-1248 (Aroclor 1248)	--	--	--	MG/KG	0.018 U	0.018 U	0.018 U	0.018 U	0.019 U
PCB-1254 (Aroclor 1254)	--	--	--	MG/KG	0.018 U	0.018 U	0.018 U	0.018 U	0.019 U
PCB-1260 (Aroclor 1260)	--	--	--	MG/KG	0.018 U	0.018 U	0.018 U	0.018 U	0.019 U
PCB-1262 (Aroclor 1262)	--	--	--	MG/KG	0.018 U	0.018 U	0.018 U	0.018 U	0.019 U
PCB-1268 (Aroclor 1268)	--	--	--	MG/KG	0.018 U	0.018 U	0.018 U	0.018 U	0.019 U
Polychlorinated Biphenyl (PCBs)	**0.1**	1	3.2	MG/KG	0.018 U	0.018 U	0.018 U	0.018 U	0.019 U

Table 5. Summary of Polychlorinated Biphenyls in Soil, 35-18 Steinway Street, Astoria, Queens, New York

			Sample Designation:		RSB-9	RSB-9	RSB-9	RSB-9
			Sample Date:		12/15/2025	12/17/2025	12/17/2025	12/17/2025
			Sample Depth (ft bls):		0 - 2	16 - 18	20 - 22	22 - 24
			Normal Sample or Field Duplicate:		N	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
PCB-1016 (Aroclor 1016)	--	--	--	MG/KG	0.019 U	0.02 U	0.02 U	0.02 U
PCB-1221 (Aroclor 1221)	--	--	--	MG/KG	0.019 U	0.02 U	0.02 U	0.02 U
PCB-1232 (Aroclor 1232)	--	--	--	MG/KG	0.019 U	0.02 U	0.02 U	0.02 U
PCB-1242 (Aroclor 1242)	--	--	--	MG/KG	0.019 U	0.02 U	0.02 U	0.02 U
PCB-1248 (Aroclor 1248)	--	--	--	MG/KG	0.019 U	0.02 U	0.02 U	0.02 U
PCB-1254 (Aroclor 1254)	--	--	--	MG/KG	0.019 U	0.02 U	0.02 U	0.02 U
PCB-1260 (Aroclor 1260)	--	--	--	MG/KG	0.019 U	0.02 U	0.02 U	0.02 U
PCB-1262 (Aroclor 1262)	--	--	--	MG/KG	0.019 U	0.02 U	0.02 U	0.02 U
PCB-1268 (Aroclor 1268)	--	--	--	MG/KG	0.019 U	0.02 U	0.02 U	0.02 U
Polychlorinated Biphenyl (PCBs)	**0.1**	1	3.2	MG/KG	0.019 U	0.02 U	0.02 U	0.02 U

Table 6. Summary of Pesticides and Herbicides in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-1	RSB-1	RSB-1	RSB-1
				Sample Date:	12/01/2025	12/01/2025	12/01/2025	12/02/2025
				Sample Depth (ft bls):	0 - 2	2 - 4	4 - 6	20 - 22
				Normal Sample or Field Duplicate:	N	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
2,4-D (Dichlorophenoxyacetic Acid)	--	--	--	MG/KG	0.013 U	0.013 U	0.013 U	0.014 U
Acetic acid, (2,4,5-trichlorophenoxy)-	--	--	--	MG/KG	0.0074 U	0.0077 U	0.0078 U	0.008 U
Aldrin	0.0048	0.044	0.19	MG/KG	0.001 U	0.0011 U	0.0011 U	0.0011 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.02	0.18	0.02	MG/KG	0.0007 U	0.00074 U	0.00075 U	0.00077 U
Alpha Endosulfan	4.3	35	65	MG/KG	0.0011 U	0.0011 U	0.0011 U	0.0012 U
Beta Bhc (Beta Hexachlorocyclohexane)	0.021	0.18	0.09	MG/KG	0.00078 U	0.00081 U	0.00083 U	0.00085 U
Beta Endosulfan	4.3	35	44	MG/KG	0.0018 U	0.0019 U	0.0019 U	0.002 U
Chlordane (Technical)	--	--	--	MG/KG	0.017 U	0.018 U	0.018 U	0.018 U
cis-Chlordane	0.014	0.65	4.5	MG/KG	0.0011 U	0.0012 U	0.0012 U	0.0012 U
Delta BHC (Delta Hexachlorocyclohexane)	0.04	100	0.1	MG/KG	0.00042 U	0.00045 U	0.00045 U	0.00047 U
Dieldrin	0.005	0.075	0.1	MG/KG	0.0009 U	0.00095 U	0.00096 U	0.00099 U
Endosulfan Sulfate	4.3	35	47	MG/KG	0.00087 U	0.00091 U	0.00093 U	0.00095 U
Endrin	0.014	5.3	0.06	MG/KG	0.00099 U	0.001 U	0.0011 U	0.0011 U
Endrin Aldehyde	--	--	--	MG/KG	0.0016 U	0.0017 U	0.0017 U	0.0018 U
Endrin Ketone	--	--	--	MG/KG	0.0013 U	0.0014 U	0.0014 U	0.0015 U
Gamma Bhc (Lindane)	0.025	0.21	0.05	MG/KG	0.00064 U	0.00067 U	0.00068 U	0.0007 U
Heptachlor	0.013	0.53	0.38	MG/KG	0.00082 U	0.00086 U	0.00087 U	0.0009 U
Heptachlor Epoxide	--	--	--	MG/KG	0.001 U	0.0011 U	0.0011 U	0.0011 U
Methoxychlor	--	--	--	MG/KG	0.0016 U	0.0017 U	0.0017 U	0.0017 U
P,P'-DDD	0.0033	5	14	MG/KG	0.0012 U	0.0012 U	0.0013 U	0.0013 U
P,P'-DDE	**0.0033**	3.4	9.3	MG/KG	0.00082 U	0.00086 U	0.00087 U	0.0009 U
P,P'-DDT	0.0033	3.8	135	MG/KG	0.0013 U	0.0013 U	0.0014 U	0.0014 U
Silvex (2,4,5-TP)	--	--	--	MG/KG	0.0036 U	0.0038 U	0.0038 U	0.0039 U
Toxaphene	--	--	--	MG/KG	0.025 U	0.026 U	0.027 U	0.027 U

Table 6. Summary of Pesticides and Herbicides in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-2	RSB-2	RSB-2	RSB-2
				Sample Date:	12/01/2025	12/01/2025	12/01/2025	12/01/2025
				Sample Depth (ft bls):	0 - 2	1 - 3	1 - 3	3 - 5
				Normal Sample or Field Duplicate:	N	N	FD	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
2,4-D (Dichlorophenoxyacetic Acid)	--	--	--	MG/KG	0.013 U	0.013 U	0.013 U	0.013 U
Acetic acid, (2,4,5-trichlorophenoxy)-	--	--	--	MG/KG	0.0076 U	0.0077 U	0.0078 U	0.0074 U
Aldrin	0.0048	0.044	0.19	MG/KG	0.0011 U	0.0011 U	0.0011 U	0.0011 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.02	0.18	0.02	MG/KG	0.00073 U	0.00074 U	0.00075 U	0.00071 U
Alpha Endosulfan	4.3	35	65	MG/KG	0.0011 U	0.0011 U	0.0011 U	0.0011 U
Beta Bhc (Beta Hexachlorocyclohexane)	0.021	0.18	0.09	MG/KG	0.00081 U	0.00081 U	0.00082 U	0.00079 U
Beta Endosulfan	4.3	35	44	MG/KG	0.0018 U	0.0019 U	0.0019 U	0.0018 U
Chlordane (Technical)	--	--	--	MG/KG	0.017 U	0.018 U	0.018 U	0.017 U
cis-Chlordane	0.014	0.65	4.5	MG/KG	0.0011 U	0.0012 U	0.0012 U	0.0011 U
Delta BHC (Delta Hexachlorocyclohexane)	0.04	100	0.1	MG/KG	0.00044 U	0.00044 U	0.00045 U	0.00043 U
Dieldrin	0.005	0.075	0.1	MG/KG	0.00093 U	0.00094 U	0.00095 U	0.00091 U
Endosulfan Sulfate	4.3	35	47	MG/KG	0.0009 U	0.00091 U	0.00092 U	0.00088 U
Endrin	0.014	5.3	0.06	MG/KG	0.001 U	0.001 U	0.0011 U	0.001 U
Endrin Aldehyde	--	--	--	MG/KG	0.0017 U	0.0017 U	0.0017 U	0.0017 U
Endrin Ketone	--	--	--	MG/KG	0.0014 U	0.0014 U	0.0014 U	0.0014 U
Gamma Bhc (Lindane)	0.025	0.21	0.05	MG/KG	0.00067 U	0.00067 U	0.00068 U	0.00065 U
Heptachlor	0.013	0.53	0.38	MG/KG	0.00085 U	0.00086 U	0.00087 U	0.00083 U
Heptachlor Epoxide	--	--	--	MG/KG	0.0011 U	0.0011 U	0.0011 U	0.001 U
Methoxychlor	--	--	--	MG/KG	0.0016 U	0.0017 U	0.0017 U	0.0016 U
P,P'-DDD	0.0033	5	14	MG/KG	0.0012 U	0.0012 U	0.0013 U	0.0012 U
P,P'-DDE	**0.0033**	3.4	9.3	MG/KG	0.00085 U	0.00086 U	0.00087 U	0.00083 U
P,P'-DDT	0.0033	3.8	135	MG/KG	0.0013 U	0.0013 U	0.0013 U	0.0013 U
Silvex (2,4,5-TP)	--	--	--	MG/KG	0.0037 U	0.0038 U	0.0038 U	0.0036 U
Toxaphene	--	--	--	MG/KG	0.026 U	0.026 U	0.027 U	0.025 U

Table 6. Summary of Pesticides and Herbicides in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-2	RSB-3	RSB-3	RSB-3
				Sample Date:	12/02/2025	12/01/2025	12/01/2025	12/01/2025
				Sample Depth (ft bls):	20 - 22	0 - 2	2 - 4	4 - 6
				Normal Sample or Field Duplicate:	N	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
2,4-D (Dichlorophenoxyacetic Acid)	--	--	--	MG/KG	0.013 U	0.013 U	0.013 U	0.013 U
Acetic acid, (2,4,5-trichlorophenoxy)-	--	--	--	MG/KG	0.0075 U	0.0077 U	0.0076 U	0.0073 U
Aldrin	0.0048	0.044	0.19	MG/KG	0.0011 U	0.0011 U	0.0011 U	0.001 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.02	0.18	0.02	MG/KG	0.00072 U	0.00073 U	0.00073 U	0.0007 U
Alpha Endosulfan	4.3	35	65	MG/KG	0.0011 U	0.0011 U	0.0011 U	0.0011 U
Beta Bhc (Beta Hexachlorocyclohexane)	0.021	0.18	0.09	MG/KG	0.00079 U	0.00081 U	0.00081 U	0.00077 U
Beta Endosulfan	4.3	35	44	MG/KG	0.0018 U	0.0019 U	0.0018 U	0.0018 U
Chlordane (Technical)	--	--	--	MG/KG	0.017 U	0.017 U	0.017 U	0.017 U
cis-Chlordane	0.014	0.65	4.5	MG/KG	0.0011 U	0.0042 J	0.0011 U	0.0011 U
Delta BHC (Delta Hexachlorocyclohexane)	0.04	100	0.1	MG/KG	0.00043 U	0.00044 U	0.00044 U	0.00042 U
Dieldrin	0.005	0.075	0.1	MG/KG	0.00092 U	0.00094 U	0.00094 U	0.0009 U
Endosulfan Sulfate	4.3	35	47	MG/KG	0.00089 U	0.0009 U	0.0009 U	0.00087 U
Endrin	0.014	5.3	0.06	MG/KG	0.001 U	0.001 U	0.001 U	0.00099 U
Endrin Aldehyde	--	--	--	MG/KG	0.0017 U	0.0017 U	0.0017 U	0.0016 U
Endrin Ketone	--	--	--	MG/KG	0.0014 U	0.0014 U	0.0014 U	0.0013 U
Gamma Bhc (Lindane)	0.025	0.21	0.05	MG/KG	0.00066 U	0.00067 U	0.00067 U	0.00064 U
Heptachlor	0.013	0.53	0.38	MG/KG	0.00084 U	0.00085 U	0.00085 U	0.00081 U
Heptachlor Epoxide	--	--	--	MG/KG	0.0011 U	0.0011 U	0.0011 U	0.001 U
Methoxychlor	--	--	--	MG/KG	0.0016 U	0.0016 U	0.0016 U	0.0016 U
P,P'-DDD	0.0033	5	14	MG/KG	0.0012 U	0.0012 U	0.0012 U	0.0012 U
P,P'-DDE	**0.0033**	3.4	9.3	MG/KG	0.00084 U	0.00085 U	0.00085 U	0.00081 U
P,P'-DDT	0.0033	3.8	135	MG/KG	0.0013 U	0.0013 U	0.0013 U	0.0013 U
Silvex (2,4,5-TP)	--	--	--	MG/KG	0.0037 U	0.0038 U	0.0037 U	0.0036 U
Toxaphene	--	--	--	MG/KG	0.026 U	0.026 U	0.026 U	0.025 U

Table 6. Summary of Pesticides and Herbicides in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-3	RSB-4	RSB-4	RSB-4
				Sample Date:	12/02/2025	12/03/2025	12/03/2025	12/03/2025
				Sample Depth (ft bls):	20 - 22	0 - 2	2 - 4	4 - 6
				Normal Sample or Field Duplicate:	N	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
2,4-D (Dichlorophenoxyacetic Acid)	--	--	--	MG/KG	0.013 U	0.013 U	0.012 U	0.012 U
Acetic acid, (2,4,5-trichlorophenoxy)-	--	--	--	MG/KG	0.0075 U	0.0079 U	0.0071 U	0.0071 U
Aldrin	0.0048	0.044	0.19	MG/KG	0.0011 U	0.0011 U	0.001 U	0.001 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.02	0.18	0.02	MG/KG	0.00072 U	0.00076 UT	0.00068 UT	0.00068 UT
Alpha Endosulfan	4.3	35	65	MG/KG	0.0011 U	0.0011 U	0.001 U	0.001 U
Beta Bhc (Beta Hexachlorocyclohexane)	0.021	0.18	0.09	MG/KG	0.0008 U	0.00083 U	0.00075 U	0.00075 U
Beta Endosulfan	4.3	35	44	MG/KG	0.0018 U	0.0019 U	0.0017 U	0.0017 U
Chlordane (Technical)	--	--	--	MG/KG	0.017 U	0.018 U	0.016 U	0.016 U
cis-Chlordane	0.014	0.65	4.5	MG/KG	0.0011 U	0.0012 U	0.0011 U	0.0011 U
Delta BHC (Delta Hexachlorocyclohexane)	0.04	100	0.1	MG/KG	0.00044 U	0.00046 UT	0.00041 UT	0.00041 UT
Dieldrin	0.005	0.075	0.1	MG/KG	0.00093 U	0.00097 U	0.00087 U	0.00087 U
Endosulfan Sulfate	4.3	35	47	MG/KG	0.00089 U	0.00093 U	0.00084 U	0.00084 U
Endrin	0.014	5.3	0.06	MG/KG	0.001 U	0.0011 U	0.00096 U	0.00096 U
Endrin Aldehyde	--	--	--	MG/KG	0.0017 U	0.0018 U	0.0016 U	0.0016 U
Endrin Ketone	--	--	--	MG/KG	0.0014 U	0.0014 U	0.0013 U	0.0013 U
Gamma Bhc (Lindane)	0.025	0.21	0.05	MG/KG	0.00066 U	0.00069 U	0.00062 U	0.00062 U
Heptachlor	0.013	0.53	0.38	MG/KG	0.00084 U	0.00088 U	0.00079 U	0.00079 U
Heptachlor Epoxide	--	--	--	MG/KG	0.0011 U	0.0011 U	0.001 U	0.001 U
Methoxychlor	--	--	--	MG/KG	0.0016 U	0.0017 U	0.0015 U	0.0015 U
P,P'-DDD	0.0033	5	14	MG/KG	0.0012 U	0.0013 U	0.0011 U	0.0011 U
P,P'-DDE	**0.0033**	3.4	9.3	MG/KG	0.00084 U	0.00088 U	0.00079 U	0.00079 U
P,P'-DDT	0.0033	3.8	135	MG/KG	0.0013 U	0.0014 U	0.0012 U	0.0012 U
Silvex (2,4,5-TP)	--	--	--	MG/KG	0.0037 U	0.0039 U	0.0035 U	0.0035 U
Toxaphene	--	--	--	MG/KG	0.026 U	0.027 U	0.024 U	0.024 U

Table 6. Summary of Pesticides and Herbicides in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-4	RSB-5	RSB-5	RSB-5
				Sample Date:	12/03/2025	12/01/2025	12/01/2025	12/01/2025
				Sample Depth (ft bls):	20 - 22	0 - 2	2 - 4	4 - 6
				Normal Sample or Field Duplicate:	N	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
2,4-D (Dichlorophenoxyacetic Acid)	--	--	--	MG/KG	0.013 U	0.013 U	0.013 U	0.013 U
Acetic acid, (2,4,5-trichlorophenoxy)-	--	--	--	MG/KG	0.0076 U	0.0076 U	0.0079 U	0.0077 U
Aldrin	0.0048	0.044	0.19	MG/KG	0.0011 U	0.0011 U	0.0011 U	0.0011 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.02	0.18	0.02	MG/KG	0.00073 UT	0.00073 U	0.00076 U	0.00074 U
Alpha Endosulfan	4.3	35	65	MG/KG	0.0011 U	0.0011 U	0.0011 U	0.0011 U
Beta Bhc (Beta Hexachlorocyclohexane)	0.021	0.18	0.09	MG/KG	0.0008 U	0.0008 U	0.00083 U	0.00082 U
Beta Endosulfan	4.3	35	44	MG/KG	0.0018 U	0.0018 U	0.0019 U	0.0019 U
Chlordane (Technical)	--	--	--	MG/KG	0.017 U	0.017 U	0.018 U	0.018 U
cis-Chlordane	0.014	0.65	4.5	MG/KG	0.0011 U	0.0011 U	0.0012 U	0.0012 U
Delta BHC (Delta Hexachlorocyclohexane)	0.04	100	0.1	MG/KG	0.00044 UT	0.00044 U	0.00046 U	0.00045 U
Dieldrin	0.005	0.075	0.1	MG/KG	0.00093 U	0.00093 U	0.00097 U	0.00095 U
Endosulfan Sulfate	4.3	35	47	MG/KG	0.0009 U	0.0009 U	0.00093 U	0.00092 U
Endrin	0.014	5.3	0.06	MG/KG	0.001 U	0.001 U	0.0011 U	0.001 U
Endrin Aldehyde	--	--	--	MG/KG	0.0017 U	0.0017 U	0.0018 U	0.0017 U
Endrin Ketone	--	--	--	MG/KG	0.0014 U	0.0014 U	0.0014 U	0.0014 U
Gamma Bhc (Lindane)	0.025	0.21	0.05	MG/KG	0.00067 U	0.00066 U	0.00069 U	0.00068 U
Heptachlor	0.013	0.53	0.38	MG/KG	0.00085 U	0.00084 U	0.00088 U	0.00086 U
Heptachlor Epoxide	--	--	--	MG/KG	0.0011 U	0.0011 U	0.0011 U	0.0011 U
Methoxychlor	--	--	--	MG/KG	0.0016 U	0.0016 U	0.0017 U	0.0017 U
P,P'-DDD	0.0033	5	14	MG/KG	0.0012 U	0.0012 U	0.0013 U	0.0012 U
P,P'-DDE	**0.0033**	3.4	9.3	MG/KG	0.00085 U	0.0027 J	0.00088 U	0.00086 U
P,P'-DDT	0.0033	3.8	135	MG/KG	0.0013 U	0.0013 U	0.0014 U	0.0013 U
Silvex (2,4,5-TP)	--	--	--	MG/KG	0.0037 U	0.0037 U	0.0039 U	0.0038 U
Toxaphene	--	--	--	MG/KG	0.026 U	0.026 U	0.027 U	0.026 U

Table 6. Summary of Pesticides and Herbicides in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-5	RSB-5	RSB-5	RSB-6
				Sample Date:	12/02/2025	12/02/2025	12/15/2025	12/12/2025
				Sample Depth (ft bls):	6 - 8	20 - 22	8 - 10	0 - 2
				Normal Sample or Field Duplicate:	N	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
2,4-D (Dichlorophenoxyacetic Acid)	--	--	--	MG/KG	0.014 UJ	0.012 U	0.012 U	0.013 U
Acetic acid, (2,4,5-trichlorophenoxy)-	--	--	--	MG/KG	0.0084 UJ	0.0073 U	0.0073 U	0.0076 U
Aldrin	0.0048	0.044	0.19	MG/KG	0.0012 UJ	0.001 U	0.001 U	0.0011 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.02	0.18	0.02	MG/KG	0.0008 UJ	0.00069 U	0.00069 U	0.00073 U
Alpha Endosulfan	4.3	35	65	MG/KG	0.0012 UJ	0.001 U	0.001 U	0.0011 U
Beta Bhc (Beta Hexachlorocyclohexane)	0.021	0.18	0.09	MG/KG	0.00088 UJ	0.00076 U	0.00077 U	0.00081 U
Beta Endosulfan	4.3	35	44	MG/KG	0.002 UJ	0.0018 U	0.0018 U	0.0018 U
Chlordane (Technical)	--	--	--	MG/KG	0.019 UJ	0.017 U	0.017 U	0.017 U
cis-Chlordane	0.014	0.65	4.5	MG/KG	0.0012 UJ	0.0011 U	0.0011 U	0.0011 U
Delta BHC (Delta Hexachlorocyclohexane)	0.04	100	0.1	MG/KG	0.00048 UJ	0.00042 U	0.00042 U	0.00044 UT
Dieldrin	0.005	0.075	0.1	MG/KG	0.001 UJ	0.00089 U	0.00089 U	0.00094 U
Endosulfan Sulfate	4.3	35	47	MG/KG	0.00099 UJ	0.00086 U	0.00086 U	0.0009 U
Endrin	0.014	5.3	0.06	MG/KG	0.0011 UJ	0.00098 U	0.00098 U	0.001 U
Endrin Aldehyde	--	--	--	MG/KG	0.0019 UJ	0.0016 U	0.0016 U	0.0017 U
Endrin Ketone	--	--	--	MG/KG	0.0015 UJ	0.0013 U	0.0013 U	0.0014 U
Gamma Bhc (Lindane)	0.025	0.21	0.05	MG/KG	0.00073 UJ	0.00063 U	0.00063 U	0.00067 U
Heptachlor	0.013	0.53	0.38	MG/KG	0.00093 UJ	0.00081 U	0.00081 U	0.00085 U
Heptachlor Epoxide	--	--	--	MG/KG	0.0012 UJ	0.001 U	0.001 U	0.0011 U
Methoxychlor	--	--	--	MG/KG	0.0018 UJ	0.0016 U	0.0016 UJ	0.0016 U
P,P'-DDD	0.0033	5	14	MG/KG	0.0013 UJ	0.0012 U	0.0012 U	0.0012 UT
P,P'-DDE	**0.0033**	3.4	9.3	MG/KG	0.00093 UJ	0.00081 U	0.00081 U	0.00085 U
P,P'-DDT	0.0033	3.8	135	MG/KG	0.0014 UJ	0.0013 U	0.0013 U	0.0013 U
Silvex (2,4,5-TP)	--	--	--	MG/KG	0.0041 UJ	0.0036 U	0.0036 U	0.0037 U
Toxaphene	--	--	--	MG/KG	0.028 UJ	0.025 U	0.025 U	0.026 U

Table 6. Summary of Pesticides and Herbicides in Soil, 35-18 Steinway Street, Astoria, Queens, New York

			Sample Designation:		RSB-6	RSB-6	RSB-6	RSB-6
			Sample Date:		12/12/2025	12/12/2025	12/16/2025	12/16/2025
			Sample Depth (ft bls):		2 - 4	4 - 6	6 - 8	20 - 22
			Normal Sample or Field Duplicate:		N	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
2,4-D (Dichlorophenoxyacetic Acid)	--	--	--	MG/KG	0.013 U	0.014 U	0.013 U	0.014 U
Acetic acid, (2,4,5-trichlorophenoxy)-	--	--	--	MG/KG	0.0076 U	0.008 U	0.0079 U	0.0081 U
Aldrin	0.0048	0.044	0.19	MG/KG	0.0011 U	0.0011 U	0.0011 U	0.0011 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.02	0.18	0.02	MG/KG	0.00073 U	0.00077 U	0.00075 U	0.00077 U
Alpha Endosulfan	4.3	35	65	MG/KG	0.0011 U	0.0012 U	0.0011 U	0.0012 U
Beta Bhc (Beta Hexachlorocyclohexane)	0.021	0.18	0.09	MG/KG	0.0008 U	0.00085 U	0.00083 U	0.00085 U
Beta Endosulfan	4.3	35	44	MG/KG	0.0018 U	0.0019 U	0.0019 U	0.002 U
Chlordane (Technical)	--	--	--	MG/KG	0.017 U	0.018 U	0.018 U	0.018 U
cis-Chlordane	0.014	0.65	4.5	MG/KG	0.0011 U	0.0012 U	0.0012 U	0.0012 U
Delta BHC (Delta Hexachlorocyclohexane)	0.04	100	0.1	MG/KG	0.00044 UT	0.00046 UT	0.00045 U	0.00047 U
Dieldrin	0.005	0.075	0.1	MG/KG	0.00093 U	0.00098 U	0.00096 U	0.00099 U
Endosulfan Sulfate	4.3	35	47	MG/KG	0.0009 U	0.00095 U	0.00092 U	0.00095 U
Endrin	0.014	5.3	0.06	MG/KG	0.001 U	0.0011 U	0.0011 U	0.0011 U
Endrin Aldehyde	--	--	--	MG/KG	0.0017 U	0.0018 U	0.0017 U	0.0018 U
Endrin Ketone	--	--	--	MG/KG	0.0014 U	0.0015 U	0.0014 U	0.0015 U
Gamma Bhc (Lindane)	0.025	0.21	0.05	MG/KG	0.00066 U	0.0007 U	0.00068 U	0.0007 U
Heptachlor	0.013	0.53	0.38	MG/KG	0.00084 U	0.00089 U	0.00087 U	0.0009 U
Heptachlor Epoxide	--	--	--	MG/KG	0.0011 U	0.0011 U	0.0011 U	0.0011 U
Methoxychlor	--	--	--	MG/KG	0.0016 U	0.0017 U	0.0017 U	0.0017 UJ
P,P'-DDD	0.0033	5	14	MG/KG	0.0012 UT	0.0013 UT	0.0013 U	0.0013 U
P,P'-DDE	**0.0033**	3.4	9.3	MG/KG	0.00084 U	0.00089 U	0.00087 U	0.0009 U
P,P'-DDT	0.0033	3.8	135	MG/KG	0.0013 U	0.0014 U	0.0014 U	0.0014 U
Silvex (2,4,5-TP)	--	--	--	MG/KG	0.0037 U	0.0039 U	0.0039 U	0.004 U
Toxaphene	--	--	--	MG/KG	0.026 U	0.027 U	0.027 U	0.027 U

Table 6. Summary of Pesticides and Herbicides in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-7	RSB-7	RSB-7	RSB-7
				Sample Date:	12/08/2025	12/08/2025	12/08/2025	12/16/2025
				Sample Depth (ft bls):	0 - 2	2 - 4	4 - 6	6 - 8
				Normal Sample or Field Duplicate:	N	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
2,4-D (Dichlorophenoxyacetic Acid)	--	--	--	MG/KG	0.013 U	0.013 U	0.013 U	0.013 U
Acetic acid, (2,4,5-trichlorophenoxy)-	--	--	--	MG/KG	0.0077 U	0.0077 U	0.0079 U	0.0076 U
Aldrin	0.0048	0.044	0.19	MG/KG	0.0011 U	0.0011 U	0.0011 U	0.0011 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.02	0.18	0.02	MG/KG	0.00074 U	0.00073 U	0.00076 U	0.00073 U
Alpha Endosulfan	4.3	35	65	MG/KG	0.0011 U	0.0011 U	0.0011 U	0.0011 U
Beta Bhc (Beta Hexachlorocyclohexane)	0.021	0.18	0.09	MG/KG	0.00081 U	0.00081 U	0.00083 U	0.0008 U
Beta Endosulfan	4.3	35	44	MG/KG	0.0019 U	0.0018 U	0.0019 U	0.0018 U
Chlordane (Technical)	--	--	--	MG/KG	0.018 U	0.017 U	0.018 U	0.017 U
cis-Chlordane	0.014	0.65	4.5	MG/KG	0.0011 U	0.0011 U	0.0012 U	0.0011 U
Delta BHC (Delta Hexachlorocyclohexane)	0.04	100	0.1	MG/KG	0.00044 UT	0.00044 UT	0.00046 UT	0.00044 U
Dieldrin	0.005	0.075	0.1	MG/KG	0.00094 U	0.00093 U	0.00097 U	0.00093 U
Endosulfan Sulfate	4.3	35	47	MG/KG	0.00091 U	0.0009 U	0.00093 U	0.0009 U
Endrin	0.014	5.3	0.06	MG/KG	0.001 U	0.001 U	0.0011 U	0.001 U
Endrin Aldehyde	--	--	--	MG/KG	0.0017 U	0.0017 U	0.0018 U	0.0017 U
Endrin Ketone	--	--	--	MG/KG	0.0014 U	0.0014 U	0.0014 U	0.0014 U
Gamma Bhc (Lindane)	0.025	0.21	0.05	MG/KG	0.00067 U	0.00067 U	0.00069 U	0.00066 U
Heptachlor	0.013	0.53	0.38	MG/KG	0.00085 U	0.00085 U	0.00088 U	0.00084 U
Heptachlor Epoxide	--	--	--	MG/KG	0.0011 U	0.0011 U	0.0011 U	0.0011 U
Methoxychlor	--	--	--	MG/KG	0.0017 U	0.0016 U	0.0017 U	0.0016 U
P,P'-DDD	0.0033	5	14	MG/KG	0.0012 U	0.0012 U	0.0013 U	0.0012 U
P,P'-DDE	**0.0033**	3.4	9.3	MG/KG	0.00085 U	0.00085 U	0.00088 U	0.00084 U
P,P'-DDT	0.0033	3.8	135	MG/KG	0.0013 U	0.0013 U	0.0014 U	0.0013 U
Silvex (2,4,5-TP)	--	--	--	MG/KG	0.0038 U	0.0038 U	0.0039 U	0.0037 U
Toxaphene	--	--	--	MG/KG	0.026 U	0.026 U	0.027 U	0.026 U

Table 6. Summary of Pesticides and Herbicides in Soil, 35-18 Steinway Street, Astoria, Queens, New York

			Sample Designation:		RSB-7	RSB-7	RSB-8	RSB-8
			Sample Date:		12/16/2025	12/16/2025	12/11/2025	12/11/2025
			Sample Depth (ft bls):		8 - 10	25 - 27	0 - 2	1 - 3
			Normal Sample or Field Duplicate:		N	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
2,4-D (Dichlorophenoxyacetic Acid)	--	--	--	MG/KG	0.012 UJ	0.013 U	0.013 U	0.012 U
Acetic acid, (2,4,5-trichlorophenoxy)-	--	--	--	MG/KG	0.0072 UJ	0.0078 U	0.0075 U	0.0071 U
Aldrin	0.0048	0.044	0.19	MG/KG	0.001 UJ	0.0011 U	0.0011 UT	0.001 UT
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.02	0.18	0.02	MG/KG	0.00069 UJ	0.00075 U	0.00072 UT	0.00068 UT
Alpha Endosulfan	4.3	35	65	MG/KG	0.001 UJ	0.0011 U	0.0011 UT	0.001 UT
Beta Bhc (Beta Hexachlorocyclohexane)	0.021	0.18	0.09	MG/KG	0.00076 UJ	0.00083 U	0.0008 UT	0.00075 UT
Beta Endosulfan	4.3	35	44	MG/KG	0.0017 UJ	0.0019 U	0.0018 UT	0.0017 UT
Chlordane (Technical)	--	--	--	MG/KG	0.016 UJ	0.018 U	0.063 J	0.016 U
cis-Chlordane	0.014	0.65	4.5	MG/KG	0.0011 UJ	0.0012 U	0.0072 J	0.0011 UT
Delta BHC (Delta Hexachlorocyclohexane)	0.04	100	0.1	MG/KG	0.00041 UJ	0.00045 U	0.00044 UT	0.00041 UT
Dieldrin	0.005	0.075	0.1	MG/KG	0.00088 UJ	0.00097 U	0.00092 UT	0.00087 UT
Endosulfan Sulfate	4.3	35	47	MG/KG	0.00085 UJ	0.00093 U	0.00089 UT	0.00084 UT
Endrin	0.014	5.3	0.06	MG/KG	0.00097 UJ	0.0011 U	0.001 UT	0.00096 UT
Endrin Aldehyde	--	--	--	MG/KG	0.0016 UJ	0.0018 U	0.0017 UT	0.0016 UT
Endrin Ketone	--	--	--	MG/KG	0.0013 UJ	0.0014 U	0.0014 UT	0.0013 UT
Gamma Bhc (Lindane)	0.025	0.21	0.05	MG/KG	0.00062 UJ	0.00069 U	0.00066 UT	0.00062 UT
Heptachlor	0.013	0.53	0.38	MG/KG	0.0008 UJ	0.00088 U	0.00084 UT	0.00079 UT
Heptachlor Epoxide	--	--	--	MG/KG	0.001 UJ	0.0011 U	0.0011 UT	0.001 UT
Methoxychlor	--	--	--	MG/KG	0.0015 UJ	0.0017 UJ	0.0016 UT	0.0015 UT
P,P'-DDD	0.0033	5	14	MG/KG	0.0011 UJ	0.0013 U	0.0012 UT	0.0011 UT
P,P'-DDE	**0.0033**	3.4	9.3	MG/KG	0.0008 UJ	0.00088 U	**0.0055 JT**	0.00079 UT
P,P'-DDT	0.0033	3.8	135	MG/KG	0.0012 UJ	0.0014 U	0.0013 UT	0.0012 UT
Silvex (2,4,5-TP)	--	--	--	MG/KG	0.0035 UJ	0.0038 U	0.0037 U	0.0035 U
Toxaphene	--	--	--	MG/KG	0.024 UJ	0.027 U	0.026 U	0.024 U

Table 6. Summary of Pesticides and Herbicides in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-8	RSB-8	RSB-8	RSB-8
				Sample Date:	12/11/2025	12/11/2025	12/15/2025	12/15/2025
				Sample Depth (ft bls):	1 - 3	3 - 5	5 - 7	25 - 27
				Normal Sample or Field Duplicate:	FD	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
2,4-D (Dichlorophenoxyacetic Acid)	--	--	--	MG/KG	0.012 U	0.012 U	0.012 U	0.013 U
Acetic acid, (2,4,5-trichlorophenoxy)-	--	--	--	MG/KG	0.0072 U	0.0072 U	0.0072 U	0.0074 U
Aldrin	0.0048	0.044	0.19	MG/KG	0.001 UT	0.001 UT	0.001 U	0.0011 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.02	0.18	0.02	MG/KG	0.00069 UT	0.00069 UT	0.00069 U	0.00072 U
Alpha Endosulfan	4.3	35	65	MG/KG	0.001 UT	0.001 UT	0.001 U	0.0011 U
Beta Bhc (Beta Hexachlorocyclohexane)	0.021	0.18	0.09	MG/KG	0.00076 UT	0.00076 UT	0.00076 U	0.00079 U
Beta Endosulfan	4.3	35	44	MG/KG	0.0017 UT	0.0017 UT	0.0017 U	0.0018 U
Chlordane (Technical)	--	--	--	MG/KG	0.016 U	0.016 U	0.016 U	0.017 U
cis-Chlordane	0.014	0.65	4.5	MG/KG	0.0011 UT	0.0011 UT	0.0011 U	0.0011 U
Delta BHC (Delta Hexachlorocyclohexane)	0.04	100	0.1	MG/KG	0.00042 UT	0.00042 UT	0.00041 U	0.00043 U
Dieldrin	0.005	0.075	0.1	MG/KG	0.00088 UT	0.00088 UT	0.00088 U	0.00091 U
Endosulfan Sulfate	4.3	35	47	MG/KG	0.00085 UT	0.00085 UT	0.00085 U	0.00088 U
Endrin	0.014	5.3	0.06	MG/KG	0.00097 UT	0.00097 UT	0.00097 U	0.001 U
Endrin Aldehyde	--	--	--	MG/KG	0.0016 UT	0.0016 UT	0.0016 U	0.0017 U
Endrin Ketone	--	--	--	MG/KG	0.0013 UT	0.0013 UT	0.0013 U	0.0014 U
Gamma Bhc (Lindane)	0.025	0.21	0.05	MG/KG	0.00063 UT	0.00063 UT	0.00063 U	0.00065 U
Heptachlor	0.013	0.53	0.38	MG/KG	0.0008 UT	0.0008 UT	0.0008 U	0.00083 U
Heptachlor Epoxide	--	--	--	MG/KG	0.001 UT	0.001 UT	0.001 U	0.0011 U
Methoxychlor	--	--	--	MG/KG	0.0015 UT	0.0016 UT	0.0015 U	0.0016 UJ
P,P'-DDD	0.0033	5	14	MG/KG	0.0012 UT	0.0012 UT	0.0012 U	0.0012 U
P,P'-DDE	**0.0033**	3.4	9.3	MG/KG	0.0008 UT	0.0008 UT	0.0008 U	0.00083 U
P,P'-DDT	0.0033	3.8	135	MG/KG	0.0012 UT	0.0012 UT	0.0012 U	0.0013 U
Silvex (2,4,5-TP)	--	--	--	MG/KG	0.0035 U	0.0035 U	0.0035 U	0.0036 U
Toxaphene	--	--	--	MG/KG	0.025 U	0.025 U	0.024 U	0.025 U

Table 6. Summary of Pesticides and Herbicides in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-9	RSB-9	RSB-9	RSB-9
				Sample Date:	12/15/2025	12/17/2025	12/17/2025	12/17/2025
				Sample Depth (ft bls):	0 - 2	16 - 18	20 - 22	22 - 24
				Normal Sample or Field Duplicate:	N	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units				
2,4-D (Dichlorophenoxyacetic Acid)	--	--	--	MG/KG	0.013 U	0.013 U	0.013 U	0.013 U
Acetic acid, (2,4,5-trichlorophenoxy)-	--	--	--	MG/KG	0.0075 U	0.0078 U	0.0079 U	0.0079 U
Aldrin	0.0048	0.044	0.19	MG/KG	0.0011 U	0.0011 U	0.0011 U	0.0011 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.02	0.18	0.02	MG/KG	0.00071 U	0.00075 U	0.00075 U	0.00075 U
Alpha Endosulfan	4.3	35	65	MG/KG	0.0011 U	0.0011 U	0.0011 U	0.0011 U
Beta Bhc (Beta Hexachlorocyclohexane)	0.021	0.18	0.09	MG/KG	0.00079 U	0.00083 U	0.00083 U	0.00083 U
Beta Endosulfan	4.3	35	44	MG/KG	0.0018 U	0.0019 U	0.0019 U	0.0019 U
Chlordane (Technical)	--	--	--	MG/KG	0.017 U	0.018 U	0.018 U	0.018 U
cis-Chlordane	0.014	0.65	4.5	MG/KG	0.0011 U	0.0012 U	0.0012 U	0.0012 U
Delta BHC (Delta Hexachlorocyclohexane)	0.04	100	0.1	MG/KG	0.00043 U	0.00045 U	0.00046 U	0.00045 U
Dieldrin	0.005	0.075	0.1	MG/KG	0.00091 U	0.00096 U	0.00097 U	0.00096 U
Endosulfan Sulfate	4.3	35	47	MG/KG	0.00088 U	0.00092 U	0.00093 U	0.00093 U
Endrin	0.014	5.3	0.06	MG/KG	0.001 U	0.0011 U	0.0011 U	0.0011 U
Endrin Aldehyde	--	--	--	MG/KG	0.0017 U	0.0017 U	0.0018 U	0.0017 U
Endrin Ketone	--	--	--	MG/KG	0.0014 U	0.0014 U	0.0014 U	0.0014 U
Gamma Bhc (Lindane)	0.025	0.21	0.05	MG/KG	0.00065 U	0.00068 U	0.00069 U	0.00069 U
Heptachlor	0.013	0.53	0.38	MG/KG	0.00083 U	0.00087 U	0.00088 U	0.00087 U
Heptachlor Epoxide	--	--	--	MG/KG	0.0011 U	0.0011 U	0.0011 U	0.0011 U
Methoxychlor	--	--	--	MG/KG	0.0016 UJ	0.0017 UJ	0.0017 UJ	0.0017 UJ
P,P'-DDD	0.0033	5	14	MG/KG	0.0012 U	0.0013 U	0.0013 U	0.0013 U
P,P'-DDE	**0.0033**	3.4	9.3	MG/KG	0.00083 U	0.00087 U	0.00088 U	0.00087 U
P,P'-DDT	0.0033	3.8	135	MG/KG	0.0013 U	0.0014 U	0.0014 U	0.0014 U
Silvex (2,4,5-TP)	--	--	--	MG/KG	0.0037 U	0.0038 U	0.0039 U	0.0039 U
Toxaphene	--	--	--	MG/KG	0.025 U	0.027 U	0.027 U	0.027 U

Table 7. Summary of Per- and Polyfluoroalkyl Substances in Soil, 35-18 Steinway Street, Astoria, Queens, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	RSB-1	RSB-1	RSB-1
Sample Designation:					RSB-1	RSB-1	RSB-1
Sample Date:					12/01/2025	12/01/2025	12/01/2025
Sample Depth (ft bls):					0 - 2	2 - 4	4 - 6
Normal Sample or Field Duplicate:					N	N	N
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid	--	--	--	UG/KG	0.099 U	0.099 U	0.098 U
2-(N-ethyl perfluoro-1-octanesulfonamido)-ethanol	--	--	--	UG/KG	0.49 U	0.49 U	0.49 U
2-(N-methyl perfluoro-1-octanesulfonamido)-ethanol	--	--	--	UG/KG	0.49 U	0.49 U	0.49 U
2-(N-methyl perfluorooctanesulfonamido) acetic acid	--	--	--	UG/KG	0.099 U	0.099 U	0.098 U
2H,2H,3H,3H-Perfluorooctanoic acid (5:3FTCA)	--	--	--	UG/KG	0.49 U	0.49 U	0.49 U
3-Perfluoroheptyl propanoic acid (7:3FTCA)	--	--	--	UG/KG	0.49 U	0.49 U	0.49 U
3-Perfluoropropyl propanoic acid (3:3 FTCA)	--	--	--	UG/KG	0.2 U	0.2 U	0.2 U
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	--	--	--	UG/KG	0.099 U	0.099 U	0.098 U
9-Chlorohexadecafluoro-3-Oxanonane-1-Sulfonic Acid	--	--	--	UG/KG	0.099 U	0.099 U	0.098 U
N-ethyl perfluoro-1-octanesulfonamide	--	--	--	UG/KG	0.099 U	0.099 U	0.098 U
N-ethyl perfluorooctanesulfonamidoacetic acid	--	--	--	UG/KG	0.099 U	0.099 U	0.098 U
N-methyl perfluoro-1-octanesulfonamide	--	--	--	UG/KG	0.099 U	0.099 U	0.098 U
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	--	--	--	UG/KG	0.099 U	0.099 U	0.098 U
Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	--	--	--	UG/KG	0.099 U	0.099 U	0.098 U
Perfluoro(2-Propoxypropanoic) Acid	--	--	--	UG/KG	0.099 U	0.099 U	0.098 U
Perfluoro-3-methoxypropanoic acid (PFMPA)	--	--	--	UG/KG	0.099 U	0.099 U	0.098 U
Perfluoro-4-methoxybutanoic acid (PFMBA)	--	--	--	UG/KG	0.099 U	0.099 U	0.098 U
Perfluorobutanesulfonic acid (PFBS)	--	--	--	UG/KG	0.099 U	0.099 U	0.098 U
Perfluorobutanoic Acid	--	--	--	UG/KG	0.099 U	0.099 U	0.098 U
Perfluorodecane Sulfonic Acid	--	--	--	UG/KG	0.099 U	0.099 U	0.098 U
Perfluorodecanoic acid (PFDA)	--	--	--	UG/KG	0.059 U	0.059 U	0.059 U
Perfluorododecane sulfonate (PFDoDS)	--	--	--	UG/KG	0.099 U	0.099 U	0.098 U
Perfluorododecanoic acid (PFDoA)	--	--	--	UG/KG	0.099 U	0.099 U	0.098 U
Perfluoroheptane Sulfonate (PFHPS)	--	--	--	UG/KG	0.099 U	0.099 U	0.098 U
Perfluoroheptanoic acid (PFHpA)	--	--	--	UG/KG	0.099 U	0.099 U	0.098 U
Perfluorohexanesulfonic acid (PFHxS)	--	--	--	UG/KG	0.099 U	0.099 U	0.098 U
Perfluorohexanoic acid (PFHxA)	--	--	--	UG/KG	0.099 U	0.099 U	0.098 U
Perfluorononanesulfonic Acid (PFNS)	--	--	--	UG/KG	0.099 U	0.099 U	0.098 U
Perfluorononanoic acid (PFNA)	--	--	--	UG/KG	0.099 U	0.099 U	0.098 U
Perfluorooctane Sulfonamide (FOSA)	--	--	--	UG/KG	0.099 U	0.099 U	0.098 U
Perfluorooctanesulfonic acid (PFOS)	**0.88**	44	1	UG/KG	0.3	0.22	0.098 U
Perfluorooctanoic acid (PFOA)	0.66	33	0.8	UG/KG	0.12 U	0.13 J	0.059 U

Table 7. Summary of Per- and Polyfluoroalkyl Substances in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-1	RSB-1	RSB-1
				Sample Date:	12/01/2025	12/01/2025	12/01/2025
				Sample Depth (ft bls):	0 - 2	2 - 4	4 - 6
				Normal Sample or Field Duplicate:	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units			
Perfluoropentanesulfonic Acid (PFPeS)	--	--	--	UG/KG	0.099 U	0.099 U	0.098 U
Perfluoropentanoic Acid (PFPeA)	--	--	--	UG/KG	0.099 U	0.099 U	0.098 U
Perfluorotetradecanoic acid (PFTA)	--	--	--	UG/KG	0.099 U	0.099 U	0.098 U
Perfluorotridecanoic Acid (PFTriA)	--	--	--	UG/KG	0.099 U	0.099 U	0.098 U
Perfluoroundecanoic Acid (PFUnA)	--	--	--	UG/KG	0.099 U	0.099 U	0.098 U
Sodium 1H,1H,2H,2H-Perfluorodecane Sulfonate (8:2)	--	--	--	UG/KG	0.2 U	0.2 U	0.2 U
Sodium 1H,1H,2H,2H-Perfluorohexane Sulfonate (4:2)	--	--	--	UG/KG	0.2 U	0.2 U	0.2 U
Sodium 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2)	--	--	--	UG/KG	0.2 U	0.2 U	0.2 U

Table 7. Summary of Per- and Polyfluoroalkyl Substances in Soil, 35-18 Steinway Street, Astoria, Queens, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	RSB-1	RSB-2	RSB-2
Sample Designation:					RSB-1	RSB-2	RSB-2
Sample Date:					12/02/2025	12/01/2025	12/01/2025
Sample Depth (ft bls):					20 - 22	0 - 2	1 - 3
Normal Sample or Field Duplicate:					N	N	N
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid	--	--	--	UG/KG	0.11 U	0.1 U	0.097 U
2-(N-ethyl perfluoro-1-octanesulfonamido)-ethanol	--	--	--	UG/KG	0.56 U	0.5 R	0.49 U
2-(N-methyl perfluoro-1-octanesulfonamido)-ethanol	--	--	--	UG/KG	0.56 U	0.5 UJ	0.49 U
2-(N-methyl perfluorooctanesulfonamido) acetic acid	--	--	--	UG/KG	0.11 U	0.1 U	0.097 U
2H,2H,3H,3H-Perfluorooctanoic acid (5:3FTCA)	--	--	--	UG/KG	0.56 U	0.5 U	0.49 U
3-Perfluoroheptyl propanoic acid (7:3FTCA)	--	--	--	UG/KG	0.56 U	0.5 U	0.49 U
3-Perfluoropropyl propanoic acid (3:3 FTCA)	--	--	--	UG/KG	0.22 U	0.2 U	0.19 U
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	--	--	--	UG/KG	0.11 U	0.1 U	0.097 U
9-Chlorohexadecafluoro-3-Oxanonane-1-Sulfonic Acid	--	--	--	UG/KG	0.11 U	0.1 U	0.097 U
N-ethyl perfluoro-1-octanesulfonamide	--	--	--	UG/KG	0.11 U	0.1 U	0.097 U
N-ethyl perfluorooctanesulfonamidoacetic acid	--	--	--	UG/KG	0.11 U	0.1 U	0.097 U
N-methyl perfluoro-1-octanesulfonamide	--	--	--	UG/KG	0.11 U	0.1 U	0.097 U
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	--	--	--	UG/KG	0.11 U	0.1 U	0.097 U
Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	--	--	--	UG/KG	0.11 U	0.1 U	0.097 U
Perfluoro(2-Propoxypropanoic) Acid	--	--	--	UG/KG	0.11 U	0.1 U	0.097 U
Perfluoro-3-methoxypropanoic acid (PFMPA)	--	--	--	UG/KG	0.11 U	0.1 U	0.097 U
Perfluoro-4-methoxybutanoic acid (PFMBA)	--	--	--	UG/KG	0.11 U	0.1 U	0.097 U
Perfluorobutanesulfonic acid (PFBS)	--	--	--	UG/KG	0.11 U	0.1 U	0.097 U
Perfluorobutanoic Acid	--	--	--	UG/KG	0.11 U	0.1 U	0.097 U
Perfluorodecane Sulfonic Acid	--	--	--	UG/KG	0.11 U	0.1 U	0.097 U
Perfluorodecanoic acid (PFDA)	--	--	--	UG/KG	0.067 U	0.06 U	0.058 U
Perfluorododecane sulfonate (PFDoDS)	--	--	--	UG/KG	0.11 U	0.1 U	0.097 U
Perfluorododecanoic acid (PFDoA)	--	--	--	UG/KG	0.11 U	0.1 U	0.097 U
Perfluoroheptane Sulfonate (PFHPS)	--	--	--	UG/KG	0.11 U	0.1 U	0.097 U
Perfluoroheptanoic acid (PFHpA)	--	--	--	UG/KG	0.11 U	0.1 U	0.097 U
Perfluorohexanesulfonic acid (PFHxS)	--	--	--	UG/KG	0.11 U	0.1 U	0.097 U
Perfluorohexanoic acid (PFHxA)	--	--	--	UG/KG	0.11 U	0.1 U	0.097 U
Perfluorononanesulfonic Acid (PFNS)	--	--	--	UG/KG	0.11 U	0.1 U	0.097 U
Perfluorononanoic acid (PFNA)	--	--	--	UG/KG	0.11 U	0.1 U	0.097 U
Perfluorooctane Sulfonamide (FOSA)	--	--	--	UG/KG	0.11 U	0.1 U	0.097 U
Perfluorooctanesulfonic acid (PFOS)	**0.88**	44	1	UG/KG	0.19 J	0.49	0.41
Perfluorooctanoic acid (PFOA)	0.66	33	0.8	UG/KG	0.067 U	0.072 J	0.067 J

Table 7. Summary of Per- and Polyfluoroalkyl Substances in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-1	RSB-2	RSB-2
				Sample Date:	12/02/2025	12/01/2025	12/01/2025
				Sample Depth (ft bls):	20 - 22	0 - 2	1 - 3
				Normal Sample or Field Duplicate:	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units			
Perfluoropentanesulfonic Acid (PFPeS)	--	--	--	UG/KG	0.11 U	0.1 U	0.097 U
Perfluoropentanoic Acid (PFPeA)	--	--	--	UG/KG	0.11 U	0.1 U	0.097 U
Perfluorotetradecanoic acid (PFTA)	--	--	--	UG/KG	0.11 U	0.1 U	0.097 U
Perfluorotridecanoic Acid (PFTriA)	--	--	--	UG/KG	0.11 U	0.1 U	0.097 U
Perfluoroundecanoic Acid (PFUnA)	--	--	--	UG/KG	0.11 U	0.1 U	0.097 U
Sodium 1H,1H,2H,2H-Perfluorodecane Sulfonate (8:2)	--	--	--	UG/KG	0.22 U	0.2 U	0.19 U
Sodium 1H,1H,2H,2H-Perfluorohexane Sulfonate (4:2)	--	--	--	UG/KG	0.22 U	0.2 U	0.19 U
Sodium 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2)	--	--	--	UG/KG	0.22 U	0.2 U	0.19 U

Table 7. Summary of Per- and Polyfluoroalkyl Substances in Soil, 35-18 Steinway Street, Astoria, Queens, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	RSB-2	RSB-2	RSB-2
Sample Designation:					RSB-2	RSB-2	RSB-2
Sample Date:					12/01/2025	12/01/2025	12/02/2025
Sample Depth (ft bls):					1 - 3	3 - 5	20 - 22
Normal Sample or Field Duplicate:					FD	N	N
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid	--	--	--	UG/KG	0.098 U	0.098 U	0.097 U
2-(N-ethyl perfluoro-1-octanesulfonamido)-ethanol	--	--	--	UG/KG	0.49 U	0.49 U	0.49 U
2-(N-methyl perfluoro-1-octanesulfonamido)-ethanol	--	--	--	UG/KG	0.49 U	0.49 U	0.49 U
2-(N-methyl perfluorooctanesulfonamido) acetic acid	--	--	--	UG/KG	0.098 U	0.098 U	0.097 U
2H,2H,3H,3H-Perfluorooctanoic acid (5:3FTCA)	--	--	--	UG/KG	0.49 U	0.49 U	0.49 U
3-Perfluoroheptyl propanoic acid (7:3FTCA)	--	--	--	UG/KG	0.49 U	0.49 U	0.49 U
3-Perfluoropropyl propanoic acid (3:3 FTCA)	--	--	--	UG/KG	0.2 U	0.2 U	0.19 U
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	--	--	--	UG/KG	0.098 U	0.098 U	0.097 U
9-Chlorohexadecafluoro-3-Oxanonane-1-Sulfonic Acid	--	--	--	UG/KG	0.098 U	0.098 U	0.097 U
N-ethyl perfluoro-1-octanesulfonamide	--	--	--	UG/KG	0.098 U	0.098 U	0.097 U
N-ethyl perfluorooctanesulfonamidoacetic acid	--	--	--	UG/KG	0.098 U	0.098 U	0.097 U
N-methyl perfluoro-1-octanesulfonamide	--	--	--	UG/KG	0.098 U	0.098 U	0.097 U
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	--	--	--	UG/KG	0.098 U	0.098 U	0.097 U
Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	--	--	--	UG/KG	0.098 U	0.098 U	0.097 U
Perfluoro(2-Propoxypropanoic) Acid	--	--	--	UG/KG	0.098 U	0.098 U	0.097 U
Perfluoro-3-methoxypropanoic acid (PFMPA)	--	--	--	UG/KG	0.098 U	0.098 U	0.097 U
Perfluoro-4-methoxybutanoic acid (PFMBA)	--	--	--	UG/KG	0.098 U	0.098 U	0.097 U
Perfluorobutanesulfonic acid (PFBS)	--	--	--	UG/KG	0.098 U	0.098 U	0.097 U
Perfluorobutanoic Acid	--	--	--	UG/KG	0.098 U	0.098 U	0.097 U
Perfluorodecane Sulfonic Acid	--	--	--	UG/KG	0.098 U	0.098 U	0.097 U
Perfluorodecanoic acid (PFDA)	--	--	--	UG/KG	0.059 U	0.059 U	0.058 U
Perfluorododecane sulfonate (PFDoDS)	--	--	--	UG/KG	0.098 U	0.098 U	0.097 U
Perfluorododecanoic acid (PFDoA)	--	--	--	UG/KG	0.098 U	0.098 U	0.097 U
Perfluoroheptane Sulfonate (PFHPS)	--	--	--	UG/KG	0.098 U	0.098 U	0.097 U
Perfluoroheptanoic acid (PFHpA)	--	--	--	UG/KG	0.098 U	0.098 U	0.097 U
Perfluorohexanesulfonic acid (PFHxS)	--	--	--	UG/KG	0.098 U	0.098 U	0.097 U
Perfluorohexanoic acid (PFHxA)	--	--	--	UG/KG	0.098 U	0.098 U	0.097 U
Perfluorononanesulfonic Acid (PFNS)	--	--	--	UG/KG	0.098 U	0.098 U	0.097 U
Perfluorononanoic acid (PFNA)	--	--	--	UG/KG	0.098 U	0.098 U	0.097 U
Perfluorooctane Sulfonamide (FOSA)	--	--	--	UG/KG	0.098 U	0.098 U	0.097 U
Perfluorooctanesulfonic acid (PFOS)	**0.88**	44	1	UG/KG	0.35	0.24	0.097 U
Perfluorooctanoic acid (PFOA)	0.66	33	0.8	UG/KG	0.059 U	0.066 J	0.1 J

Table 7. Summary of Per- and Polyfluoroalkyl Substances in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-2	RSB-2	RSB-2
				Sample Date:	12/01/2025	12/01/2025	12/02/2025
				Sample Depth (ft bls):	1 - 3	3 - 5	20 - 22
				Normal Sample or Field Duplicate:	FD	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units			
Perfluoropentanesulfonic Acid (PFPeS)	--	--	--	UG/KG	0.098 U	0.098 U	0.097 U
Perfluoropentanoic Acid (PFPeA)	--	--	--	UG/KG	0.098 U	0.098 U	0.097 U
Perfluorotetradecanoic acid (PFTA)	--	--	--	UG/KG	0.098 U	0.098 U	0.097 U
Perfluorotridecanoic Acid (PFTriA)	--	--	--	UG/KG	0.098 U	0.098 U	0.097 U
Perfluoroundecanoic Acid (PFUnA)	--	--	--	UG/KG	0.098 U	0.098 U	0.097 U
Sodium 1H,1H,2H,2H-Perfluorodecane Sulfonate (8:2)	--	--	--	UG/KG	0.2 U	0.2 U	0.19 U
Sodium 1H,1H,2H,2H-Perfluorohexane Sulfonate (4:2)	--	--	--	UG/KG	0.2 U	0.2 U	0.19 U
Sodium 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2)	--	--	--	UG/KG	0.2 U	0.2 U	0.19 U

Table 7. Summary of Per- and Polyfluoroalkyl Substances in Soil, 35-18 Steinway Street, Astoria, Queens, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	RSB-3 12/01/2025 0 - 2 N	RSB-3 12/01/2025 2 - 4 N	RSB-3 12/01/2025 4 - 6 N
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid	--	--	--	UG/KG	0.099 U	0.099 U	0.099 U
2-(N-ethyl perfluoro-1-octanesulfonamido)-ethanol	--	--	--	UG/KG	0.49 U	0.5 U	0.95 U
2-(N-methyl perfluoro-1-octanesulfonamido)-ethanol	--	--	--	UG/KG	0.49 U	0.5 U	0.95 U
2-(N-methyl perfluorooctanesulfonamido) acetic acid	--	--	--	UG/KG	0.099 U	0.099 U	0.099 U
2H,2H,3H,3H-Perfluorooctanoic acid (5:3FTCA)	--	--	--	UG/KG	0.49 U	0.5 U	0.5 U
3-Perfluoroheptyl propanoic acid (7:3FTCA)	--	--	--	UG/KG	0.49 U	0.5 U	0.5 U
3-Perfluoropropyl propanoic acid (3:3 FTCA)	--	--	--	UG/KG	0.2 U	0.2 U	0.2 U
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	--	--	--	UG/KG	0.099 U	0.099 U	0.099 U
9-Chlorohexadecafluoro-3-Oxanonane-1-Sulfonic Acid	--	--	--	UG/KG	0.099 U	0.099 U	0.099 U
N-ethyl perfluoro-1-octanesulfonamide	--	--	--	UG/KG	0.099 U	0.099 U	0.099 U
N-ethyl perfluorooctanesulfonamidoacetic acid	--	--	--	UG/KG	0.099 U	0.099 U	0.099 U
N-methyl perfluoro-1-octanesulfonamide	--	--	--	UG/KG	0.099 U	0.099 U	0.099 U
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	--	--	--	UG/KG	0.099 U	0.099 U	0.099 U
Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	--	--	--	UG/KG	0.099 U	0.099 U	0.099 U
Perfluoro(2-Propoxypropanoic) Acid	--	--	--	UG/KG	0.099 U	0.099 U	0.099 U
Perfluoro-3-methoxypropanoic acid (PFMPA)	--	--	--	UG/KG	0.099 U	0.099 U	0.099 U
Perfluoro-4-methoxybutanoic acid (PFMBA)	--	--	--	UG/KG	0.099 U	0.099 U	0.099 U
Perfluorobutanesulfonic acid (PFBS)	--	--	--	UG/KG	0.099 U	0.099 U	0.099 U
Perfluorobutanoic Acid	--	--	--	UG/KG	0.099 U	0.099 U	0.099 U
Perfluorodecane Sulfonic Acid	--	--	--	UG/KG	0.099 U	0.099 U	0.099 U
Perfluorodecanoic acid (PFDA)	--	--	--	UG/KG	0.059 U	0.059 U	0.059 U
Perfluorododecane sulfonate (PFDoDS)	--	--	--	UG/KG	0.099 U	0.099 U	0.099 U
Perfluorododecanoic acid (PFDoA)	--	--	--	UG/KG	0.099 U	0.099 U	0.099 UJ
Perfluoroheptane Sulfonate (PFHPS)	--	--	--	UG/KG	0.099 U	0.099 U	0.099 U
Perfluoroheptanoic acid (PFHpA)	--	--	--	UG/KG	0.099 U	0.099 U	0.099 U
Perfluorohexanesulfonic acid (PFHxS)	--	--	--	UG/KG	0.099 U	0.099 U	0.099 U
Perfluorohexanoic acid (PFHxA)	--	--	--	UG/KG	0.099 U	0.099 U	0.099 U
Perfluorononanesulfonic Acid (PFNS)	--	--	--	UG/KG	0.099 U	0.099 U	0.099 U
Perfluorononanoic acid (PFNA)	--	--	--	UG/KG	0.099 U	0.099 U	0.099 U
Perfluorooctane Sulfonamide (FOSA)	--	--	--	UG/KG	0.099 U	0.099 U	0.099 U
Perfluorooctanesulfonic acid (PFOS)	**0.88**	44	1	UG/KG	0.25	0.35	0.66
Perfluorooctanoic acid (PFOA)	0.66	33	0.8	UG/KG	0.059 U	0.059 U	0.061 J

Table 7. Summary of Per- and Polyfluoroalkyl Substances in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-3	RSB-3	RSB-3
				Sample Date:	12/01/2025	12/01/2025	12/01/2025
				Sample Depth (ft bls):	0 - 2	2 - 4	4 - 6
				Normal Sample or Field Duplicate:	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units			
Perfluoropentanesulfonic Acid (PFPeS)	--	--	--	UG/KG	0.099 U	0.099 U	0.099 U
Perfluoropentanoic Acid (PFPeA)	--	--	--	UG/KG	0.099 U	0.099 U	0.099 U
Perfluorotetradecanoic acid (PFTA)	--	--	--	UG/KG	0.099 U	0.099 U	0.099 UJ
Perfluorotridecanoic Acid (PFTriA)	--	--	--	UG/KG	0.099 U	0.099 U	0.099 U
Perfluoroundecanoic Acid (PFUnA)	--	--	--	UG/KG	0.099 U	0.099 U	0.099 U
Sodium 1H,1H,2H,2H-Perfluorodecane Sulfonate (8:2)	--	--	--	UG/KG	0.2 U	0.2 U	0.2 U
Sodium 1H,1H,2H,2H-Perfluorohexane Sulfonate (4:2)	--	--	--	UG/KG	0.2 U	0.2 U	0.2 U
Sodium 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2)	--	--	--	UG/KG	0.2 U	0.2 U	0.2 U

Table 7. Summary of Per- and Polyfluoroalkyl Substances in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-3	RSB-4	RSB-4
				Sample Date:	12/02/2025	12/03/2025	12/03/2025
				Sample Depth (ft bls):	20 - 22	0 - 2	2 - 4
				Normal Sample or Field Duplicate:	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units			
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid	--	--	--	UG/KG	0.096 U	0.099 U	0.099 U
2-(N-ethyl perfluoro-1-octanesulfonamido)-ethanol	--	--	--	UG/KG	0.48 U	0.5 U	0.49 U
2-(N-methyl perfluoro-1-octanesulfonamido)-ethanol	--	--	--	UG/KG	0.48 U	0.5 U	0.49 U
2-(N-methyl perfluorooctanesulfonamido) acetic acid	--	--	--	UG/KG	0.096 U	0.099 U	0.099 U
2H,2H,3H,3H-Perfluorooctanoic acid (5:3FTCA)	--	--	--	UG/KG	0.48 U	0.5 U	0.49 U
3-Perfluoroheptyl propanoic acid (7:3FTCA)	--	--	--	UG/KG	0.48 U	0.5 U	0.49 U
3-Perfluoropropyl propanoic acid (3:3 FTCA)	--	--	--	UG/KG	0.19 U	0.2 U	0.2 U
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	--	--	--	UG/KG	0.096 U	0.099 U	0.099 U
9-Chlorohexadecafluoro-3-Oxanonane-1-Sulfonic Acid	--	--	--	UG/KG	0.096 U	0.099 U	0.099 U
N-ethyl perfluoro-1-octanesulfonamide	--	--	--	UG/KG	0.096 U	0.099 U	0.099 U
N-ethyl perfluorooctanesulfonamidoacetic acid	--	--	--	UG/KG	0.096 U	0.099 U	0.099 U
N-methyl perfluoro-1-octanesulfonamide	--	--	--	UG/KG	0.096 U	0.099 U	0.099 U
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	--	--	--	UG/KG	0.096 U	0.099 U	0.099 U
Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	--	--	--	UG/KG	0.096 U	0.099 U	0.099 U
Perfluoro(2-Propoxypropanoic) Acid	--	--	--	UG/KG	0.096 U	0.099 U	0.099 U
Perfluoro-3-methoxypropanoic acid (PFMPA)	--	--	--	UG/KG	0.096 U	0.099 U	0.099 U
Perfluoro-4-methoxybutanoic acid (PFMBA)	--	--	--	UG/KG	0.096 U	0.099 U	0.099 U
Perfluorobutanesulfonic acid (PFBS)	--	--	--	UG/KG	0.096 U	0.099 U	0.099 U
Perfluorobutanoic Acid	--	--	--	UG/KG	0.096 U	0.099 U	0.099 U
Perfluorodecane Sulfonic Acid	--	--	--	UG/KG	0.096 U	0.099 U	0.099 U
Perfluorodecanoic acid (PFDA)	--	--	--	UG/KG	0.058 U	0.059 U	0.059 U
Perfluorododecane sulfonate (PFDoDS)	--	--	--	UG/KG	0.096 U	0.099 U	0.099 U
Perfluorododecanoic acid (PFDoA)	--	--	--	UG/KG	0.096 U	0.099 U	0.099 U
Perfluoroheptane Sulfonate (PFHPS)	--	--	--	UG/KG	0.096 U	0.099 U	0.099 U
Perfluoroheptanoic acid (PFHpA)	--	--	--	UG/KG	0.096 U	0.099 U	0.099 U
Perfluorohexanesulfonic acid (PFHxS)	--	--	--	UG/KG	0.096 U	0.099 U	0.099 U
Perfluorohexanoic acid (PFHxA)	--	--	--	UG/KG	0.096 U	0.099 U	0.099 U
Perfluorononanesulfonic Acid (PFNS)	--	--	--	UG/KG	0.096 U	0.099 U	0.099 U
Perfluorononanoic acid (PFNA)	--	--	--	UG/KG	0.096 U	0.099 U	0.099 U
Perfluorooctane Sulfonamide (FOSA)	--	--	--	UG/KG	0.096 U	0.099 U	0.099 U
Perfluorooctanesulfonic acid (PFOS)	**0.88**	44	1	UG/KG	0.096 U	0.7	0.55
Perfluorooctanoic acid (PFOA)	0.66	33	0.8	UG/KG	0.058 U	0.092 J	0.14 J

Table 7. Summary of Per- and Polyfluoroalkyl Substances in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-3	RSB-4	RSB-4
				Sample Date:	12/02/2025	12/03/2025	12/03/2025
				Sample Depth (ft bls):	20 - 22	0 - 2	2 - 4
				Normal Sample or Field Duplicate:	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units			
Perfluoropentanesulfonic Acid (PFPeS)	--	--	--	UG/KG	0.096 U	0.099 U	0.099 U
Perfluoropentanoic Acid (PFPeA)	--	--	--	UG/KG	0.096 U	0.099 U	0.099 U
Perfluorotetradecanoic acid (PFTA)	--	--	--	UG/KG	0.096 U	0.099 U	0.099 U
Perfluorotridecanoic Acid (PFTriA)	--	--	--	UG/KG	0.096 U	0.099 U	0.099 U
Perfluoroundecanoic Acid (PFUnA)	--	--	--	UG/KG	0.096 U	0.099 U	0.099 U
Sodium 1H,1H,2H,2H-Perfluorodecane Sulfonate (8:2)	--	--	--	UG/KG	0.19 U	0.2 U	0.2 U
Sodium 1H,1H,2H,2H-Perfluorohexane Sulfonate (4:2)	--	--	--	UG/KG	0.19 U	0.2 U	0.2 U
Sodium 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2)	--	--	--	UG/KG	0.19 U	0.2 U	0.2 U

Table 7. Summary of Per- and Polyfluoroalkyl Substances in Soil, 35-18 Steinway Street, Astoria, Queens, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	RSB-4	RSB-4	RSB-5
Sample Designation:					RSB-4	RSB-4	RSB-5
Sample Date:					12/03/2025	12/03/2025	12/01/2025
Sample Depth (ft bls):					4 - 6	20 - 22	0 - 2
Normal Sample or Field Duplicate:					N	N	N
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid	--	--	--	UG/KG	0.1 U	0.097 U	0.098 U
2-(N-ethyl perfluoro-1-octanesulfonamido)-ethanol	--	--	--	UG/KG	0.5 U	0.49 U	0.49 U
2-(N-methyl perfluoro-1-octanesulfonamido)-ethanol	--	--	--	UG/KG	0.5 U	0.49 U	0.49 U
2-(N-methyl perfluorooctanesulfonamido) acetic acid	--	--	--	UG/KG	0.1 U	0.097 U	0.098 U
2H,2H,3H,3H-Perfluorooctanoic acid (5:3FTCA)	--	--	--	UG/KG	0.5 U	0.49 U	0.49 U
3-Perfluoroheptyl propanoic acid (7:3FTCA)	--	--	--	UG/KG	0.5 U	0.49 U	0.49 U
3-Perfluoropropyl propanoic acid (3:3 FTCA)	--	--	--	UG/KG	0.2 U	0.19 U	0.2 U
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	--	--	--	UG/KG	0.1 U	0.097 U	0.098 U
9-Chlorohexadecafluoro-3-Oxanonane-1-Sulfonic Acid	--	--	--	UG/KG	0.1 U	0.097 U	0.098 U
N-ethyl perfluoro-1-octanesulfonamide	--	--	--	UG/KG	0.1 U	0.097 U	0.098 U
N-ethyl perfluorooctanesulfonamidoacetic acid	--	--	--	UG/KG	0.1 U	0.097 U	0.098 U
N-methyl perfluoro-1-octanesulfonamide	--	--	--	UG/KG	0.1 U	0.097 U	0.098 U
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	--	--	--	UG/KG	0.1 U	0.097 U	0.098 U
Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	--	--	--	UG/KG	0.1 U	0.097 U	0.098 U
Perfluoro(2-Propoxypropanoic) Acid	--	--	--	UG/KG	0.1 U	0.097 U	0.098 U
Perfluoro-3-methoxypropanoic acid (PFMPA)	--	--	--	UG/KG	0.1 U	0.097 U	0.098 U
Perfluoro-4-methoxybutanoic acid (PFMBA)	--	--	--	UG/KG	0.1 U	0.097 U	0.098 U
Perfluorobutanesulfonic acid (PFBS)	--	--	--	UG/KG	0.1 U	0.097 U	0.098 U
Perfluorobutanoic Acid	--	--	--	UG/KG	0.1 U	0.097 U	0.098 U
Perfluorodecane Sulfonic Acid	--	--	--	UG/KG	0.1 U	0.097 U	0.098 U
Perfluorodecanoic acid (PFDA)	--	--	--	UG/KG	0.06 U	0.058 U	0.059 U
Perfluorododecane sulfonate (PFDoDS)	--	--	--	UG/KG	0.1 U	0.097 U	0.098 U
Perfluorododecanoic acid (PFDoA)	--	--	--	UG/KG	0.1 U	0.097 U	0.098 U
Perfluoroheptane Sulfonate (PFHPS)	--	--	--	UG/KG	0.1 U	0.097 U	0.098 U
Perfluoroheptanoic acid (PFHpA)	--	--	--	UG/KG	0.1 U	0.097 U	0.098 U
Perfluorohexanesulfonic acid (PFHxS)	--	--	--	UG/KG	0.1 U	0.097 U	0.098 U
Perfluorohexanoic acid (PFHxA)	--	--	--	UG/KG	0.1 U	0.097 U	0.098 U
Perfluorononanesulfonic Acid (PFNS)	--	--	--	UG/KG	0.1 U	0.097 U	0.098 U
Perfluorononanoic acid (PFNA)	--	--	--	UG/KG	0.1 U	0.097 U	0.098 U
Perfluorooctane Sulfonamide (FOSA)	--	--	--	UG/KG	0.1 U	0.097 U	0.098 U
Perfluorooctanesulfonic acid (PFOS)	**0.88**	44	1	UG/KG	0.12 J	0.097 U	0.098 U
Perfluorooctanoic acid (PFOA)	0.66	33	0.8	UG/KG	0.29	0.058 U	0.059 U

Table 7. Summary of Per- and Polyfluoroalkyl Substances in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-4	RSB-4	RSB-5
				Sample Date:	12/03/2025	12/03/2025	12/01/2025
				Sample Depth (ft bls):	4 - 6	20 - 22	0 - 2
				Normal Sample or Field Duplicate:	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units			
Perfluoropentanesulfonic Acid (PFPeS)	--	--	--	UG/KG	0.1 U	0.097 U	0.098 U
Perfluoropentanoic Acid (PFPeA)	--	--	--	UG/KG	0.1 U	0.097 U	0.098 U
Perfluorotetradecanoic acid (PFTA)	--	--	--	UG/KG	0.1 U	0.097 U	0.098 U
Perfluorotridecanoic Acid (PFTriA)	--	--	--	UG/KG	0.1 U	0.097 U	0.098 U
Perfluoroundecanoic Acid (PFUnA)	--	--	--	UG/KG	0.1 U	0.097 U	0.098 U
Sodium 1H,1H,2H,2H-Perfluorodecane Sulfonate (8:2)	--	--	--	UG/KG	0.2 U	0.19 U	0.2 U
Sodium 1H,1H,2H,2H-Perfluorohexane Sulfonate (4:2)	--	--	--	UG/KG	0.2 U	0.19 U	0.2 U
Sodium 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2)	--	--	--	UG/KG	0.2 U	0.19 U	0.2 U

Table 7. Summary of Per- and Polyfluoroalkyl Substances in Soil, 35-18 Steinway Street, Astoria, Queens, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	RSB-5	RSB-5	RSB-5
Sample Designation:					RSB-5	RSB-5	RSB-5
Sample Date:					12/01/2025	12/01/2025	12/02/2025
Sample Depth (ft bls):					2 - 4	4 - 6	6 - 8
Normal Sample or Field Duplicate:					N	N	N
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid	--	--	--	UG/KG	0.097 U	0.098 U	0.1 UJ
2-(N-ethyl perfluoro-1-octanesulfonamido)-ethanol	--	--	--	UG/KG	0.49 U	0.49 U	0.5 UJ
2-(N-methyl perfluoro-1-octanesulfonamido)-ethanol	--	--	--	UG/KG	0.49 U	0.49 U	0.5 UJ
2-(N-methyl perfluorooctanesulfonamido) acetic acid	--	--	--	UG/KG	0.097 U	0.098 U	0.1 UJ
2H,2H,3H,3H-Perfluorooctanoic acid (5:3FTCA)	--	--	--	UG/KG	0.49 U	0.49 U	0.5 UJ
3-Perfluoroheptyl propanoic acid (7:3FTCA)	--	--	--	UG/KG	0.49 U	0.49 U	0.5 UJ
3-Perfluoropropyl propanoic acid (3:3 FTCA)	--	--	--	UG/KG	0.19 U	0.2 U	0.2 UJ
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	--	--	--	UG/KG	0.097 U	0.098 U	0.1 UJ
9-Chlorohexadecafluoro-3-Oxanonane-1-Sulfonic Acid	--	--	--	UG/KG	0.097 U	0.098 U	0.1 UJ
N-ethyl perfluoro-1-octanesulfonamide	--	--	--	UG/KG	0.097 U	0.098 U	0.1 UJ
N-ethyl perfluorooctanesulfonamidoacetic acid	--	--	--	UG/KG	0.097 U	0.098 U	0.1 UJ
N-methyl perfluoro-1-octanesulfonamide	--	--	--	UG/KG	0.097 U	0.098 U	0.1 UJ
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	--	--	--	UG/KG	0.097 U	0.098 U	0.1 UJ
Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	--	--	--	UG/KG	0.097 U	0.098 U	0.1 UJ
Perfluoro(2-Propoxypropanoic) Acid	--	--	--	UG/KG	0.097 U	0.098 U	0.1 UJ
Perfluoro-3-methoxypropanoic acid (PFMPA)	--	--	--	UG/KG	0.097 U	0.098 U	0.1 UJ
Perfluoro-4-methoxybutanoic acid (PFMBA)	--	--	--	UG/KG	0.097 U	0.098 U	0.1 UJ
Perfluorobutanesulfonic acid (PFBS)	--	--	--	UG/KG	0.097 U	0.098 U	0.1 UJ
Perfluorobutanoic Acid	--	--	--	UG/KG	0.097 U	0.098 U	0.1 UJ
Perfluorodecane Sulfonic Acid	--	--	--	UG/KG	0.097 U	0.098 U	0.1 UJ
Perfluorodecanoic acid (PFDA)	--	--	--	UG/KG	0.058 U	0.059 U	0.06 UJ
Perfluorododecane sulfonate (PFDoDS)	--	--	--	UG/KG	0.097 U	0.098 U	0.1 UJ
Perfluorododecanoic acid (PFDoA)	--	--	--	UG/KG	0.097 U	0.098 U	0.1 UJ
Perfluoroheptane Sulfonate (PFHPS)	--	--	--	UG/KG	0.097 U	0.098 U	0.1 UJ
Perfluoroheptanoic acid (PFHpA)	--	--	--	UG/KG	0.097 U	0.098 U	0.1 UJ
Perfluorohexanesulfonic acid (PFHxS)	--	--	--	UG/KG	0.097 U	0.098 U	0.1 UJ
Perfluorohexanoic acid (PFHxA)	--	--	--	UG/KG	0.097 U	0.098 U	0.1 UJ
Perfluorononanesulfonic Acid (PFNS)	--	--	--	UG/KG	0.097 U	0.098 U	0.1 UJ
Perfluorononanoic acid (PFNA)	--	--	--	UG/KG	0.097 U	0.098 U	0.1 UJ
Perfluorooctane Sulfonamide (FOSA)	--	--	--	UG/KG	0.097 U	0.098 U	0.1 UJ
Perfluorooctanesulfonic acid (PFOS)	**0.88**	44	1	UG/KG	0.42	0.098 U	0.1 UJ
Perfluorooctanoic acid (PFOA)	0.66	33	0.8	UG/KG	0.12 J	0.37	0.065 J-

Table 7. Summary of Per- and Polyfluoroalkyl Substances in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-5	RSB-5	RSB-5
				Sample Date:	12/01/2025	12/01/2025	12/02/2025
				Sample Depth (ft bls):	2 - 4	4 - 6	6 - 8
				Normal Sample or Field Duplicate:	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units			
Perfluoropentanesulfonic Acid (PFPeS)	--	--	--	UG/KG	0.097 U	0.098 U	0.1 UJ
Perfluoropentanoic Acid (PFPeA)	--	--	--	UG/KG	0.097 U	0.098 U	0.1 UJ
Perfluorotetradecanoic acid (PFTA)	--	--	--	UG/KG	0.097 U	0.098 U	0.1 UJ
Perfluorotridecanoic Acid (PFTriA)	--	--	--	UG/KG	0.097 U	0.098 U	0.1 UJ
Perfluoroundecanoic Acid (PFUnA)	--	--	--	UG/KG	0.097 U	0.098 U	0.1 UJ
Sodium 1H,1H,2H,2H-Perfluorodecane Sulfonate (8:2)	--	--	--	UG/KG	0.19 U	0.2 U	0.2 UJ
Sodium 1H,1H,2H,2H-Perfluorohexane Sulfonate (4:2)	--	--	--	UG/KG	0.19 U	0.2 U	0.2 UJ
Sodium 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2)	--	--	--	UG/KG	0.19 U	0.2 U	0.2 UJ

Table 7. Summary of Per- and Polyfluoroalkyl Substances in Soil, 35-18 Steinway Street, Astoria, Queens, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	RSB-5	RSB-5	RSB-6
Sample Designation:					RSB-5	RSB-5	RSB-6
Sample Date:					12/02/2025	12/15/2025	12/12/2025
Sample Depth (ft bls):					20 - 22	8 - 10	0 - 2
Normal Sample or Field Duplicate:					N	N	N
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid	--	--	--	UG/KG	0.096 U	0.097 U	0.097 U
2-(N-ethyl perfluoro-1-octanesulfonamido)-ethanol	--	--	--	UG/KG	0.48 U	0.48 U	0.48 U
2-(N-methyl perfluoro-1-octanesulfonamido)-ethanol	--	--	--	UG/KG	0.48 U	0.48 U	0.48 U
2-(N-methyl perfluorooctanesulfonamido) acetic acid	--	--	--	UG/KG	0.096 U	0.097 U	0.097 U
2H,2H,3H,3H-Perfluorooctanoic acid (5:3FTCA)	--	--	--	UG/KG	0.48 U	0.48 U	0.48 U
3-Perfluoroheptyl propanoic acid (7:3FTCA)	--	--	--	UG/KG	0.48 U	0.48 U	0.48 U
3-Perfluoropropyl propanoic acid (3:3 FTCA)	--	--	--	UG/KG	0.19 U	0.19 U	0.19 U
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	--	--	--	UG/KG	0.096 U	0.097 U	0.097 U
9-Chlorohexadecafluoro-3-Oxanonane-1-Sulfonic Acid	--	--	--	UG/KG	0.096 U	0.097 U	0.097 U
N-ethyl perfluoro-1-octanesulfonamide	--	--	--	UG/KG	0.096 U	0.097 U	0.097 U
N-ethyl perfluorooctanesulfonamidoacetic acid	--	--	--	UG/KG	0.096 U	0.097 U	0.097 U
N-methyl perfluoro-1-octanesulfonamide	--	--	--	UG/KG	0.096 U	0.097 U	0.097 U
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	--	--	--	UG/KG	0.096 U	0.097 U	0.097 U
Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	--	--	--	UG/KG	0.096 U	0.097 U	0.097 U
Perfluoro(2-Propoxypropanoic) Acid	--	--	--	UG/KG	0.096 U	0.097 U	0.097 U
Perfluoro-3-methoxypropanoic acid (PFMPA)	--	--	--	UG/KG	0.096 U	0.097 U	0.097 U
Perfluoro-4-methoxybutanoic acid (PFMBA)	--	--	--	UG/KG	0.096 U	0.097 U	0.097 U
Perfluorobutanesulfonic acid (PFBS)	--	--	--	UG/KG	0.096 U	0.097 U	0.097 U
Perfluorobutanoic Acid	--	--	--	UG/KG	0.096 U	0.097 U	0.097 U
Perfluorodecane Sulfonic Acid	--	--	--	UG/KG	0.096 U	0.097 U	0.097 U
Perfluorodecanoic acid (PFDA)	--	--	--	UG/KG	0.057 U	0.058 U	0.058 U
Perfluorododecane sulfonate (PFDoDS)	--	--	--	UG/KG	0.096 U	0.097 U	0.097 U
Perfluorododecanoic acid (PFDoA)	--	--	--	UG/KG	0.096 U	0.097 U	0.097 U
Perfluoroheptane Sulfonate (PFHPS)	--	--	--	UG/KG	0.096 U	0.097 U	0.097 U
Perfluoroheptanoic acid (PFHpA)	--	--	--	UG/KG	0.096 U	0.097 U	0.097 U
Perfluorohexanesulfonic acid (PFHxS)	--	--	--	UG/KG	0.096 U	0.097 U	0.097 U
Perfluorohexanoic acid (PFHxA)	--	--	--	UG/KG	0.096 U	0.097 U	0.097 U
Perfluorononanesulfonic Acid (PFNS)	--	--	--	UG/KG	0.096 U	0.097 U	0.097 U
Perfluorononanoic acid (PFNA)	--	--	--	UG/KG	0.096 U	0.097 U	0.097 U
Perfluorooctane Sulfonamide (FOSA)	--	--	--	UG/KG	0.096 U	0.097 U	0.097 U
Perfluorooctanesulfonic acid (PFOS)	**0.88**	44	1	UG/KG	0.096 U	0.097 U	0.41
Perfluorooctanoic acid (PFOA)	0.66	33	0.8	UG/KG	0.087 J	0.058 U	0.058 U

Table 7. Summary of Per- and Polyfluoroalkyl Substances in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-5	RSB-5	RSB-6
				Sample Date:	12/02/2025	12/15/2025	12/12/2025
				Sample Depth (ft bls):	20 - 22	8 - 10	0 - 2
				Normal Sample or Field Duplicate:	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units			
Perfluoropentanesulfonic Acid (PFPeS)	--	--	--	UG/KG	0.096 U	0.097 U	0.097 U
Perfluoropentanoic Acid (PFPeA)	--	--	--	UG/KG	0.096 U	0.097 U	0.097 U
Perfluorotetradecanoic acid (PFTA)	--	--	--	UG/KG	0.096 U	0.097 U	0.097 U
Perfluorotridecanoic Acid (PFTriA)	--	--	--	UG/KG	0.096 U	0.097 U	0.097 U
Perfluoroundecanoic Acid (PFUnA)	--	--	--	UG/KG	0.096 U	0.097 U	0.097 U
Sodium 1H,1H,2H,2H-Perfluorodecane Sulfonate (8:2)	--	--	--	UG/KG	0.19 U	0.19 U	0.19 U
Sodium 1H,1H,2H,2H-Perfluorohexane Sulfonate (4:2)	--	--	--	UG/KG	0.19 U	0.19 U	0.19 U
Sodium 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2)	--	--	--	UG/KG	0.19 U	0.19 U	0.19 U

Table 7. Summary of Per- and Polyfluoroalkyl Substances in Soil, 35-18 Steinway Street, Astoria, Queens, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	RSB-6	RSB-6	RSB-6
Sample Designation:					RSB-6	RSB-6	RSB-6
Sample Date:					12/12/2025	12/12/2025	12/16/2025
Sample Depth (ft bls):					2 - 4	4 - 6	6 - 8
Normal Sample or Field Duplicate:					N	N	N
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid	--	--	--	UG/KG	0.098 U	0.097 U	0.098 U
2-(N-ethyl perfluoro-1-octanesulfonamido)-ethanol	--	--	--	UG/KG	0.49 U	0.49 U	0.49 U
2-(N-methyl perfluoro-1-octanesulfonamido)-ethanol	--	--	--	UG/KG	0.49 U	0.49 U	0.49 U
2-(N-methyl perfluorooctanesulfonamido) acetic acid	--	--	--	UG/KG	0.098 U	0.097 U	0.098 U
2H,2H,3H,3H-Perfluorooctanoic acid (5:3FTCA)	--	--	--	UG/KG	0.49 U	0.49 U	0.49 U
3-Perfluoroheptyl propanoic acid (7:3FTCA)	--	--	--	UG/KG	0.49 U	0.49 U	0.49 U
3-Perfluoropropyl propanoic acid (3:3 FTCA)	--	--	--	UG/KG	0.2 U	0.19 U	0.2 U
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	--	--	--	UG/KG	0.098 U	0.097 U	0.098 U
9-Chlorohexadecafluoro-3-Oxanonane-1-Sulfonic Acid	--	--	--	UG/KG	0.098 U	0.097 U	0.098 U
N-ethyl perfluoro-1-octanesulfonamide	--	--	--	UG/KG	0.098 U	0.097 U	0.098 U
N-ethyl perfluorooctanesulfonamidoacetic acid	--	--	--	UG/KG	0.098 U	0.097 U	0.098 U
N-methyl perfluoro-1-octanesulfonamide	--	--	--	UG/KG	0.098 U	0.097 U	0.098 U
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	--	--	--	UG/KG	0.098 U	0.097 U	0.098 U
Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	--	--	--	UG/KG	0.098 U	0.097 U	0.098 U
Perfluoro(2-Propoxypropanoic) Acid	--	--	--	UG/KG	0.098 U	0.097 U	0.098 U
Perfluoro-3-methoxypropanoic acid (PFMPA)	--	--	--	UG/KG	0.098 U	0.097 U	0.098 U
Perfluoro-4-methoxybutanoic acid (PFMBA)	--	--	--	UG/KG	0.098 U	0.097 U	0.098 U
Perfluorobutanesulfonic acid (PFBS)	--	--	--	UG/KG	0.098 U	0.097 U	0.098 U
Perfluorobutanoic Acid	--	--	--	UG/KG	0.098 U	0.097 U	0.098 U
Perfluorodecane Sulfonic Acid	--	--	--	UG/KG	0.098 U	0.097 U	0.098 U
Perfluorodecanoic acid (PFDA)	--	--	--	UG/KG	0.059 U	0.058 U	0.059 U
Perfluorododecane sulfonate (PFDoDS)	--	--	--	UG/KG	0.098 U	0.097 U	0.098 U
Perfluorododecanoic acid (PFDoA)	--	--	--	UG/KG	0.098 U	0.097 U	0.098 U
Perfluoroheptane Sulfonate (PFHPS)	--	--	--	UG/KG	0.098 U	0.097 U	0.098 U
Perfluoroheptanoic acid (PFHpA)	--	--	--	UG/KG	0.098 U	0.097 U	0.098 U
Perfluorohexanesulfonic acid (PFHxS)	--	--	--	UG/KG	0.098 U	0.097 U	0.098 U
Perfluorohexanoic acid (PFHxA)	--	--	--	UG/KG	0.098 U	0.097 U	0.098 U
Perfluorononanesulfonic Acid (PFNS)	--	--	--	UG/KG	0.098 U	0.097 U	0.098 U
Perfluorononanoic acid (PFNA)	--	--	--	UG/KG	0.098 U	0.097 U	0.098 U
Perfluorooctane Sulfonamide (FOSA)	--	--	--	UG/KG	0.098 U	0.097 U	0.098 U
Perfluorooctanesulfonic acid (PFOS)	**0.88**	44	1	UG/KG	**0.9**	0.098 J	0.098 U
Perfluorooctanoic acid (PFOA)	0.66	33	0.8	UG/KG	0.059 U	0.069 J	0.12 J

Table 7. Summary of Per- and Polyfluoroalkyl Substances in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-6	RSB-6	RSB-6
				Sample Date:	12/12/2025	12/12/2025	12/16/2025
				Sample Depth (ft bls):	2 - 4	4 - 6	6 - 8
				Normal Sample or Field Duplicate:	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units			
Perfluoropentanesulfonic Acid (PFPeS)	--	--	--	UG/KG	0.098 U	0.097 U	0.098 U
Perfluoropentanoic Acid (PFPeA)	--	--	--	UG/KG	0.098 U	0.097 U	0.098 U
Perfluorotetradecanoic acid (PFTA)	--	--	--	UG/KG	0.098 U	0.097 U	0.098 U
Perfluorotridecanoic Acid (PFTriA)	--	--	--	UG/KG	0.098 U	0.097 U	0.098 U
Perfluoroundecanoic Acid (PFUnA)	--	--	--	UG/KG	0.098 U	0.097 U	0.098 U
Sodium 1H,1H,2H,2H-Perfluorodecane Sulfonate (8:2)	--	--	--	UG/KG	0.2 U	0.19 U	0.2 U
Sodium 1H,1H,2H,2H-Perfluorohexane Sulfonate (4:2)	--	--	--	UG/KG	0.2 U	0.19 U	0.2 U
Sodium 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2)	--	--	--	UG/KG	0.37 J	0.19 U	0.2 U

Table 7. Summary of Per- and Polyfluoroalkyl Substances in Soil, 35-18 Steinway Street, Astoria, Queens, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	RSB-6	RSB-7	RSB-7
Sample Designation:					RSB-6	RSB-7	RSB-7
Sample Date:					12/16/2025	12/08/2025	12/08/2025
Sample Depth (ft bls):					20 - 22	0 - 2	2 - 4
Normal Sample or Field Duplicate:					N	N	N
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid	--	--	--	UG/KG	0.097 U	0.096 U	0.097 U
2-(N-ethyl perfluoro-1-octanesulfonamido)-ethanol	--	--	--	UG/KG	0.48 U	0.48 U	0.49 U
2-(N-methyl perfluoro-1-octanesulfonamido)-ethanol	--	--	--	UG/KG	0.48 U	0.48 U	0.49 U
2-(N-methyl perfluorooctanesulfonamido) acetic acid	--	--	--	UG/KG	0.097 U	0.096 U	0.097 U
2H,2H,3H,3H-Perfluorooctanoic acid (5:3FTCA)	--	--	--	UG/KG	0.48 U	0.48 U	0.49 U
3-Perfluoroheptyl propanoic acid (7:3FTCA)	--	--	--	UG/KG	0.48 U	0.48 U	0.49 U
3-Perfluoropropyl propanoic acid (3:3 FTCA)	--	--	--	UG/KG	0.19 U	0.19 U	0.19 U
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	--	--	--	UG/KG	0.097 U	0.096 U	0.097 U
9-Chlorohexadecafluoro-3-Oxanonane-1-Sulfonic Acid	--	--	--	UG/KG	0.097 U	0.096 U	0.097 U
N-ethyl perfluoro-1-octanesulfonamide	--	--	--	UG/KG	0.097 U	0.096 U	0.097 U
N-ethyl perfluorooctanesulfonamidoacetic acid	--	--	--	UG/KG	0.097 U	0.096 U	0.097 U
N-methyl perfluoro-1-octanesulfonamide	--	--	--	UG/KG	0.097 U	0.096 U	0.097 U
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	--	--	--	UG/KG	0.097 U	0.096 U	0.097 U
Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	--	--	--	UG/KG	0.097 U	0.096 U	0.097 U
Perfluoro(2-Propoxypropanoic) Acid	--	--	--	UG/KG	0.097 U	0.096 U	0.097 U
Perfluoro-3-methoxypropanoic acid (PFMPA)	--	--	--	UG/KG	0.097 U	0.096 U	0.097 U
Perfluoro-4-methoxybutanoic acid (PFMBA)	--	--	--	UG/KG	0.097 U	0.096 U	0.097 U
Perfluorobutanesulfonic acid (PFBS)	--	--	--	UG/KG	0.097 U	0.096 U	0.097 U
Perfluorobutanoic Acid	--	--	--	UG/KG	0.097 U	0.096 U	0.097 U
Perfluorodecane Sulfonic Acid	--	--	--	UG/KG	0.097 U	0.096 U	0.097 U
Perfluorodecanoic acid (PFDA)	--	--	--	UG/KG	0.058 U	0.057 U	0.058 U
Perfluorododecane sulfonate (PFDoDS)	--	--	--	UG/KG	0.097 U	0.096 U	0.097 U
Perfluorododecanoic acid (PFDoA)	--	--	--	UG/KG	0.097 U	0.096 U	0.097 U
Perfluoroheptane Sulfonate (PFHPS)	--	--	--	UG/KG	0.097 U	0.096 U	0.097 U
Perfluoroheptanoic acid (PFHpA)	--	--	--	UG/KG	0.097 U	0.096 U	0.097 U
Perfluorohexanesulfonic acid (PFHxS)	--	--	--	UG/KG	0.097 U	0.096 U	0.097 U
Perfluorohexanoic acid (PFHxA)	--	--	--	UG/KG	0.097 U	0.096 U	0.097 U
Perfluorononanesulfonic Acid (PFNS)	--	--	--	UG/KG	0.097 U	0.096 U	0.097 U
Perfluorononanoic acid (PFNA)	--	--	--	UG/KG	0.097 U	0.096 U	0.097 U
Perfluorooctane Sulfonamide (FOSA)	--	--	--	UG/KG	0.097 U	0.096 U	0.097 U
Perfluorooctanesulfonic acid (PFOS)	**0.88**	44	1	UG/KG	0.097 U	0.65	0.58
Perfluorooctanoic acid (PFOA)	0.66	33	0.8	UG/KG	0.058 U	0.079 J	0.099 J

Table 7. Summary of Per- and Polyfluoroalkyl Substances in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-6	RSB-7	RSB-7
				Sample Date:	12/16/2025	12/08/2025	12/08/2025
				Sample Depth (ft bls):	20 - 22	0 - 2	2 - 4
				Normal Sample or Field Duplicate:	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units			
Perfluoropentanesulfonic Acid (PFPeS)	--	--	--	UG/KG	0.097 U	0.096 U	0.097 U
Perfluoropentanoic Acid (PFPeA)	--	--	--	UG/KG	0.097 U	0.096 U	0.097 U
Perfluorotetradecanoic acid (PFTA)	--	--	--	UG/KG	0.097 U	0.096 U	0.097 U
Perfluorotridecanoic Acid (PFTriA)	--	--	--	UG/KG	0.097 U	0.096 U	0.097 U
Perfluoroundecanoic Acid (PFUnA)	--	--	--	UG/KG	0.097 U	0.096 U	0.097 U
Sodium 1H,1H,2H,2H-Perfluorodecane Sulfonate (8:2)	--	--	--	UG/KG	0.19 U	0.19 U	0.19 U
Sodium 1H,1H,2H,2H-Perfluorohexane Sulfonate (4:2)	--	--	--	UG/KG	0.19 U	0.19 U	0.19 U
Sodium 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2)	--	--	--	UG/KG	0.19 U	0.19 U	0.19 U

Table 7. Summary of Per- and Polyfluoroalkyl Substances in Soil, 35-18 Steinway Street, Astoria, Queens, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	RSB-7	RSB-7	RSB-7
Sample Designation:					RSB-7	RSB-7	RSB-7
Sample Date:					12/08/2025	12/16/2025	12/16/2025
Sample Depth (ft bls):					4 - 6	6 - 8	8 - 10
Normal Sample or Field Duplicate:					N	N	N
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid	--	--	--	UG/KG	0.098 U	0.097 U	0.099 UT
2-(N-ethyl perfluoro-1-octanesulfonamido)-ethanol	--	--	--	UG/KG	0.49 U	0.49 U	0.49 U
2-(N-methyl perfluoro-1-octanesulfonamido)-ethanol	--	--	--	UG/KG	0.49 U	0.49 U	0.49 UT
2-(N-methyl perfluorooctanesulfonamido) acetic acid	--	--	--	UG/KG	0.098 U	0.097 U	0.099 U
2H,2H,3H,3H-Perfluorooctanoic acid (5:3FTCA)	--	--	--	UG/KG	0.49 U	0.49 U	0.49 U
3-Perfluoroheptyl propanoic acid (7:3FTCA)	--	--	--	UG/KG	0.49 U	0.49 U	0.49 U
3-Perfluoropropyl propanoic acid (3:3 FTCA)	--	--	--	UG/KG	0.2 U	0.19 U	0.2 U
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	--	--	--	UG/KG	0.098 U	0.097 U	0.099 U
9-Chlorohexadecafluoro-3-Oxanonane-1-Sulfonic Acid	--	--	--	UG/KG	0.098 U	0.097 U	0.099 U
N-ethyl perfluoro-1-octanesulfonamide	--	--	--	UG/KG	0.098 U	0.097 U	0.099 U
N-ethyl perfluorooctanesulfonamidoacetic acid	--	--	--	UG/KG	0.098 U	0.097 U	0.099 U
N-methyl perfluoro-1-octanesulfonamide	--	--	--	UG/KG	0.098 U	0.097 U	0.099 U
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	--	--	--	UG/KG	0.098 U	0.097 U	0.099 U
Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	--	--	--	UG/KG	0.098 U	0.097 U	0.099 U
Perfluoro(2-Propoxypropanoic) Acid	--	--	--	UG/KG	0.098 U	0.097 U	0.099 U
Perfluoro-3-methoxypropanoic acid (PFMPA)	--	--	--	UG/KG	0.098 U	0.097 U	0.099 U
Perfluoro-4-methoxybutanoic acid (PFMBA)	--	--	--	UG/KG	0.098 U	0.097 U	0.099 U
Perfluorobutanesulfonic acid (PFBS)	--	--	--	UG/KG	0.098 U	0.097 U	0.099 U
Perfluorobutanoic Acid	--	--	--	UG/KG	0.098 U	0.097 U	0.099 U
Perfluorodecane Sulfonic Acid	--	--	--	UG/KG	0.098 U	0.097 U	0.099 UT
Perfluorodecanoic acid (PFDA)	--	--	--	UG/KG	0.059 U	0.058 U	0.059 U
Perfluorododecane sulfonate (PFDoDS)	--	--	--	UG/KG	0.098 U	0.097 U	0.099 UT
Perfluorododecanoic acid (PFDoA)	--	--	--	UG/KG	0.098 U	0.097 U	0.099 U
Perfluoroheptane Sulfonate (PFHPS)	--	--	--	UG/KG	0.098 U	0.097 U	0.099 U
Perfluoroheptanoic acid (PFHpA)	--	--	--	UG/KG	0.098 U	0.097 U	0.099 U
Perfluorohexanesulfonic acid (PFHxS)	--	--	--	UG/KG	0.098 U	0.097 U	0.099 U
Perfluorohexanoic acid (PFHxA)	--	--	--	UG/KG	0.098 U	0.097 U	0.099 U
Perfluorononanesulfonic Acid (PFNS)	--	--	--	UG/KG	0.098 U	0.097 U	0.099 U
Perfluorononanoic acid (PFNA)	--	--	--	UG/KG	0.098 U	0.097 U	0.099 U
Perfluorooctane Sulfonamide (FOSA)	--	--	--	UG/KG	0.098 U	0.097 U	0.099 U
Perfluorooctanesulfonic acid (PFOS)	**0.88**	44	1	UG/KG	0.098 U	0.097 U	0.099 U
Perfluorooctanoic acid (PFOA)	0.66	33	0.8	UG/KG	0.19 J	0.45	0.12 J

Table 7. Summary of Per- and Polyfluoroalkyl Substances in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-7	RSB-7	RSB-7
				Sample Date:	12/08/2025	12/16/2025	12/16/2025
				Sample Depth (ft bls):	4 - 6	6 - 8	8 - 10
				Normal Sample or Field Duplicate:	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units			
Perfluoropentanesulfonic Acid (PFPeS)	--	--	--	UG/KG	0.098 U	0.097 U	0.099 U
Perfluoropentanoic Acid (PFPeA)	--	--	--	UG/KG	0.098 U	0.097 U	0.099 U
Perfluorotetradecanoic acid (PFTA)	--	--	--	UG/KG	0.098 U	0.097 U	0.099 U
Perfluorotridecanoic Acid (PFTriA)	--	--	--	UG/KG	0.098 U	0.097 U	0.099 U
Perfluoroundecanoic Acid (PFUnA)	--	--	--	UG/KG	0.098 U	0.097 U	0.099 U
Sodium 1H,1H,2H,2H-Perfluorodecane Sulfonate (8:2)	--	--	--	UG/KG	0.2 U	0.19 U	0.2 U
Sodium 1H,1H,2H,2H-Perfluorohexane Sulfonate (4:2)	--	--	--	UG/KG	0.2 U	0.19 U	0.2 U
Sodium 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2)	--	--	--	UG/KG	0.2 U	0.19 U	0.2 U

Table 7. Summary of Per- and Polyfluoroalkyl Substances in Soil, 35-18 Steinway Street, Astoria, Queens, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	RSB-7	RSB-8	RSB-8
Sample Designation:					RSB-7	RSB-8	RSB-8
Sample Date:					12/16/2025	12/11/2025	12/11/2025
Sample Depth (ft bls):					25 - 27	0 - 2	1 - 3
Normal Sample or Field Duplicate:					N	N	N
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid	--	--	--	UG/KG	0.097 U	0.099 U	0.098 U
2-(N-ethyl perfluoro-1-octanesulfonamido)-ethanol	--	--	--	UG/KG	0.49 U	0.5 U	0.49 U
2-(N-methyl perfluoro-1-octanesulfonamido)-ethanol	--	--	--	UG/KG	0.49 U	0.5 U	0.49 U
2-(N-methyl perfluorooctanesulfonamido) acetic acid	--	--	--	UG/KG	0.097 U	0.099 U	0.098 U
2H,2H,3H,3H-Perfluorooctanoic acid (5:3FTCA)	--	--	--	UG/KG	0.49 U	0.5 U	0.49 U
3-Perfluoroheptyl propanoic acid (7:3FTCA)	--	--	--	UG/KG	0.49 U	0.5 U	0.49 U
3-Perfluoropropyl propanoic acid (3:3 FTCA)	--	--	--	UG/KG	0.19 U	0.2 U	0.2 U
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	--	--	--	UG/KG	0.097 U	0.099 U	0.098 U
9-Chlorohexadecafluoro-3-Oxanonane-1-Sulfonic Acid	--	--	--	UG/KG	0.097 U	0.099 U	0.098 U
N-ethyl perfluoro-1-octanesulfonamide	--	--	--	UG/KG	0.097 U	0.099 U	0.098 U
N-ethyl perfluorooctanesulfonamidoacetic acid	--	--	--	UG/KG	0.097 U	0.099 U	0.098 U
N-methyl perfluoro-1-octanesulfonamide	--	--	--	UG/KG	0.097 U	0.099 U	0.098 U
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	--	--	--	UG/KG	0.097 U	0.099 U	0.098 U
Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	--	--	--	UG/KG	0.097 U	0.099 U	0.098 U
Perfluoro(2-Propoxypropanoic) Acid	--	--	--	UG/KG	0.097 U	0.099 U	0.098 U
Perfluoro-3-methoxypropanoic acid (PFMPA)	--	--	--	UG/KG	0.097 U	0.099 U	0.098 U
Perfluoro-4-methoxybutanoic acid (PFMBA)	--	--	--	UG/KG	0.097 U	0.099 U	0.098 U
Perfluorobutanesulfonic acid (PFBS)	--	--	--	UG/KG	0.097 U	0.099 U	0.098 U
Perfluorobutanoic Acid	--	--	--	UG/KG	0.097 U	0.099 U	0.098 U
Perfluorodecane Sulfonic Acid	--	--	--	UG/KG	0.097 U	0.099 U	0.098 U
Perfluorodecanoic acid (PFDA)	--	--	--	UG/KG	0.058 U	0.059 U	0.059 U
Perfluorododecane sulfonate (PFDoDS)	--	--	--	UG/KG	0.097 U	0.099 U	0.098 U
Perfluorododecanoic acid (PFDoA)	--	--	--	UG/KG	0.097 U	0.099 U	0.098 U
Perfluoroheptane Sulfonate (PFHPS)	--	--	--	UG/KG	0.097 U	0.099 U	0.098 U
Perfluoroheptanoic acid (PFHpA)	--	--	--	UG/KG	0.097 U	0.099 U	0.098 U
Perfluorohexanesulfonic acid (PFHxS)	--	--	--	UG/KG	0.097 U	0.099 U	0.098 U
Perfluorohexanoic acid (PFHxA)	--	--	--	UG/KG	0.097 U	0.099 U	0.098 U
Perfluorononanesulfonic Acid (PFNS)	--	--	--	UG/KG	0.097 U	0.099 U	0.098 U
Perfluorononanoic acid (PFNA)	--	--	--	UG/KG	0.097 U	0.099 U	0.098 U
Perfluorooctane Sulfonamide (FOSA)	--	--	--	UG/KG	0.097 U	0.099 U	0.098 U
Perfluorooctanesulfonic acid (PFOS)	**0.88**	44	1	UG/KG	0.097 U	0.38	0.31
Perfluorooctanoic acid (PFOA)	0.66	33	0.8	UG/KG	0.058 U	0.059 U	0.15 J

Table 7. Summary of Per- and Polyfluoroalkyl Substances in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-7	RSB-8	RSB-8
				Sample Date:	12/16/2025	12/11/2025	12/11/2025
				Sample Depth (ft bls):	25 - 27	0 - 2	1 - 3
				Normal Sample or Field Duplicate:	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units			
Perfluoropentanesulfonic Acid (PFPeS)	--	--	--	UG/KG	0.097 U	0.099 U	0.098 U
Perfluoropentanoic Acid (PFPeA)	--	--	--	UG/KG	0.097 U	0.099 U	0.098 U
Perfluorotetradecanoic acid (PFTA)	--	--	--	UG/KG	0.097 U	0.099 U	0.098 U
Perfluorotridecanoic Acid (PFTriA)	--	--	--	UG/KG	0.097 U	0.099 U	0.098 U
Perfluoroundecanoic Acid (PFUnA)	--	--	--	UG/KG	0.097 U	0.099 U	0.098 U
Sodium 1H,1H,2H,2H-Perfluorodecane Sulfonate (8:2)	--	--	--	UG/KG	0.19 U	0.2 U	0.2 U
Sodium 1H,1H,2H,2H-Perfluorohexane Sulfonate (4:2)	--	--	--	UG/KG	0.19 U	0.2 U	0.2 U
Sodium 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2)	--	--	--	UG/KG	0.19 U	0.2 U	0.2 U

Table 7. Summary of Per- and Polyfluoroalkyl Substances in Soil, 35-18 Steinway Street, Astoria, Queens, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	RSB-8	RSB-8	RSB-8
Sample Designation:					RSB-8	RSB-8	RSB-8
Sample Date:					12/11/2025	12/11/2025	12/15/2025
Sample Depth (ft bls):					1 - 3	3 - 5	5 - 7
Normal Sample or Field Duplicate:					FD	N	N
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid	--	--	--	UG/KG	0.1 U	0.099 U	0.087 U
2-(N-ethyl perfluoro-1-octanesulfonamido)-ethanol	--	--	--	UG/KG	0.5 U	0.49 U	0.44 U
2-(N-methyl perfluoro-1-octanesulfonamido)-ethanol	--	--	--	UG/KG	0.5 U	0.49 U	0.44 U
2-(N-methyl perfluorooctanesulfonamido) acetic acid	--	--	--	UG/KG	0.1 U	0.099 U	0.087 U
2H,2H,3H,3H-Perfluorooctanoic acid (5:3FTCA)	--	--	--	UG/KG	0.5 U	0.49 U	0.44 U
3-Perfluoroheptyl propanoic acid (7:3FTCA)	--	--	--	UG/KG	0.5 U	0.49 U	0.44 U
3-Perfluoropropyl propanoic acid (3:3 FTCA)	--	--	--	UG/KG	0.2 U	0.2 U	0.17 U
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	--	--	--	UG/KG	0.1 U	0.099 U	0.087 U
9-Chlorohexadecafluoro-3-Oxanonane-1-Sulfonic Acid	--	--	--	UG/KG	0.1 U	0.099 U	0.087 U
N-ethyl perfluoro-1-octanesulfonamide	--	--	--	UG/KG	0.1 U	0.099 U	0.087 U
N-ethyl perfluorooctanesulfonamidoacetic acid	--	--	--	UG/KG	0.1 U	0.099 U	0.087 U
N-methyl perfluoro-1-octanesulfonamide	--	--	--	UG/KG	0.1 U	0.099 U	0.087 U
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	--	--	--	UG/KG	0.1 U	0.099 U	0.087 U
Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	--	--	--	UG/KG	0.1 U	0.099 U	0.087 U
Perfluoro(2-Propoxypropanoic) Acid	--	--	--	UG/KG	0.1 U	0.099 U	0.087 U
Perfluoro-3-methoxypropanoic acid (PFMPA)	--	--	--	UG/KG	0.1 U	0.099 U	0.087 U
Perfluoro-4-methoxybutanoic acid (PFMBA)	--	--	--	UG/KG	0.1 U	0.099 U	0.087 U
Perfluorobutanesulfonic acid (PFBS)	--	--	--	UG/KG	0.1 U	0.099 U	0.087 U
Perfluorobutanoic Acid	--	--	--	UG/KG	0.1 U	0.099 U	0.087 U
Perfluorodecane Sulfonic Acid	--	--	--	UG/KG	0.1 U	0.099 U	0.087 U
Perfluorodecanoic acid (PFDA)	--	--	--	UG/KG	0.06 U	0.059 U	0.052 U
Perfluorododecane sulfonate (PFDoDS)	--	--	--	UG/KG	0.1 U	0.099 U	0.087 U
Perfluorododecanoic acid (PFDoA)	--	--	--	UG/KG	0.1 U	0.099 U	0.087 U
Perfluoroheptane Sulfonate (PFHPS)	--	--	--	UG/KG	0.1 U	0.099 U	0.087 U
Perfluoroheptanoic acid (PFHpA)	--	--	--	UG/KG	0.1 U	0.099 U	0.087 U
Perfluorohexanesulfonic acid (PFHxS)	--	--	--	UG/KG	0.1 U	0.099 U	0.087 U
Perfluorohexanoic acid (PFHxA)	--	--	--	UG/KG	0.1 U	0.099 U	0.087 U
Perfluorononanesulfonic Acid (PFNS)	--	--	--	UG/KG	0.1 U	0.099 U	0.087 U
Perfluorononanoic acid (PFNA)	--	--	--	UG/KG	0.1 U	0.099 U	0.087 U
Perfluorooctane Sulfonamide (FOSA)	--	--	--	UG/KG	0.1 U	0.099 U	0.087 U
Perfluorooctanesulfonic acid (PFOS)	**0.88**	44	1	UG/KG	0.1 U	0.099 U	0.087 U
Perfluorooctanoic acid (PFOA)	0.66	33	0.8	UG/KG	0.1 J	0.1 J	0.052 U

Table 7. Summary of Per- and Polyfluoroalkyl Substances in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-8	RSB-8	RSB-8
				Sample Date:	12/11/2025	12/11/2025	12/15/2025
				Sample Depth (ft bls):	1 - 3	3 - 5	5 - 7
				Normal Sample or Field Duplicate:	FD	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units			
Perfluoropentanesulfonic Acid (PFPeS)	--	--	--	UG/KG	0.1 U	0.099 U	0.087 U
Perfluoropentanoic Acid (PFPeA)	--	--	--	UG/KG	0.1 U	0.099 U	0.087 U
Perfluorotetradecanoic acid (PFTA)	--	--	--	UG/KG	0.1 U	0.099 U	0.087 U
Perfluorotridecanoic Acid (PFTriA)	--	--	--	UG/KG	0.1 U	0.099 U	0.087 U
Perfluoroundecanoic Acid (PFUnA)	--	--	--	UG/KG	0.1 U	0.099 U	0.087 U
Sodium 1H,1H,2H,2H-Perfluorodecane Sulfonate (8:2)	--	--	--	UG/KG	0.2 U	0.2 U	0.17 U
Sodium 1H,1H,2H,2H-Perfluorohexane Sulfonate (4:2)	--	--	--	UG/KG	0.2 U	0.2 U	0.17 U
Sodium 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2)	--	--	--	UG/KG	0.2 U	0.2 U	0.17 U

Table 7. Summary of Per- and Polyfluoroalkyl Substances in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-8	RSB-9	RSB-9
				Sample Date:	12/15/2025	12/15/2025	12/17/2025
				Sample Depth (ft bls):	25 - 27	0 - 2	16 - 18
				Normal Sample or Field Duplicate:	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units			
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid	--	--	--	UG/KG	0.097 U	0.097 U	0.097 U
2-(N-ethyl perfluoro-1-octanesulfonamido)-ethanol	--	--	--	UG/KG	0.49 U	0.48 U	0.49 U
2-(N-methyl perfluoro-1-octanesulfonamido)-ethanol	--	--	--	UG/KG	0.49 U	0.48 U	0.49 U
2-(N-methyl perfluorooctanesulfonamido) acetic acid	--	--	--	UG/KG	0.097 U	0.097 U	0.097 U
2H,2H,3H,3H-Perfluorooctanoic acid (5:3FTCA)	--	--	--	UG/KG	0.49 U	0.48 U	0.49 U
3-Perfluoroheptyl propanoic acid (7:3FTCA)	--	--	--	UG/KG	0.49 U	0.48 U	0.49 U
3-Perfluoropropyl propanoic acid (3:3 FTCA)	--	--	--	UG/KG	0.19 U	0.19 U	0.19 U
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	--	--	--	UG/KG	0.097 U	0.097 U	0.097 U
9-Chlorohexadecafluoro-3-Oxanonane-1-Sulfonic Acid	--	--	--	UG/KG	0.097 U	0.097 U	0.097 U
N-ethyl perfluoro-1-octanesulfonamide	--	--	--	UG/KG	0.097 U	0.097 U	0.097 U
N-ethyl perfluorooctanesulfonamidoacetic acid	--	--	--	UG/KG	0.097 U	0.097 U	0.097 U
N-methyl perfluoro-1-octanesulfonamide	--	--	--	UG/KG	0.097 U	0.097 U	0.097 U
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	--	--	--	UG/KG	0.097 U	0.097 U	0.097 U
Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	--	--	--	UG/KG	0.097 U	0.097 U	0.097 U
Perfluoro(2-Propoxypropanoic) Acid	--	--	--	UG/KG	0.097 U	0.097 U	0.097 U
Perfluoro-3-methoxypropanoic acid (PFMPA)	--	--	--	UG/KG	0.097 U	0.097 U	0.097 U
Perfluoro-4-methoxybutanoic acid (PFMBA)	--	--	--	UG/KG	0.097 U	0.097 U	0.097 U
Perfluorobutanesulfonic acid (PFBS)	--	--	--	UG/KG	0.097 U	0.097 U	0.097 U
Perfluorobutanoic Acid	--	--	--	UG/KG	0.097 U	0.097 U	0.097 U
Perfluorodecane Sulfonic Acid	--	--	--	UG/KG	0.097 U	0.097 U	0.097 U
Perfluorodecanoic acid (PFDA)	--	--	--	UG/KG	0.058 U	0.058 U	0.058 U
Perfluorododecane sulfonate (PFDoDS)	--	--	--	UG/KG	0.097 U	0.097 U	0.097 U
Perfluorododecanoic acid (PFDoA)	--	--	--	UG/KG	0.097 U	0.097 U	0.097 U
Perfluoroheptane Sulfonate (PFHPS)	--	--	--	UG/KG	0.097 U	0.097 U	0.097 U
Perfluoroheptanoic acid (PFHpA)	--	--	--	UG/KG	0.097 U	0.097 U	0.097 U
Perfluorohexanesulfonic acid (PFHxS)	--	--	--	UG/KG	0.097 U	0.097 U	0.097 U
Perfluorohexanoic acid (PFHxA)	--	--	--	UG/KG	0.097 U	0.097 U	0.097 U
Perfluorononanesulfonic Acid (PFNS)	--	--	--	UG/KG	0.097 U	0.097 U	0.097 U
Perfluorononanoic acid (PFNA)	--	--	--	UG/KG	0.097 U	0.097 U	0.097 U
Perfluorooctane Sulfonamide (FOSA)	--	--	--	UG/KG	0.097 U	0.097 U	0.097 U
Perfluorooctanesulfonic acid (PFOS)	**0.88**	44	1	UG/KG	0.097 U	0.24	0.097 U
Perfluorooctanoic acid (PFOA)	0.66	33	0.8	UG/KG	0.11 J	0.058 U	0.15 J

Table 7. Summary of Per- and Polyfluoroalkyl Substances in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-8	RSB-9	RSB-9
				Sample Date:	12/15/2025	12/15/2025	12/17/2025
				Sample Depth (ft bls):	25 - 27	0 - 2	16 - 18
				Normal Sample or Field Duplicate:	N	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units			
Perfluoropentanesulfonic Acid (PFPeS)	--	--	--	UG/KG	0.097 U	0.097 U	0.097 U
Perfluoropentanoic Acid (PFPeA)	--	--	--	UG/KG	0.097 U	0.097 U	0.097 U
Perfluorotetradecanoic acid (PFTA)	--	--	--	UG/KG	0.097 U	0.097 U	0.097 U
Perfluorotridecanoic Acid (PFTriA)	--	--	--	UG/KG	0.097 U	0.097 U	0.097 U
Perfluoroundecanoic Acid (PFUnA)	--	--	--	UG/KG	0.097 U	0.097 U	0.097 U
Sodium 1H,1H,2H,2H-Perfluorodecane Sulfonate (8:2)	--	--	--	UG/KG	0.19 U	0.19 U	0.19 U
Sodium 1H,1H,2H,2H-Perfluorohexane Sulfonate (4:2)	--	--	--	UG/KG	0.19 U	0.19 U	0.19 U
Sodium 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2)	--	--	--	UG/KG	0.19 U	0.19 U	0.19 U

Table 7. Summary of Per- and Polyfluoroalkyl Substances in Soil, 35-18 Steinway Street, Astoria, Queens, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	Sample Designation: RSB-9 Sample Date: 12/17/2025 Sample Depth (ft bls): 20 - 22 Normal Sample or Field Duplicate: N	Sample Designation: RSB-9 Sample Date: 12/17/2025 Sample Depth (ft bls): 22 - 24 Normal Sample or Field Duplicate: N
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid	--	--	--	UG/KG	0.084 U	0.1 U
2-(N-ethyl perfluoro-1-octanesulfonamido)-ethanol	--	--	--	UG/KG	0.42 U	0.5 U
2-(N-methyl perfluoro-1-octanesulfonamido)-ethanol	--	--	--	UG/KG	0.42 U	0.5 U
2-(N-methyl perfluorooctanesulfonamido) acetic acid	--	--	--	UG/KG	0.084 U	0.1 U
2H,2H,3H,3H-Perfluorooctanoic acid (5:3FTCA)	--	--	--	UG/KG	0.42 U	0.5 U
3-Perfluoroheptyl propanoic acid (7:3FTCA)	--	--	--	UG/KG	0.42 U	0.5 U
3-Perfluoropropyl propanoic acid (3:3 FTCA)	--	--	--	UG/KG	0.17 U	0.2 U
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	--	--	--	UG/KG	0.084 U	0.1 U
9-Chlorohexadecafluoro-3-Oxanonane-1-Sulfonic Acid	--	--	--	UG/KG	0.084 U	0.1 U
N-ethyl perfluoro-1-octanesulfonamide	--	--	--	UG/KG	0.084 U	0.1 U
N-ethyl perfluorooctanesulfonamidoacetic acid	--	--	--	UG/KG	0.084 U	0.1 U
N-methyl perfluoro-1-octanesulfonamide	--	--	--	UG/KG	0.084 U	0.1 U
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	--	--	--	UG/KG	0.084 U	0.1 U
Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	--	--	--	UG/KG	0.084 U	0.1 U
Perfluoro(2-Propoxypropanoic) Acid	--	--	--	UG/KG	0.084 U	0.1 U
Perfluoro-3-methoxypropanoic acid (PFMPA)	--	--	--	UG/KG	0.084 U	0.1 U
Perfluoro-4-methoxybutanoic acid (PFMBA)	--	--	--	UG/KG	0.084 U	0.1 U
Perfluorobutanesulfonic acid (PFBS)	--	--	--	UG/KG	0.084 U	0.1 U
Perfluorobutanoic Acid	--	--	--	UG/KG	0.084 U	0.1 U
Perfluorodecane Sulfonic Acid	--	--	--	UG/KG	0.084 U	0.1 U
Perfluorodecanoic acid (PFDA)	--	--	--	UG/KG	0.051 U	0.06 U
Perfluorododecane sulfonate (PFDoDS)	--	--	--	UG/KG	0.084 U	0.1 U
Perfluorododecanoic acid (PFDoA)	--	--	--	UG/KG	0.084 U	0.1 U
Perfluoroheptane Sulfonate (PFHPS)	--	--	--	UG/KG	0.084 U	0.1 U
Perfluoroheptanoic acid (PFHpA)	--	--	--	UG/KG	0.084 U	0.1 U
Perfluorohexanesulfonic acid (PFHxS)	--	--	--	UG/KG	0.084 U	0.1 U
Perfluorohexanoic acid (PFHxA)	--	--	--	UG/KG	0.084 U	0.1 U
Perfluorononanesulfonic Acid (PFNS)	--	--	--	UG/KG	0.084 U	0.1 U
Perfluorononanoic acid (PFNA)	--	--	--	UG/KG	0.084 U	0.1 U
Perfluorooctane Sulfonamide (FOSA)	--	--	--	UG/KG	0.084 U	0.1 U
Perfluorooctanesulfonic acid (PFOS)	**0.88**	44	1	UG/KG	0.084 U	0.1 U
Perfluorooctanoic acid (PFOA)	0.66	33	0.8	UG/KG	0.12 J	0.17 J

Table 7. Summary of Per- and Polyfluoroalkyl Substances in Soil, 35-18 Steinway Street, Astoria, Queens, New York

				Sample Designation:	RSB-9	RSB-9
				Sample Date:	12/17/2025	12/17/2025
				Sample Depth (ft bls):	20 - 22	22 - 24
				Normal Sample or Field Duplicate:	N	N
Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Restricted Residential SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units		
Perfluoropentanesulfonic Acid (PFPeS)	--	--	--	UG/KG	0.084 U	0.1 U
Perfluoropentanoic Acid (PFPeA)	--	--	--	UG/KG	0.084 U	0.1 U
Perfluorotetradecanoic acid (PFTA)	--	--	--	UG/KG	0.084 U	0.1 U
Perfluorotridecanoic Acid (PFTriA)	--	--	--	UG/KG	0.084 U	0.1 U
Perfluoroundecanoic Acid (PFUnA)	--	--	--	UG/KG	0.084 U	0.1 U
Sodium 1H,1H,2H,2H-Perfluorodecane Sulfonate (8:2)	--	--	--	UG/KG	0.17 U	0.2 U
Sodium 1H,1H,2H,2H-Perfluorohexane Sulfonate (4:2)	--	--	--	UG/KG	0.17 U	0.2 U
Sodium 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2)	--	--	--	UG/KG	0.17 U	0.2 U

Table 8. Summary of Volatile Organic Compounds in Groundwater, 35-18 Steinway Street, Astoria, Queens, New York

		Sample Designation:	RMW-1	RMW-2	RMW-3	RMW-4	RMW-4	RMW-5
		Sample Date:	12/18/2025	12/22/2025	12/18/2025	12/18/2025	12/18/2025	12/22/2025
		Normal Sample or Field Duplicate:	N	N	N	N	FD	N
Parameter	NYSDEC Ambient Water Quality Standards and Guidance Values	Units						
1,1,1-Trichloroethane (TCA)	5	UG/L	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
1,1,2,2-Tetrachloroethane	5	UG/L	0.085 U	0.085 U	0.085 U	0.085 U	0.085 U	0.085 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	5	UG/L	0.31 U	0.31 U	0.31 U	0.31 U	0.31 U	0.31 U
1,1,2-Trichloroethane	1	UG/L	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U	0.19 U
1,1-Dichloroethane	5	UG/L	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
1,1-Dichloroethene	5	UG/L	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
1,2,3-Trichlorobenzene	5	UG/L	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U
1,2,4-Trichlorobenzene	5	UG/L	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U
1,2,4-Trimethylbenzene	5	UG/L	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U
1,2-Dibromo-3-Chloropropane	0.04	UG/L	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U
1,2-Dibromoethane (Ethylene Dibromide)	0.0006	UG/L	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichlorobenzene	3	UG/L	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U
1,2-Dichloroethane	0.6	UG/L	0.087 U	0.087 U	0.087 U	0.087 U	0.087 U	0.087 U
1,2-Dichloropropane	1	UG/L	0.074 U	0.074 U	0.074 U	0.074 U	0.074 U	0.074 U
1,3,5-Trimethylbenzene (Mesitylene)	5	UG/L	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
1,3-Dichlorobenzene	3	UG/L	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U
1,4-Dichlorobenzene	3	UG/L	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U	0.33 U
2-Hexanone	50	UG/L	1.1 UJ	1.1 U	1.1 UJ	1.1 UJ	1.1 UJ	1.1 U
Acetone	50	UG/L	4.4 U	4.4 U	4.4 U	4.4 U	4.4 U	4.4 U
Benzene	1	UG/L	0.07 U	0.07 U	0.07 U	0.07 U	0.07 U	0.07 U
Bromochloromethane	5	UG/L	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U
Bromodichloromethane	50	UG/L	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U	0.15 U
Bromoform	50	UG/L	0.54 U	0.54 U	0.54 U	0.54 U	0.54 U	0.54 U
Bromomethane	5	UG/L	0.55 U	0.55 U	0.55 U	0.55 U	0.55 U	0.55 U
Carbon Disulfide	60	UG/L	0.82 U	0.82 U	0.82 U	0.82 U	0.82 U	0.82 U
Carbon Tetrachloride	5	UG/L	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U
Chlorobenzene	5	UG/L	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U
Chloroethane	5	UG/L	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U
Chloroform	7	UG/L	0.33 U	0.33 U	0.33 U	1.5	1.6	0.33 U
Chloromethane	5	UG/L	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
Cis-1,2-Dichloroethylene	5	UG/L	0.48 U	0.48 U	0.48 U	1.4	1.5	0.48 U
Cis-1,3-Dichloropropene	--	UG/L	0.069 U	0.069 U	0.069 U	0.069 U	0.069 U	0.069 U

Table 8. Summary of Volatile Organic Compounds in Groundwater, 35-18 Steinway Street, Astoria, Queens, New York

		Sample Designation:	RMW-1	RMW-2	RMW-3	RMW-4	RMW-4	RMW-5
		Sample Date:	12/18/2025	12/22/2025	12/18/2025	12/18/2025	12/18/2025	12/22/2025
		Normal Sample or Field Duplicate:	N	N	N	N	FD	N
Parameter	NYSDEC Ambient Water Quality Standards and Guidance Values	Units						
Cyclohexane	--	UG/L	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U
Dibromochloromethane	50	UG/L	0.086 U	0.086 U	0.086 U	0.086 U	0.086 U	0.086 U
Dichlorodifluoromethane	5	UG/L	0.31 U	0.31 U	0.31 U	0.31 U	0.31 U	0.31 U
Ethylbenzene	5	UG/L	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Isopropylbenzene (Cumene)	5	UG/L	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U
m,p-Xylene	5	UG/L	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U	0.3 U
Methyl Acetate	--	UG/L	0.79 U	0.79 U	0.79 U	0.79 U	0.79 U	0.79 U
Methyl Ethyl Ketone (2-Butanone)	50	UG/L	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U	3.9 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	--	UG/L	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Methylcyclohexane	--	UG/L	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U	0.71 U
Methylene Chloride	5	UG/L	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U
N-Butylbenzene	5	UG/L	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U
N-Propylbenzene	5	UG/L	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U
O-Xylene (1,2-Dimethylbenzene)	5	UG/L	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U
Sec-Butylbenzene	5	UG/L	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U
Styrene	5	UG/L	0.42 U	0.42 U	0.42 U	0.42 U	0.42 U	0.42 U
T-Butylbenzene	5	UG/L	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U	0.34 U
Tert-Butyl Methyl Ether	10	UG/L	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U	0.22 U
Tetrachloroethylene (PCE)	5	UG/L	0.35 J	0.28 U	0.5	1.9	2.3	0.28 U
Toluene	5	UG/L	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U
Trans-1,2-Dichloroethene	5	UG/L	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U	0.24 U
Trans-1,3-Dichloropropene	--	UG/L	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U
Trichloroethylene (TCE)	5	UG/L	0.074 U	0.074 U	0.074 U	0.46	0.56	0.074 U
Trichlorofluoromethane	5	UG/L	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U	0.32 U
Vinyl Chloride	2	UG/L	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
Xylenes	5	UG/L	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U

Table 9. Summary of Semivolatile Organic Compounds in Groundwater, 35-18 Steinway Street, Astoria, Queens, New York

		Sample Designation:	RMW-1	RMW-1	RMW-2	RMW-2	RMW-3	RMW-3	RMW-4
		Sample Date:	12/18/2025	12/18/2025	12/22/2025	12/22/2025	12/18/2025	12/18/2025	12/18/2025
		Normal Sample or Field Duplicate:	N	N	N	N	N	N	N
		Total or Dissolved:	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total
Parameter	NYSDEC Ambient Water Quality Standards and Guidance Values	Units							
1,2,4,5-Tetrachlorobenzene	5	UG/L	1.2 U	1.2 UJ	1.2 U	1.2 U	1.2 U	1.2 UJ	1.2 U
1,4-Dioxane (P-Dioxane)	0.35	UG/L	0.072 U	NA	0.072 U	NA	0.072 U	NA	0.072 U
2,3,4,6-Tetrachlorophenol	--	UG/L	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U
2,4,5-Trichlorophenol	--	UG/L	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U
2,4,6-Trichlorophenol	--	UG/L	0.86 U	0.86 U	0.86 U	0.86 U	0.86 U	0.86 U	0.86 U
2,4-Dichlorophenol	5	UG/L	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
2,4-Dimethylphenol	50	UG/L	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U
2,4-Dinitrophenol	10	UG/L	11 U	11 U	11 U	11 U	11 U	11 U	11 U
2,4-Dinitrotoluene	5	UG/L	1 U	1 U	1 U	1 U	1 U	1 U	1 U
2,6-Dinitrotoluene	5	UG/L	0.83 U	0.83 U	0.83 U	0.83 U	0.83 U	0.83 U	0.83 U
2-Chloronaphthalene	10	UG/L	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U
2-Chlorophenol	--	UG/L	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U
2-Methylnaphthalene	--	UG/L	0.53 U	0.53 U	0.96 J	0.53 U	0.53 U	0.53 U	0.53 U
2-Methylphenol (O-Cresol)	--	UG/L	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U
2-Nitroaniline	5	UG/L	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U
2-Nitrophenol	--	UG/L	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U
3,3'-Dichlorobenzidine	5	UG/L	1.4 UJ	1.4 U	1.4 U	1.4 U	1.4 UJ	1.4 U	1.4 UJ
3-Nitroaniline	5	UG/L	1.9 UJ	1.9 U	1.9 U	1.9 U	1.9 UJ	1.9 U	1.9 UJ
4,6-Dinitro-2-Methylphenol	--	UG/L	8.6 U	8.6 U	8.6 U	8.6 U	8.6 U	8.6 U	8.6 U
4-Bromophenyl Phenyl Ether	--	UG/L	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U
4-Chloro-3-Methylphenol	--	UG/L	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
4-Chloroaniline	5	UG/L	1.9 UJ	1.9 U	1.9 U	1.9 U	1.9 UJ	1.9 U	1.9 UJ
4-Chlorophenyl Phenyl Ether	--	UG/L	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
4-Methylphenol (P-Cresol)	--	UG/L	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U
4-Nitroaniline	5	UG/L	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U
4-Nitrophenol	--	UG/L	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Acenaphthene	20	UG/L	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Acenaphthylene	20	UG/L	0.82 U	0.82 U	0.82 U	0.82 U	0.82 U	0.82 U	0.82 U
Acetophenone	--	UG/L	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U
Anthracene	50	UG/L	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Atrazine	7.5	UG/L	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U

Table 9. Summary of Semivolatile Organic Compounds in Groundwater, 35-18 Steinway Street, Astoria, Queens, New York

		Sample Designation:	RMW-1	RMW-1	RMW-2	RMW-2	RMW-3	RMW-3	RMW-4
		Sample Date:	12/18/2025	12/18/2025	12/22/2025	12/22/2025	12/18/2025	12/18/2025	12/18/2025
		Normal Sample or Field Duplicate:	N	N	N	N	N	N	N
		Total or Dissolved:	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total
Parameter	NYSDEC Ambient Water Quality Standards and Guidance Values	Units							
Benzaldehyde	--	UG/L	2.1 UJ	2.1 UJ	2.1 UJ	2.1 UJ	2.1 UJ	2.1 UJ	2.1 UJ
Benzo(A)Anthracene	0.002	UG/L	0.59 U	0.59 U	0.59 U	0.59 U	0.59 U	0.59 U	0.59 U
Benzo(A)Pyrene	0	UG/L	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U
Benzo(B)Fluoranthene	0.002	UG/L	0.68 U	0.68 U	0.68 U	0.68 U	0.68 U	0.68 U	0.68 U
Benzo(G,H,I)Perylene	--	UG/L	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
Benzo(K)Fluoranthene	0.002	UG/L	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U
Benzyl Butyl Phthalate	50	UG/L	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U
Biphenyl (Diphenyl)	5	UG/L	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U
Bis(2-Chloroethoxy) Methane	5	UG/L	0.59 U	0.59 U	0.59 U	0.59 U	0.59 U	0.59 U	0.59 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	1	UG/L	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U
Bis(2-Chloroisopropyl) Ether	5	UG/L	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U
Bis(2-Ethylhexyl) Phthalate	5	UG/L	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Caprolactam	--	UG/L	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U
Carbazole	--	UG/L	0.68 U	0.68 U	0.68 U	0.68 U	0.68 U	0.68 U	0.68 U
Chrysene	0.002	UG/L	0.91 U	0.91 U	0.91 U	0.91 U	0.91 U	0.91 U	0.91 U
Cresols, M & P	--	UG/L	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U
Dibenz(A,H)Anthracene	--	UG/L	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U
Dibenzofuran	--	UG/L	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Diethyl Phthalate	50	UG/L	0.98 U	0.98 U	0.98 U	0.98 U	0.98 U	0.98 U	0.98 U
Dimethyl Phthalate	50	UG/L	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U
Di-N-Butyl Phthalate	50	UG/L	0.84 U	0.84 U	0.84 U	0.84 U	0.84 U	0.84 U	0.84 U
Di-N-Octylphthalate	--	UG/L	4 U	4 U	4 U	4 U	4 U	4 U	4 U
Fluoranthene	50	UG/L	0.84 U	0.84 U	0.84 U	0.84 U	0.84 U	0.84 U	0.84 U
Fluorene	50	UG/L	0.91 U	0.91 U	0.91 U	0.91 U	0.91 U	0.91 U	0.91 U
Hexachlorobenzene	0.04	UG/L	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
Hexachlorobutadiene	0.5	UG/L	0.78 U	0.78 U	0.78 U	0.78 U	0.78 U	0.78 U	0.78 U
Hexachlorocyclopentadiene	5	UG/L	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U
Hexachloroethane	5	UG/L	0.31 U	0.31 U	0.31 U	0.31 U	0.31 U	0.31 U	0.31 U
Indeno(1,2,3-C,D)Pyrene	0.002	UG/L	0.94 U	0.94 U	0.94 U	0.94 U	0.94 U	0.94 U	0.94 U
Isophorone	50	UG/L	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Naphthalene	10	UG/L	0.54 U	0.54 U	0.54 U	0.54 U	0.54 U	0.54 U	0.54 U

Table 9. Summary of Semivolatile Organic Compounds in Groundwater, 35-18 Steinway Street, Astoria, Queens, New York

		Sample Designation:	RMW-1	RMW-1	RMW-2	RMW-2	RMW-3	RMW-3	RMW-4
		Sample Date:	12/18/2025	12/18/2025	12/22/2025	12/22/2025	12/18/2025	12/18/2025	12/18/2025
		Normal Sample or Field Duplicate:	N	N	N	N	N	N	N
		Total or Dissolved:	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total
Parameter	NYSDEC Ambient Water Quality Standards and Guidance Values	Units							
Nitrobenzene	0.4	UG/L	0.57 U	0.57 U	0.57 U	0.57 U	0.57 U	0.57 U	0.57 U
N-Nitrosodi-N-Propylamine	--	UG/L	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U
N-Nitrosodiphenylamine	50	UG/L	0.89 U	0.89 U	0.89 U	0.89 U	0.89 U	0.89 U	0.89 U
Pentachlorophenol	1	UG/L	6.6 U	6.6 U	6.6 U	6.6 U	6.6 U	6.6 U	6.6 U
Phenanthrene	50	UG/L	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Phenol	1	UG/L	0.29 U	0.29 U	0.29 U	0.29 U	0.29 U	0.29 U	0.29 U
Pyrene	50	UG/L	1.6 U	1.6 U	1.6 U	1.6 U	1.6 U	1.6 U	1.6 U

Table 9. Summary of Semivolatile Organic Compounds in Groundwater, 35-18 Steinway Street, Astoria, Queens, New York

		Sample Designation:	RMW-4	RMW-4	RMW-4	RMW-5	RMW-5
		Sample Date:	12/18/2025	12/18/2025	12/18/2025	12/22/2025	12/22/2025
		Normal Sample or Field Duplicate:	N	FD	FD	N	N
		Total or Dissolved:	Dissolved	Total	Dissolved	Total	Dissolved
Parameter	NYSDEC Ambient Water Quality Standards and Guidance Values	Units					
1,2,4,5-Tetrachlorobenzene	5	UG/L	1.2 UJ	1.2 U	1.2 UJ	1.2 U	1.2 U
1,4-Dioxane (P-Dioxane)	0.35	UG/L	NA	0.072 U	NA	0.072 U	NA
2,3,4,6-Tetrachlorophenol	--	UG/L	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U
2,4,5-Trichlorophenol	--	UG/L	0.88 U	0.88 U	0.88 U	0.88 U	0.88 U
2,4,6-Trichlorophenol	--	UG/L	0.86 U	0.86 U	0.86 U	0.86 U	0.86 U
2,4-Dichlorophenol	5	UG/L	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
2,4-Dimethylphenol	50	UG/L	0.62 U	0.62 U	0.62 U	0.62 U	0.62 U
2,4-Dinitrophenol	10	UG/L	11 U	11 U	11 U	11 U	11 U
2,4-Dinitrotoluene	5	UG/L	1 U	1 U	1 U	1 U	1 U
2,6-Dinitrotoluene	5	UG/L	0.83 U	0.83 U	0.83 U	0.83 U	0.83 U
2-Chloronaphthalene	10	UG/L	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U
2-Chlorophenol	--	UG/L	0.95 U	0.95 U	0.95 U	0.95 U	0.95 U
2-Methylnaphthalene	--	UG/L	0.53 U	0.53 U	0.53 U	0.53 U	0.53 U
2-Methylphenol (O-Cresol)	--	UG/L	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U
2-Nitroaniline	5	UG/L	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U
2-Nitrophenol	--	UG/L	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U
3,3'-Dichlorobenzidine	5	UG/L	1.4 U	1.4 UJ	1.4 U	1.4 U	1.4 U
3-Nitroaniline	5	UG/L	1.9 U	1.9 UJ	1.9 U	1.9 U	1.9 U
4,6-Dinitro-2-Methylphenol	--	UG/L	8.6 U	8.6 U	8.6 U	8.6 U	8.6 U
4-Bromophenyl Phenyl Ether	--	UG/L	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U
4-Chloro-3-Methylphenol	--	UG/L	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
4-Chloroaniline	5	UG/L	1.9 U	1.9 UJ	1.9 U	1.9 U	1.9 U
4-Chlorophenyl Phenyl Ether	--	UG/L	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
4-Methylphenol (P-Cresol)	--	UG/L	0.65 U	0.65 U	0.65 U	0.65 U	0.65 U
4-Nitroaniline	5	UG/L	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U
4-Nitrophenol	--	UG/L	4 U	4 U	4 U	4 U	4 U
Acenaphthene	20	UG/L	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Acenaphthylene	20	UG/L	0.82 U	0.82 U	0.82 U	0.82 U	0.82 U
Acetophenone	--	UG/L	2.3 U	2.3 U	2.3 U	2.3 U	2.3 U
Anthracene	50	UG/L	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Atrazine	7.5	UG/L	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U

Table 9. Summary of Semivolatile Organic Compounds in Groundwater, 35-18 Steinway Street, Astoria, Queens, New York

Parameter	NYSDEC Ambient Water Quality Standards and Guidance Values	Units	RMW-4	RMW-4	RMW-4	RMW-5	RMW-5
Sample Date:			12/18/2025	12/18/2025	12/18/2025	12/22/2025	12/22/2025
Normal Sample or Field Duplicate:			N	FD	FD	N	N
Total or Dissolved:			Dissolved	Total	Dissolved	Total	Dissolved
Benzaldehyde	--	UG/L	2.1 UJ	2.1 UJ	2.1 UJ	2.1 UJ	2.1 UJ
Benzo(A)Anthracene	0.002	UG/L	0.59 U	0.59 U	0.59 U	0.59 U	0.59 U
Benzo(A)Pyrene	0	UG/L	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U
Benzo(B)Fluoranthene	0.002	UG/L	0.68 U	0.68 U	0.68 U	0.68 U	0.68 U
Benzo(G,H,I)Perylene	--	UG/L	0.7 U	0.7 U	0.7 U	0.7 U	0.7 U
Benzo(K)Fluoranthene	0.002	UG/L	0.67 U	0.67 U	0.67 U	0.67 U	0.67 U
Benzyl Butyl Phthalate	50	UG/L	0.85 U	0.85 U	0.85 U	0.85 U	0.85 U
Biphenyl (Diphenyl)	5	UG/L	1.2 U	1.2 U	1.2 U	1.2 U	1.2 U
Bis(2-Chloroethoxy) Methane	5	UG/L	0.59 U	0.59 U	0.59 U	0.59 U	0.59 U
Bis(2-Chloroethyl) Ether (2-Chloroethyl Ether)	1	UG/L	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U
Bis(2-Chloroisopropyl) Ether	5	UG/L	0.63 U	0.63 U	0.63 U	0.63 U	0.63 U
Bis(2-Ethylhexyl) Phthalate	5	UG/L	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Caprolactam	--	UG/L	2.2 U	2.2 U	2.2 U	2.2 U	2.2 U
Carbazole	--	UG/L	0.68 U	0.68 U	0.68 U	0.68 U	0.68 U
Chrysene	0.002	UG/L	0.91 U	0.91 U	0.91 U	0.91 U	0.91 U
Cresols, M & P	--	UG/L	0.64 U	0.64 U	0.64 U	0.64 U	0.64 U
Dibenz(A,H)Anthracene	--	UG/L	0.72 U	0.72 U	0.72 U	0.72 U	0.72 U
Dibenzofuran	--	UG/L	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U
Diethyl Phthalate	50	UG/L	0.98 U	0.98 U	0.98 U	0.98 U	0.98 U
Dimethyl Phthalate	50	UG/L	0.77 U	0.77 U	0.77 U	0.77 U	0.77 U
Di-N-Butyl Phthalate	50	UG/L	0.84 U	0.84 U	0.84 U	0.84 U	0.84 U
Di-N-Octylphthalate	--	UG/L	4 U	4 U	4 U	4 U	4 U
Fluoranthene	50	UG/L	0.84 U	0.84 U	0.84 U	0.84 U	0.84 U
Fluorene	50	UG/L	0.91 U	0.91 U	0.91 U	0.91 U	0.91 U
Hexachlorobenzene	0.04	UG/L	0.4 U	0.4 U	0.4 U	0.4 U	0.4 U
Hexachlorobutadiene	0.5	UG/L	0.78 U	0.78 U	0.78 U	0.78 U	0.78 U
Hexachlorocyclopentadiene	5	UG/L	3.6 U	3.6 U	3.6 U	3.6 U	3.6 U
Hexachloroethane	5	UG/L	0.31 U	0.31 U	0.31 U	0.31 U	0.31 U
Indeno(1,2,3-C,D)Pyrene	0.002	UG/L	0.94 U	0.94 U	0.94 U	0.94 U	0.94 U
Isophorone	50	UG/L	0.8 U	0.8 U	0.8 U	0.8 U	0.8 U
Naphthalene	10	UG/L	0.54 U	0.54 U	0.54 U	0.54 U	0.54 U

Table 9. Summary of Semivolatile Organic Compounds in Groundwater, 35-18 Steinway Street, Astoria, Queens, New York

Parameter	NYSDEC Ambient Water Quality Standards and Guidance Values	Units	RMW-4	RMW-4	RMW-4	RMW-5	RMW-5
Sample Designation:			RMW-4	RMW-4	RMW-4	RMW-5	RMW-5
Sample Date:			12/18/2025	12/18/2025	12/18/2025	12/22/2025	12/22/2025
Normal Sample or Field Duplicate:			N	FD	FD	N	N
Total or Dissolved:			Dissolved	Total	Dissolved	Total	Dissolved
Nitrobenzene	0.4	UG/L	0.57 U	0.57 U	0.57 U	0.57 U	0.57 U
N-Nitrosodi-N-Propylamine	--	UG/L	0.43 U	0.43 U	0.43 U	0.43 U	0.43 U
N-Nitrosodiphenylamine	50	UG/L	0.89 U	0.89 U	0.89 U	0.89 U	0.89 U
Pentachlorophenol	1	UG/L	6.6 U	6.6 U	6.6 U	6.6 U	6.6 U
Phenanthrene	50	UG/L	1.3 U	1.3 U	1.3 U	1.3 U	1.3 U
Phenol	1	UG/L	0.29 U	0.29 U	0.29 U	0.29 U	0.29 U
Pyrene	50	UG/L	1.6 U	1.6 U	1.6 U	1.6 U	1.6 U

Table 10. Summary of Metals in Groundwater, 35-18 Steinway Street,Astoria, Queens, New York

Sample Designation:			RMW-1	RMW-1	RMW-2	RMW-2	RMW-3	RMW-3	RMW-4	RMW-4	RMW-4
Sample Date:			12/18/2025	12/18/2025	12/22/2025	12/22/2025	12/18/2025	12/18/2025	12/18/2025	12/18/2025	12/18/2025
Normal Sample or Field Duplicate:			N	N	N	N	N	N	N	N	FD
Total or Dissolved:			Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total
Parameter	NYSDEC Ambient Water Quality Standards and Guidance Values	Units									
Aluminum	--	UG/L	341	11.7 U	59.3	11.7 U	19 J	11.7 U	23 J	11.7 U	22.5 J
Antimony	3	UG/L	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U
Arsenic	25	UG/L	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U	0.48 U
Barium	1000	UG/L	143	136	184	185	73.1	73.8	73.6	81.9	75.1
Beryllium	3	UG/L	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U
Cadmium	5	UG/L	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U	0.26 U
Calcium	--	UG/L	113000	119000	128000	128000	84900	83600	91900 J	118000 J	99300
Chromium III	--	UG/L	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U
Chromium, Hexavalent	50	UG/L	2.9 U	2.9 U	3.9 J	3.9 J	2.9 U	2.9 U	2.9 U	2.9 U	2.9 U
Chromium, Total	50	UG/L	1.7 U	1.7 U	1.7 U	1.7 U	1.7 U	1.7 U	1.7 U	1.7 U	1.7 U
Cobalt	--	UG/L	0.88 J	0.48 J	1.2 J	1.3 J	0.23 J	0.21 J	0.54 J	0.49 J	0.55 J
Copper	200	UG/L	3 J	2 U	2.3 J	2.8 J	2 U	2 U	2 U	2 U	2 U
Cyanide	200	UG/L	3 J	NA	5.5	NA	1.5 J	NA	2 J	NA	1.7 J
Iron	**300**	UG/L	**634**	33.7 U	59.4 J	33.7 U	33.7 U	33.7 U	39.6 J	33.7 U	40.2 J
Lead	25	UG/L	0.76 J	0.42 U	0.42 U	0.42 U	0.42 U	0.42 U	0.44 J	0.42 U	0.42 U
Magnesium	**35000**	UG/L	**37500**	**36400**	28400	29100	21000	19900	26600 J	31600 J	27700
Manganese	**300**	UG/L	**1160**	**1080**	195	196	5.8 J	5.2 J	93.6	107	89
Mercury	0.7	UG/L	0.091 U	0.091 U	0.091 U	0.091 U	0.091 U	0.091 U	0.091 U	0.091 U	0.091 U
Nickel	100	UG/L	2.5 J	1.4 U	1.6 J	1.6 J	1.4 U	1.4 U	1.5 J	1.4 U	1.5 J
Potassium	--	UG/L	3700	3580	5330	5400	2500	2310	3910	3950	3930
Selenium	10	UG/L	2.7	3	0.43 U	0.43 U	1.9 J	1.8 J	1.3 J	1.8 J	1.5 J
Silver	50	UG/L	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U	0.21 U
Sodium	**20000**	UG/L	**93700**	**92600**	**111000**	**111000**	**130000**	**120000**	**79400**	**75100**	**78700**
Thallium	0.5	UG/L	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U	0.16 U
Vanadium	--	UG/L	1.2 J	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U
Zinc	2000	UG/L	13 J	10.6 J	5.1 J	4.2 U	4.2 U	16.1	4.2 U	6.8 J	4.2 U

Table 10. Summary of Metals in Groundwater, 35-18 Steinway Street,Astoria, Queens, New York

	Sample Designation:		RMW-4	RMW-5	RMW-5
	Sample Date:		12/18/2025	12/22/2025	12/22/2025
	Normal Sample or Field Duplicate:		FD	N	N
	Total or Dissolved:		Dissolved	Total	Dissolved
Parameter	NYSDEC Ambient Water Quality Standards and Guidance Values	Units			
Aluminum	--	UG/L	11.7 U	80.6	11.7 U
Antimony	3	UG/L	0.48 U	0.48 U	0.48 U
Arsenic	25	UG/L	0.48 U	0.48 U	0.48 U
Barium	1000	UG/L	73	83.3	84.3
Beryllium	3	UG/L	0.12 U	0.12 U	0.12 U
Cadmium	5	UG/L	0.26 U	0.26 U	0.26 U
Calcium	--	UG/L	97800	85500	86500
Chromium III	--	UG/L	NA	10 U	NA
Chromium, Hexavalent	50	UG/L	2.9 U	3.9 J	3.9 J
Chromium, Total	50	UG/L	1.7 U	1.7 U	1.7 U
Cobalt	--	UG/L	0.48 J	0.45 J	0.36 J
Copper	200	UG/L	2 U	2 U	2 U
Cyanide	200	UG/L	NA	4.8 J	NA
Iron	**300**	UG/L	33.7 U	99.5 J	33.7 U
Lead	25	UG/L	0.42 U	0.44 J	0.42 U
Magnesium	**35000**	UG/L	26700	19300	19800
Manganese	**300**	UG/L	89.3	27.1	28.3
Mercury	0.7	UG/L	0.091 U	0.091 U	0.091 U
Nickel	100	UG/L	1.4 U	1.4 U	1.4 U
Potassium	--	UG/L	3800	2960	2950
Selenium	10	UG/L	1.7 J	1.5 J	1.9 J
Silver	50	UG/L	0.21 U	0.21 U	0.21 U
Sodium	**20000**	UG/L	**79600**	**146000**	**140000**
Thallium	0.5	UG/L	0.16 U	0.16 U	0.16 U
Vanadium	--	UG/L	1 U	1 U	1 U
Zinc	2000	UG/L	7.5 J	4.2 U	4.2 U

Table 11. Summary of Polychlorinated Biphenyls in Groundwater, 35-18 Steinway Street, Astoria, Queens, New York

		Sample Designation:	RMW-1	RMW-2	RMW-3	RMW-4	RMW-4	RMW-5
		Sample Date:	12/18/2025	12/22/2025	12/18/2025	12/18/2025	12/18/2025	12/22/2025
		Normal Sample or Field Duplicate:	N	N	N	N	FD	N
Parameter	NYSDEC Ambient Water Quality Standards and Guidance Values	Units						
PCB-1016 (Aroclor 1016)	--	UG/L	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U
PCB-1221 (Aroclor 1221)	--	UG/L	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U
PCB-1232 (Aroclor 1232)	--	UG/L	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U
PCB-1242 (Aroclor 1242)	--	UG/L	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U
PCB-1248 (Aroclor 1248)	--	UG/L	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U
PCB-1254 (Aroclor 1254)	--	UG/L	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U
PCB-1260 (Aroclor 1260)	--	UG/L	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U
PCB-1262 (Aroclor 1262)	--	UG/L	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U
PCB-1268 (Aroclor 1268)	--	UG/L	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U
Polychlorinated Biphenyl (PCBs)	0.09	UG/L	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U

Table 12. Summary of Pesticides and Herbicides in Groundwater, 35-18 Steinway Street, Astoria, Queens, New York

Parameter	NYSDEC Ambient Water Quality Standards and Guidance Values	Units	RMW-1	RMW-2	RMW-3	RMW-4	RMW-4	RMW-5
Sample Designation:			RMW-1	RMW-2	RMW-3	RMW-4	RMW-4	RMW-5
Sample Date:			12/18/2025	12/22/2025	12/18/2025	12/18/2025	12/18/2025	12/22/2025
Normal Sample or Field Duplicate:			N	N	N	N	FD	N
2,4-D (Dichlorophenoxyacetic Acid)	50	UG/L	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U
Acetic acid, (2,4,5-trichlorophenoxy)-	35	UG/L	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U	0.12 U
Aldrin	0	UG/L	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.01	UG/L	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U	0.007 U
Alpha Endosulfan	--	UG/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Beta Bhc (Beta Hexachlorocyclohexane)	0.04	UG/L	0.015 U	0.015 U	0.015 U	0.015 U	0.015 U	0.015 U
Beta Endosulfan	--	UG/L	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U
Chlordane (Technical)	--	UG/L	0.055 U	0.055 U	0.055 U	0.055 U	0.055 U	0.055 U
cis-Chlordane	--	UG/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
Delta BHC (Delta Hexachlorocyclohexane)	0.04	UG/L	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Dieldrin	0.004	UG/L	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U
Endosulfan Sulfate	--	UG/L	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U
Endrin	0	UG/L	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U
Endrin Aldehyde	5	UG/L	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U
Endrin Ketone	5	UG/L	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U	0.008 U
Gamma Bhc (Lindane)	0.05	UG/L	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U	0.012 U
Heptachlor	0.04	UG/L	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.003 U
Heptachlor Epoxide	0.03	UG/L	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.005 U
Methoxychlor	35	UG/L	0.004 U	0.004 U	0.004 UJ	0.004 U	0.004 U	0.004 U
P,P'-DDD	0.3	UG/L	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U	0.006 U
P,P'-DDE	0.2	UG/L	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U	0.002 U
P,P'-DDT	0.2	UG/L	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U	0.004 U
Silvex (2,4,5-TP)	0.26	UG/L	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U
Toxaphene	0.06	UG/L	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U	0.11 U

Table 13. Summary of Per- and Polyfluoroalkyl Substances in Groundwater, 35-18 Steinway Street, Astoria, Queens, New York

	Sample Designation:		RMW-1	RMW-2	RMW-3	RMW-4	RMW-4	RMW-5
	Sample Date:		12/18/2025	12/22/2025	12/18/2025	12/18/2025	12/18/2025	12/22/2025
	Normal Sample or Field Duplicate:		N	N	N	N	FD	N
Parameter	NYSDEC Ambient Water Quality Standards and Guidance Values	Units						
11-Chloroeicosafluoro-3-Oxaundecane-1-Sulfonic Acid	--	UG/L	0.00041 U	0.00045 U	0.00043 U	0.00035 U	0.00035 U	0.00048 U
2-(N-ethyl perfluoro-1-octanesulfonamido)-ethanol	--	UG/L	0.00332 U	0.00359 U	0.00345 U	0.0028 U	0.0028 U	0.00381 U
2-(N-methyl perfluoro-1-octanesulfonamido)-ethanol	--	UG/L	0.00207 U	0.00224 U	0.00216 U	0.00175 U	0.00175 U	0.00238 U
2-(N-methyl perfluorooctanesulfonamido) acetic acid	--	UG/L	0.00041 U	0.00045 U	0.00043 U	0.00035 U	0.00035 U	0.00048 U
2H,2H,3H,3H-Perfluorooctanoic acid (5:3FTCA)	--	UG/L	0.00232 U	0.00251 U	0.00242 U	0.00196 U	0.00196 U	0.00266 U
3-Perfluoroheptyl propanoic acid (7:3FTCA)	--	UG/L	0.00207 U	0.00224 U	0.00216 U	0.00175 U	0.00175 U	0.00238 U
3-Perfluoropropyl propanoic acid (3:3 FTCA)	--	UG/L	0.00083 U	0.0009 U	0.00086 U	0.0007 U	0.0007 U	0.00095 U
4,8-Dioxa-3H-perfluorononanoic acid (ADONA)	--	UG/L	0.00041 U	0.00045 U	0.00043 U	0.00035 U	0.00035 U	0.00048 U
9-Chlorohexadecafluoro-3-Oxanonane-1-Sulfonic Acid	--	UG/L	0.00041 U	0.00045 U	0.00043 U	0.00035 U	0.00035 U	0.00048 U
N-ethyl perfluoro-1-octanesulfonamide	--	UG/L	0.00041 U	0.00045 U	0.00043 U	0.00035 U	0.00035 U	0.00048 U
N-ethyl perfluorooctanesulfonamidoacetic acid	--	UG/L	0.00041 U	0.00117 J	0.00043 U	0.00035 U	0.00035 U	0.00048 U
N-methyl perfluoro-1-octanesulfonamide	--	UG/L	0.00041 U	0.00045 U	0.00043 U	0.00035 U	0.00035 U	0.00048 U
Nonafluoro-3,6-dioxaheptanoic acid (NFDHA)	--	UG/L	0.00041 U	0.00045 R	0.00043 U	0.00035 U	0.00035 U	0.00048 R
Perfluoro(2-ethoxyethane)sulfonic acid (PFEESA)	--	UG/L	0.00041 U	0.00045 U	0.00043 U	0.00035 U	0.00035 U	0.00048 U
Perfluoro(2-Propoxypropanoic) Acid	--	UG/L	0.00116 U	0.00126 U	0.00121 U	0.00098 U	0.00098 U	0.00133 U
Perfluoro-3-methoxypropanoic acid (PFMPA)	--	UG/L	0.00041 U	0.00045 U	0.00043 U	0.00035 U	0.00035 U	0.00048 U
Perfluoro-4-methoxybutanoic acid (PFMBA)	--	UG/L	0.00041 U	0.00045 U	0.00043 U	0.00035 U	0.00035 U	0.00048 U
Perfluorobutanesulfonic acid (PFBS)	--	UG/L	0.00617	0.00827	0.0139	0.013	0.0129	0.0182
Perfluorobutanoic Acid	--	UG/L	0.0122	0.0173	0.0102	0.0111	0.011	0.0119
Perfluorodecane Sulfonic Acid	--	UG/L	0.00041 U	0.00045 U	0.00043 U	0.00035 U	0.00035 U	0.00048 U
Perfluorodecanoic acid (PFDA)	--	UG/L	0.00041 U	0.00204	0.00081 J	0.00045 J	0.00041 J	0.00176 J
Perfluorododecane sulfonate (PFDoDS)	--	UG/L	0.0005 U	0.00054 U	0.00052 U	0.00042 U	0.00042 U	0.00057 U
Perfluorododecanoic acid (PFDoA)	--	UG/L	0.00041 U	0.00045 U	0.00043 U	0.00035 U	0.00035 U	0.00048 U
Perfluoroheptane Sulfonate (PFHPS)	--	UG/L	0.0005 J	0.00045 U	0.00043 U	0.00035 U	0.00035 U	0.00048 U
Perfluoroheptanoic acid (PFHpA)	--	UG/L	0.00818	0.00593	0.00503	0.00554	0.00594	0.00356
Perfluorohexanesulfonic acid (PFHxS)	--	UG/L	0.00555	0.00286	0.00341	0.00397	0.00372	0.00165 J
Perfluorohexanoic acid (PFHxA)	--	UG/L	0.0123	0.0208	0.00984	0.00972	0.0103	0.00875
Perfluorononanesulfonic Acid (PFNS)	--	UG/L	0.00041 U	0.00045 U	0.00043 U	0.00035 U	0.00035 U	0.00048 U
Perfluorononanoic acid (PFNA)	--	UG/L	0.00313	0.00265	0.00211 EMPC	0.00102 J	0.0009 J	0.00215
Perfluorooctane Sulfonamide (FOSA)	--	UG/L	0.00041 U	0.00045 U	0.00043 U	0.00035 U	0.00035 U	0.00048 U
Perfluorooctanesulfonic acid (PFOS)	**0.0027**	UG/L	**0.0867**	**0.0107**	**0.0212**	**0.0111**	**0.0108**	**0.00988**
Perfluorooctanoic acid (PFOA)	**0.0067**	UG/L	**0.0344**	**0.0196**	**0.024**	**0.0187**	**0.0174**	**0.0179**

Table 13. Summary of Per- and Polyfluoroalkyl Substances in Groundwater, 35-18 Steinway Street, Astoria, Queens, New York

		Sample Designation:	RMW-1	RMW-2	RMW-3	RMW-4	RMW-4	RMW-5
		Sample Date:	12/18/2025	12/22/2025	12/18/2025	12/18/2025	12/18/2025	12/22/2025
		Normal Sample or Field Duplicate:	N	N	N	N	FD	N
Parameter	NYSDEC Ambient Water Quality Standards and Guidance Values	Units						
Perfluoropentanesulfonic Acid (PFPeS)	--	UG/L	0.00048 J	0.00045 U	0.00043 U	0.0005 J	0.00043 J	0.00048 U
Perfluoropentanoic Acid (PFPeA)	--	UG/L	0.0147	0.0297	0.0125	0.0116	0.0116	0.012
Perfluorotetradecanoic acid (PFTA)	--	UG/L	0.00041 U	0.00045 U	0.00043 U	0.00035 U	0.00035 U	0.00048 U
Perfluorotridecanoic Acid (PFTriA)	--	UG/L	0.00041 U	0.00045 U	0.00043 U	0.00035 U	0.00035 U	0.00048 U
Perfluoroundecanoic Acid (PFUnA)	--	UG/L	0.00041 U	0.00045 U	0.00043 U	0.00035 U	0.00035 U	0.00048 U
Sodium 1H,1H,2H,2H-Perfluorodecane Sulfonate (8:2)	--	UG/L	0.00083 U	0.0009 U	0.00086 U	0.0007 U	0.0007 U	0.00095 U
Sodium 1H,1H,2H,2H-Perfluorohexane Sulfonate (4:2)	--	UG/L	0.00083 U	0.0009 U	0.00086 U	0.0007 U	0.0007 U	0.00095 U
Sodium 1H,1H,2H,2H-Perfluorooctane Sulfonate (6:2)	--	UG/L	0.00083 U	0.0009 U	0.00086 U	0.0007 U	0.0007 U	0.00095 U

Table 14. Summary of Volatile Organic Compounds in Soil Vapor not Associated with Soil Vapor Intrusion, 35-18 Steinway Street, Astoria, Queens, New York

Sample Designation:		RSV-1	RSV-2	RSV-3	RSV-3	RSV-4	RSV-5	RSV-6	RSV-7
Sample Date:		12/19/2025	12/22/2025	12/19/2025	12/19/2025	12/19/2025	12/22/2025	12/19/2025	12/22/2025
Normal Sample or Field Duplicate:		N	N	N	FD	N	N	N	N
Parameter	Units								
1,1,1-Trichloroethane (TCA)	UG/M3	0.24 U	0.48 U	0.24 UJ	0.24 U	0.24 UJ	0.48 U	0.24 U	0.96 U
1,1,2,2-Tetrachloroethane	UG/M3	0.3 U	0.59 U	0.3 UJ	0.3 U	0.3 UJ	0.59 U	0.3 U	1.2 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	UG/M3	**0.54 J**	0.81 U	**0.55 J**	**0.49 J**	**0.53 J**	0.81 U	**0.64 J**	1.6 U
1,1,2-Trichloroethane	UG/M3	0.4 U	0.81 U	0.4 UJ	0.4 U	0.4 UJ	0.81 U	0.4 U	1.6 U
1,1-Dichloroethane	UG/M3	0.1 U	0.2 U	0.1 UJ	0.1 U	0.1 UJ	0.2 U	0.1 U	0.4 U
1,1-Dichloroethene	UG/M3	0.1 U	0.21 U	0.1 UJ	0.1 U	0.1 UJ	0.21 U	0.1 U	0.41 U
1,2,4-Trichlorobenzene	UG/M3	0.38 U	0.76 U	0.38 UJ	0.38 U	0.38 UJ	0.76 U	0.38 U	1.5 U
1,2,4-Trimethylbenzene	UG/M3	0.39 U	0.79 U	0.39 UJ	0.39 U	**2.2 J**	0.79 U	**0.7 J**	1.6 U
1,2-Dibromoethane (Ethylene Dibromide)	UG/M3	0.32 U	0.65 U	0.32 UJ	0.32 U	0.32 UJ	0.65 U	0.32 U	1.3 U
1,2-Dichlorobenzene	UG/M3	0.4 U	0.79 U	0.4 UJ	0.4 U	0.4 UJ	0.79 U	0.4 U	1.6 U
1,2-Dichloroethane	UG/M3	0.38 U	0.75 U	0.38 UJ	0.38 U	0.38 UJ	0.75 U	0.38 U	1.5 U
1,2-Dichloropropane	UG/M3	0.43 U	0.87 U	0.43 UJ	0.43 U	0.43 UJ	0.87 U	0.43 U	1.7 U
1,2-Dichlorotetrafluoroethane	UG/M3	**1.6**	0.67 U	0.34 UJ	0.34 U	0.34 UJ	0.67 U	0.34 U	**2.6 J**
1,3,5-Trimethylbenzene (Mesitylene)	UG/M3	0.23 U	0.46 U	0.23 UJ	0.23 U	0.23 UJ	0.46 U	0.23 U	0.92 U
1,3-Butadiene	UG/M3	0.086 U	0.17 U	0.086 UJ	0.086 U	0.086 UJ	0.17 U	0.086 U	0.35 U
1,3-Dichlorobenzene	UG/M3	0.45 U	0.89 U	0.45 UJ	0.45 U	0.45 UJ	0.89 U	0.45 U	1.8 U
1,4-Dichlorobenzene	UG/M3	0.54 U	1.1 U	0.54 UJ	0.54 U	0.54 UJ	1.1 U	0.54 U	2.1 U
1,4-Dioxane (P-Dioxane)	UG/M3	0.17 U	0.34 U	**0.31 J**	0.17 U	0.17 UJ	0.34 U	**0.45 J**	0.68 U
2,2,4-Trimethylpentane	UG/M3	**110 D**	0.36 U	**0.69 J**	**0.68 J**	**25 J**	**0.85 J**	**1.9**	0.71 U
2-Chlorotoluene	UG/M3	0.24 U	0.48 U	0.24 UJ	0.24 U	0.24 UJ	0.48 U	0.24 U	0.95 U
2-Hexanone	UG/M3	**0.62 J**	1.2 U	0.62 UJ	0.62 U	**3.7 J**	1.2 U	0.62 U	2.5 U
4-Ethyltoluene	UG/M3	0.24 U	0.48 U	0.24 UJ	**0.65 J**	**2.4 J**	0.48 U	0.24 U	0.96 U
Acetone	UG/M3	**52**	**56**	**32 J**	**32**	**99 J**	**51**	**37**	**130**
Allyl Chloride (3-Chloropropene)	UG/M3	0.38 U	0.75 U	0.38 UJ	0.38 U	0.38 UJ	0.75 U	0.38 U	1.5 U
Benzene	UG/M3	**1.4**	**0.77 J**	**0.54 J**	**0.66**	**0.88 J**	**0.86 J**	**0.68**	0.56 U
Benzyl Chloride	UG/M3	0.46 U	0.91 U	0.46 UJ	0.46 U	0.46 UJ	0.91 U	0.46 U	1.8 U
Bromodichloromethane	UG/M3	0.34 U	0.67 U	0.34 UJ	0.34 U	0.34 UJ	0.67 U	0.34 U	1.3 U
Bromoform	UG/M3	1.2 U	2.5 U	1.2 UJ	1.2 U	1.2 UJ	2.5 U	1.2 U	5 U
Bromomethane	UG/M3	0.28 U	0.55 U	0.28 UJ	0.28 U	0.28 UJ	0.55 U	0.28 U	1.1 U
Butane	UG/M3	**4.8**	**5.4**	0.48 UJ	0.48 U	0.48 UJ	0.95 U	0.48 U	**2.2 J**
Carbon Disulfide	UG/M3	**0.72 J**	**1.2 J**	0.41 UJ	0.41 U	**2.8 J**	**2.9 J**	**0.51 J**	1.6 U
Carbon Tetrachloride	UG/M3	0.14 U	0.28 U	0.14 UJ	0.14 U	0.14 UJ	0.28 U	0.14 U	0.55 U
Chlorobenzene	UG/M3	0.2 U	0.41 U	0.2 UJ	0.2 U	0.2 UJ	0.41 U	0.2 U	0.81 U
Chlorodifluoromethane	UG/M3	0.42 U	0.85 U	0.42 UJ	0.42 U	0.42 UJ	0.85 U	0.42 U	1.7 U
Chloroethane	UG/M3	0.48 U	0.95 U	0.48 UJ	0.48 U	0.48 UJ	0.95 U	0.48 U	1.9 U
Chloroform	UG/M3	**0.84 J**	**1.4 J**	**0.44 J**	**0.4 J**	**9.3 J**	**0.86 J**	**0.59 J**	**1.1 J**

Table 14. Summary of Volatile Organic Compounds in Soil Vapor not Associated with Soil Vapor Intrusion, 35-18 Steinway Street, Astoria, Queens, New York

Sample Designation:		RSV-1	RSV-2	RSV-3	RSV-3	RSV-4	RSV-5	RSV-6	RSV-7
Sample Date:		12/19/2025	12/22/2025	12/19/2025	12/19/2025	12/19/2025	12/22/2025	12/19/2025	12/22/2025
Normal Sample or Field Duplicate:		N	N	N	FD	N	N	N	N
Parameter	Units								
Chloromethane	UG/M3	0.31 U	0.62 U	0.31 UJ	0.31 U	0.31 UJ	0.62 U	0.31 U	1.2 U
Cis-1,2-Dichloroethylene	UG/M3	0.083 U	0.17 U	0.083 UJ	0.083 U	0.083 UJ	0.17 U	0.083 U	0.33 U
Cis-1,3-Dichloropropene	UG/M3	0.2 U	0.41 U	0.2 UJ	0.2 U	0.2 UJ	0.41 U	0.2 U	0.82 U
Cyclohexane	UG/M3	**5.3**	0.22 U	**0.32 J**	**0.43 J**	**3.9 J**	0.22 U	**1**	0.44 U
Cymene	UG/M3	0.34 U	0.67 U	0.34 UJ	0.34 U	0.34 UJ	0.67 U	0.34 U	1.3 U
Dibromochloromethane	UG/M3	0.13 U	0.26 U	0.13 UJ	0.13 U	0.13 UJ	0.26 U	0.13 U	0.52 U
Dichlorodifluoromethane	UG/M3	**3.1**	**3.4 J**	**2.9 J**	**2.4 J**	**4.3 J**	**3.3 J**	**2.8**	**5.2 J**
Ethylbenzene	UG/M3	**3.5**	0.45 U	**3.3 J**	**3.5**	**6.9 J**	0.45 U	**4**	0.9 U
Hexachlorobutadiene	UG/M3	1.2 U	2.3 U	1.2 UJ	1.2 U	1.2 UJ	2.3 U	1.2 U	4.7 U
Isopropanol	UG/M3	**4 J**	7.9 U	3.9 UJ	**5 J**	**3.9 J**	7.9 U	3.9 U	16 U
Isopropylbenzene (Cumene)	UG/M3	0.2 U	0.4 U	0.2 UJ	0.2 U	**0.64 J**	0.4 U	0.2 U	0.81 U
m,p-Xylene	UG/M3	**9.8**	**2.2 J**	**12 J**	**14**	**28 J**	**2.7 J**	**17**	1.7 U
Methyl Ethyl Ketone (2-Butanone)	UG/M3	**4**	2.9 U	**1.8 J**	**1.6**	**10 J**	**4.1**	**1.8**	5.8 U
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	UG/M3	0.53 U	1.1 U	0.53 UJ	0.53 U	**0.86 J**	1.1 U	0.53 U	2.1 U
Methyl Methacrylate	UG/M3	0.57 U	1.1 U	0.57 UJ	0.57 U	0.57 UJ	1.1 U	0.57 U	2.3 U
Methylene Chloride	UG/M3	0.63 U	1.3 U	0.63 UJ	0.63 U	0.63 UJ	1.3 U	0.63 U	2.5 U
Naphthalene	UG/M3	1.6 U	3.1 U	1.6 UJ	1.6 U	1.6 UJ	3.1 U	1.6 U	6.3 U
N-Butylbenzene	UG/M3	0.6 U	1.2 U	0.6 UJ	0.6 U	0.6 UJ	1.2 U	0.6 U	2.4 U
N-Heptane	UG/M3	0.23 U	**1.6**	**1.6 J**	**2.6 J**	**2.4 J**	0.45 U	**1.1**	0.9 U
N-Hexane	UG/M3	**2**	**38**	**0.95 J**	**1.1 J**	**2.3 J**	**1.4 J**	**1.6 J**	1.6 U
N-Propylbenzene	UG/M3	0.23 U	0.46 U	0.23 UJ	0.23 U	**0.62 J**	0.46 U	0.23 U	0.92 U
O-Xylene (1,2-Dimethylbenzene)	UG/M3	**2**	0.45 U	**3.3 J**	**3.8**	**8 J**	**0.94 J**	**4.5**	0.9 U
Sec-Butylbenzene	UG/M3	0.25 U	0.49 U	0.25 UJ	0.25 U	0.25 UJ	0.49 U	0.25 U	0.99 U
Styrene	UG/M3	0.25 U	0.5 U	0.25 UJ	0.25 U	0.25 UJ	0.5 U	0.25 U	1 U
T-Butylbenzene	UG/M3	0.26 U	0.52 U	0.26 UJ	0.26 U	0.26 UJ	0.52 U	0.26 U	1 U
Tert-Butyl Alcohol	UG/M3	**18**	7.3 U	**16 J**	**19**	**18 J**	**8.9 J**	**13 J**	15 U
Tert-Butyl Methyl Ether	UG/M3	0.13 U	0.26 U	0.13 UJ	0.13 U	0.13 UJ	0.26 U	0.13 U	0.52 U
Tetrachloroethylene (PCE)	UG/M3	**1.2 J**	0.28 U	**9.8 J**	**1.7 R**	**2 R**	0.28 U	**1.5**	0.57 U
Tetrahydrofuran	UG/M3	3.8 U	7.7 U	3.8 UJ	3.8 U	3.8 UJ	7.7 U	3.8 U	15 U
Toluene	UG/M3	**19**	**1.9**	**2.6 J**	**2.8**	**3.9 J**	**2.3**	**3.8**	**2 J**
Trans-1,2-Dichloroethene	UG/M3	0.091 U	0.18 U	0.091 UJ	0.091 U	0.091 UJ	0.18 U	0.091 U	0.36 U
Trans-1,3-Dichloropropene	UG/M3	0.25 U	0.49 U	0.25 UJ	0.25 U	0.25 UJ	0.49 U	0.25 U	0.98 U
Trichloroethylene (TCE)	UG/M3	0.13 U	0.27 U	**4.1 J**	**3.5**	0.13 UJ	0.27 U	0.13 U	0.54 U
Trichlorofluoromethane	UG/M3	**1.4**	**2.5**	**1.5 J**	**1.4**	**2.3 J**	**2.2**	**1.6**	1.1 U
Vinyl Bromide	UG/M3	0.22 U	0.44 U	0.22 UJ	0.22 U	0.22 UJ	0.44 U	0.22 U	0.88 U
Vinyl Chloride	UG/M3	0.054 U	0.11 U	0.054 UJ	0.054 U	0.054 UJ	0.11 U	0.054 U	0.21 U

Table 14. Summary of Volatile Organic Compounds in Soil Vapor not Associated with Soil Vapor Intrusion, 35-18 Steinway Street, Astoria, Queens, New York

Sample Designation:		RSV-8	RSV-9
Sample Date:		12/19/2025	12/19/2025
Normal Sample or Field Duplicate:		N	N
Parameter	Units		
1,1,1-Trichloroethane (TCA)	UG/M3	0.24 U	0.24 U
1,1,2,2-Tetrachloroethane	UG/M3	0.3 U	0.3 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	UG/M3	**0.54 J**	**0.59 J**
1,1,2-Trichloroethane	UG/M3	0.4 U	0.4 U
1,1-Dichloroethane	UG/M3	0.1 U	0.1 U
1,1-Dichloroethene	UG/M3	0.1 U	0.1 U
1,2,4-Trichlorobenzene	UG/M3	0.38 U	0.38 U
1,2,4-Trimethylbenzene	UG/M3	0.39 U	0.39 U
1,2-Dibromoethane (Ethylene Dibromide)	UG/M3	0.32 U	0.32 U
1,2-Dichlorobenzene	UG/M3	0.4 U	0.4 U
1,2-Dichloroethane	UG/M3	0.38 U	0.38 U
1,2-Dichloropropane	UG/M3	0.43 U	0.43 U
1,2-Dichlorotetrafluoroethane	UG/M3	0.34 U	0.34 U
1,3,5-Trimethylbenzene (Mesitylene)	UG/M3	0.23 U	0.23 U
1,3-Butadiene	UG/M3	0.086 U	0.086 U
1,3-Dichlorobenzene	UG/M3	0.45 U	0.45 U
1,4-Dichlorobenzene	UG/M3	0.54 U	0.54 U
1,4-Dioxane (P-Dioxane)	UG/M3	0.17 U	**1.7 J**
2,2,4-Trimethylpentane	UG/M3	**2.4**	**8.3**
2-Chlorotoluene	UG/M3	0.24 U	0.24 U
2-Hexanone	UG/M3	0.62 U	0.62 U
4-Ethyltoluene	UG/M3	**1.5**	0.24 U
Acetone	UG/M3	**81 D**	**210 D**
Allyl Chloride (3-Chloropropene)	UG/M3	0.38 U	0.38 U
Benzene	UG/M3	**2.8**	**1.4**
Benzyl Chloride	UG/M3	0.46 U	0.46 U
Bromodichloromethane	UG/M3	0.34 U	0.34 U
Bromoform	UG/M3	1.2 U	1.2 U
Bromomethane	UG/M3	0.28 U	0.28 U
Butane	UG/M3	**12**	**25**
Carbon Disulfide	UG/M3	**0.85 J**	**2**
Carbon Tetrachloride	UG/M3	0.14 U	**0.56**
Chlorobenzene	UG/M3	0.2 U	0.2 U
Chlorodifluoromethane	UG/M3	0.42 U	0.42 U
Chloroethane	UG/M3	0.48 U	0.48 U
Chloroform	UG/M3	**0.68 J**	**3.2**

Table 14. Summary of Volatile Organic Compounds in Soil Vapor not Associated with Soil Vapor Intrusion, 35-18 Steinway Street, Astoria, Queens, New York

Sample Designation:		RSV-8	RSV-9
Sample Date:		12/19/2025	12/19/2025
Normal Sample or Field Duplicate:		N	N
Parameter	Units		
Chloromethane	UG/M3	0.31 U	0.31 U
Cis-1,2-Dichloroethylene	UG/M3	0.083 U	0.083 U
Cis-1,3-Dichloropropene	UG/M3	0.2 U	0.2 U
Cyclohexane	UG/M3	**1.7**	**7.3**
Cymene	UG/M3	0.34 U	0.34 U
Dibromochloromethane	UG/M3	0.13 U	0.13 U
Dichlorodifluoromethane	UG/M3	**2.4 J**	**2.6**
Ethylbenzene	UG/M3	**69**	**6.3**
Hexachlorobutadiene	UG/M3	1.2 U	1.2 U
Isopropanol	UG/M3	**10 J**	**8.9 J**
Isopropylbenzene (Cumene)	UG/M3	0.2 U	0.2 U
m,p-Xylene	UG/M3	**200**	**24**
Methyl Ethyl Ketone (2-Butanone)	UG/M3	**4.6**	**13**
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	UG/M3	**0.61 J**	0.53 U
Methyl Methacrylate	UG/M3	0.57 U	0.57 U
Methylene Chloride	UG/M3	**4.1**	0.63 U
Naphthalene	UG/M3	1.6 U	1.6 U
N-Butylbenzene	UG/M3	0.6 U	0.6 U
N-Heptane	UG/M3	**1.7**	**3.7**
N-Hexane	UG/M3	**5**	**10**
N-Propylbenzene	UG/M3	0.23 U	0.23 U
O-Xylene (1,2-Dimethylbenzene)	UG/M3	**38**	**5.4**
Sec-Butylbenzene	UG/M3	0.25 U	0.25 U
Styrene	UG/M3	0.25 U	0.25 U
T-Butylbenzene	UG/M3	0.26 U	0.26 U
Tert-Butyl Alcohol	UG/M3	**7.8 J**	**42**
Tert-Butyl Methyl Ether	UG/M3	0.13 U	0.13 U
Tetrachloroethylene (PCE)	UG/M3	**2.1**	**20**
Tetrahydrofuran	UG/M3	3.8 U	3.8 U
Toluene	UG/M3	**15**	**3.5**
Trans-1,2-Dichloroethene	UG/M3	0.091 U	0.091 U
Trans-1,3-Dichloropropene	UG/M3	0.25 U	0.25 U
Trichloroethylene (TCE)	UG/M3	0.13 U	**0.95**
Trichlorofluoromethane	UG/M3	**1.8**	**1.8**
Vinyl Bromide	UG/M3	0.22 U	0.22 U
Vinyl Chloride	UG/M3	0.054 U	0.054 U

Table 15. Remedial Alternative 1 Remedial Cost Estimate, 35-18 Steinway Street, New York, New York

Item No.	Description of Remedial Item	Estimated Quantity	Unit	Unit Price	Cost
REMEDIAL ACTION CONTRACTOR FEES					
1	General Conditions: Personnel, tools/storage, and office oversight.	1	LS	$745,000	$745,000
2	General Requirements: Security, safety, utility consumption, temporary electric, signage, temporary faciltites, survey, schedule, and pest control.	1	LS	$931,000	$931,000
3	Sitework: Fencing, sidewalk protection, clear/demolish site, and erosion and sediment control.	1	LS	$561,000	$561,000
4	Support of Excavation: Support of excavation to reach remedial excavation depths.	1	LS	$2,391,000	$2,391,000
5	Dewatering and Water Treatment: Dewatering to reach remedial excavation depths. Includes permitting and discharge fees.	1	LS	$491,000	$491,000
6	Soil Excavation and Loading of Material: Accounts for remedial excavation of material containing concentrations exceeding Track 1 Unrestricted Use Soil Cleanup Objectives.	1	LS	$977,500	$977,500
7	Transport and Disposal of Excavated Material: Includes transport vehicles and disposal soil exceeding Track 1 Unrestricted Use Soil Cleanup Objectives.	12750	TON	$72	$918,000
8	Backfill: Includes backfill meeting UUSCOs for the areas excavated below the redevelopment depth.	260	CY	$55	$14,300
REMEDIAL ACTION CONTRACTOR FEES SUBTOTAL					**$7,028,800**
ENGINEERING FEES/SUPPLEMENTAL BCP COSTS					
1	Remedial Investigation/Waste Characterization: To delineate nature and extent of contamination and classify material to be excavated for off-site disposal.	1	LS	$360,900	$361,000
2	Confirmation Sampling: To confirm Track 1 is achieved. Includes 47 confirmation bottom endpoint samples and eight confirmation sidewall samples analyzed for full list of Part 375 parameters and emerging contaminants.	1	LS	$100,000	$100,000
3	Remediation Oversight and CAMP: This cost includes full time field oversight/CAMP implementation and office support, as well as equipment rental fees associated with implementation of CAMP, which will be performed during excavation.	6	MONTH	$43,200	$259,200
5	BCP Engineering Services/BCP Regulatory Coordination/BCP Legal Fees: RAWP development, SOE Design, SWPPP Preparation/Implementation, Legal Support, Construction Manager Regulatory/Team Coordination, Construction Meetings and Construction Administration, Brownfield Cleanup Program Consultation, Vibration Monitoring for Adjacent Structures and Technical Support, Citizens Participation Activities and Final Engineering Report.	1	LS	$400,000	$400,000
ENGINEERING FEES/SUPPLEMENTAL BCP COSTS SUBTOTAL					**$1,120,200**
			Total Estimated Cost		**$8,149,000**

Table 16. Remedial Alternative 2 Remedial Cost Estimate, 35-18 Steinway Street, New York, New York

Item No.	Description of Environmental Item	Estimated Quantity	Unit	Unit Price	Cost
REMEDIAL ACTION CONTRACTOR FEES					
1	General Conditions: Personnel, tools/storage, and office oversight.	1	LS	$745,000	$745,000
2	General Requirements: Security, safety, utility consumption, temporary electric, signage, temporary faciltites, survey, schedule, and pest control.	1	LS	$931,000	$931,000
3	Sitework: Fencing, sidewalk protection, clear/demolish site, and erosion and sediment control.	1	LS	$561,000	$561,000
4	Support of Excavation: Support of excavation to reach remedial excavation depths.	1	LS	$1,167,371	$1,167,400
5	Soil Excavation and Loading of Material: Accounts for remedial excavation of material containing concentrations exceeding Track 2 RRSCOs to a maximum depth of 15 feet below land surface.	1	LS	$477,250	$477,250
6	Transport and Disposal of Excavated Material: Includes transport vehicles and disposal soil exceedingTrack 2 Restricted Residential Use Soil Cleanup Objectives.	6225	TON	$72	$448,200
REMEDIAL ACTION CONTRACTOR FEES SUBTOTAL					**$4,329,900**
ENGINEERING FEES/SUPPLEMENTAL BCP COSTS					
1	Remedial Investigation/Waste characterization: To delineate nature and extent of contamination and classify material to be excavated for off-site disposal.	1	LS	$360,900	$361,000
2	Confirmation Sampling: To confirm Track 2 is achieved. Includes 16 confirmation bottom endpoint samples analyzed for full list of Part 375 parameters and emerging contaminants.	1	LS	$30,000	$30,000
3	Remediation Oversight and CAMP: This cost includes full time field oversight/CAMP implementation and office support, as well as equipment rental fees associated with implementation of CAMP, which will be performed during excavation.	4	MONTH	$43,200	$172,800
5	BCP Engineering Services/BCP Regulatory Coordination/BCP Legal Fees: RAWP development, SOE Design, SWPPP Preparation/Implementation, Legal Support, Construction Manager Regulatory/Team Coordination, Construction Meetings and Construction Administration, Brownfield Cleanup Program Consultation, Vibration Monitoring for Adjacent Structures and Technical Support, Citizens Participation Activities, Final Engineering Report, Environmental Easement and Site Management Plan.	1	LS	$400,000	$400,000
ENGINEERING FEES/SUPPLEMENTAL BCP COSTS SUBTOTAL					**$963,800**
			Total Estimated Cost		**$5,293,700**
Annual Inspection and Reporting Cost					
	Annual Inspection of Institutional Controls and Periodic Review Report	1	LS	$10,000	$10,000

LS - Lump Sum
CY - Cubic Yard
RRSCOs - Restricted Residential Cleanup Objectives
CAMP - Community Air Monitoring Plan
BCP - Brownfield Cleanup Program
RAWP - Remedial Action Work Plan
SOE - Support of Excavation
SWPPP - Stormwater Pollution Prevention Plan

Table 17. Remedial Alternative 3 Remedial Cost Estimate, 35-18 Steinway Street, New York, New York

Item No.	Description of Environmental Item	Estimated Quantity	Unit	Unit Price	Cost
REMEDIAL ACTION CONTRACTOR FEES					
1	General Conditions: Personnel, tools/storage, and office oversight.	1	LS	$745,000	$745,000
2	General Requirements: Security, safety, utility consumption, temporary electric, signage, temporary faciltites, survey, schedule, and pest control.	1	LS	$931,000	$931,000
3	Sitework: Fencing, sidewalk protection, clear/demolish site, and erosion and sediment control.	1	LS	$561,000	$561,000
4	Soil Excavation and Loading of Material: Accounts for remedial excavation of soil with concentrations exceeding RRSCOs in the top two feet.	1	LS	$132,250	$132,250
5	Transport and Disposal of Excavated Material: Includes transport vehicles and disposal soil exceedingTrack 2 Restricted Residential Use Soil Cleanup Objectives.	1800	TON	$72	$129,600
6	Site Cover System: Includes concrete bulding foundation and subbase material.	32172	SF	$30	$965,160
REMEDIAL ACTION CONTRACTOR FEES SUBTOTAL					**$3,464,100**
ENGINEERING FEES/SUPPLEMENTAL BCP COSTS					
1	Remedial Investigation/Waste characterization: To delineate nature and extent of contamination and classify material to be excavated for off-site disposal.	1	LS	$360,900	$361,000
2	Confirmation Sampling: To document remaining contamination in areas excavated to two feet below land surface. Includes 16 documentation bottom endpoint samples analyzed for full list of Part 375 parameters and emerging contaminants.	1	LS	$30,000	$30,000
3	Remediation Oversight and CAMP: This cost includes full time field oversight/CAMP implementation and office support, as well as equipment rental fees associated with implementation of CAMP, which will be performed during excavation.	3	MONTH	$43,200	$129,600
5	BCP Engineering Services/BCP Regulatory Coordination/BCP Legal Fees: RAWP development, SOE Design, SWPPP Preparation/Implementation, Legal Support, Construction Manager Regulatory/Team Coordination, Construction Meetings and Construction Administration, Brownfield Cleanup Program Consultation, Vibration Monitoring for Adjacent Structures and Technical Support, Citizens Participation Activities, Final Engineering Report, Environmental Easement and Site Management Plan.	1	LS	$400,000	$400,000
ENGINEERING FEES/SUPPLEMENTAL BCP COSTS SUBTOTAL					**$920,600**
			Total Estimated Cost		**$4,384,700**
Annual Inspection and Reporting Cost					
	Annual Inspection of Engineering and Institutional Controls and Periodic Review Report	1	LS	$10,000	$10,000

LS - Lump Sum
CY - Cubic Yard
SF - Square Feet
RRSCOs - Restricted Residential Cleanup Objectives
CAMP - Community Air Monitoring Plan
BCP - Brownfield Cleanup Program
RAWP - Remedial Action Work Plan
SOE - Support of Excavation
SWPPP - Stormwater Pollution Prevention Plan

Table 18. Summary of Permits/Approvals, 35-18 Steinway Street, Astoria, Queens, New York

Regulatory Agency	Permit
NYCDEP	Dewatering Permit and Sewer Discharge Permit (for temporary discharge during construction)
NYCDEP	Sewer Certification and Sewer Permit (for new building connection)
NYCDEP	Fire Hydrant Permit
NYCDOB	Demolition Permit
NYCDOB	New Building (NB) Permit
NYCDOB	Fence Permit
NYCDOB	Foundation/Earthwork Permit
NYCDOB	Builder's Paving Plan
NYCDOB	Underground Plumbing Permit
NYCTA	Plan review and no impact determination
NYSDEC	Water Withdrawal Permit

Note: This list only accounts for permits required from the street level and below. Permits for aboveground portions of the building are not listed.

NYCCPC - New York City City Planning Commission

NYCDEP - New York City Department of Environmental Protection

NYCDOB - New York City Department of Buildings

NYCDOT - New York City Department of Transportation

NYCDPR - New York City Department of Parks & Recreation

NYCTA - New York City Transit Authority

NYSDEC - New York State Department of Environmental Conservation

Table 19. Track 1 Soil Cleanup Objectives, 35-18 Steinway Street, Astoria, Queens, New York

Parameter	Track 1 Soil Cleanup Objectives[1]	Track 2/4 Soil Cleanup Objectives[2]
Volatile Organic Compounds (Concentrations in µg/kg)		
1,1,1-Trichloroethane	680	100000
1,1-Dichloroethane	270	47000
1,1-Dichloroethene	240	980
1,2,4-Trimethylbenzene	5900	100000
1,3,5-Trimethylbenzene	3100	100000
1,2-Dichlorobenzene	1100	100000
1,2-Dichloroethane	20	5800
1,3-Dichlorobenzene	2600	38000
1,4-Dichlorobenzene	1800	24000
2-Butanone (MEK)	100	100000
Acetone	30	100000
Benzene	60	3700
n-Butylbenzene	18000	100000
Carbon tetrachloride	760	7100
Chlorobenzene	4500	100000
Chloroform	370	24000
cis-1,2-Dichloroethene	190	41000
Ethylbenzene	1000	76000
m,p-Xylene	260	100000
Methylene chloride	50	81000
MTBE	100	100000
n-Propylbenzene	5000	100000
o-Xylene	260	100000
sec-Butylbenzene	25000	100000
tert-Butylbenzene	11000	100000
Tetrachloroethene	1300	18000
Toluene	700	100000
trans-1,2-Dichloroethene	190	100000
Trichloroethene	470	6400
Vinyl chloride	30	480
Xylenes (total)	260	100000
Semivolatile Organic Compounds (Concentrations in µg/kg)		
1,4-Dioxane	100	5700
2-Methylphenol	330	100000
3&4-Methylphenol	330	100000
Acenaphthene	20000	100000
Acenaphthylene	100000	100000
Anthracene	100000	100000
Benzo[a]anthracene	1000	1400
Benzo[a]pyrene	1000	1000
Benzo[b]fluoranthene	1000	1400
Benzo[g,h,i]perylene	640	4900
Benzo[k]fluoranthene	800	4900
Chrysene	1000	4900
Cresols, M&P	330	100000
Dibenzo[a,h]anthracene	330	330
Dibenzofuran	2100	18000
Fluoranthene	85000	100000
Fluorene	30000	100000
Hexachlorobenzene	330	330
Indeno[1,2,3-cd]pyrene	500	1400
Naphthalene	12000	100000
Nitrobenzene	80	1800
Pentachlorophenol	800	1300
Phenanthrene	1100	4900
Phenol	330	100000
Pyrene	64000	100000

Table 19. Track 1 Soil Cleanup Objectives, 35-18 Steinway Street, Astoria, Queens, New York

Parameter	Track 1 Soil Cleanup Objectives[1]	Track 2/4 Soil Cleanup Objectives[2]
Metals (Concentrations in mg/kg)		
Arsenic	13	16
Barium	410	410
Beryllium	4.4	43
Cadmium	2.5	2.5
Chromium, Trivalent	30	110
Chromium, Hexavalent	1	1
Chromium	30	110
Copper	50	280
Cyanide, Total	2.3	13
Lead	63	400
Manganese	1600	2000
Mercury	0.18	0.3
Nickel	30	320
Selenium	3.9	110
Silver	2	110
Zinc	109	6600
Pesticides (Concentrations in µg/kg)		
Aldrin	4.8	44
Alpha Bhc (Alpha Hexachlorocyclohexane)	20	180
Alpha Endosulfan	4300	35000
Beta Bhc (Beta Hexachlorocyclohexane)	21	180
Beta Endosulfan	4300	35000
cis-Chlordane	14	650
Delta BHC (Delta Hexachlorocyclohexane)	40	100000
Dieldrin	5	75
Endosulfan Sulfate	4300	35000
Endrin	14	5300
Gamma Bhc (Lindane)	25	210
Heptachlor	13	530
P,P'-DDD	3.3	5000
P,P'-DDE	3.3	3400
P,P'-DDT	3.3	3800
Perfluorinated Alkyl Acids (Concentrations in µg/kg)		
1H,1H,2H,2H-PERFLUORODECANESULFONIC ACID (8:2FTS)	--	--
1H,1H,2H,2H-PERFLUOROOCTANESULFONIC ACID (6:2FTS)	--	--
N-ETHYL PERFLUOROOCTANESULFONAMIDOACETIC ACID (NETFOSAA)	--	--
N-METHYL PERFLUOROOCTANESULFONAMIDOACETIC ACID (NMEFOSAA)	--	--
PERFLUOROBUTANESULFONIC ACID (PFBS)	--	--
PERFLUOROBUTANOIC ACID (PFBA)	--	--
PERFLUORODECANESULFONIC ACID (PFDS)	--	--
PERFLUORODECANOIC ACID (PFDA)	--	--
PERFLUORODODECANOIC ACID (PFDOA)	--	--
PERFLUOROHEPTANESULFONIC ACID (PFHPS)	--	--
PERFLUOROHEPTANOIC ACID (PFHPA)	--	--
PERFLUOROHEXANESULFONIC ACID (PFHXS)	--	--
PERFLUOROHEXANOIC ACID (PFHXA)	--	--
PERFLUORONONANOIC ACID (PFNA)	--	--
PERFLUOROOCTANESULFONAMIDE (FOSA)	--	--
PERFLUOROOCTANESULFONIC ACID (PFOS)	0.88[4]	44
PERFLUOROOCTANOIC ACID (PFOA)	0.66[4]	33
PERFLUOROPENTANOIC ACID (PFPEA)	--	--
PERFLUOROTETRADECANOIC ACID (PFTA)	--	--
PERFLUOROTRIDECANOIC ACID (PFTRDA)	--	--
PERFLUOROUNDECANOIC ACID (PFUNA)	--	--
PFOA/PFOS, TOTAL	--	--

1- Soil cleanup objectives for the Track 1 remedy are the NYSDEC Part 375 Unrestricted Use SCOs.
2- Soil cleanup objectives for the Track 2 and Track 4 remedy are the NYSDEC Part 375 Restricted Residential Use SCOs.
3- Soil cleanup objectives for imported clean fill for the Track 2 and Track 4 remedy are the lower of NYSDEC Part 375 Protection of Groundwater SCOs or Restricted Residential SCOs.
4 - SCOs for PFOS and PFOA not yet final. The guidance values shown are to be used until SCOs are in effect.
µg/kg - Micrograms per kilogram
mg/kg - Milligrams per kilogram
NYSDEC - New York State Department of Environmental Conservation
SCOs - Soil Cleanup Objectives

Table 20. Proposed Documentation/Confirmation Soil Sample Identifications and Depths
35-18 Steinway Street, Astoria, Queens, New York

	Sample Identification	Waste Characterization Grid	Starting Elevation	elevation	Proposed Remedial Excavation Elevation (ft NAVD88)	Proposed Remedial Excavation Depth (ft)[4]	Sample Elevation Interval (ft NAVD88)	Sample Depth Interval (ft bls)
Bottom Confirmation Soil Samples								
1	BCS-1	WC-1	38	34	-1	4	-1 to -3	4 to 6
2	BCS-2	WC-1	39	35	-1	4	-1 to -3	4 to 6
3	BCS-3	WC-2	39.5	35.5	-3.5	4	-3.5 to -5.5	4 to 6
4	BCS-4	WC-2	39.5	35.5	-1	4	-1 to -3	4 to 6
5	BCS-5	WC-3	40.5	33.5	-1	7	-1 to -3	7 to 9
6	BCS-6	WC-3	41	34	4	7	4 to 2	7 to 9
7	BCS-7	WC-1	38.5	34.5	4	4	4 to 2	4 to 6
8	BCS-8	WC-1	39.5	35.5	4	4	4 to 2	4 to 6
9	BCS-9	WC-2	40	36	4	4	4 to 2	4 to 6
10	BCS-10	WC-2	40	36	4	4	4 to 2	4 to 6
11	BCS-11	WC-3	41	34	-1	7	-1 to -3	7 to 9
12	BCS-12	WC-3	41	34	-1	7	-1 to -3	7 to 9
13	BCS-13	WC-1	38.5	34.5	-1	4	-1 to -3	4 to 6
14	BCS-14	WC-1	39.5	35.5	-1	4	-1 to -3	4 to 6
15	BCS-15	WC-2	40	36	-1	4	-1 to -3	4 to 6
16	BCS-16	WC-2	40	36	-1	4	-1 to -3	4 to 6
17	BCS-17	WC-3	40	33	10	7	10 to 8	7 to 9
18	BCS-18	WC-3	41	34	3	7	4 to 2	7 to 9
19	BCS-19	WC-4	39	31	3	8	4 to 2	8 to 10
20	BCS-20	WC-4	40	32	5	8	5 to 3	8 to 10
21	BCS-21	WC-5	40.5	32.5	5	8	5 to 3	8 to 10
22	BCS-22	WC-5	40.5	32.5	5	8	5 to 3	8 to 10
23	BCS-23	WC-6	41	40	5	1	5 to 3	1 to 3
24	BCS-24	WC-6	41.5	40.5	10	1	10 to 8	1 to 3
25	BCS-25	WC-4	39.5	31.5	10	8	10 to 8	8 to 10
26	BCS-26	WC-4	40	32	10	8	10 to 8	8 to 10
27	BCS-27	WC-5	40.5	32.5	10	8	10 to 8	8 to 10
28	BCS-28	WC-5	40	32	4	8	4 to 2	8 to 10
29	BCS-29	WC-6	41	40	4	1	4 to 2	1 to 3
30	BCS-30	WC-6	41.5	40.5	4	1	4 to 2	1 to 3
31	BCS-31	WC-4	39.5	31.5	4	8	4 to 2	8 to 10
32	BCS-32	WC-4	40	32	10	8	10 to 8	8 to 10
33	BCS-33	WC-5	41	19	10	22	10 to 8	22 to 24
34	BCS-34	WC-5	41	33	10	8	10 to 8	8 to 10
35	BCS-35	WC-6	41	40	10	1	10 to 8	1 to 3
36	BCS-36	WC-6	41.5	40.5	9	1	9 to 7	1 to 3
37	BCS-37	WC-7	39.5	31.5	9	8	9 to 7	8 to 10
38	BCS-38	WC-7	40.5	18.5	9	22	9 to 7	22 to 24
39	BCS-39	WC-7	41	19	9	22	9 to 7	22 to 24
40	BCS-40	WC-7	41.5	19.5	10	22	10 to 8	22 to 24
41	BCS-41	WC-8	41.5	29.5	10	12	10 to 8	12 to 14
42	BCS-42	WC-8	42	30	10	12	10 to 8	12 to 14
43	BCS-43	WC-8	41	37	10	4	10 to 8	4 to 6
44	BCS-44	WC-8	41.5	37.5	10	4	10 to 8	4 to 6
45	BCS-45	WC-8	42	38	10	4	10 to 8	4 to 6
46	BCS-46	WC-7	39.5	31.5	7	8	7 to 5	8 to 10
47	BCS-47	WC-7	40.5	18.5	7	22	7 to 5	22 to 24
48	SCS-1	WC-7	40	18	7	22	7 to 5	20 to 22
49	SCS-2	WC-7	40	18	7	22	7 to 5	20 to 22
50	SCS-3	WC-5	40.5	18.5	7	22	7 to 5	20 to 22
51	SCS-4	WC-5	40.5	18.5	7	22	7 to 5	20 to 22
52	SCS-5	WC-5	41	19	7	22	7 to 5	20 to 22
53	SCS-6	WC-7	41	19	7	22	7 to 5	20 to 22
54	SCS-7	WC-7	41	19	7	22	7 to 5	20 to 22
55	SCS-8	WC-7	41	19	7	22	7 to 5	20 to 22

Notes:

1. All samples will be analyzed for full Part 375 list of parameters and emerging contaminants.

2. The topography of the Site is sloped toward the northwest. Therefore, the excavation depth required to reach the remedial elevations shown is lower on the northwest portion of the Site compared to the southeast portion of the Site.

3. Confirmation sampling frequency is one sample per 900 square feet. Locations are approximate. All end point samples will be biased toward impacted soil, if any is observed in the vicinity of the proposed location.

ft - feet

NAVD88 - North American Vertical Datum of 1988

bls - below land surface

BCS - Bottom Confirmation Sample

NA - Not applicable

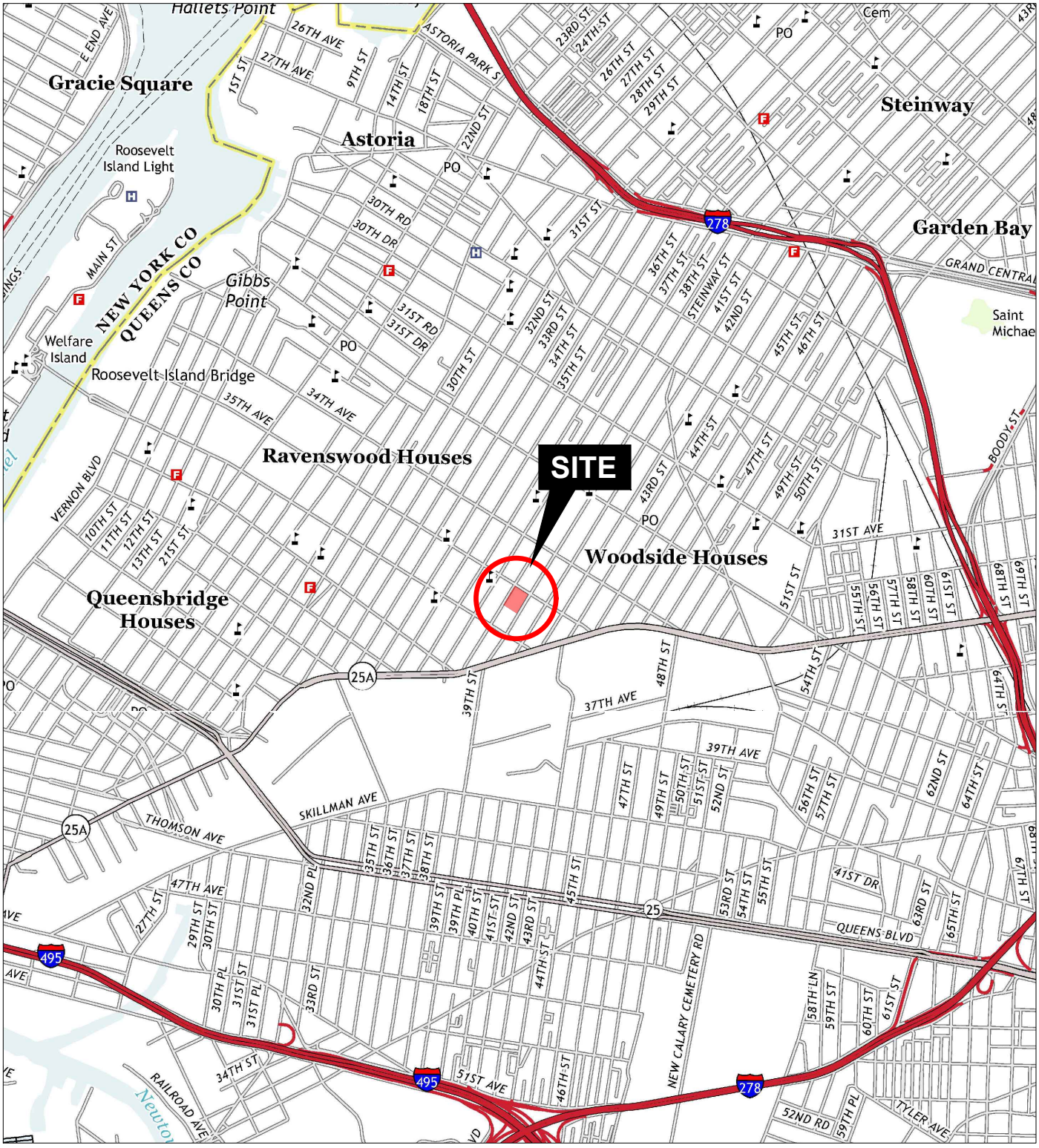
FIGURES

1. Site Location Map
2. Existing Site Plan with Sampling Locations
3. Groundwater Contour Map, December 18, 2025
4. Summary of Exceedances in Soil
5. Summary of Exceedances in Groundwater
6. Summary of Detections in Soil Vapor
7. Remedial Alternative 1: Track 1 Unrestricted Use Cleanup
8. Remedial Alternative 2: Track 2 Restricted Residential Use Cleanup

9A. Remedial Alternative 3: Track 4 Restricted Residential Use Cleanup – Proposed Excavation

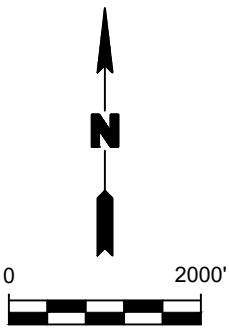
9B. Remedial Alternative 3: Track 4 Restricted Residential Use Cleanup – Proposed Site Cover System Details

10. Truck Routes



QUADRANGLE LOCATION

SOURCE:
USGS, 2013, Brooklyn, NY
USGS, 2013, Central Park, NY
7.5 Minute Topographic Quadrangle



Title:

SITE LOCATION MAP

35-18 STEINWAY STREET
ASTORIA, QUEENS, NEW YORK

Prepared for:

LMXD INNOQ B1 LLC
STEINWAY 1 OWNER LLC

ROUX

Compiled by: J.R.	Date: 08JAN26
Prepared by: G.M.	Scale: AS SHOWN
Project Mgr: J.R.	Project: 4806.0001Y000
File: 4806.0001Y113.06.DWG	

FIGURE 1

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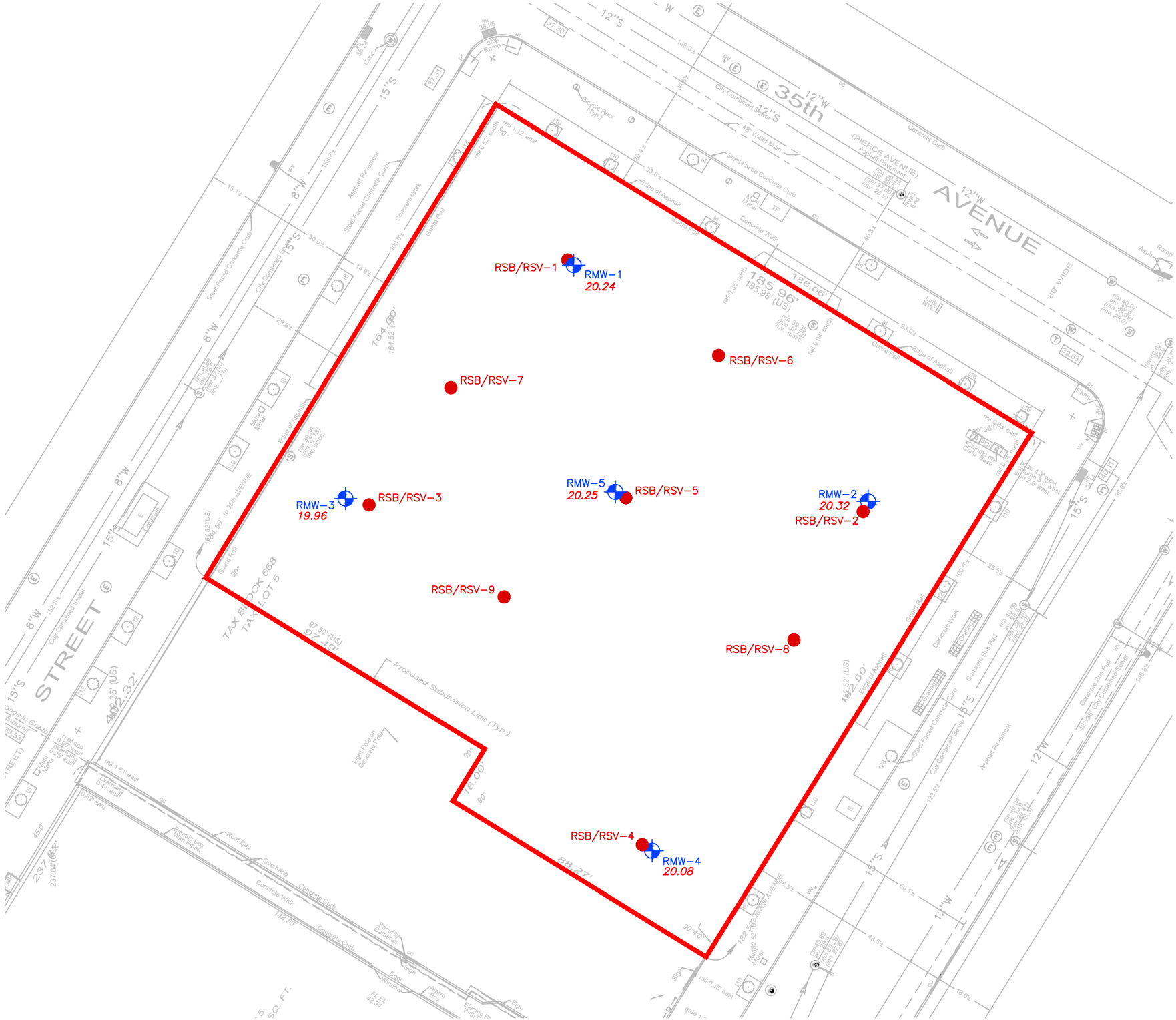

LEGEND

SITE BOUNDARY

BCP REMEDIAL INVESTIGATION SAMPLING LOCATIONS

RSB–1/ RSV–1 — SOIL BORING/SOIL VAPOR SAMPLING LOCATION AND DESIGNATION

RMW–1 — MONITORING WELL SAMPLING LOCATION AND DESIGNATION

N

30' 0 30'

Title:

SITE PLAN WITH SAMPLING LOCATIONS

35-18 STEINWAY STREET
ASTORIA, QUEENS, NEW YORK

Prepared for:

LMXD INNOQ B1 LLC
STEINWAY 1 OWNER LLC

ROUX

Compiled by: J.R.	Date: 1/28/2026	FIGURE
Prepared by: G.M.	Scale: AS SHOWN	2
Project Mgr: N.C.	Project: 4806.0001Y000	
File: 4806.0001Y113.07.DWG		

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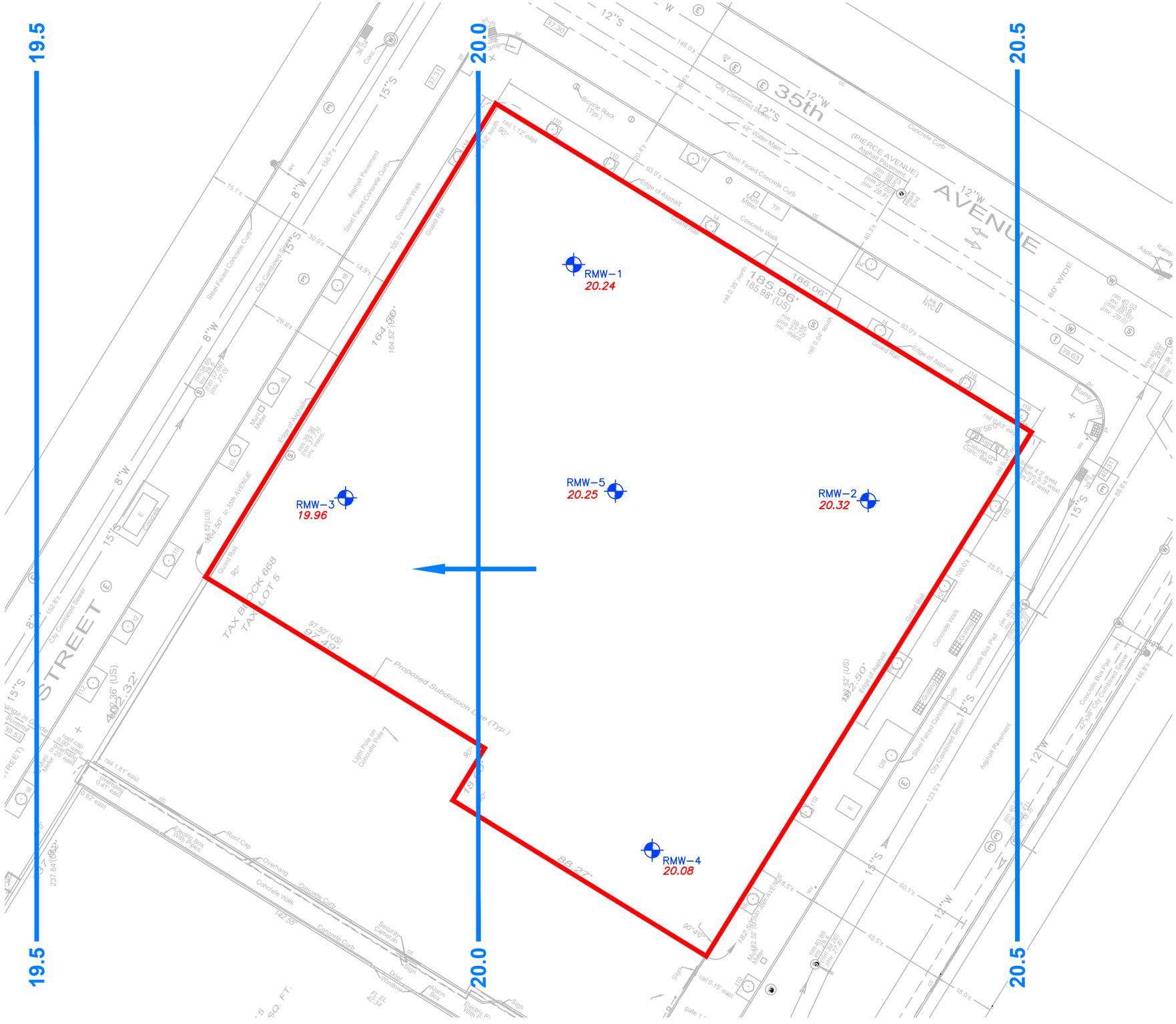

LEGEND

SITE BOUNDARY

BCP REMEDIAL INVESTIGATION SAMPLING LOCATIONS

RMW–1 — MONITORING WELL SAMPLING LOCATION AND DESIGNATION

20.24 — GROUNDWATER ELEVATION IN FEET (NAVD 88)

20.0 — LINE OF EQUAL GROUNDWATER ELEVATION IN FEET (NAVD 88)

INFERRED GROUNDWATER FLOW DIRECTION

NOTE

NAVD 88 – NORTH AMERICAN VERTICAL DATUM 1988.

N

30' 0 30'

Title:

GROUNDWATER CONTOUR MAP DECEMBER 18, 2025

35-18 STEINWAY STREET
ASTORIA, QUEENS, NEW YORK

Prepared for:

LMXD INNOQ B1 LLC
STEINWAY 1 OWNER LLC

ROUX

Compiled by: J.R.	Date: 1/28/2026	FIGURE 3
Prepared by: G.M.	Scale: AS SHOWN	
Project Mgr: N.C.	Project: 4806.0001Y000	
File: 4806.0001Y113.07.DWG		

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RSB-7	12/08/2025	12/08/2025	12/08/2025	12/16/2025	12/16/2025	12/16/2025
Depth (ft bls)	0 - 2	2 - 4	4 - 6	6 - 8	8 - 10	25 - 27
VOCs						
Acetone	NE	NE	NE	ND	**0.11 J**	ND
Metals						
Copper	NE	**60.9**	NE	NE	NE	NE
Lead	NE	**1290**	**116**	NE	NE	NE
Zinc	NE	**117**	NE	**177**	NE	NE

RSB-5	12/01/2025	12/01/2025	12/01/2025	12/02/2025	12/15/2025	12/02/2025
Depth (ft bls)	0 - 2	2 - 4	4 - 6	6 - 8	8 - 10	20 - 22
Metals						
Copper	NE	NE	**63.2**	**131 J-**	NE	NE
Lead	**71.8**	**76**	NE	**83.9 J-**	NE	NE

RSB-1	12/01/2025	12/01/2025	12/01/2025	12/02/2025
Depth (ft bls)	0 - 2	2 - 4	4 - 6	20 - 22
Metals				
Lead	**77.7**	**185**	NE	NE
Mercury	NE	**0.79**	NE	ND
Zinc	NE	**117**	NE	NE

RSB-6	12/12/2025	12/12/2025	12/12/2025	12/16/2025	12/16/2025
Depth (ft bls)	0 - 2	2 - 4	4 - 6	6 - 8	20 - 22
SVOCs					
Benzo(B)Fluoranthene	**1.1**	NE	NE	ND	ND
Indeno(1,2,3-C,D)Pyrene	**0.53**	ND	ND	ND	ND
Metals					
Lead	**126**	NE	NE	NE	NE
Zinc	**243**	NE	NE	NE	NE
PFAS					
Perfluorooctanesulfonic acid (PFOS)	NE	**0.9**	NE	ND	ND

RSB-3	12/01/2025	12/01/2025	12/01/2025	12/02/2025
Depth (ft bls)	0 - 2	2 - 4	4 - 6	20 - 22
VOCs				
Acetone	NE	**0.033 J+**	**0.049 J+**	NE
Metals				
Lead	**97.9**	**82.7**	NE	NE
Zinc	**136**	**159**	NE	NE

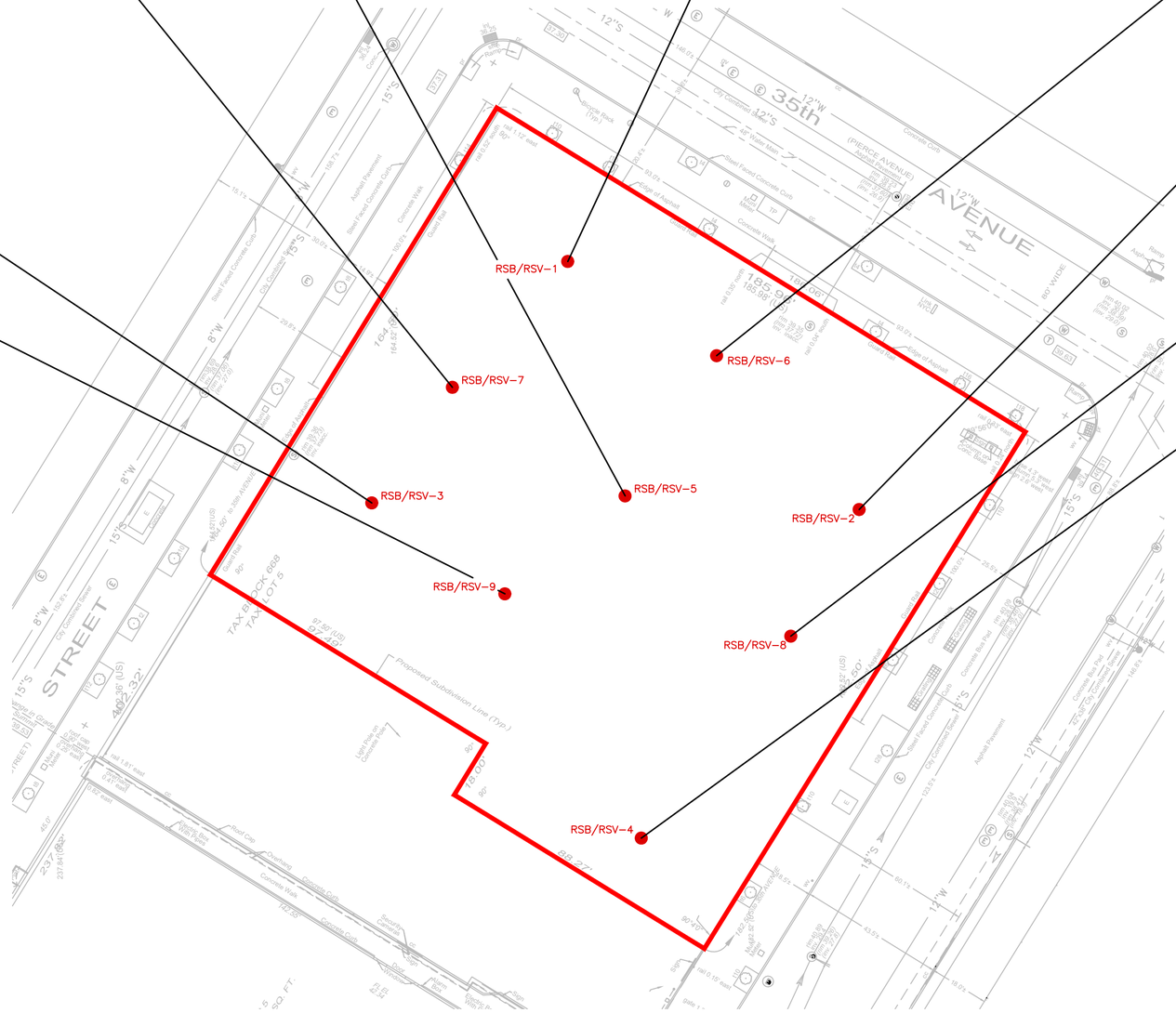
RSB-2	12/01/2025	12/01/2025	12/01/2025	12/01/2025	12/02/2025
Depth (ft bls)	0 - 2	1 - 3	1 - 3 DUP	3 - 5	20 - 22
VOCs					
Acetone	NE	NE	NE	**0.042 J+**	NE
Metals					
Lead	**105**	NE	NE	NE	NE

RSB-8	12/11/2025	12/11/2025	12/11/2025	12/11/2025	12/15/2025	12/15/2025
Depth (ft bls)	0 - 2	1 - 3	1 - 3	3 - 5	5 - 7	25 - 27
Metals						
Lead	**70.4 J**	NE	NE	NE	NE	NE
Pesticides/Herbicides						
P,P'-DDE	**0.0055 JT**	ND	ND	ND	ND	ND

RSB-9	12/15/2025	12/17/2025	12/17/2025	12/17/2025
Depth (ft bls)	0 - 2	16 - 18	20 - 22	22 - 24
Metals				
Cadmium	NE	NE	**2.9**	NE
Chromium III	**549**	NE	NE	NE
Chromium, Total	**549**	NE	NE	NE
Copper	**9320**	NE	NE	NE
Lead	**159**	NE	NE	NE
Nickel	**302**	NE	NE	NE
Zinc	**696**	NE	**813**	NE

RSB-4	12/03/2025	12/03/2025	12/03/2025	12/03/2025
Depth (ft bls)	0 - 2	2 - 4	4 - 6	20 - 22
SVOCs				
Benzo(A)Anthracene	**17**	**10**	ND	ND
Benzo(A)Pyrene	**14**	**8.8**	NE	ND
Benzo(B)Fluoranthene	**19**	**13**	NE	ND
Benzo(G,H,I)Perylene	**5.5 J-**	**4.6**	NE	ND
Benzo(K)Fluoranthene	**4.6 J-**	**3.6**	ND	ND
Chrysene	**16**	**9.5**	NE	ND
Dibenz(A,H)Anthracene	**1.7 J-**	**1.4**	ND	ND
Indeno(1,2,3-C,D)Pyrene	**6.3 J-**	**5.3**	ND	ND
Phenanthrene	**22**	**15**	NE	ND
Metals				
Lead	**290**	**242**	NE	NE
Mercury	NE	**0.19**	NE	NE
Zinc	**601**	**485**	NE	NE
PCBs				
Polychlorinated Biphenyl (PCBs)	**0.14**	**0.25 J**	ND	ND

Parameter	NYSDEC Part 375 Unrestricted Use Soil Cleanup Objectives	NYSDEC Part 375 Restricted Residential Soil Cleanup Objectives	NYSDEC Part 375 Protection of Groundwater Soil Cleanup Objectives	Units
VOCs				
Acetone	**0.03**	100	0.03	mg/kg
SVOCs				
Benzo(A)Anthracene	**1**	1.4	1	mg/kg
Benzo(A)Pyrene	**1**	1	22	mg/kg
Benzo(B)Fluoranthene	**1**	1.4	2.1	mg/kg
Benzo(G,H,I)Perylene	**0.64**	4.9	1000	mg/kg
Benzo(K)Fluoranthene	**0.8**	4.9	2	mg/kg
Chrysene	**1**	4.9	1	mg/kg
Dibenz(A,H)Anthracene	**0.33**	0.33	1000	mg/kg
Indeno(1,2,3-C,D)Pyrene	**0.5**	1.4	6.6	mg/kg
Phenanthrene	**1.1**	4.9	1000	mg/kg
Metals				
Cadmium	**2.5**	2.5	7.5	mg/kg
Chromium III	**30**	110	--	mg/kg
Chromium, Total	**30**	110	--	mg/kg
Copper	**50**	280	1720	mg/kg
Lead	**63**	400	450	mg/kg
Mercury	**0.18**	0.3	0.73	mg/kg
Nickel	**30**	320	130	mg/kg
Zinc	**109**	6600	2480	mg/kg
PCBs				
Polychlorinated Biphenyl (PCBs)	**0.1**	1	3.2	mg/kg
Pesticides/Herbicides				
P,P'-DDE	**0.0033**	3.4	9.3	mg/kg
PFAS				
Perfluorooctanesulfonic acid (PFOS)	**0.88**	44	1	µg/kg



mg/kg – MILLIGRAMS PER KILOGRAM
µg/kg – MICROGRAMS PER KILOGRAM
NYSDEC – NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
– – NO NYSDEC PART 375 SOIL CLEANUP OBJECTIVES AVAILABLE
J – ESTIMATED VALUE
T – INDICATES THAT A QUALITY CONTROL PARAMETER HAS EXCEEDED LABORATORY LIMITS
J+ – ESTIMATED VALUE, HIGH BIAS
J– – ESTIMATED VALUE, LOW BIAS
DUP – DUPLICATE SAMPLE
VOCS – VOLATILE ORGANIC COMPOUNDS
SVOCS – SEMIVOLATILE ORGANIC COMPOUNDS
PCBS – POLYCHLORINATED BIPHENYLS
PFAS – PER– AND POLYFLUOROALKYL SUBSTANCES
NE – NO EXCEEDANCE
ND – NO DETECTION
FT BLS – FEET BELOW LAND SURFACE

LEGEND

SITE BOUNDARY

BCP REMEDIAL INVESTIGATION SAMPLING LOCATIONS

RSB–1/RSV–1 SOIL BORING/SOIL VAPOR SAMPLING LOCATION AND DESIGNATION

N

30' 0 30'

Title:

SUMMARY OF EXCEEDANCES IN SOIL

35-18 STEINWAY STREET
ASTORIA, QUEENS, NEW YORK

Prepared for:

LMXD INNOQ B1 LLC
STEINWAY 1 OWNER LLC

ROUX

Compiled by: J.R.	Date: 1/28/2026	FIGURE
Prepared by: G.M.	Scale: AS SHOWN	4
Project Mgr: N.C.	Project: 4806.0001Y000	
File: 4806.0001Y113.07.DWG		

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RMW-1	12/18/2025
Metals, Total	
Iron	**634**
Magnesium	**37500**
Manganese	**1160**
Sodium	**93700**
Metals, Dissolved	
Magnesium	**36400**
Manganese	**1080**
Sodium	**92600**
PFAS	
Perfluorooctanesulfonic acid (PFOS)	**0.0867**
Perfluorooctanoic acid (PFOA)	**0.0344**

RMW-5	12/22/2025
Metals, Total	
Sodium	**146000**
Metals, Dissolved	
Sodium	**140000**
PFAS	
Perfluorooctanesulfonic acid (PFOS)	**0.00988**
Perfluorooctanoic acid (PFOA)	**0.0179**

RMW-2	12/22/2025
Metals, Total	
Sodium	**111000**
Metals, Dissolved	
Sodium	**111000**
PFAS	
Perfluorooctanesulfonic acid (PFOS)	**0.0107**
Perfluorooctanoic acid (PFOA)	**0.0196**

RMW-3	12/18/2025
Metals, Total	
Sodium	**130000**
Metals, Dissolved	
Sodium	**120000**
PFAS	
Perfluorooctanesulfonic acid (PFOS)	**0.0212**
Perfluorooctanoic acid (PFOA)	**0.024**

RMW-4	12/18/2025	12/18/2025 DUP
Metals, Total		
Sodium	**79400**	**78700**
Metals, Dissolved		
Sodium	**75100**	**79600**
PFAS		
Perfluorooctanesulfonic acid (PFOS)	**0.0111**	**0.0108**
Perfluorooctanoic acid (PFOA)	**0.0187**	**0.0174**

RMW-1
RMW-2
RMW-3
RMW-4
RMW-5
35th AVENUE
STREET
Proposed Subdivision Line (Typ.)
TAX BLOCK 608
TAX LOT 15
195.96'
185.98' (US)
164.52' (RD)
97.59' (US)
97.43' (RD)
96.22'
90°
90°
90°
90°
Concrete Walk
Asphalt Pavement
Steel Fence
Concrete Curb
Edge of Asphalt
Roof Cap
Overhang
Concrete Slab
Security Camera
Metal Fence
Gate
Wood Fence
Chain Link Fence
Brick Wall
Concrete Block Wall
Retaining Wall
Stairs
Ramp
Light Pole
Utility Pole
Fire Hydrant
Manhole
Catch Basin
Curb Inlet
Drain Inlet
Gas Valve
Water Valve
Gas Meter
Water Meter
Electric Meter
Bollard
Guide Rail
Tree
Shrub
Hedge
Bench
Bicycle Rack
Flag Pole
Sign
Awning
Canopy
Vault
Transformer
Generator
Air Conditioning Unit
Satellite Dish
Antenna
Vent
Skylight
Chimney
Parapet
Coping
Flashing
Scupper
Downspout
Leader
Cleanout
Manhole
Handhole
Pull Box
Conduit
Duct Bank
Overhead Wires
Guy Wire
Concrete Pad
Transformer Pad
Generator Pad

RSV-1	12/19/2025
VOCs	
1,1,2-Trichloro-1,2,2-Trifluoroethane	**0.54 J**
1,2-Dichlorotetrafluoroethane	**1.6**
2,2,4-Trimethylpentane	**110 D**
2-Hexanone	**0.62 J**
Acetone	**52**
Benzene	**1.4**
Butane	**4.8**
Carbon Disulfide	**0.72 J**
Chloroform	**0.84 J**
Cyclohexane	**5.3**
Dichlorodifluoromethane	**3.1**
Ethylbenzene	**3.5**
Isopropanol	**4 J**
m,p-Xylene	**9.8**
Methyl Ethyl Ketone (2-Butanone)	**4**
N-Hexane	**2**
O-Xylene (1,2-Dimethylbenzene)	**2**
Tert-Butyl Alcohol	**18**
Tetrachloroethylene (PCE)	**1.2 J**
Toluene	**19**
Trichlorofluoromethane	**1.4**

RSV-5	12/22/2025
VOCs	
2,2,4-Trimethylpentane	**0.85 J**
Acetone	**51**
Benzene	**0.86 J**
Carbon Disulfide	**2.9 J**
Chloroform	**0.86 J**
Dichlorodifluoromethane	**3.3 J**
m,p-Xylene	**2.7 J**
Methyl Ethyl Ketone (2-Butanone)	**4.1**
N-Hexane	**1.4 J**
O-Xylene (1,2-Dimethylbenzene)	**0.94 J**
Tert-Butyl Alcohol	**8.9 J**
Toluene	**2.3**
Trichlorofluoromethane	**2.2**

RSV-6	12/19/2025
VOCs	
1,1,2-Trichloro-1,2,2-Trifluoroethane	**0.64 J**
1,2,4-Trimethylbenzene	**0.7 J**
1,4-Dioxane (P-Dioxane)	**0.45 J**
2,2,4-Trimethylpentane	**1.9**
Acetone	**37**
Benzene	**0.68**
Carbon Disulfide	**0.51 J**
Chloroform	**0.59 J**
Cyclohexane	**1**
Dichlorodifluoromethane	**2.8**
Ethylbenzene	**4**
m,p-Xylene	**17**
Methyl Ethyl Ketone (2-Butanone)	**1.8**
N-Heptane	**1.1**
N-Hexane	**1.6 J**
O-Xylene (1,2-Dimethylbenzene)	**4.5**
Tert-Butyl Alcohol	**13 J**
Tetrachloroethylene (PCE)	**1.5**
Toluene	**3.8**
Trichlorofluoromethane	**1.6**

RSV-7	12/22/2025
VOCs	
1,2-Dichlorotetrafluoroethane	**2.6 J**
Acetone	**130**
Butane	**2.2 J**
Chloroform	**1.1 J**
Dichlorodifluoromethane	**5.2 J**
Toluene	**2 J**

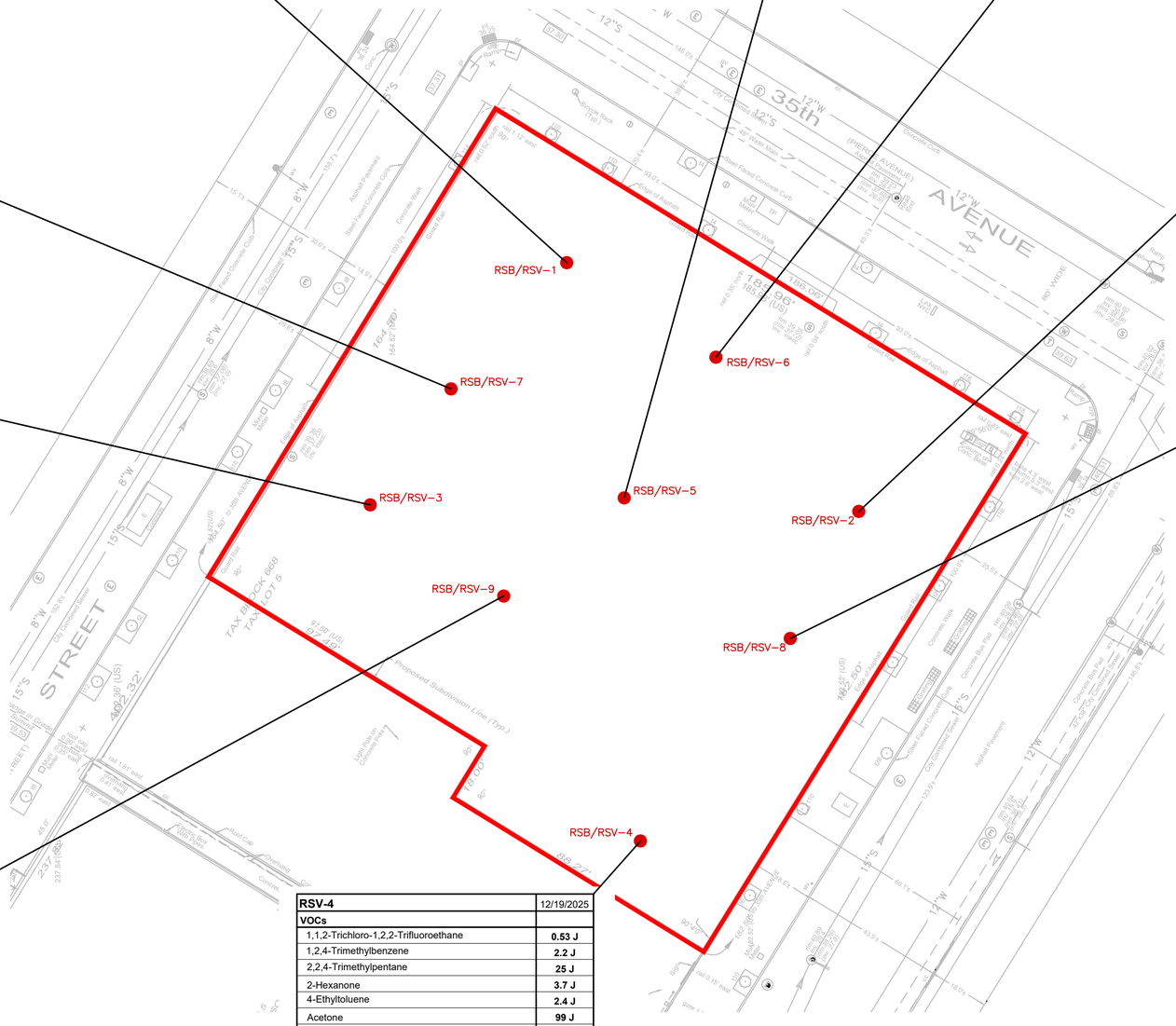
RSV-2	12/22/2025
VOCs	
Acetone	**56**
Benzene	**0.77 J**
Butane	**5.4**
Carbon Disulfide	**1.2 J**
Chloroform	**1.4 J**
Dichlorodifluoromethane	**3.4 J**
m,p-Xylene	**2.2 J**
N-Heptane	**1.6**
N-Hexane	**38**
Toluene	**1.9**
Trichlorofluoromethane	**2.5**

RSV-3	12/19/2025	12/19/2025
VOCs		DUP
1,1,2-Trichloro-1,2,2-Trifluoroethane	**0.55 J**	**0.49 J**
1,4-Dioxane (P-Dioxane)	**0.31 J**	ND
2,2,4-Trimethylpentane	**0.69 J**	**0.68 J**
4-Ethyltoluene	ND	**0.65 J**
Acetone	**32 J**	**32**
Benzene	**0.54 J**	**0.66**
Chloroform	**0.44 J**	**0.4 J**
Cyclohexane	**0.32 J**	**0.43 J**
Dichlorodifluoromethane	**2.9 J**	**2.4 J**
Ethylbenzene	**3.3 J**	**3.5**
Isopropanol	ND	**5 J**
m,p-Xylene	**12 J**	**14**
Methyl Ethyl Ketone (2-Butanone)	**1.8 J**	**1.6**
N-Heptane	**1.6 J**	**2.6 J**
N-Hexane	**0.95 J**	**1.1 J**
O-Xylene (1,2-Dimethylbenzene)	**3.3 J**	**3.8**
Tert-Butyl Alcohol	**16 J**	**19**
Tetrachloroethylene (PCE)	**9.8 J**	**1.7 R**
Toluene	**2.6 J**	**2.8**
Trichloroethylene (TCE)	**4.1 J**	**3.5**
Trichlorofluoromethane	**1.5 J**	**1.4**

RSV-8	12/19/2025
VOCs	
1,1,2-Trichloro-1,2,2-Trifluoroethane	**0.54 J**
2,2,4-Trimethylpentane	**2.4**
4-Ethyltoluene	**1.5**
Acetone	**81 D**
Benzene	**2.8**
Butane	**12**
Carbon Disulfide	**0.85 J**
Chloroform	**0.68 J**
Cyclohexane	**1.7**
Dichlorodifluoromethane	**2.4 J**
Ethylbenzene	**69**
Isopropanol	**10 J**
m,p-Xylene	**200**
Methyl Ethyl Ketone (2-Butanone)	**4.6**
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	**0.61 J**
Methylene Chloride	**4.1**
N-Heptane	**1.7**
N-Hexane	**5**
O-Xylene (1,2-Dimethylbenzene)	**38**
Tert-Butyl Alcohol	**7.8 J**
Tetrachloroethylene (PCE)	**2.1**
Toluene	**15**
Trichlorofluoromethane	**1.8**

RSV-9	12/19/2025
VOCs	
1,1,2-Trichloro-1,2,2-Trifluoroethane	**0.59 J**
1,4-Dioxane (P-Dioxane)	**1.7 J**
2,2,4-Trimethylpentane	**8.3**
Acetone	**210 D**
Benzene	**1.4**
Butane	**25**
Carbon Disulfide	**2**
Carbon Tetrachloride	**0.56**
Chloroform	**3.2**
Cyclohexane	**7.3**
Dichlorodifluoromethane	**2.6**
Ethylbenzene	**6.3**
Isopropanol	**8.9 J**
m,p-Xylene	**24**
Methyl Ethyl Ketone (2-Butanone)	**13**
N-Heptane	**3.7**
N-Hexane	**10**
O-Xylene (1,2-Dimethylbenzene)	**5.4**
Tert-Butyl Alcohol	**42**
Tetrachloroethylene (PCE)	**20**
Toluene	**3.5**
Trichloroethylene (TCE)	**0.95**
Trichlorofluoromethane	**1.8**

RSV-4	12/19/2025
VOCs	
1,1,2-Trichloro-1,2,2-Trifluoroethane	**0.53 J**
1,2,4-Trimethylbenzene	**2.2 J**
2,2,4-Trimethylpentane	**25 J**
2-Hexanone	**3.7 J**
4-Ethyltoluene	**2.4 J**
Acetone	**99 J**
Benzene	**0.88 J**
Carbon Disulfide	**2.8 J**
Chloroform	**9.3 J**
Cyclohexane	**3.9 J**
Dichlorodifluoromethane	**4.3 J**
Ethylbenzene	**6.9 J**
Isopropanol	**3.9 J**
Isopropylbenzene (Cumene)	**0.64 J**
m,p-Xylene	**28 J**
Methyl Ethyl Ketone (2-Butanone)	**10 J**
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	**0.86 J**
N-Heptane	**2.4 J**
N-Hexane	**2.3 J**
N-Propylbenzene	**0.62 J**
O-Xylene (1,2-Dimethylbenzene)	**8 J**
Tert-Butyl Alcohol	**18 J**
Tetrachloroethylene (PCE)	**2 R**
Toluene	**3.9 J**
Trichlorofluoromethane	**2.3 J**



30' 0 30'

LEGEND

SITE BOUNDARY

BCP REMEDIAL INVESTIGATION SAMPLING LOCATIONS

RSB–1/RSV–1 SOIL BORING/SOIL VAPOR SAMPLING LOCATION AND DESIGNATION

CONCENTRATIONS IN µg/m³

µg/m³ – MICROGRAMS PER CUBIC METER

VOCS – VOLATILE ORGANIC COMPOUNDS

ND – COMPOUND WAS ANALYZED FOR BUT NOT DETECTED

J – ESTIMATED VALUE

D – A SECONDARY ANALYSIS AFTER DILUTION DUE TO EXCEEDANCE OF THE CALIBRATION RANGE IN THE ORIGINAL SAMPLE

R – SAMPLE RESULTS REJECTED BY VALIDATOR

Title:

SUMMARY OF EXCEEDANCES IN SOIL VAPOR

35-18 STEINWAY STREET
ASTORIA, QUEENS, NEW YORK

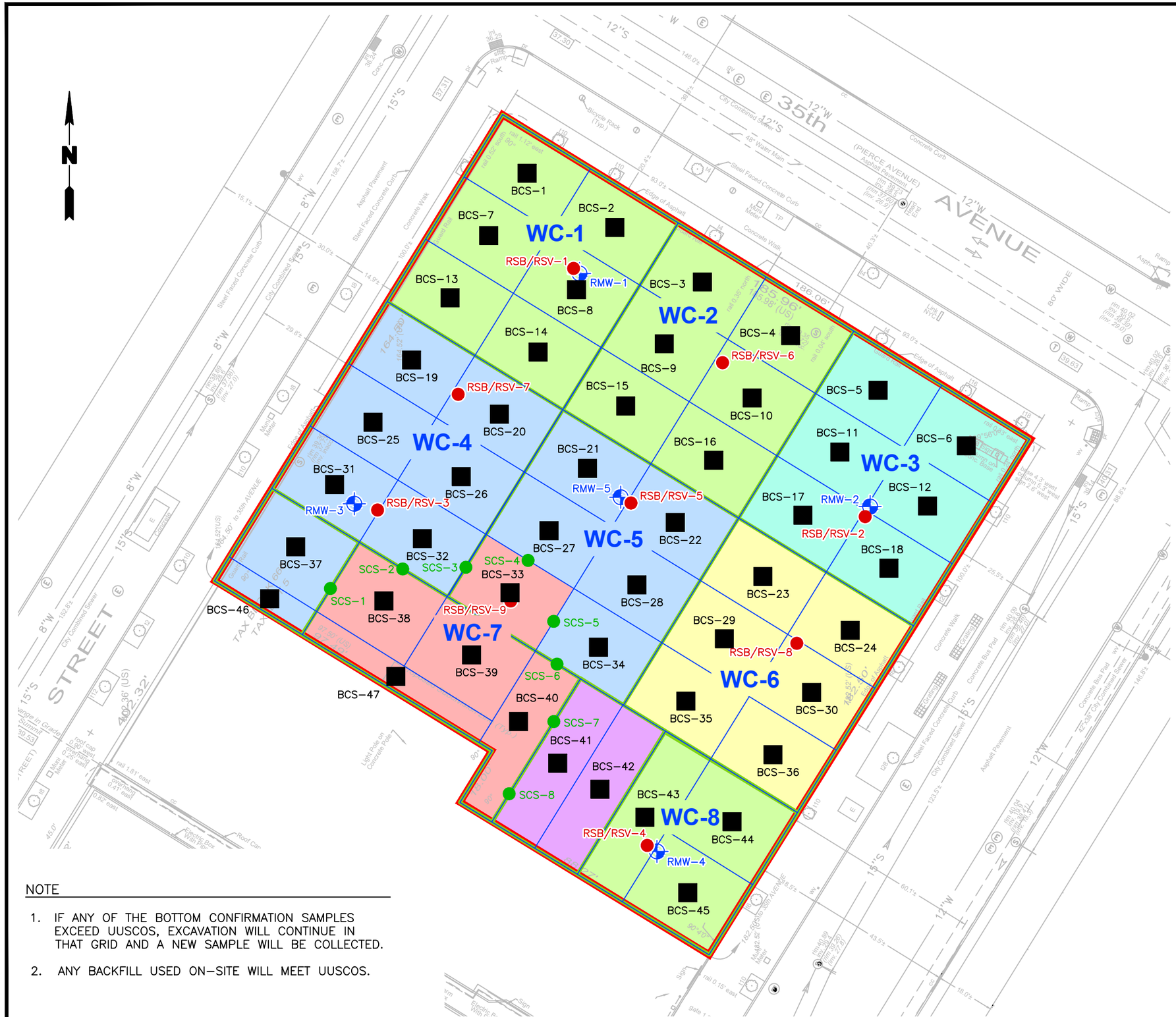
Prepared for:

LMXD INNOQ B1 LLC
STEINWAY 1 OWNER LLC

ROUX

Compiled by: J.R.	Date: 1/28/2026	FIGURE
Prepared by: G.M.	Scale: AS SHOWN	6
Project Mgr: N.C.	Project: 4806.0001Y000	
File: 4806.0001Y113.07.DWG		

V:\CAD\PROJECTS\4806\Y000\Y113\4806.000Y113.07.DWG GMILLION



LEGEND

- SITE BOUNDARY
- WC-1 — WASTE CHARACTERIZATION GRID
- BOTTOM CONFIRMATION ENDPOINT SAMPLE GRID

BCP REMEDIAL INVESTIGATION SAMPLING LOCATIONS

- RSB–1/RSV–1 — SOIL BORING/SOIL VAPOR SAMPLING LOCATION AND DESIGNATION
- RMW–1 — MONITORING WELL SAMPLING LOCATION AND DESIGNATION
- BCS–1 — PROPOSED BOTTOM CONFIRMATION SAMPLE
- SCS–1 — PROPOSED SIDEWALL CONFIRMATION SAMPLE
- PROPOSED EXCAVATION TO 1 FT BLS
- PROPOSED EXCAVATION TO 4 FT BLS
- PROPOSED EXCAVATION TO 7 FT BLS
- PROPOSED EXCAVATION TO 8 FT BLS
- PROPOSED EXCAVATION TO 12 FT BLS
- PROPOSED EXCAVATION TO 22 FT BLS

FT BLS — FEET BELOW LAND SURFACE

UUSCOs — UNRESTRICTED USE SOIL CLEANUP OBJECTIVES

30’ 0 30’

NOTE

1. IF ANY OF THE BOTTOM CONFIRMATION SAMPLES EXCEED UUSCOS, EXCAVATION WILL CONTINUE IN THAT GRID AND A NEW SAMPLE WILL BE COLLECTED.
2. ANY BACKFILL USED ON–SITE WILL MEET UUSCOS.

Title:

REMEDIAL ALTERNATIVE 1: TRACK 1 UNRESTRICTED USE CLEANUP

35-18 STEINWAY STREET
ASTORIA, NEW YORK

Prepared for:
LMXD INNOQ B1 LLC
STEINWAY 1 OWNER LLC

ROUX

Compiled by: J.R.	Date: 1/28/2026	FIGURE 7
Prepared by: G.M.	Scale: AS SHOWN	
Project Mgr: N.C.	Project: 4806.0001Y000	
File: 4806.0001Y113.02.DWG		

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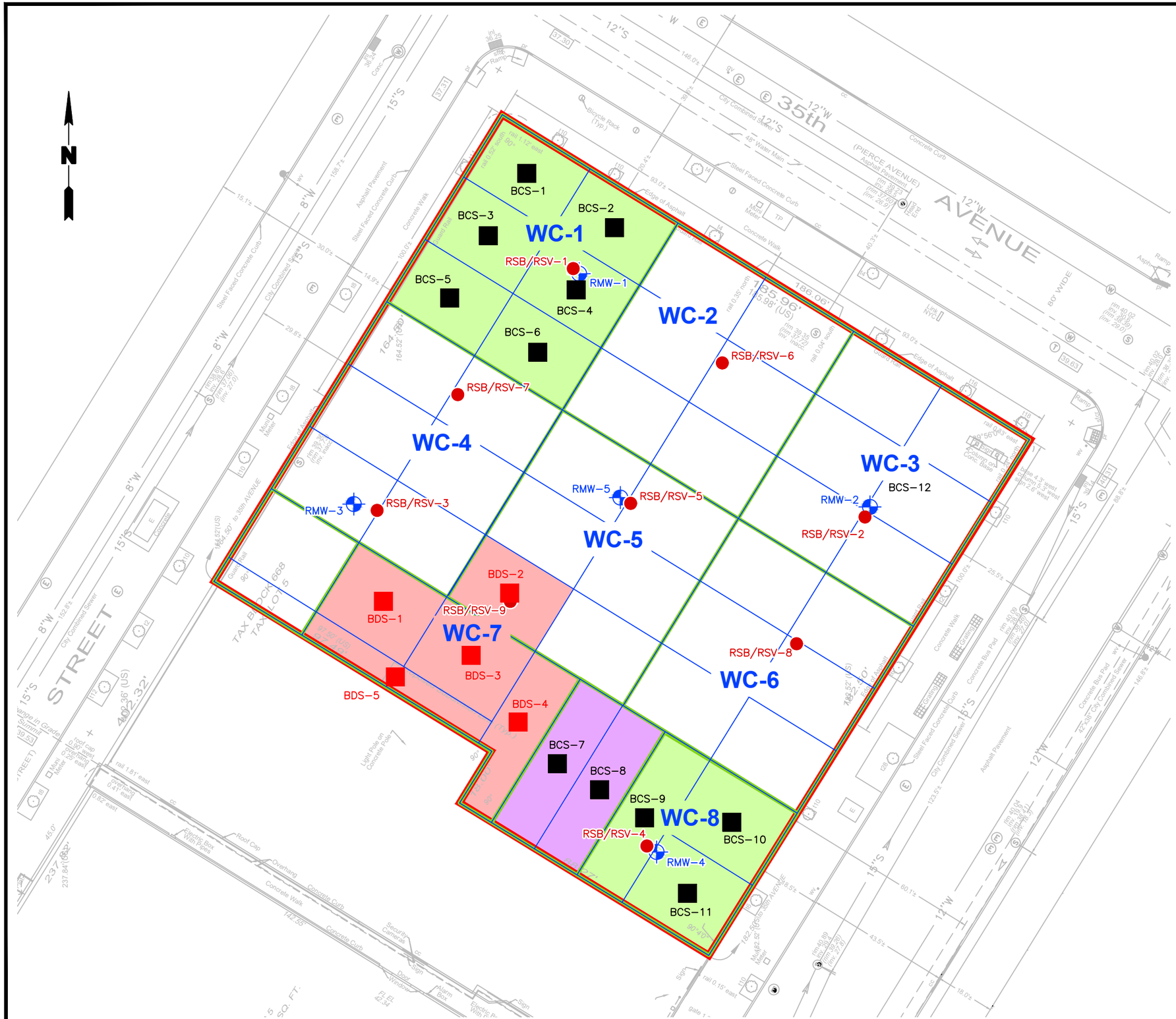

LEGEND

- SITE BOUNDARY
- WC-1 WASTE CHARACTERIZATION GRID
- BOTTOM CONFIRMATION ENDPOINT SAMPLE GRID

BCP REMEDIAL INVESTIGATION SAMPLING LOCATIONS

- RSB-1/RSV-1 SOIL BORING/SOIL VAPOR SAMPLING LOCATION AND DESIGNATION
- RMW-1 MONITORING WELL SAMPLING LOCATION AND DESIGNATION
- BCS-1 PROPOSED BOTTOM CONFIRMATION SAMPLE
- BDS-1 PROPOSED BOTTOM DOCUMENTATION SAMPLE
- PROPOSED EXCAVATION TO 4 FT BLS
- PROPOSED EXCAVATION TO 12 FT BLS
- PROPOSED EXCAVATION TO 15 FT BLS

FT BLS	FEET BELOW LAND SURFACE
RRSCOs	RESTRICTED RESIDENTIAL USE SOIL CLEANUP OBJECTIVES
PGWSCOs	PROTECTION OF GROUNDWATER SOIL CLEANUP OBJECTIVES

NOTE

1. IF ANY OF THE BOTTOM CONFIRMATION SAMPLES EXCEED RRSCOS, EXCAVATION WILL CONTINUE IN THAT GRID AND A NEW SAMPLE WILL BE COLLECTED. EXCAVATION WILL CONTINUE TO A MAXIMUM DEPTH OF 15 FT BLS.
2. ANY BACKFILL USED ON-SITE WILL MEET THE LOWER OF RRSCOS OR PGWSCOS.

30' 0 30'

Title:

REMEDIAL ALTERNATIVE 2: TRACK 2 RESTRICTED RESIDENTIAL USE CLEANUP

35-18 STEINWAY STREET
ASTORIA, NEW YORK

Prepared for:

LMXD INNOQ B1 LLC
STEINWAY 1 OWNER LLC

ROUX

Compiled by: J.R.	Date: 1/27/2026	FIGURE
Prepared by: G.M.	Scale: AS SHOWN	8
Project Mgr: N.C.	Project: 4806.0001Y000	
File: 4806.0001Y113.03.DWG		

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LEGEND

- SITE BOUNDARY
- **WC-1** WASTE CHARACTERIZATION GRID
- BOTTOM CONFIRMATION ENDPOINT SAMPLE GRID

BCP REMEDIAL INVESTIGATION SAMPLING LOCATIONS

- RSB-1/RSV-1 — SOIL BORING/SOIL VAPOR SAMPLING LOCATION AND DESIGNATION
- RMW-1 — MONITORING WELL SAMPLING LOCATION AND DESIGNATION
- BDS-1 — PROPOSED BOTTOM DOCUMENTATION SAMPLE
- PROPOSED EXCAVATION TO 2 FT BLS

FT BLS	FEET BELOW LAND SURFACE
RRSCOs	RESTRICTED RESIDENTIAL USE SOIL CLEANUP OBJECTIVES
PGWSCOs	PROTECTION OF GROUNDWATER SOIL CLEANUP OBJECTIVES

NOTE

1. SEE FIGURE 9B FOR SITE COVER SYSTEM EXTENT AND DETAILS
2. ANY BACKFILL USED ON-SITE WILL MEET THE LOWER OF RRSCOS OR PGWSCOS.

30' 0 30'

Title:

REMEDIAL ALTERNATIVE 3: TRACK 4 RESTRICTED RESIDENTIAL USE CLEANUP - PROPOSED EXCAVATION

35-18 STEINWAY STREET
ASTORIA, NEW YORK

Prepared for:
LMXD INNOQ B1 LLC
STEINWAY 1 OWNER LLC

ROUX

Compiled by: J.R.	Date: 1/28/2026	FIGURE
Prepared by: G.M.	Scale: AS SHOWN	9A
Project Mgr: N.C.	Project: 4806.0001Y000	
File: 4806.0001Y113.04.DWG		

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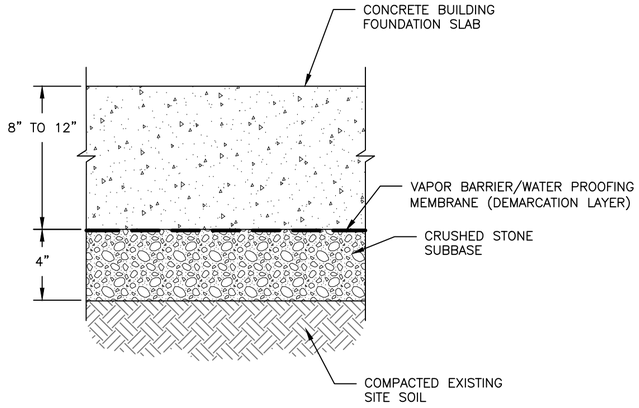
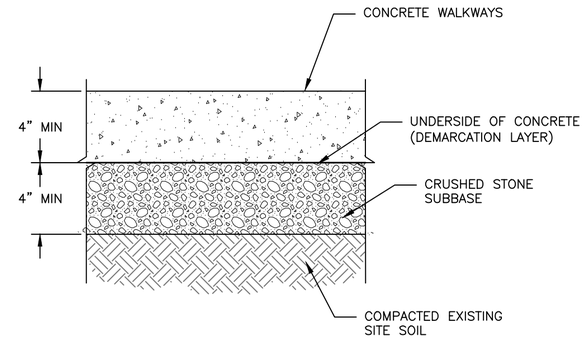


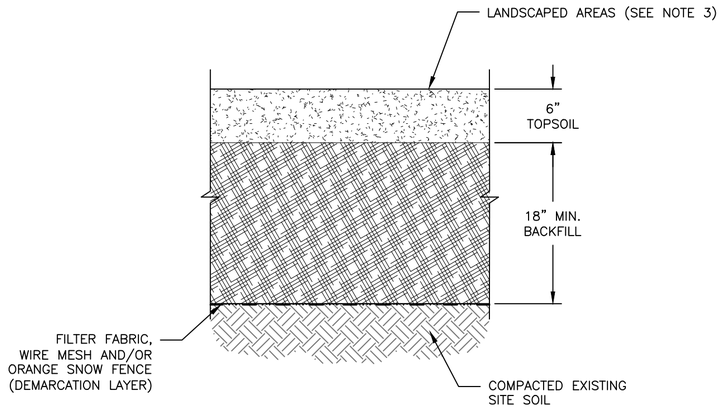
1 PROPOSED SITE COVER SYSTEM: CONCRETE BUILDING FOUNDATION

SCALE: NOT TO SCALE



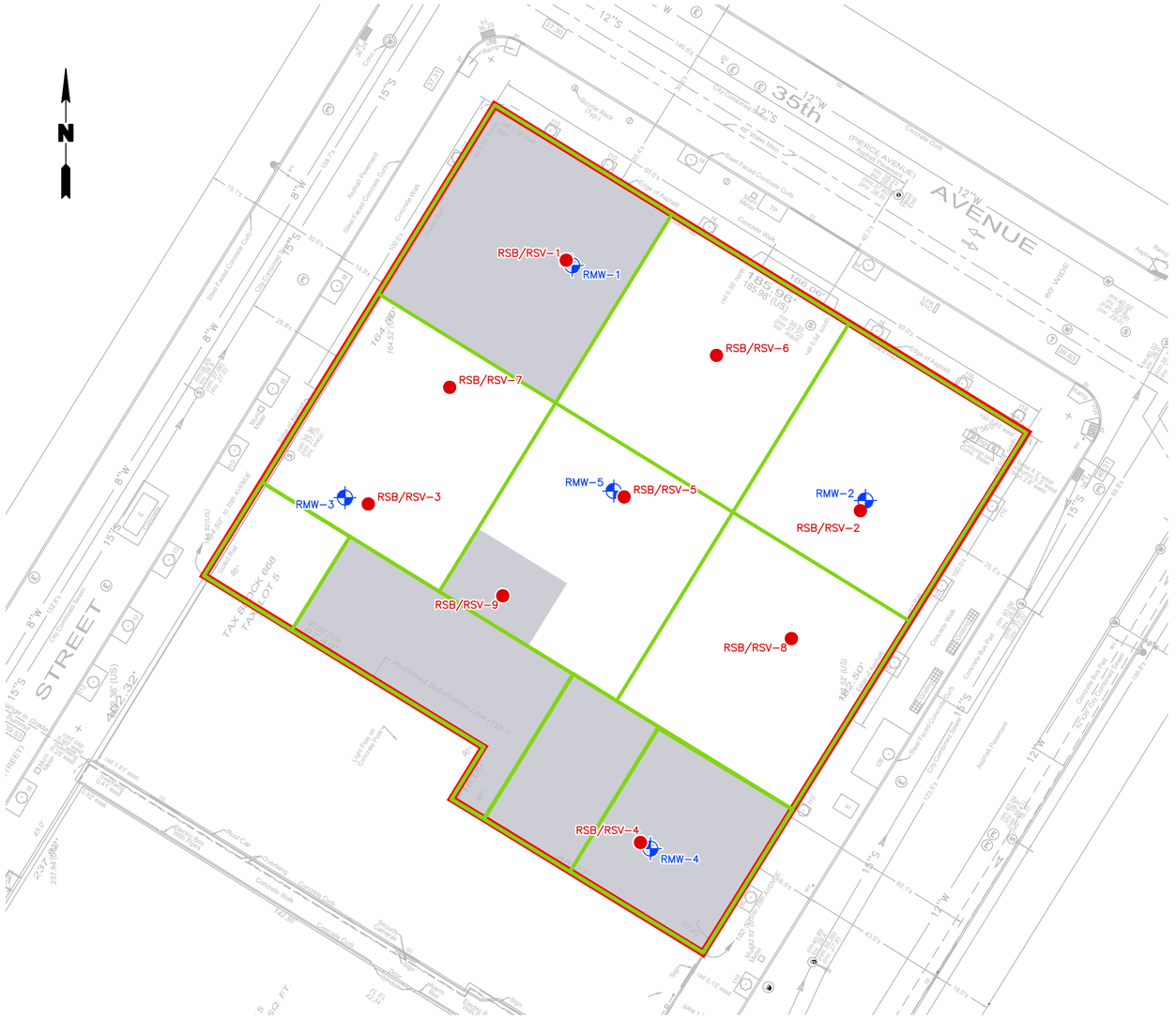
2 PROPOSED CONTINGENCY SITE COVER SYSTEM: CONCRETE WALKWAYS

SCALE: NOT TO SCALE



3 PROPOSED CONTINGENCY SITE COVER SYSTEM: LANDSCAPED AREAS

SCALE: NOT TO SCALE



LEGEND

- SITE BOUNDARY
- WASTE CHARACTERIZATION GRID

BCP REMEDIAL INVESTIGATION SAMPLING LOCATIONS

- RSB-1/RSV-1: SOIL BORING/SOIL VAPOR SAMPLING LOCATION AND DESIGNATION
- RMW-1: MONITORING WELL SAMPLING LOCATION AND DESIGNATION
- PROPOSED SITE COVER SYSTEM (SEE DETAIL 1)

FT BLS	FEET BELOW LAND SURFACE
RRSCOs	RESTRICTED RESIDENTIAL USE SOIL CLEANUP OBJECTIVES
PGWSCOs	PROTECTION OF GROUNDWATER SOIL CLEANUP OBJECTIVES

NOTE

1. SEE FIGURE 9A FOR EXTENT OF PROPOSED EXCAVATION.
2. THERE ARE NO LANDSCAPED AREAS OR SIDEWALKS/WALKWAYS CURRENTLY IDENTIFIED. THESE DETAILS ARE PROVIDED IN CASE THE DESIGN CHANGES.
3. IF NEEDED, BACKFILL FOR LANDSCAPED AREAS OR ANY OTHER AREAS ON-SITE WILL MEET THE LOWER OF THE RRSCOS OR PGWSCOS.

30' 0 30'

Title:

REMEDIAL ALTERNATIVE 3: TRACK 4 RESTRICTED RESIDENTIAL USE CLEANUP PROPOSED SITE COVER SYSTEM

35-18 STEINWAY STREET
ASTORIA, NEW YORK

Prepared for:

LMXD INNOQ B1 LLC
STEINWAY 1 OWNER LLC

ROUX

Compiled by: N.C.	Date: 1/30/2026	FIGURE
Prepared by: G.M.	Scale: AS SHOWN	9B
Project Mgr: N.C.	Project: 4806.0001Y000	
File: 4806.0001Y113.05.DWG		

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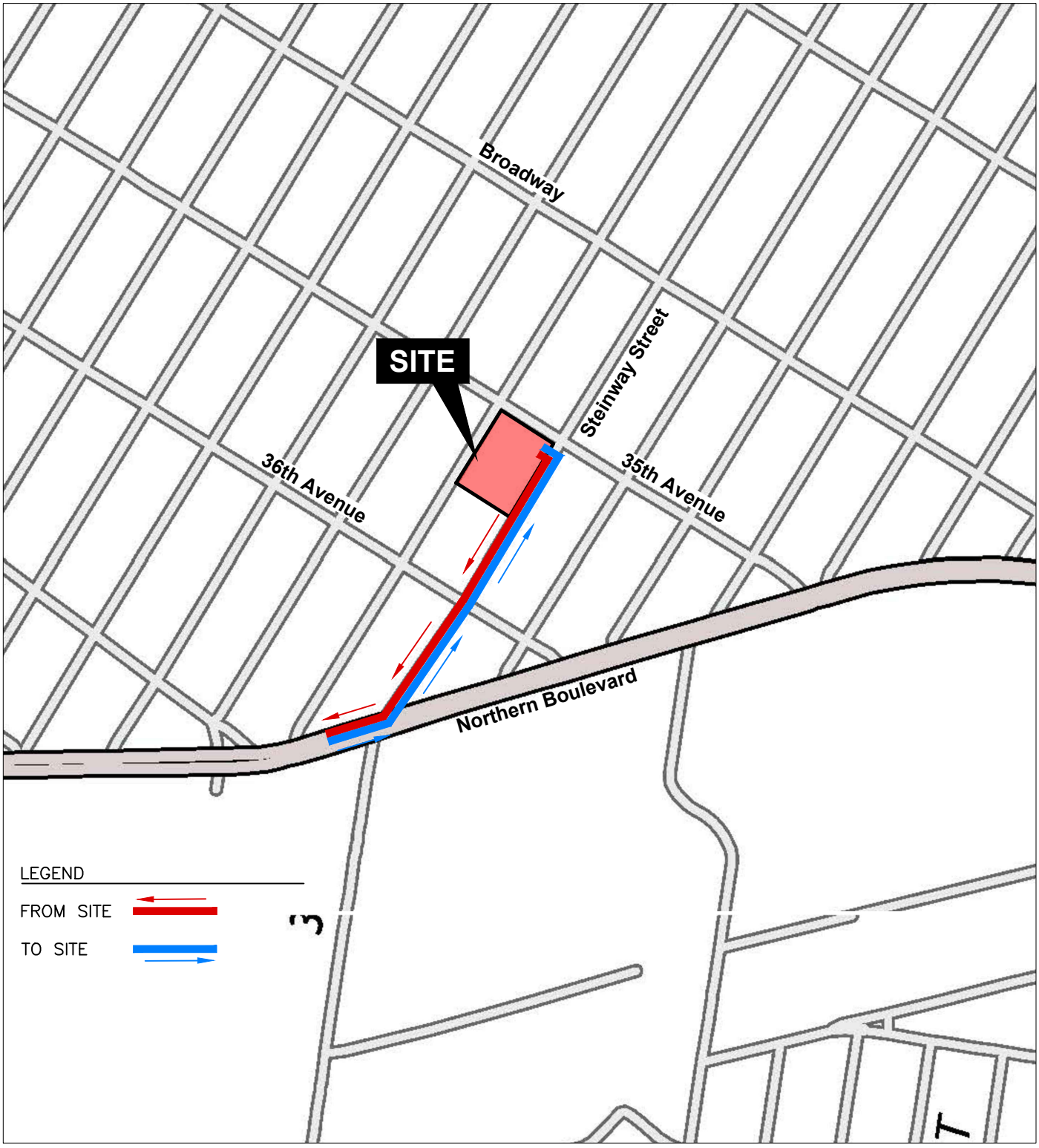
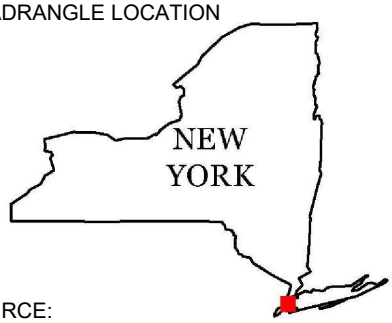
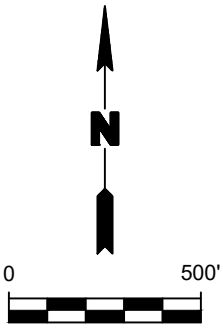


QUADRANGLE LOCATION



SOURCE:
USGS, 2013, Central Park, NY
7.5 Minute Topographic Quadrangle



Title:

TRUCK ROUTES

35-18 STEINWAY STREET
ASTORIA, NEW YORK

Prepared for:

LMXD INNOQ B1 LLC
STEINWAY 1 OWNER LLC

ROUX

Compiled by: J.R.	Date: 20JAN26
Prepared by: G.M.	Scale: AS SHOWN
Project Mgr: J.R.	Project: 4806.0001Y000
File: 4806.0001Y113.01.DWG	

FIGURE
10

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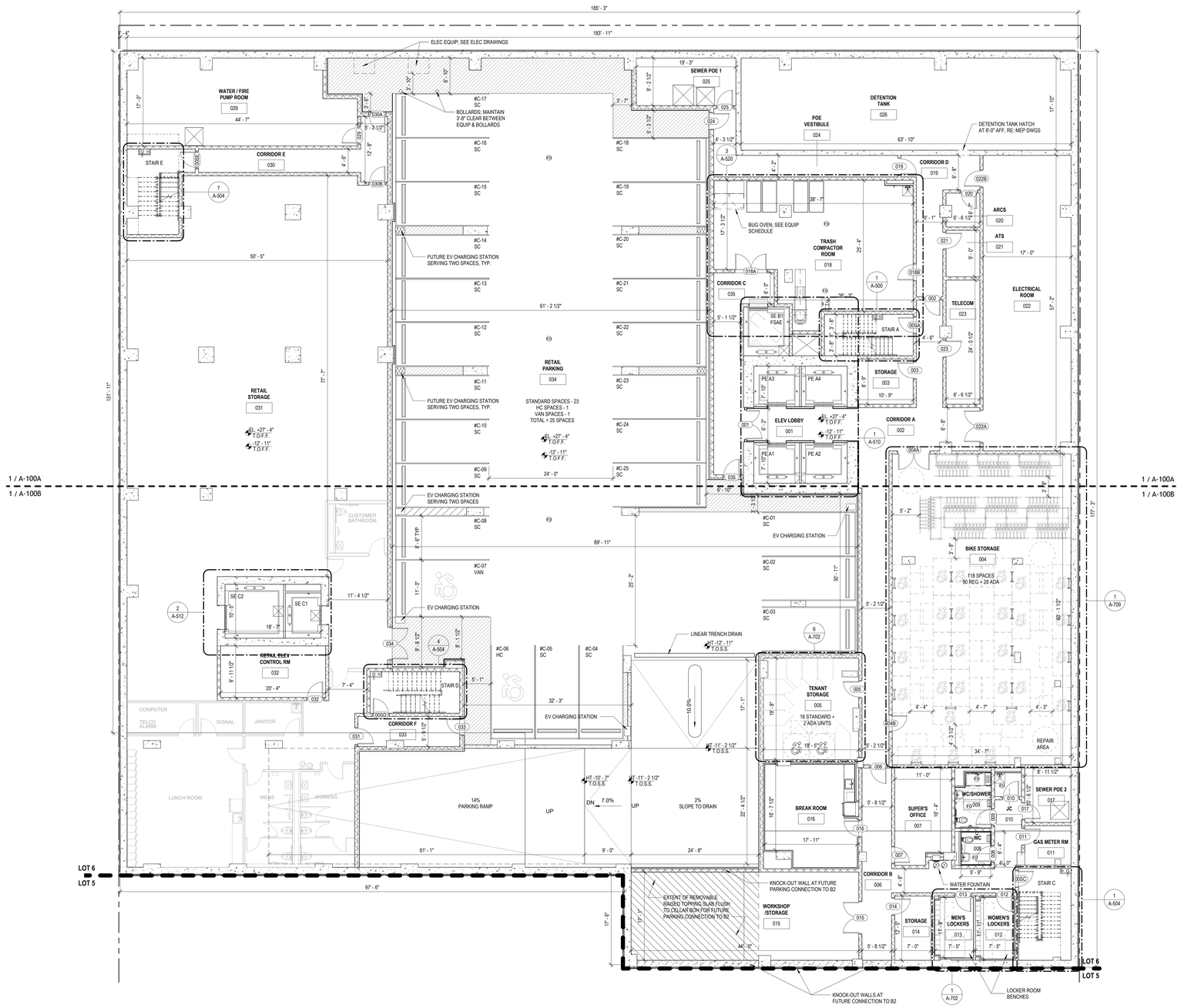
APPENDICES

A. Redevelopment Plans
B. *In Situ* Waste Characterization Data
C. Soil Boring and Well Construction Logs
D. Green and Sustainable Remediation Evaluation
E. Draft Citizen Participation Plan
F. Health and Safety Plan (and Community Air Monitoring Plan)
G. Quality Assurance Project Plan/Field Sampling Plan
H. Stormwater Pollution Prevention Plan
I. Resumes of Key Personnel
J. Request for Import/Reuse Fill Material Form

APPENDIX A

Redevelopment Plans

PARKING SCHEDULE		
TYPE	COUNT	SIZE
ACCESSIBLE SPACE	1	18'-0 x 8'-6"
ACCESSIBLE SPACE - VAN	1	18'-0" x 11'-0"
STANDARD SPACE	23	18'-0 x 8'-6"
Grand total: 25		



1 A-100 OVERALL FLOOR PLAN - CELLAR
1/8" = 1'-0"

GENERAL FLOOR PLAN NOTES

1. SEE SOE STRUCTURAL, MECHANICAL, PLUMBING, ELECTRICAL, FIRE PROTECTION, FIRE ALARM, AND LANDSCAPE DRAWINGS FOR ADDITIONAL INFORMATION.
2. IF THERE ARE ANY CONFLICTS BETWEEN THESE DOCUMENTS OR BETWEEN THESE DOCUMENTS AND THAT OF OTHER DESIGN TEAM CONSULTANTS, PLEASE NOTIFY THE ARCHITECT IN WRITING, IDENTIFYING THE AREAS IN QUESTION PRIOR TO INSTALLATION OR CONSTRUCTION.
3. CM SHALL BE RESPONSIBLE FOR REVIEWING ALL PARTITION TAGS AND COORDINATING FINISH REQUIREMENTS, HOLLOW METAL AND WOOD FRAMES, ETC.
4. ALL HORIZONTAL AND VERTICAL EXHAUST AND SUPPLY DUCT-WORK SHALL BE ENCLOSED IN 2-HOUR FIRE RATED SHAFT CONSTRUCTION. SEE PARTITION SCHEDULE FOR DETAILS. REFER TO MECHANICAL DRAWINGS FOR SIZES AND LOCATIONS.
5. CONTRACTOR SHALL COORDINATE ALL SLAB OPENING SIZES AND LOCATIONS WITH THE STRUCTURAL, MECHANICAL, AND EQUIPMENT SHOP DRAWINGS.
6. REFER TO SHEET A-600 FOR PARTITION TYPES.
7. REFER TO A-620 SERIES FOR DOOR SCHEDULE AND DETAILS.
8. FOR INTERIOR FINISHES, REFER TO SHEET A-630 FOR FINISH SCHEDULE.
9. REFER TO A-400 SERIES FOR EXTERIOR WALL, STOREFRONT & ROOF DRAWINGS.
10. REFER TO A-500 SERIES FOR VERTICAL TRANSPORTATION DRAWINGS.
11. ALL UNITS ARE TYPE B+NYC.
12. AS PER EXCEPTION #2 OF BC 3007.6, A 2-HOUR RATED CORRIDOR WITH SMOKE-SEALED DOORS PROVIDED, TYPICAL.
13. CM SHALL COORDINATE ALL STEEL DUNNAGE & CONCRETE HOUSEKEEPING PAD QUANTITIES, SIZES AND LOCATIONS WITH MEP EQUIPMENT REQUIREMENTS AND FINAL APPROVED EQUIPMENT SHOP DRAWINGS.
14. REFER TO LIFE SAFETY DRAWINGS FOR PARTITION RATINGS & COORDINATE DOOR RATINGS WITH DOOR SCHEDULES.
15. SEE PARTIAL INTERIOR ELEVATIONS FOR FINISHES AND FUNCTIONS IN AMENITIES AND BOH SPACES (SERIES A-700'S).
16. REFER TO SHEET A-800 FOR ALL RESIDENTIAL KITCHENS & BATHROOMS DESIGNATIONS.
17. SEE ENLARGED BATHROOM PLANS & ELEVATIONS FOR BATHROOM DIMENSIONS & LAYOUTS (SERIES A-820'S).
18. SEE ENLARGED KITCHEN PLANS & ELEVATIONS FOR KITCHEN TYPES, DIMENSIONS, & LAYOUTS (SERIES A-800'S)
19. ALL KITCHENS & BATHROOMS MUST COMPLY W/ ACCESSIBILITY REQUIREMENTS OF NYCBC, AND FAIR HOUSING ACT. SEE A-800 SERIES DRAWINGS.
20. PROVIDE TRAFFIC COATING ON HORIZONTAL SURFACES ON ALL PARKING SPACES. REFER TO MATERIAL & FINISH SCHEDULES.
21. THE PARTITIONS AND SOFFITS WITHIN ENCLOSED USABLE SPACE UNDER STAIRWAYS SHALL BE PROTECTED BY 1-HOUR RATED CONSTRUCTION OR THE FIRE RATING OF THE STAIRWAY ENCLOSURE, WHICHEVER IS GREATER.
22. DO NOT SCALE THE DRAWINGS. ONLY WRITTEN DIMENSIONS SHALL BE USED. UNLESS OTHERWISE NOTED, THE FOLLOWING DIMENSIONING CRITERIA SHALL BE USED:
    - A. FOR GYPSUM BOARD AND METAL STUD WALL CONSTRUCTION, ALL DIMENSIONS ARE TO FACE OF GYPSUM WALL BOARD (GWB). REFER TO THE BATHROOM & KITCHEN DRAWINGS FOR FINISH ASSEMBLIES APPLIED TO THE FACE OF GWB ASSEMBLIES.
    - B. REFER TO SPECIFIC PARTITION TYPE ON PROJECT PARTITION SCHEDULE FOR DIMENSIONS AND FOR ALL UL ASSEMBLY NUMBERS.
    - C. DOOR FRAME HINGES ARE LOCATED 4" NOMINALLY OFF OF THE ADJACENT PERPENDICULAR WALL UNLESS OTHERWISE NOTED. ALL FINAL DOOR LOCATIONS SHALL BE CONFIRMED WITH ARCHITECT.
    - D. DIMENSIONS STRINGS LISTED WITH A +/- INDICATING THAT THESE DIMENSIONS ARE TO BE WITHIN TOLERANCE WHILE DIMENSIONS OF OTHER ITEMS WITHOUT +/- SHALL BE HELD.

PARKING LEGEND

PARKING TAG

2 - 01 / SC — LEVEL; SPACE #; PARKING SPACE TYPE

PARKING DESIGNATION

SC	STANDARD SPACE (8'-6" X 18'-0")
VAN	VAN SPACE (11'-0" X 18'-0")
HC	ACCESSIBLE SPACE (8'-6" X 18'-0")

SHEET NOTES

1. LEVEL 13 SKIPPED FOR MARKETING PURPOSES.

35-10 STEINWAY STREET, ASTORIA, NY 11101

BEYER BLINDER BELLE

120 Broadway, 20th Fl, New York, NY 10271

CLIENT
STEINWAY 1 OWNER LLC
2 Park Avenue, 23rd Floor
New York, NY 10016

STRUCTURAL ENGINEER
DeSimone Consulting Engineers
140 Broadway, 25th Floor
New York NY 10005

MEPFP ENGINEER
EP Engineering
100 William Street, Suite 1205
New York, NY 10038

CIVIL ENGINEER
Key Civil Engineering
(631) 961-0506

VERTICAL CIRCULATION
Fortune Shepler Saling, Inc.
(862) 400-6382

GEOTECH ENGINEER
JNZ Engineering
969 S. Springfield Avenue
Springfield, NJ 07081

ACOUSTIC CONSULTANT
WSP
One Penn Plaza
New York, New York, 10119

ENVELOPE CONSULTANT
RWMJS Consulting Group, Inc
229 West 28th Street
New York, New York 10001

SUSTAINABILITY CONSULTANT
Bright Power
80 Broad Street
New York, NY 10004

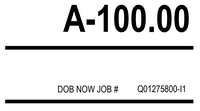
ACCESSIBILITY CONSULTANT
Accessibility Services
(718) 803-3782

LOW VOLTAGE CONSULTANT
Younity Inc.
18 West 18th Street, 2nd Floor
New York, NY, 10018

LANDSCAPE CONSULTANT
Starr Whitehouse Landscape Architects
80 Broad Street, Suite 1700
New York, NY 10004

LIGHTING CONSULTANT
Light Vs. Light
12 East 49th Street - Suite 1623
New York, NY 10017

KEY PLAN



STAMP

NO	DATE	DESCRIPTION
8	01/16/26	100% CD
6	12/05/25	90% CD
5	11/07/25	DOB SUBMISSION
4	10/14/25	50% CD
3	08/22/25	DOB / HPD SUBMISSION
2	08/01/25	100% DD
1	04/18/25	100% SD

REVISIONS

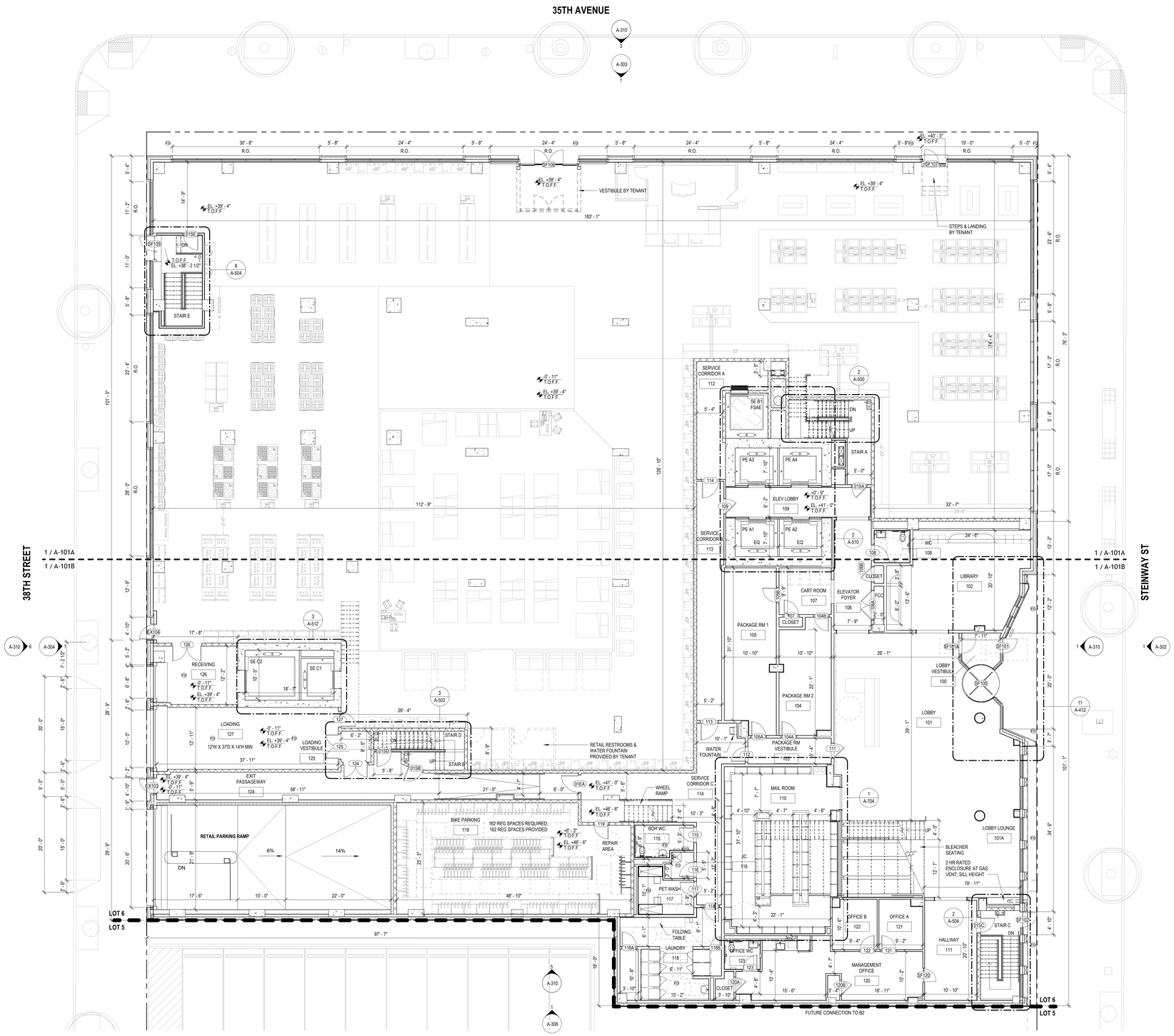
SUBMITTAL
100% CONSTRUCTION DOCUMENTS

DRAWING TITLE
OVERALL FLOOR PLAN - CELLAR

SCALE	1/8" = 1'-0"
DATE	04/18/25
PROJECT NUMBER	3053.00
DRAWING NUMBER	A-100.00

DOB NOW JOB # Q01275800-I1

1/16/2026 6:40:09 PM



2 A-101 OVERALL FLOOR PLAN - LEVEL 01 (MKTG GROUND)
1/8" = 1'-0"

GENERAL FLOOR PLAN NOTES

1. SEE SOE STRUCTURAL, MECHANICAL, PLUMBING, ELECTRICAL, FIRE PROTECTION, FIRE ALARM, AND LANDSCAPE DRAWINGS FOR ADDITIONAL INFORMATION.
2. IF THERE ARE ANY CONFLICTS BETWEEN THESE DOCUMENTS OR BETWEEN THESE DOCUMENTS AND THAT OF OTHER DESIGN TEAM CONSULTANTS, PLEASE NOTIFY THE ARCHITECT IN WRITING, IDENTIFYING THE AREAS IN QUESTION PRIOR TO INSTALLATION OR CONSTRUCTION.
3. CM SHALL BE RESPONSIBLE FOR REVIEWING ALL PARTITION TAGS AND COORDINATING FINISH REQUIREMENTS, HOLLOW METAL AND WOOD FRAMES, ETC.
4. ALL HORIZONTAL AND VERTICAL EXHAUST AND SUPPLY DUCT-WORK SHALL BE ENCLOSED IN 2-HOUR FIRE RATED SHAFT CONSTRUCTION. SEE PARTITION SCHEDULE FOR DETAILS. REFER TO MECHANICAL DRAWINGS FOR SIZES AND LOCATIONS.
5. CONTRACTOR SHALL COORDINATE ALL SLAB OPENING SIZES AND LOCATIONS WITH THE STRUCTURAL, MECHANICAL, AND EQUIPMENT SHOP DRAWINGS.
6. REFER TO SHEET A-600 FOR PARTITION TYPES.
7. REFER TO A-620 SERIES FOR DOOR SCHEDULE AND DETAILS.
8. FOR INTERIOR FINISHES, REFER TO SHEET A-630 FOR FINISH SCHEDULE.
9. REFER TO A-400 SERIES FOR EXTERIOR WALL, STOREFRONT & ROOF DRAWINGS.
10. REFER TO A-500 SERIES FOR VERTICAL TRANSPORTATION DRAWINGS.
11. ALL UNITS ARE TYPE B+NYC.
12. AS PER EXCEPTION #2 OF BC 3007.6, A 2-HOUR RATED CORRIDOR WITH SMOKE-SEALED DOORS PROVIDED, TYPICAL.
13. CM SHALL COORDINATE ALL STEEL DUNNAGE & CONCRETE HOUSEKEEPING PAD QUANTITIES, SIZES AND LOCATIONS WITH MEP EQUIPMENT REQUIREMENTS AND FINAL APPROVED EQUIPMENT SHOP DRAWINGS.
14. REFER TO LIFE SAFETY DRAWINGS FOR PARTITION RATINGS & COORDINATE DOOR RATINGS WITH DOOR SCHEDULES.
15. SEE PARTIAL INTERIOR ELEVATIONS FOR FINISHES AND FUNCTIONS IN AMENITIES AND BOH SPACES (SERIES A-700'S).
16. REFER TO SHEET A-800 FOR ALL RESIDENTIAL KITCHENS & BATHROOMS DESIGNATIONS.
17. SEE ENLARGED BATHROOM PLANS & ELEVATIONS FOR BATHROOM DIMENSIONS & LAYOUTS (SERIES A-820'S).
18. SEE ENLARGED KITCHEN PLANS & ELEVATIONS FOR KITCHEN TYPES, DIMENSIONS, & LAYOUTS (SERIES A-800'S)
19. ALL KITCHENS & BATHROOMS MUST COMPLY W/ ACCESSIBILITY REQUIREMENTS OF NYCBC, AND FAIR HOUSING ACT. SEE A-800 SERIES DRAWINGS.
20. PROVIDE TRAFFIC COATING ON HORIZONTAL SURFACES ON ALL PARKING SPACES. REFER TO MATERIAL & FINISH SCHEDULES.
21. THE PARTITIONS AND SOFFITS WITHIN ENCLOSED USABLE SPACE UNDER STAIRWAYS SHALL BE PROTECTED BY 1-HOUR RATED CONSTRUCTION OR THE FIRE RATING OF THE STAIRWAY ENCLOSURE, WHICHEVER IS GREATER.
22. DO NOT SCALE THE DRAWINGS. ONLY WRITTEN DIMENSIONS SHALL BE USED. UNLESS OTHERWISE NOTED, THE FOLLOWING DIMENSIONING CRITERIA SHALL BE USED:
    - A. FOR GYPSUM BOARD AND METAL STUD WALL CONSTRUCTION, ALL DIMENSIONS ARE TO FACE OF GYPSUM WALL BOARD (GWB). REFER TO THE BATHROOM & KITCHEN DRAWINGS FOR FINISH ASSEMBLIES APPLIED TO THE FACE OF GWB ASSEMBLIES.
    - B. REFER TO SPECIFIC PARTITION TYPE ON PROJECT PARTITION SCHEDULE FOR DIMENSIONS AND FOR ALL UL ASSEMBLY NUMBERS.
    - C. DOOR FRAME HINGES ARE LOCATED 4" NOMINALLY OFF OF THE ADJACENT PERPENDICULAR WALL UNLESS OTHERWISE NOTED. ALL FINAL DOOR LOCATIONS SHALL BE CONFIRMED WITH ARCHITECT.
    - D. DIMENSIONS STRINGS LISTED WITH A +/- INDICATING THAT THESE DIMENSIONS ARE TO BE WITHIN TOLERANCE WHILE DIMENSIONS OF OTHER ITEMS WITHOUT +/- SHALL BE HELD.

PARKING LEGEND

PARKING TAG

#2 - 01 SC — LEVEL; SPACE #; PARKING SPACE TYPE

PARKING DESIGNATION

SC	STANDARD SPACE (8'-6" X 18'-0")
VAN	VAN SPACE (11'-0" X 18'-0")
HC	ACCESSIBLE SPACE (8'-6" X 18'-0")

SHEET NOTES

1. LEVEL 13 SKIPPED FOR MARKETING PURPOSES.

35-10 STEINWAY STREET, ASTORIA, NY 11101

BEYER BLINDER BELLE

120 Broadway, 20th Fl, New York, NY 10271

CLIENT
STEINWAY 1 OWNER LLC
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STRUCTURAL ENGINEER
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140 Broadway, 25th Floor
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MEPFP ENGINEER
EP Engineering
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Key Civil Engineering
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GEOTECH ENGINEER
JNZ Engineering
969 S. Springfield Avenue
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WSP
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ENVELOPE CONSULTANT
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SUSTAINABILITY CONSULTANT
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LANDSCAPE CONSULTANT
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80 Broad Street, Suite 1700
New York, NY 10004

LIGHTING CONSULTANT
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New York, NY 10017

KEY PLAN

STAMP

NO	DATE	DESCRIPTION
8	01/16/26	100% CD
6	12/05/25	90% CD
5	11/07/25	DOB SUBMISSION
4	10/14/25	50% CD
3	08/22/25	DOB / HPD SUBMISSION
2	08/01/25	100% DD
1	04/18/25	100% SD

REVISIONS

SUBMITTAL
100% CONSTRUCTION DOCUMENTS

DRAWING TITLE

OVERALL FLOOR PLAN - LEVEL 01 (MKTG GROUND)

SCALE	1/8" = 1'-0"
DATE	03/05/21
PROJECT NUMBER	3053.00
DRAWING NUMBER	

A-101.00

DOB NOW JOB # Q01275800-I1

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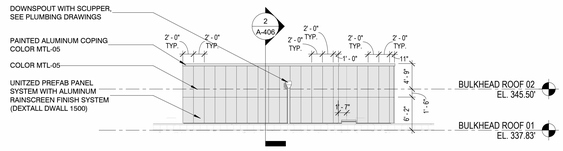
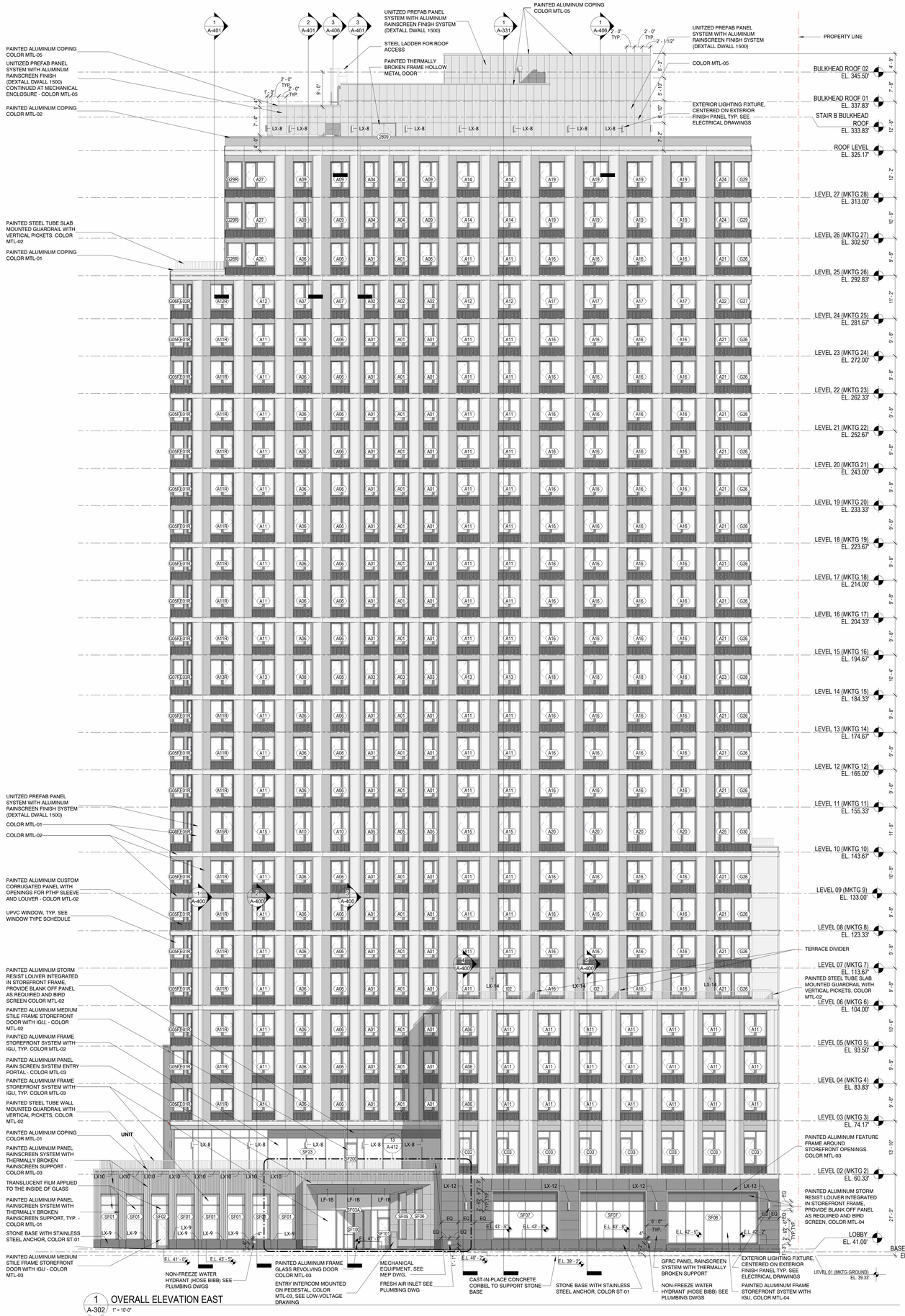


2 A-302 ELEVATION EAST - STAIR A BULKHEAD
1" = 10'-0"



1 A-302 OVERALL ELEVATION EAST
1" = 10'-0"

1/16/2026 1:00:35 PM

35-10 STEINWAY STREET, ASTORIA, NY 11101

BEYER BLINDER BELLE
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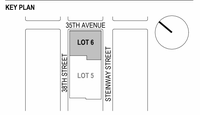
New York, NY 10017

KEY PLAN



STAMP

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4	10/14/25	50% CD
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2	08/01/25	100% DD
1	04/18/25	100% SD

REVISIONS

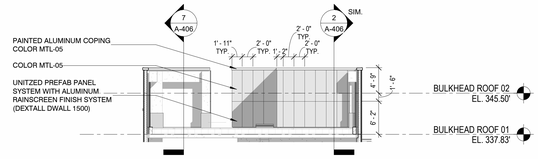
SUBMITTAL
100% CONSTRUCTION DOCUMENTS

DRAWING TITLE

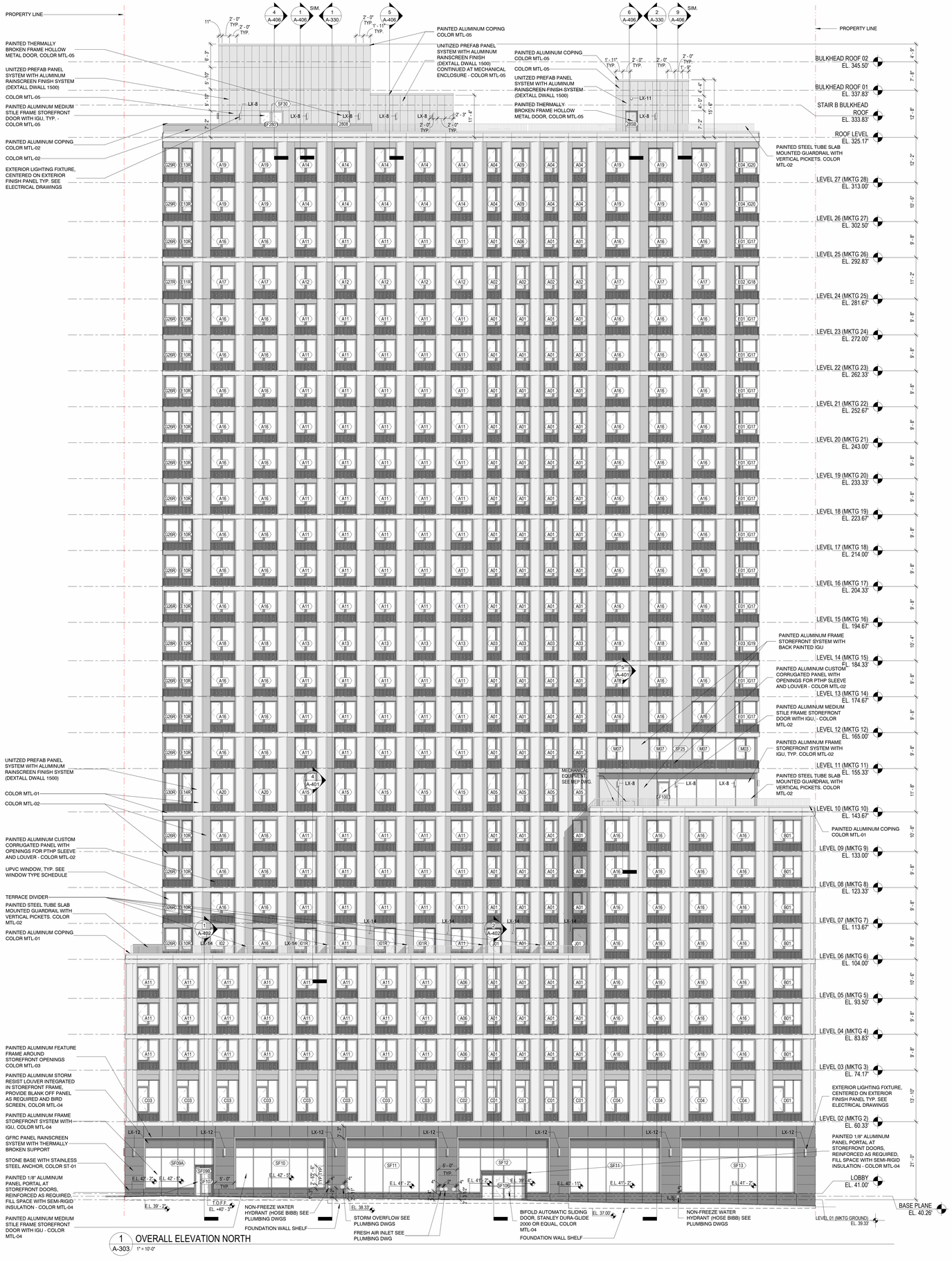
EXTERIOR ELEVATIONS - EAST (STEINWAY ST)

SCALE	1" = 10'-0"
DATE	01/16/26
PROJECT NUMBER	3053.00
DRAWING NUMBER	A-302.00

DOB NOW JOB # Q01275800-I1



2 ELEVATION NORTH - STAIR A BULKHEAD
A-303 1" = 10'-0"



1 OVERALL ELEVATION NORTH
A-303 1" = 10'-0"

35-10 STEINWAY STREET, ASTORIA, NY 11101

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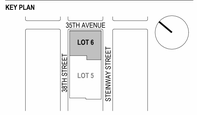

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2	08/01/25	100% DD
1	04/18/25	100% SD

REVISIONS

SUBMITTAL
100% CONSTRUCTION DOCUMENTS

DRAWING TITLE
EXTERIOR ELEVATIONS - NORTH (35TH AVE)

SCALE	1" = 10'-0"
DATE	01/16/26
PROJECT NUMBER	3053.00
DRAWING NUMBER	

A-303.00

DOB NOW JOB # Q01275800-I1

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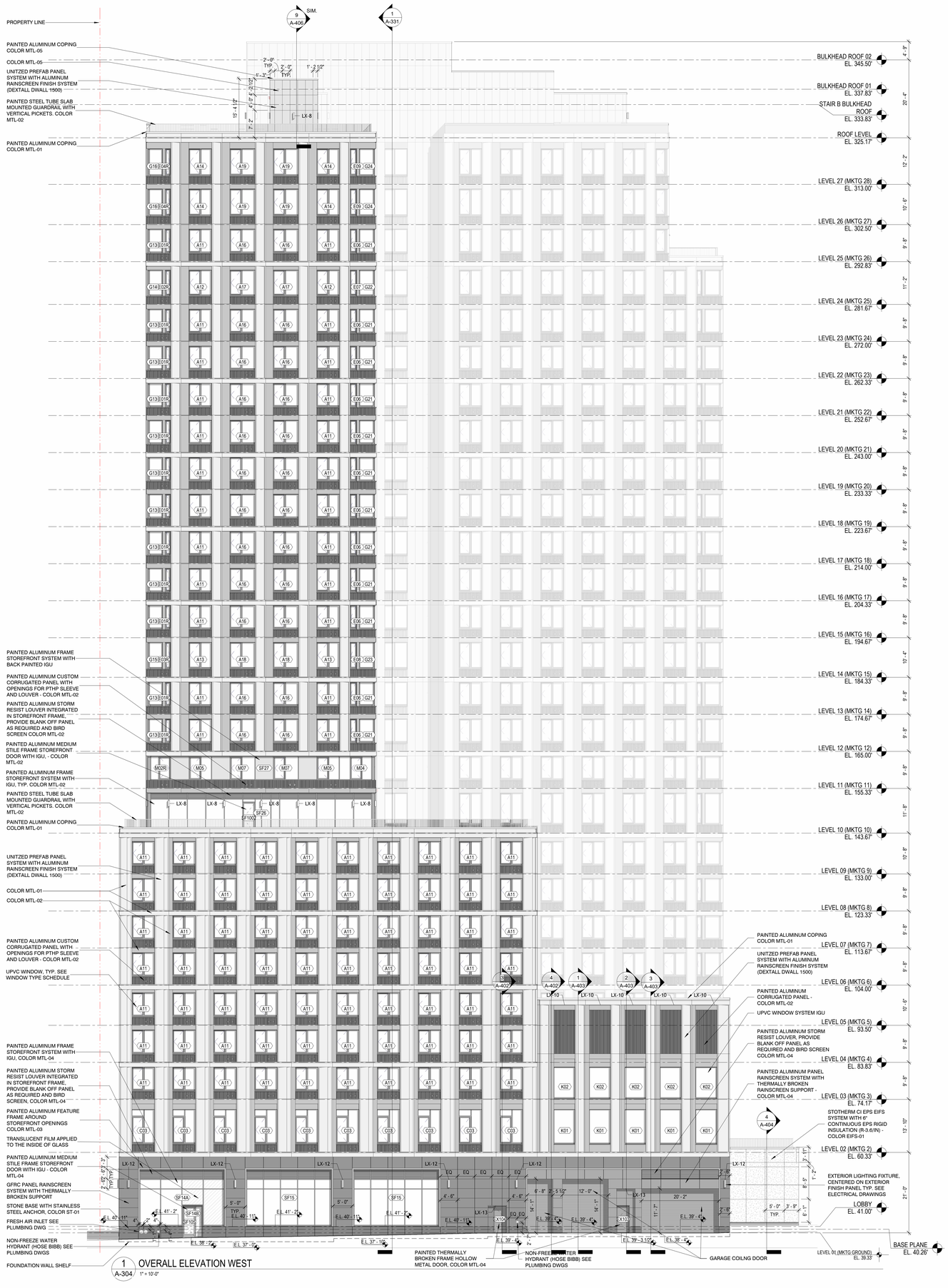
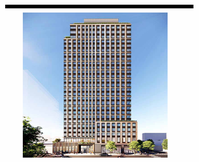


1 A-304 OVERALL ELEVATION WEST 1" = 10'-0"



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2	08/01/25	100% DD
1	04/18/25	100% SD

REVISIONS

SUBMITTAL
100% CONSTRUCTION DOCUMENTS

DRAWING TITLE

EXTERIOR ELEVATIONS - WEST (38TH ST)

SCALE	1" = 10'-0"
DATE	01/16/26
PROJECT NUMBER	3053.00
DRAWING NUMBER	

A-304.00

DOB NOW JOB # Q01275800-I1

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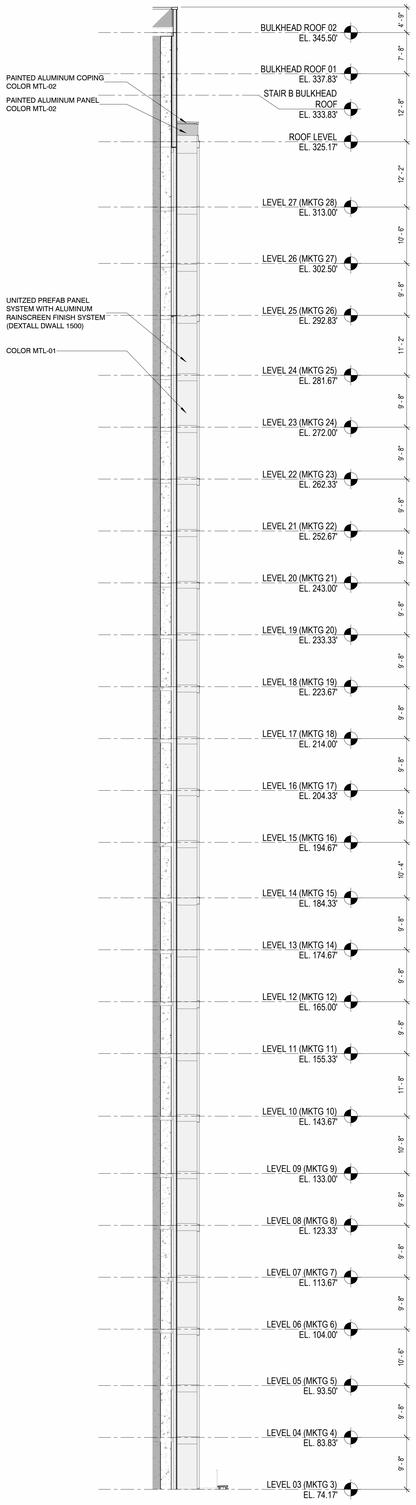
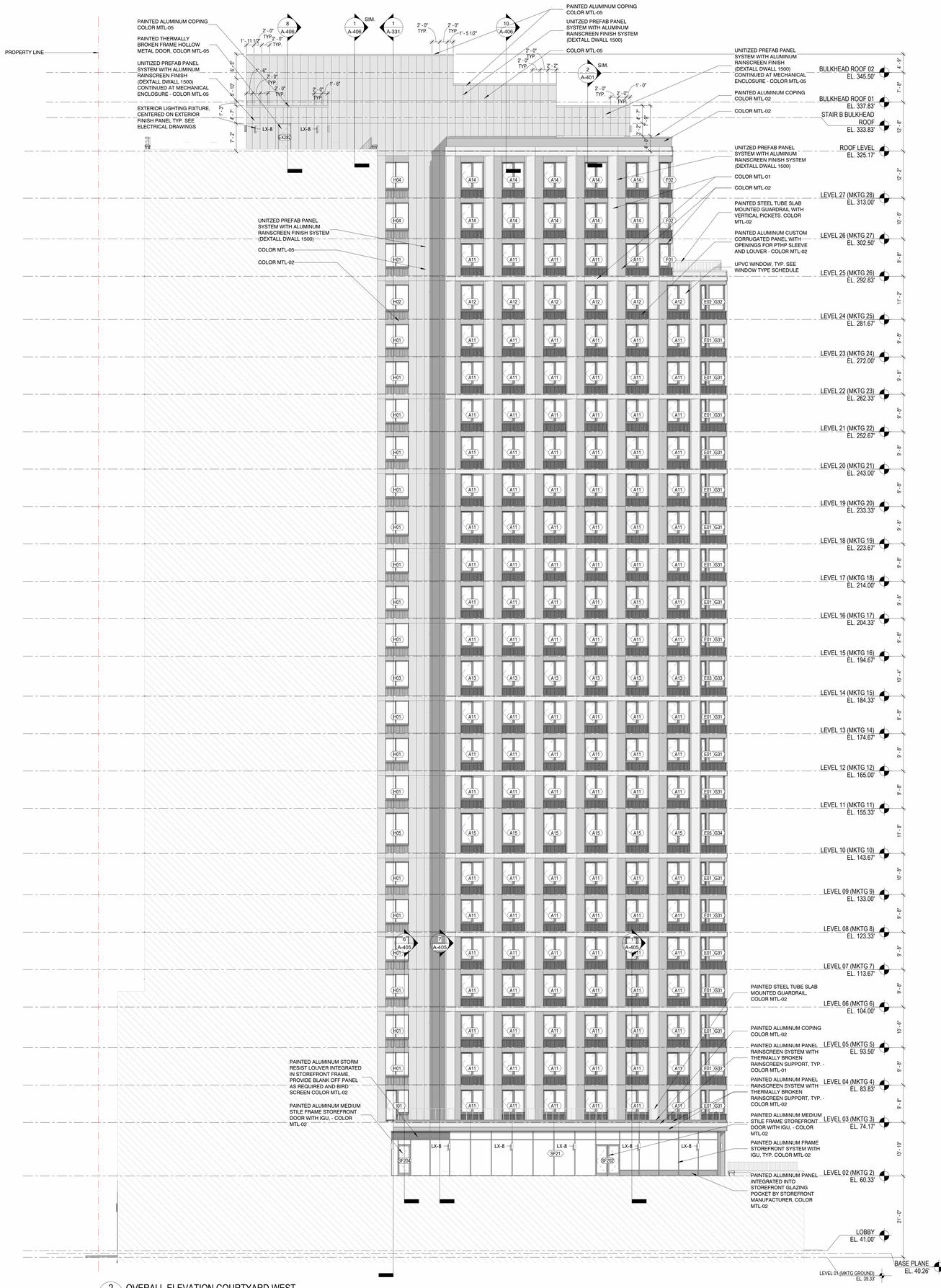
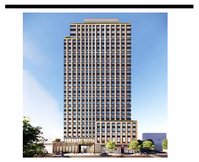


1 NORTH ELEVATION COURTYARD NORTH
A-305 1" = 10'-0"



2 OVERALL ELEVATION COURTYARD WEST
A-305 1" = 10'-0"



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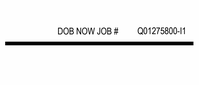
KEY PLAN



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5	11/07/25	DOB SUBMISSION
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3	08/22/25	DOB / HPD SUBMISSION
2	08/01/25	100% DD

REVISIONS

SUBMITTAL
100% CONSTRUCTION DOCUMENTS

DRAWING TITLE

EXTERIOR ELEVATIONS - COURTYARD WEST

SCALE	1" = 10'-0"
DATE	01/16/26
PROJECT NUMBER	3053.00
DRAWING NUMBER	

A-305.00

DOB NOW JOB # Q01275800-I1

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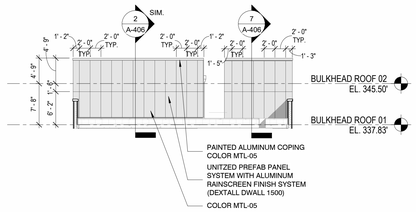
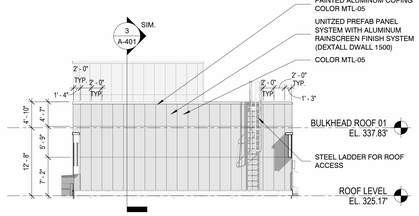
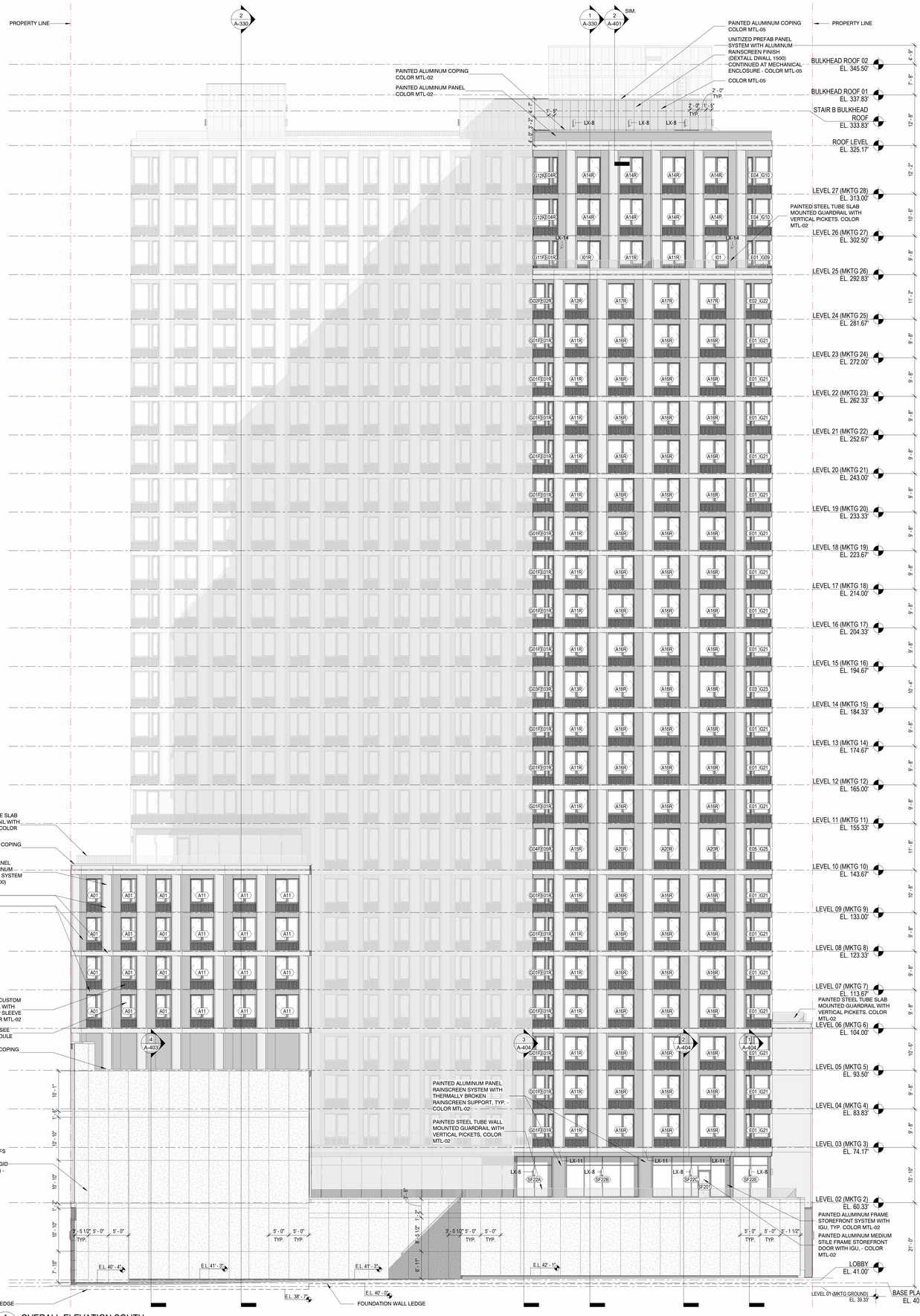


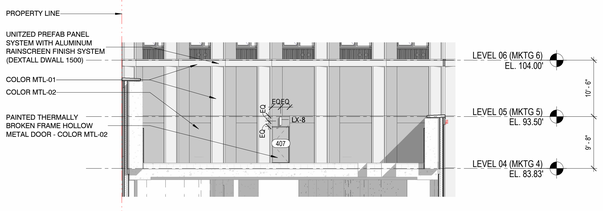
4 ELEVATION SOUTH STAIR A BUILKHEAD
A-306 1" = 10'-0"



3 ELEVATION BULKHEAD SOUTH
A-306 1" = 10'-0"



1 OVERALL ELEVATION SOUTH
A-306 1" = 10'-0"



2 ELEVATION SOUTH AT MECH ROOF
A-306 1" = 10'-0"

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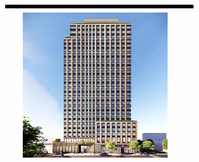

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4	10/14/25	50% CD
3	08/22/25	DOB / HPD SUBMISSION
2	08/01/25	100% DD

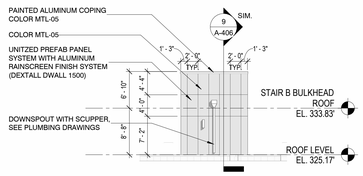
REVISIONS

SUBMITTAL
100% CONSTRUCTION DOCUMENTS

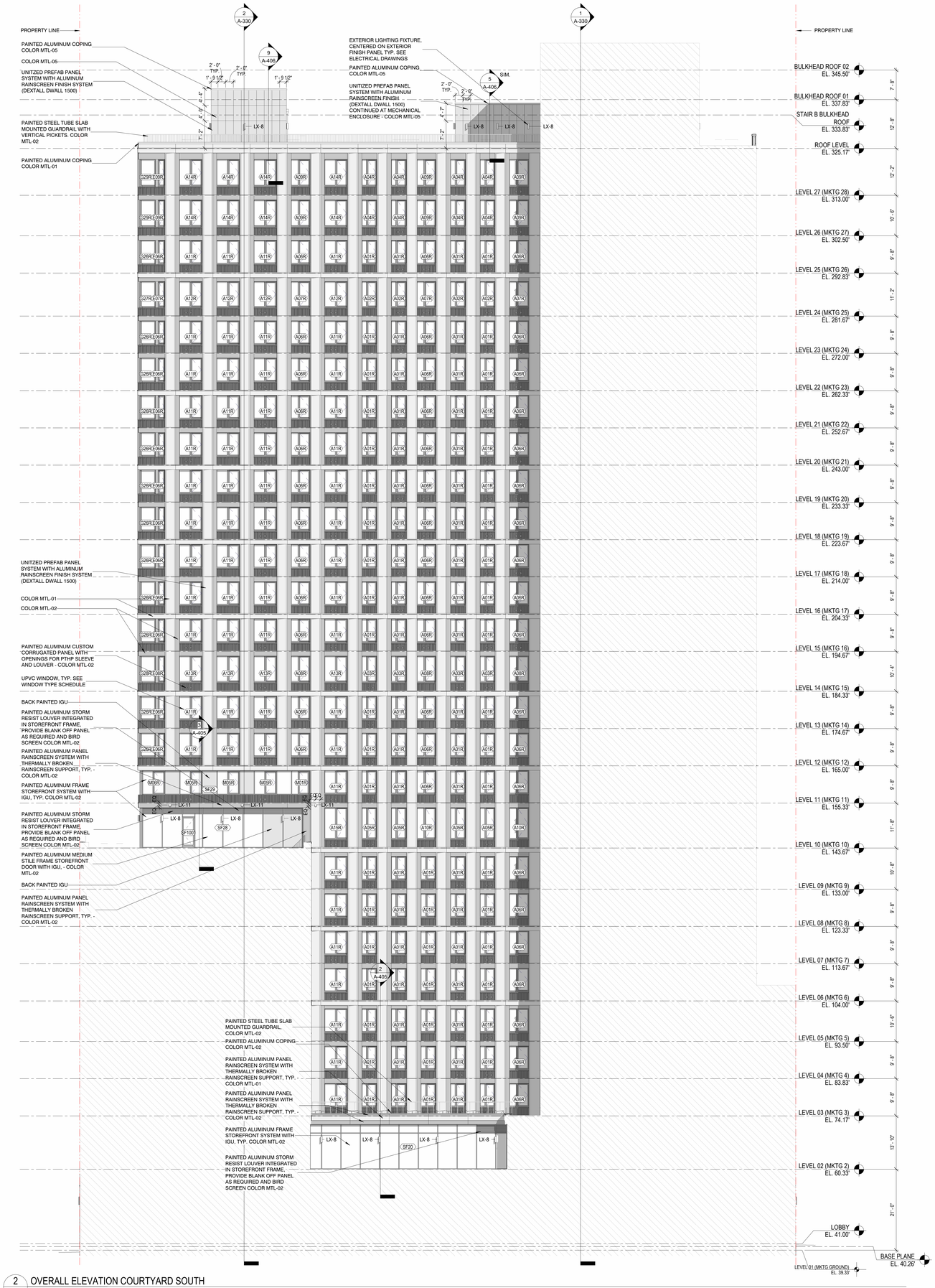
DRAWING TITLE
EXTERIOR ELEVATIONS - SOUTH

SCALE	1" = 10'-0"
DATE	01/16/26
PROJECT NUMBER	3053.00
DRAWING NUMBER	A-306.00

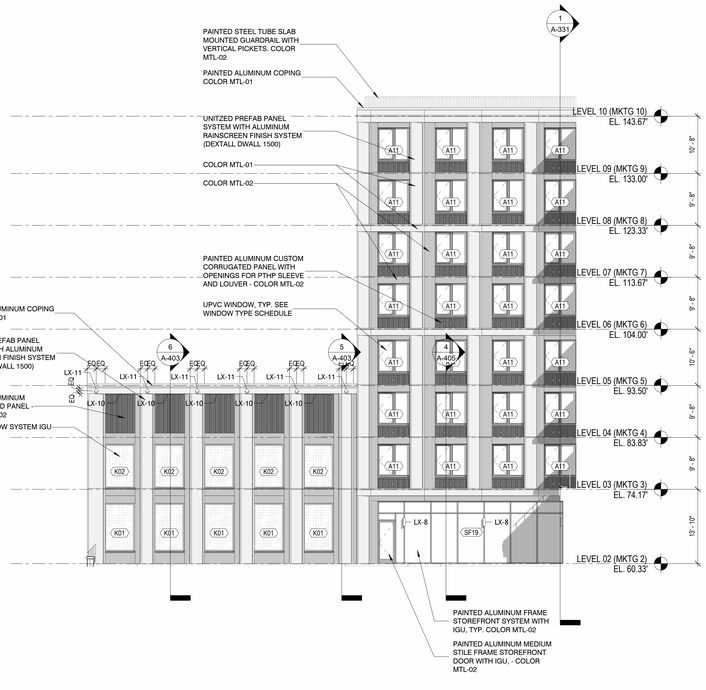
DOB NOW JOB # Q01275800-I1



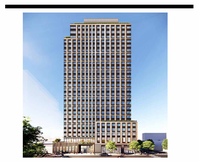
3 A-307 ELEVATION EAST - STAIR B BULKHEAD EAST
1" = 10'-0"



2 A-307 OVERALL ELEVATION COURTYARD SOUTH
1" = 10'-0"



1 A-307 OVERALL ELEVATION COURTYARD EAST
1" = 10'-0"



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2	08/01/25	100% DD

REVISIONS

SUBMITTAL
100% CONSTRUCTION DOCUMENTS

DRAWING TITLE

EXTERIOR ELEVATIONS - COURTYARD SOUTH & EAST

SCALE	1" = 10'-0"
DATE	01/16/26
PROJECT NUMBER	3053.00
DRAWING NUMBER	

A-307.00

DOB NOW JOB # Q01275800-I1

1/16/2026 12:42:55 PM

REFERENCES:

1. THESE PLANS ARE DEVELOPED FROM:
   a. A MARCH 24, 2025 REPORT OF GEOTECHNICAL INVESTIGATION PREPARED BY JZN ENGINEERING, PC.
   b. A LAST REVISED JANUARY 16, 2026 100% CD STRUCTURAL PLAN SET PREPARED BY DESIMONE CONSULTING ENGINEERS.
   c. A LAST REVISED JANUARY 27, 2025 TOPOGRAPHICAL SURVEY PREPARED BY MONTROSE SURVEYING CO.
   d. A DECEMBER 16, 2025 DOT FIXED SKETCH PREPARED BY CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
   e. A LAST REVISED FEBRUARY 23, 2015 PILE CAP LAYOUT FOR V-13-6 TRANSFORMER VAULTS PREPARED BY CONSOLIDATED EDISON COMPANY OF NEW YORK, INC.
2. LOCATION OF EXISTING TRANSIT STRUCTURE OBTAINED FROM THE FOLLOWING DRAWINGS FROM THE NYCT MICROFILM DATABASE:
   a. AN APRIL 29, 1929 STEINWAY ST. QUEENS, NORTHERN BOULEVARD TO 35TH AVE. STA. 1342+60 TO STA. 1352+10, STRUCTURAL PLANS SECTIONS A-A, B-B, & N-N (FILE NO. 6502; DWG NO. 393)
   b. AN APRIL 29, 1929 STEINWAY ST. QUEENS, NORTHERN BOULEVARD TO 35TH AVE. STA. 1342+60 TO STA. 1352+10, STRUCTURAL PLANS SECTIONS O-O & P-P (FILE NO. 6502; DWG NO. 393)
   c. A DECEMBER 24, 1928 STEINWAY ST FROM NORTHERN BLVD TO BROADWAY QUEENS C.L. STA 1344+70 TO C.L. STA 1366+50 STRUCTURAL PLANS ALIGNMENT & GRADES (FILE NO. 6502; DWG NO. 306)
   d. A MARCH 23, 1929 STEINWAY ST. QUEENS, 35TH AVENUE TO 34TH AVENUE STA. 1352+10 TO STA. 1356+85 STRUCTURAL PLANS ROOF PLAN (FILE NO. 6502; DWG NO. 369)
   e. AN APRIL 29, 1929 STEINWAY ST. QUEENS, NORTHERN BOULEVARD TO 35TH AVE. STA. 1342+60 TO STA 1352+10 STRUCTURAL PLANS ROOF PLAN (FILE NO. 6502; DWG NO. 390)

PLAN SET DESIGN SCOPE

THIS PLAN SET REPRESENTS THE DESIGN AND SPECIFICATIONS OF THE PROPOSED BUILDING'S TEMPORARY SUPPORT OF EXCAVATION, INCLUDING INSTALLATION OF SOLDIER PILES, LAGGING, SOIL SLOPING, AND SOIL MIX WALL.

GENERAL NOTES:

1. ALL ELEVATIONS ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88) UNLESS NOTED OTHERWISE.
2. THE CONTRACTOR, MATERIALS AND WORKMANSHIP SHALL COMPLY WITH THE REQUIREMENTS OF THE NEW YORK BUILDING CODE (NYCBC 2022) AND ALL APPLICABLE FEDERAL AND STATE CODES, STANDARDS, REGULATIONS, AND LAWS.
3. THE CONTRACTOR SHALL PROTECT EXISTING FACILITIES, STRUCTURES AND UTILITY LINES FROM ALL DAMAGE.
4. THE GROUNDWATER TABLE IS AT +/-ELEV. 21.6 FEET
5. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DEWATERING OF EXCAVATIONS WHERE NECESSARY.
6. THE OWNER IS RESPONSIBLE FOR OBTAINING CONTROLLED INSPECTIONS ACCORDING TO NEW YORK BUILDING CODE (NYCBC 2022).
7. IF CONDITIONS IN THE FIELD ARE DIFFERENT THAN THOSE INDICATED ON THE CONTRACT DOCUMENTS OR DESIGN CALCULATIONS, WORK SHOULD STOP AND THE ENGINEER SHALL BE NOTIFIED IMMEDIATELY.
8. NO REVISIONS, ALTERNATES OR SUBSTITUTIONS TO THE CONTRACT DOCUMENTS ARE ALLOWED WITHOUT PRIOR WRITTEN APPROVAL FROM THE ENGINEER.
9. THE DRAWINGS ARE NOT TO BE SCALED FOR DIMENSIONS.
10. IF ANY CONFLICTS SHALL ARISE BETWEEN OR WITHIN THE CONSTRUCTION DRAWINGS AND MANUFACTURER'S RECOMMENDATIONS THE MOST STRINGENT REQUIREMENT SHALL APPLY.
11. THE CONTRACTOR IS RESPONSIBLE FOR ALL PERMANENT FALL PROTECTION AND/OR VEHICULAR BARRIERS WHICH MAY BE REQUIRED BY GOVERNING CODES. THE LOCATION, TYPE AND DESIGN OF THESE ITEMS ARE BY OTHERS.
12. LOCATIONS AND ELEVATIONS OF ALL PROPOSED STRUCTURAL BUILDING ELEMENTS SHOWN ON THIS DRAWING MAY BE APPROXIMATE AND SHALL BE SUPERSEDED BY FINAL STRUCTURAL AND ARCHITECTURAL DRAWINGS. CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL SOE ELEMENTS DO NOT INTERSECT WITH EXISTING AND PROPOSED BUILDING ELEMENTS. ALL SOE ELEMENTS ON THIS DRAWING SET ARE PLACED IN RELATION TO THE STRUCTURAL BUILDING ELEMENTS AND SHOULD BE VERIFIED FOR SUCH.
13. THE CONTRACTOR SHALL VERIFY ALL DIMENSIONS AND CONDITIONS, AND COORDINATE WITH ALL CONTRACT DRAWINGS, PROJECT SHOP DRAWINGS AND FIELD CONDITIONS PRIOR TO CONSTRUCTION. IF ANY DISCREPANCIES BETWEEN FIELD CONDITIONS AND DESIGN PLANS ARISE, THE ENGINEER SHALL BE NOTIFIED IMMEDIATELY.
14. CONTRACTOR SHALL PROVIDE DRILLING AND INSTALLATION MEANS AND METHODS, MATERIAL SPECIFICATIONS, DETAILING, AND SEQUENCE OF CONSTRUCTION PRIOR TO THE START OF CONSTRUCTION.
15. THE CONTRACTOR SHALL BE RESPONSIBLE TO MAKE SURE THAT ALL REQUIRED PERMITS AND APPROVALS HAVE BEEN OBTAINED PRIOR TO STARTING WORK.
16. NOTIFY NEIGHBORING PROPERTY OWNERS PRIOR TO EXCAVATION AS REQUIRED BY LOCAL REGULATIONS.
17. THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING THE EXACT LOCATION AND DEPTH OF UTILITIES, PIPING, ETC. PRIOR TO THE START OF WORK. THE CONTRACTOR MUST CONTACT THE APPROPRIATE LOCAL "ONE CALL" SYSTEM TO ENSURE THAT ALL UTILITIES ARE PROPERLY AND COMPLETELY MARKED OUT IN THE FIELD PRIOR TO ANY WORK AT THE SITE. ANY DISCREPANCIES BETWEEN THE FIELD LOCATIONS AND THE PLANS SHALL BE REPORTED TO THE ENGINEER IN WRITING IMMEDIATELY. THE CONTRACTOR IS ADVISED THAT UTILITY INFORMATION SHOWN ON THE PLAN IS A COMPILATION OF FIELD LOCATIONS AND RECORD DRAWINGS AND MUST BE CONFIRMED ACCORDINGLY. THE CONTRACTOR IS ALSO ADVISED THAT SUCH FACILITIES DISTURBED DURING CONSTRUCTION MUST BE REPAIRED OR REPLACED AT THE CONTRACTOR'S EXPENSE.
18. IF ANY UTILITY IS TO BE REMOVED, RELOCATED, OR HAVE ITS SERVICE INTERRUPTED, THE UTILITY COMPANY OR CITY AGENCY AFFECTED SHALL BE NOTIFIED AT LEAST 72 HOURS IN ADVANCE. PRIOR TO THE REMOVAL OF ANY SERVICE. THE UTILITY CONNECTION SHALL BE DISCONNECTED AND CAPPED, AND CERTIFICATIONS TO THAT EFFECT ISSUED BY THE REPRESENTATIVE UTILITY COMPANY SHALL BE FILED WITH THE DEPARTMENT.
19. THESE DRAWINGS DO NOT EXPRESS SAFETY ISSUES RELATED TO THE EXCAVATION OR CONSTRUCTION OF THE SHORING SYSTEM. ENGINEER OF RECORD NOT RESPONSIBLE FOR SITE OR JOB SITE SUPERVISION. SITE SAFETY AND CONSTRUCTION PROCEDURES ARE THE RESPONSIBILITY OF THE CONTRACTOR AND SITE SUPERVISOR.
20. SEQUENCE AND COORDINATION OF CONSTRUCTION IS SOLELY THE CONTRACTOR'S RESPONSIBILITY.
21. BARRIERS AND FENCING AROUND SITE MUST BE PROVIDED BY CONTRACTOR IN ACCORDANCE WITH ALL APPLICABLE LAWS, BUILDING CODES, TOWN ORDINANCES, AND REGULATIONS.
22. EXCAVATIONS WITHIN 5 FT AND 20 FT IN DEPTH SHALL HAVE A MAXIMUM SLOPE OF 1.5H:1V UNLESS OTHERWISE APPROVED BY THE ENGINEER OF RECORD. CONTRACTOR TO PROVIDE EROSION AND STORM WATER CONTROLS AT ALL TIMES TO PROTECT FROM SLOPE SLOUGHING AND EROSION.
23. ALL SIDES OR SLOPES OF EXCAVATIONS SHALL BE INSPECTED AFTER STORM EVENTS, AND SAFE CONDITIONS SHALL BE RESTORED.
24. EVERY EXCAVATION SHALL PROVIDE A SAFE MEANS OF INGRESS AND EGRESS THAT IS KEPT AVAILABLE AT ALL TIMES.
25. THE CONTRACTOR SHALL EXERCISE EXTREME CARE WHEN PERFORMING ANY WORK ACTIVITIES ADJACENT TO EXISTING BUILDINGS/ STRUCTURES/ UTILITY LINES/RETAINING WALLS TO REMAIN. CONTRACTOR SHALL BE RESPONSIBLE FOR TAKING THE APPROPRIATE MEASURES AS NECESSARY TO ENSURE THE STRUCTURAL STABILITY OF FOUNDATIONS/ STRUCTURES/ WALLS/ SIDEWALKS AND PAVEMENT TO REMAIN, AND PROVIDE A SAFE WORK AREA.
26. OBSERVED MOVEMENTS OF THE SUPPORT OF EXCAVATION OR OTHER STRUCTURES SHALL BE BROUGHT TO THE ATTENTION OF THE CONSTRUCTION MANAGER AND ENGINEER.
27. WHERE THE WATER PROOF INTEGRITY OF AN ADJOINING WALL OR BUILDING HAS BEEN IMPAIRED DURING CONSTRUCTION OPERATIONS, THE CONTRACTOR SHALL PROVIDE THE NECESSARY MEASURES TO PERMANENTLY WATERPROOF THE ADJOINING WALL OR BUILDING IN ORDER TO ESTABLISH OR RESTORE THE WEATHERPROOF INTEGRITY OF SUCH ADJOINING WALL OR BUILDING. THIS SHALL INCLUDE, BUT NOT BE LIMITED TO:
   a. BENDING OVER AND FLASHING ALL ROOFING MATERIAL OF ADJOINING BUILDINGS;
   b. SEALING AND PERMANENTLY WATERPROOFING ALL DOORS OR OTHER OPENINGS IN PARTY WALLS;
   c. PROPERLY SEALING ALL CORNICES, WHERE CUT;
   d. POINTING UP AND MAKING WATERPROOF ANY WALLS AND PARAPETS AND ANY WALLS THAT HAVE BEEN DISTURBED;
   e. REMOVING ALL EXPOSED FURRING, LATH, AND PLASTER ON PARTY WALLS; AND
   f. REMOVING, REPLACING, AND FIRMLY ANCHORING ANY LOOSE WALL MATERIALS.
29. CONTRACTOR SHALL PROTECT ALL ADJOINING PROPERTIES IN ACCORDANCE TO NYCBC-2022.
30. CONTRACTOR SHALL PREVENT THE ACCUMULATION OF WATER OR WATER DAMAGE TO ANY FOUNDATIONS ON THE PREMISES OR TO ADJOINING PROPERTY. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO TAKE EROSION CONTROL MEASURES NECESSARY IN ACCORDANCE WITH NYC GUIDELINES FOR URBAN EROSION & SEDIMENT CONTROL TO PREVENT SEDIMENT AND/OR LOOSE DEBRIS FROM WASHING INTO ADJACENT PROPERTIES.
31. ALL EXCAVATIONS SHALL BE DRAINED, AND THE DRAINAGE SHALL BE MAINTAINED AS LONG AS THE EXCAVATION CONTINUES OR REMAINS. WHERE NECESSARY, PUMPING SHALL BE USED, PROVIDED PROPER PERMITS ARE OBTAINED FROM THE NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION.
32. CONTRACTOR SHALL ENSURE THAT NO INTERFERENCE WITH NATURAL SURFACE DRAINAGE WILL BE CREATED AS A RESULT OF CONSTRUCTION OR DEMOLITION OPERATIONS.
33. WATER COURSES, DRAINAGE DITCHES, ETC., SHALL NOT BE OBSTRUCTED BY ANY DEBRIS THAT MAY INTERFERE WITH SURFACE DRAINAGE OR CAUSE THE IMPOUNDMENT OF SURFACE WATERS.
34. DEWATERING DESIGN BY OTHERS. CONTRACTOR TO COORDINATE DEWATERING & SOE INSTALLATION. MEASURES SHALL BE TAKEN TO PREVENT SETTLEMENT, SLOPE FAILURE, AND DAMAGE TO ADJACENT BUILDINGS (INCLUDING DRAWDOWN CONSIDERATIONS), STRUCTURES, AND PROPERTY AFFECTED BY DEWATERING OPERATIONS.
35. WATERPROOFING DESIGN TO BE COMPLETED BY OTHERS.
36. SEE PROFILES FOR ALLOWABLE EXCAVATIONS ADJACENT TO SOE ELEMENTS.
37. IF JZN ENGINEERING, PC. HAS BEEN RELEASED OR HAS WITHDRAWN ITS RESPONSIBILITY FOR SPECIAL INSPECTIONS AND A FIRM OTHER THAN JZN ENGINEERING, PC. IS ENGAGED BY THE OWNER, OWNER'S REPRESENTATIVE, OR CONTRACTOR FOR SPECIAL INSPECTION OF THE DESIGN SHOWN ON THESE DRAWINGS, THEN WE REQUIRE THAT JZN ENGINEERING, PC. BE RETAINED TO REVIEW THE INSPECTION AGENCY'S FIELD REPORTS AND FOR SITE VISITS BY OUR PERSONNEL DURING RELEVANT CONSTRUCTION ACTIVITIES.

NYCDOB NOTES

1. CONTRACTOR SHALL TAKE NOTICE OF THE REQUIREMENTS CONTAINED IN 1RCNY SECTION 52-01 FOR EXCAVATIONS & EARTHWORK AND THE 2022 NEW YORK CITY CONSTRUCTION CODE, SECTION 33 FOR SAFEGUARDS DURING CONSTRUCTION. CONTRACTOR SHALL FULLY COMPLY WITH EACH AND EVERY ONE OF SAID REQUIREMENTS THROUGHOUT THE PROJECT. CONTRACTOR SHOULD REFER TO WWW.NYC.GOV/BUILDINGS FOR ADDITIONAL INFORMATION.
2. AS PER SECTION 27-195 OF THE ADMINISTRATIVE CODE, NO EARTHWORK SHALL START UNLESS THE PERMIT HOLDER NOTIFIES THE NYCDOB VIA PHONE OR ELECTRONICALLY AT LEAST 24 HOURS, BUT NO MORE THAN 48 HOURS PRIOR TO THE COMMENCEMENT OF EARTHWORK. EXCAVATIONS 5' TO 10' IN DEPTH WITHIN 10 FEET OF AN ADJACENT BUILDING OR EXCAVATION OVER 10' DEEP ANYWHERE ON SITE REQUIRE THAT THE PERSONS CAUSING THE EXCAVATION PROVIDE WRITTEN NOTICE TO THE OWNERS OF ADJACENT BUILDING OR BUILDINGS NOT LESS THAN 10 DAYS PRIOR TO THE SCHEDULED STARTING DATE OF THE EXCAVATION. THE WRITTEN NOTICE SHALL PROVIDE A DESCRIPTION OF THE WORK TO BE PERFORMED, THE TIMEFRAME AND SCHEDULE, AND CONTACT INFORMATION OF THE PERSON CAUSING THE EXCAVATION AND OF THE DEPARTMENT. SHOULD THE NOTIFICATION DATE FALL ON A WEEKEND OR AN OFFICIAL HOLIDAY, THE PERMIT HOLDER SHALL NOTIFY THE DEPARTMENT ON THE LAST BUSINESS DAY BEFORE THE COMMENCEMENT DATE AND A MINIMUM OF 24-48 HOURS PRIOR TO START OF CONSTRUCTION.
3. UNLESS SPECIFICALLY NOTED OTHERWISE, JZN ENGINEERING, P.C. IS RETAINED SOLELY TO PROVIDE PLANS FOR THE SUBJECT PROJECT AND RESPONSIBILITY IS THEREBY LIMITED TO THE ACCURACY OF THESE DRAWINGS.
4. UNLESS OTHERWISE STATED, JZN ENGINEERING, P.C. IS NOT RETAINED FOR ANY JOB SUPERVISION, BUT MAY BE RETAINED FOR SPECIFIC SPECIAL/PROGRESS INSPECTIONS. CONTRACTOR TO CONTACT THE ENGINEER DESIGNATED ON THE TECHNICAL RESPONSIBILITY FORM (TR-1) IN WRITING AT LEAST 72 HRS. PRIOR TO START OF WORK TO ARRANGE FOR REQUIRED INSPECTIONS.
5. THE SPECIAL INSPECTION AGENCY IS NOT RESPONSIBLE FOR ANY WORK PERFORMED WITHOUT PRIOR WRITTEN NOTICE TO THE ENGINEER NOR FOR ANY UNINSPECTED OR UNACCEPTABLE WORK.
6. CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL REQUIRED WORK PERMITS FOR ALL WORK SHOWN ON PLANS PRIOR TO START OF WORK. AS PER NYCDOB CODE, PERMITS FOR WORK DEPICTED IN THESE PLANS SHALL BE POSTED AT JOB SITE WITHIN 3 DAYS OF ISSUANCE.
7. COPIES OF SPECIAL INSPECTION FIELD LOGS (PERIODIC OR CONTINUOUS), TR-1 FORMS AND SPECIAL INSPECTION SIGN-IN LOGS SHALL BE KEPT ON SITE BY CONTRACTOR AND MADE AVAILABLE TO THE NYCDOB UPON REQUEST.
8. CONTRACTOR/OWNER SHALL PROVIDE JZN ENGINEERING, P.C. WITH PRE-CONSTRUCTION CONDITIONS SURVEY AND BENCHMARK SURVEYS OF ADJOINING PROPERTIES AND STRUCTURES TO DETERMINE IF ADJOINING PROPERTIES AND STRUCTURES ARE ADVERSELY AFFECTED BY EXCAVATION OPERATIONS AS OUTLINED IN THIS PLANS. SURVEY SHOULD CONTAIN A RECOMMENDED MONITORING PLAN AND BE CERTIFIED BY LICENSE NEW YORK STATE PROFESSIONAL ENGINEER.
9. ALL BUILDING DESIGNATED AS "LANDMARKS" LOCATED WITHIN 90 FEET OF THE PROPOSED EXCAVATION AND OVERALL SITE DEVELOPMENT WORK ARE TO BE MONITORED AS PER THE REQUIREMENTS OF TPPN 10/88.
10. OWNER SHALL OBTAIN WRITTEN CONSENT FROM ADJACENT PROPERTY OWNERS FOR ALL WORK THAT EXTENDS BEYOND PROPERTY LINE INTO ADJACENT PROPERTY.
11. CONTRACTOR SHALL OBTAIN NYCDOT PERMITS FOR ANY WORK THAT EXTENDS INTO SIDEWALK AND/OR ROADWAY.
12. CONTRACTOR SHALL COMPLY WITH CHAPTER 33 OF THE NYCBC-2022.

USE AND ACCESS AGREEMENT

1. THE CONTRACTOR SHALL PROVIDE WRITTEN NOTICE TO THE OWNERS OF THE ADJOINING PROPERTY NOT LESS THAN 10 DAYS PRIOR TO THE SCHEDULED STARTING DATE OF THE EXCAVATION IN ACCORDANCE TO NYCB 3304.3.2.
2. NO WORK OR PLACEMENT OF EXCAVATIONS OR SOE COMPONENTS ON ADJACENT PROPERTIES IS TO BEGIN UNTIL PROPER USE AND ACCESS AGREEMENT IS SIGNED BY OWNER OF DEVELOPED PROPERTY AS WELL AS ADJACENT BUILDING OWNERS TO AUTHORIZE UNDERPINNING OF ADJACENT BUILDINGS AND/OR PLACEMENT OF S.O.E. COMPONENTS OF ADJACENT PROPERTIES. COPY OF AGREEMENT SHALL BE FORWARDED TO DESIGN APPLICANT PRIOR TO START OF SUPPORT OF EXCAVATION/UNDERPINNING WORK.
3. WHERE CONSTRUCTION WILL REQUIRE ACCESS TO ADJOINING PROPERTIES, WRITTEN NOTIFICATION SHALL BE PROVIDED TO THE ADJOINING PROPERTY OWNER AT LEAST 60 CALENDAR DAYS PRIOR TO THE COMMENCEMENT OF WORK. SUCH NOTIFICATION SHALL DESCRIBE THE NATURE OF WORK, ESTIMATED TIMEFRAME AND DURATION, DETAILS OF THE INSPECTIONS OR MONITORING TO BE PERFORMED AT THE ADJOINING PROPERTY, PROTECTION TO BE INSTALLED ON THE ADJOINING PROPERTY, AND CONTACT INFORMATION FOR THE PROJECT. WHERE NO RESPONSE IS RECEIVED, A SECOND WRITTEN NOTIFICATION SHALL BE MADE NO MORE THAN 45 CALENDAR DAYS, AND NOT LESS THAN 30 CALENDAR DAYS, PRIOR TO THE COMMENCEMENT OF WORK.

NYCDOT APPROVAL

PRIOR TO START OF WORK, THE CONTRACTOR SHALL OBTAIN NYCDOT APPROVAL FOR THE EXCAVATION OR INSTALLATION OF S.O.E. COMPONENTS WITHIN NYCDOT R.O.W. COPY OF APPROVAL/PERMIT SHALL BE PROVIDED TO DESIGN APPLICANT ONCE OBTAINED.

FENCES AND GUARDRAILS

1. EVERY SITE WITH AN EXCAVATION SHALL BE ENCLOSED WITH A FENCE THAT MEETS THE REQUIREMENTS OF SECTION 3307.7 OF THE NYCBC-2022.
2. ALL OPEN EDGES OF AN EXCAVATION THAT ARE 6 FEET OR GREATER IN DEPTH SHALL BE PROTECTED BY A GUARDRAIL SYSTEM MEETING THE REQUIREMENTS OF SECTIONS 3308.7.1 THROUGH 3308.7.5 OF THE NYCBC-2022, OR BY A SOLID ENCLOSURE AT LEAST 3 FEET 6 INCHES HIGH.

DRAINAGE NOTES

1. NO CONDITION SHALL BE CREATED AS A RESULT OF CONSTRUCTION OR DEMOLITION OPERATIONS THAT WILL INTERFERE WITH NATURAL DRAINAGE. WATER COURSES, DRAINAGE DITCHES, ETC., SHALL NOT BE OBSTRUCTED BY REFUSE, WASTE BUILDING MATERIALS, EARTH, STONES, TREE STUMPS, BRANCHES, OR OTHER DEBRIS THAT MAY INTERFERE WITH SURFACE DRAINAGE OR CAUSE THE IMPOUNDMENT OF SURFACE WATERS PER BC 3303.14.
2. PROVISION SHALL BE MADE DURING CONSTRUCTION TO PREVENT THE ACCUMULATION OF WATER OR WATER DAMAGE TO ANY FOUNDATIONS ON THE PREMISES OR TO ADJOINING PROPERTY PER BC 3303.14.1
3. ALL EXCAVATIONS SHALL BE DRAINED, AND THE DRAINAGE SHALL BE MAINTAINED AS LONG AS THE EXCAVATION CONTINUES OR REMAINS. WHERE NECESSARY, PUMPING SHALL BE SUED, PROVIDED PROPER PERMITS ARE OBTAINED FROM THE NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION PER BC 3303.14.2.

SOLDIER PILE INSTALLATION NOTES

1. ALL PILES SHALL BE INSTALLED AT LOCATIONS AS SHOWN ON CONTRACT DRAWINGS.
2. LAYOUT OF PILE LOCATIONS BY GC (SURVEYED IN PLACE)
3. STAKE OUT LOCATIONS OF ALL EXISTING UTILITIES AND CONFIRM CLEARANCE FOR INSTALLATION OF PROPOSED SOLIDER PILES.
4. ALL SURFACE WATER (STORMWATER, ETC.) SHALL EITHER BE DIRECTED AWAY FROM TOP OF SOLDIER PILE WALL OR OVER TOP OF SOLDIER PILE WALL. WATER SHALL NOT BE ALLOWED TO DRAIN BEHIND LAGGING BOARDS.

SOIL MIX PILE WALL INSTALLATION PROCEDURE

1. INSTALL SOIL MIX PILES AS DESCRIBED BELOW AND AS NOTED ON THE PLAN.
2. INSTALL ALL SOIL MIX WALL PILES TO THE MINIMUM DEPTH SPECIFIED ON PLANS AND PROFILES. SOIL MIX WALLS SHALL CONSIST OF 500 PSI SOIL MIX PER PLANS.
3. SOIL MIX PILES SHALL BE DRILLED PER CONTRACTOR SUBMITTED AND ENGINEER APPROVED MEANS AND METHODS. CONTRACTOR SHALL ENSURE DRILL METHOD IS SUITABLE TO SATISFY THE PARAMETERS SPECIFIED ON THIS PLAN SET. DRILL METHOD SHALL ENSURE THAT THE MONITORING THRESHOLDS AS SPECIFIED PER THE PROJECT DOCUMENTS ARE SATISFIED AND SHALL PROTECT NEIGHBORING BUILDINGS FROM DAMAGE DUE TO DRILLING OPERATIONS.
4. INSERT HP8X36 CORE BEAM IN SPECIFIED LOCATIONS AFTER DRILLING WHILE SOIL MIX IS STILL WET.
5. A MINIMUM CONCRETE SET TIME OF 24 HOURS SHALL BE REQUIRED PRIOR TO DRILLING ANY SOIL MIX PILES WITHIN 10 FEET OF RECENTLY POURED PILES.
6. MASS EXCAVATION OF SITE CAN COMMENCE ONCE THE SOIL MIX PILE WALL CONCRETE HAS ACHIEVED A MINIMUM OF 70% OF DESIGN STRENGTH.
7. COLLECT SOIL MIX SAMPLES FOR LAB TESTS, MINIMUM 6 CYLINDERS PER 50 CUBIC YARDS.

SOLDIER PILE INSTALLATION PROCEDURE:

1. INSTALL SOLDIER PILES (W21X122) AS DESCRIBED BELOW AND AS NOTED ON THE PLAN.
2. SOLDIER PILES SHALL BE INSTALLED VIA DRILLED METHOD ONLY WITHIN 100 FEET OF MTA TUNNEL. REMAINDER OF SOLDIER PILE INSTALLATION ARE CONTRACTOR MEANS AND METHODS. CONTRACTOR IS ADVISED TO TAKE EVERY PRECAUTION TO PROTECT PUBLIC UTILITIES. SOLDIER PILE INSTALLATION PROCEDURE SHALL BE CONTRACTOR MEANS AND METHODS AND SHALL BE SUBMITTED FOR APPROVAL PRIOR TO CONSTRUCTION. REGARDLESS OF THE DRILL METHOD UTILIZED, DRILL METHOD MUST ENSURE THAT NO SOIL LOSS OCCURS BEYOND THE DRILL TOOLING AND CASING (IF UTILIZED). DRILL HOLE SHALL BE FILLED WITH FLOWABLE FILL (50 PSI STRENGTH) FROM THE BOTTOM UP (I.E. TREMIE METHOD OR HOLLOW STEM AUGER METHOD DEPENDING ON PROPOSED DRILL METHOD).
3. CONSTRUCT SOLDIER PILE WALLS FROM THE TOP DOWN BY REMOVING MATERIAL IN FRONT OF WALLS AND IN BETWEEN PILES AS NEEDED AND INSTALLING LAGGING BOARDS BETWEEN THEM AS EXCAVATION PROGRESSES.
4. EXCAVATION BEYOND THE PILE FLANGE SHALL BE DONE TO THE MINIMUM QUANTITY REQUIRED FOR THE INSTALLATION OF THE LAGGING. BACKFILL VOIDS BEHIND LAGGING WITH GRANULAR MATERIAL OR COMPACTED EXCAVATED MATERIAL TO THE SATISFACTION OF THE ENGINEER.
5. DEPTH OF EXCAVATION BELOW PREVIOUSLY INSTALLED LAGGING BOARDS SHALL NOT EXCEED 18-INCHES. MAINTAIN TIGHT CONTACT BETWEEN SOIL AND LAGGING BOARDS. IF MATERIAL IS CAVING INTO EXCAVATION, DECREASE THE UNBRACED EXCAVATION DEPTH AND/OR GROUT THE MATERIAL TO MINIMIZE LOSS.
6. IF MATERIAL BEHIND LAGGING HAS BEEN LOST OR DISTURBED, LEAVE A 1 TO 1-1/2 INCH SPACE BETWEEN LAGGING BOARDS TO IMMEDIATELY BACKFILL OR GROUT.
7. BACKFILL SHALL BE PLACED AND COMPACTED AS REQUIRED, OR AS DIRECTED BY THE INSPECTING GEOTECHNICAL ENGINEER.
9. EXCAVATE THE SITE TO THE FINAL PROPOSED BOTTOM OF EXCAVATION.

SURCHARGE LOADS

SOE HAS BEEN DESIGNED UTILIZING A UNIFORM SURCHARGE LOAD OF 250 PSF

SOE MATERIALS

1. ALL STRUCTURAL STEEL SHALL BE ASTM A-572 OR ASTM A-992 GRADE 50
2. TIMBER LAGGING - AITC FB = 1,100 PSI (MIN.), FY = 95 PSI (MIN.)
3. ALL SOIL MIX WALLS SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 500 PSI.

NEW YORK CITY ENERGY CONSERVATION CODE

1. TO THE BEST OF MY KNOWLEDGE, BELIEF AND PROFESSIONAL JUDGEMENT THESE PLANS AND SPECIFICATIONS ARE IN COMPLIANCE WITH THE NEW YORK CITY ENERGY CONSERVATION CODE.

SUBMITTALS

1. MATERIALS SPECIFICATIONS/CUT SHEETS
2. SOE DRILLING AND INSTALLATION PROCEDURE
3. SEQUENCE OF CONSTRUCTION
4. SOLDIER PILE ID & COORDINATE PLAN

ITEMS UNDER SPECIAL INSPECTION

- STRUCTURAL STEEL - DETAILS.....BC 1704.2.2
- CONSTRUCTION OPERATIONS INFLUENCING ADJACENT STRUCTURES.....BC 1704.25.2
- EXCAVATIONS.....BC 1705.25.3

VICINITY MAP
N.T.S.

THE STATE OF NEW YORK REQUIRES NOTIFICATION BY EXCAVATORS, DESIGNERS, OR ANY PERSON PREPARING TO DISTURB THE EARTH'S SURFACE ANYWHERE IN THE STATE.

PREPARED BY:
JZN ENGINEERING
959 S. SPRINGFIELD AVENUE, SUITE 100
SPRINGFIELD P: (973) 218-6561
NEW JERSEY 07081

NO.	DATE	BY	DESCRIPTION	APPROVED
4.	01/20/26	PN	100% CD SET	NEJ
3.	10/27/25	PN	50% CD SET	NEJ
2.	08/14/25	PN	100% DD SET (REVISIONS PER CLIENT COMMENTS)	NEJ
1.	08/05/25	PN	100% DD SET	NEJ

REVISIONS

PROJECT NAME:

INNOVATION QNS, BUILDING B1
35-10 STEINWAY STREET
BLOCK: 668; LOT: 6
ASTORIA, BOROUGH OF QUEENS
CITY & STATE OF NEW YORK

DRAWING TITLE:

NOTES

SEAL & SIGNATURE

STATE OF NEW YORK NEJM EDDIN JUNDI 083095 REGISTERED PROFESSIONAL ENGINEER

10/27/25
DATE
NEJM E. JUNDI
NEW YORK STATE PROFESSIONAL ENGINEER #083095

ALTERATION OR ADDITION TO THIS DOCUMENT EXCEPT BY A LICENSED PROFESSIONAL ENGINEER IS A VIOLATION OF SECTION 7209, SUB-DIVISION 2, OF THE NEW YORK STATE EDUCATION LAW.

DATE:	08/05/25
SCALE:	N.A.
PROJECT No:	24190-000
DOB NOW:	Q01275800-S6
DRAWING BY:	PN
CHK BY:	GR
APPROVED BY:	NEJ

DWG No:
SOE-001.00

CAD FILE No:	PAGE No:
24190000	3 of 13

NEW YORK CITY TRANSIT

GENERAL NOTES

1. THE NYC TRANSIT (NYCT) RESERVES THE RIGHT TO PLACE INSPECTORS, FLAGMEN OR OTHER PERSONNEL IN THE SUBWAY STRUCTURES DURING CONSTRUCTION OF THE PROJECT LINKED BY A TELEPHONE SYSTEM, IF DEEMED NECESSARY, TO OBSERVE THE EFFECTS OF THE CONSTRUCTION ON THE TRANSIT FACILITIES. NYCT FURTHER RESERVES THE RIGHT TO PLACE SUCH PERSONNEL WHENEVER, IN ITS OPINION, THE PROJECT CONDITIONS WARRANT SUCH PLACEMENT, REGARDLESS OF DISTANCE. THE COST OF SUCH PERSONNEL, TELEPHONE INSTALLATION AND ANY RE-ROUTES, DIVERSIONS OF SERVICE, WORK TRAINS, ETC., MADE NECESSARY BY THE PROJECT, MUST BE BORNE BY THE PROJECT OR THE RESPONSIBLE NEW YORK CITY/STATE AGENCY.

2. ALL ROCK EXCAVATION ADJACENT TO THE TRANSIT STRUCTURE IS TO BE CHANNEL DRILLED TWO FEET BELOW SUBGRADE.

3. IF TOP OF ROCK IS FOUND BELOW SUBWAY STRUCTURE, THE SUBWAY STRUCTURE MUST BE UNDERPINNED IN ACCORDANCE WITH DRAWINGS TO BE SUBMITTED TO NYCT FOR APPROVAL.

4. IF ROCK IS SOFT OR SEAMY, LATERAL SUPPORTS MUST BE PROVIDED BELOW THE SUBWAY STRUCTURE IN ACCORDANCE WITH DRAWINGS TO BE SUBMITTED TO NYCT FOR APPROVAL.

5. BLASTING WILL BE PERMITTED ONLY WITH LIGHT CHARGES SUBJECT TO THE APPROVAL OF NYCT'S ENGINEER AND IN ACCORDANCE WITH THE REGULATIONS OF THE FIRE DEPARTMENT. THE CONTRACTOR SHALL PROVIDE A DETAILED MONITORING PLAN, PROVIDING FOR MEASUREMENTS OF BOTH PARTICLE VELOCITY AND DISPLACEMENTS AT CRITICAL LOCATIONS OF THE NYCT STRUCTURE. THE MONITORING PLAN SHALL INCLUDE THRESHOLD AND UPSET LEVELS OF BOTH PARTICLE VELOCITY AND SETTLEMENT TOGETHER WITH AN ACTION PLAN FOR THEIR IMPLEMENTATION. THE CONTRACTOR SHALL SECURE AN APPROVED SEISMOLOGIST TO INSTALL AND OPERATE SUITABLE VELOCITY GAUGES TO CONTINUOUSLY MONITOR PARTICLE VELOCITY AND AN INDEPENDENT LICENSED SURVEYOR TO MONITOR DISPLACEMENTS. THE PRESENCE OF A QUALIFIED TECHNICIAN FROM MONITORING COMPANY IS NECESSARY TO PROVIDE THE VIBRATION READINGS UPON REQUEST OF NYCT ENGINEER. THE THRESHOLD MAXIMUM PARTICLE VELOCITY CAN ABOVE AMBIENT CAUSED BY THE BLASTING WILL BE 0.5 INCH PER SECOND. VALUES EXCEEDING THIS LEVEL WILL BE REVIEWED AND EVALUATED BY NYCT'S ENGINEER. IN NO CASE WILL PARTICLE VELOCITIES EXCEED THE UPSET LEVEL OF 2.0 INCHES PER SECOND.

6. BEFORE PLACING CONCRETE, THE SUBGRADE OF THE FOUNDATIONS IN THE VICINITY OF THE SUBWAY STRUCTURE IS TO BE INSPECTED AND APPROVED BY NYCT'S ENGINEER.

7. IF ANY PORTION OF THE SUBWAY STRUCTURE OR FINISH IS DAMAGED, IT SHALL BE REPAIRED OR REPLACED WITH THE SAME MATERIALS IN PLACE, SUBJECT TO THE APPROVAL OF NYCT'S ENGINEER AND AT THE EXPENSE OF THE PROJECT.

8. EXCAVATION EMBANKMENTS ARE TO BE SHORED AND BRACED. DRAWINGS INDICATING A SUGGESTED METHOD OF CONSTRUCTION ARE TO BE SUBMITTED TO NYCT FOR APPROVAL IN CONJUNCTION WITH THE PROJECT'S CONTRACT DRAWINGS. IN CASE OF EXCAVATION UNDERMINING THE SUBWAY STRUCTURE, UNDERPINNING MAY BE REQUIRED. DRAWINGS FOR UNDERPINNING ARE TO BE SUBMITTED TO NYCT FOR APPROVAL.

9. TEMPORARY SHORING MAY BE PLACED IN DIRECT CONTACT WITH NYCT STRUCTURES ONLY IF THE NYCT STRUCTURE IS SHOWN TO BE ABLE TO SUPPORT ALL ANTICIPATED LOADS THAT CAN BE TRANSFERRED THROUGH THE TEMPORARY STRUCTURES WITHOUT DAMAGING THE EXISTING STRUCTURE. AT THE COMPLETION OF THE PROJECT, THESE TEMPORARY SHORING AND BRACING SYSTEMS ARE TO BE REMOVED OR CUT-OFF AS APPROVED BY NYCT.

10. WHEN PILES ARE TO BE DRIVEN OR DRILLED ADJACENT TO THE SUBWAY STRUCTURE, BORING DATA, PILE LAYOUTS, SPECIFICATIONS AND INSTALLATION PROCEDURES ARE TO BE SUBMITTED TO NYCT FOR APPROVAL. VELOCITY METERS ARE TO BE INSTALLED IN THE SUBWAY TUNNEL AT CRITICAL LOCATIONS TO MONITOR INDUCED VIBRATIONS. INDUCED DISPLACEMENTS ALONG THE TUNNEL STRUCTURE AND TRACK INVERT ARE TO BE MONITORED DURING DRIVING OR DRILLING. THE THRESHOLD MAXIMUM PARTICLE VELOCITY ABOVE AMBIENT CAUSED BY THE DRIVING OR DRILLING WILL BE 0.5 INCH PER SECOND. VALUES EXCEEDING THIS LEVEL WILL BE REVIEWED AND EVALUATED BY NYCT'S ENGINEER. IN NO CASE WILL PARTICLE VELOCITIES EXCEED THE UPSET LEVEL OF 2.0 INCHES PER SECOND.

11. NO PILES ARE PERMITTED TO BE INSTALLED BY ANY METHOD WITHIN THREE FEET OF SUBWAY STRUCTURE, MEASURED FROM THE EDGE OF THE PILE OR CASING TO THE WALL. CLOSED-END PILES WILL NOT BE PERMITTED TO BE DRIVEN WITHIN TEN FEET OF THE SUBWAY STRUCTURE.

12. ALL PILES ARE TO BE PLACED WITHIN A PREAUGERED CASED HOLE TO THE INFLUENCE LINE. THE CASING SHALL BE CLEANED WITHOUT DISTURBING THE SOIL OUTSIDE THE CASING AND THE PILE TO BE PLACED WITHIN THE CASING FOR INSTALLATION. THE PILES MAY THEN BE DRIVEN BEYOND THE INFLUENCE LINE WITHIN THE CASING.

13. THE INFLUENCE LINE SHALL START AT THE BOTTOM OF THE SUBWAY STRUCTURE AND EXTEND FROM 1H:1V TO 2H:1V SLOPE DEPENDING ON THE SOIL PROPERTIES AND GROUND WATER TABLE. FOR PILES INSTALLED WITHIN TEN FEET OF THE SUBWAY STRUCTURE, THE CASING SHALL BE EXTENDED UP TO THE BOTTOM OF THE SUBWAY STRUCTURE.

14. ALL PILES ARE TO BE DRIVEN OR DRILLED A MINIMUM OF TEN FEET BELOW THE INTERSECTION OF THE PILE CENTERLINE AND THE INFLUENCE LINE OF THE SUBWAY STRUCTURE.

15. THE USE OF 'DOWN-THE-HOLE -HAMMERS' FOR INSTALLATION OF PILES THROUGH OVERBURDEN AND FILL WILL BE PERMITTED ONLY TO REMOVE BOULDERS. IT WILL NOT BE PERMITTED AS A MATTER OF COURSE TO ADVANCE THE HOLE. THEIR USE TO CONSTRUCT ROCK SOCKETS WILL NOT BE ALLOWED WITHIN 5 FEET OF THE NYCT STRUCTURE. THE USE OF MACHINE UTILIZING AIR FOR SOIL REMOVAL WILL NOT BE ALLOWED.

16. VIBRATORY HAMMERS WILL NOT BE PERMITTED WITHIN 75 FEET OF SUBWAY STRUCTURES. HOE RAMS WILL NOT BE PERMITTED WITHIN 25 FEET OF SUBWAY STRUCTURES.

17. DYNAMIC COMPACTION METHODS USING DROPPED HEAVY WEIGHTS CANNOT BE CONDUCTED WITHIN 1000 FEET OF ANY NYCT STRUCTURE UNLESS IT IS SHOWN THAT INDUCED SETTLEMENTS AND VIBRATIONS WILL NOT DAMAGE THESE STRUCTURES. A SUITABLE MONITORING PLAN INCLUDING SETTLEMENT AND VIBRATION MEASUREMENTS MUST BE APPROVED BY NYCT'S ENGINEER FOR ALL SUCH OPERATIONS WITHIN THESE DISTANCES.

18. THERE SHALL BE NO MACHINE EXCAVATION WITHIN 3 FEET OF NYCT STRUCTURES, POWER DUCT LINES, OR ANY OTHER FACILITIES UNTIL THEY HAVE BEEN CAREFULLY EXPOSED BY HAND EXCAVATION.

19. ALL DEWATERING OPERATIONS CONDUCTED WITHIN 500 FEET OF THE NYCT STRUCTURE MUST BE PERFORMED IN ACCORDANCE WITH DRAWINGS AND PROCEDURES SUBMITTED TO NYCT FOR APPROVAL. THE DISTANCE FROM THE STRUCTURE TO THE DEWATERING OPERATION CAN BE REDUCED PROVIDED THAT SOIL CONDITIONS AT THE SITE INDICATE THAT THE RADIUS OF INFLUENCE OF THE DEWATERING IS LESS THAN 500 FEET. FOR DEWATERING WITHIN THE RADIUS OF INFLUENCE, THE DEWATERING PROGRAM MUST BE SHOWN TO HAVE NEGLIGIBLE INFLUENCE ON SETTLEMENTS OF THE NYCT STRUCTURE.

20. SUBWAY ENTRANCES (VENTILATORS, ETC.) ARE TO BE UNDERPINNED OR SHORED AND BRACED IF DIRECTED BY NYCT'S ENGINEER.

21. NYCT, AT ITS DISCRETION, RESERVES THE RIGHT TO REQUIRE THE PROJECT TO CLOSE OR MAINTAIN AND PROTECT EXISTING SUBWAY ENTRANCES, VENTILATORS, ETC. ADJACENT TO THE PROJECT DURING CONSTRUCTION. SUCH CONSTRUCTION MAY INCLUDE UNDERPINNING, SHORING, BRACING AND ERECTION OF SUITABLE BARRICADES AND/OR CANOPIES AND SHIELDS. SUCH PROTECTION SHALL BE IN ACCORDANCE WITH DRAWINGS SUBMITTED TO NYCT FOR APPROVAL.

22. IF SHIELDS ARE TO BE INSTALLED TO PROTECT NYCT FACILITIES AND/OR THE PUBLIC, PLANS SHOWING THE LOCATION, TYPE AND METHOD OF ATTACHMENT TO THE TRANSIT STRUCTURE MUST BE SUBMITTED TO NYCT FOR APPROVAL.

23. ALL LUMBER AND PLYWOOD USED FOR PROTECTION OF SUBWAY FACILITIES MUST BE FIRE RETARDANT.

24. SUBWAY EMERGENCY EXITS MUST BE KEPT CLEAR AT ALL TIMES.

25. IN EXCAVATING OVER OR NEAR THE SUBWAY ROOF, SPECIAL CARE SHALL BE EXERCISED SO THAT THE THIN CONCRETE PROTECTION OF THE SUBWAY WATERPROOFING IS NOT DAMAGED.

26. BURNING OF, WELDING TO OR DRILLING THROUGH EXISTING STEEL STRUCTURES WILL NOT BE PERMITTED EXCEPT AS SHOWN ON DRAWINGS APPROVED BY NYCT.

27. HORIZONTAL AND VERTICAL CONTROL SURVEY DATA OF THE EXISTING NYCT STRUCTURE IS TO BE TAKEN BY A LICENSED LAND SURVEYOR TO MONITOR ANY MOVEMENTS THAT OCCUR DURING CONSTRUCTION AND TO SHOW THAT THE INDUCED MOVEMENTS ARE WITHIN ALLOWABLES NOTED BELOW. IF ANY MOVEMENTS EXCEED ALLOWABLES, REMEDIATION AS APPROVED BY NYCT SHALL BE PERFORMED.

STRUCTURE	NOTIFY NYCT ENGINEER	STOP WORK
ELEVATED	⅛ INCH	¼ INCH
SUBWAY	¼ INCH	½ INCH

28. BUS ROUTES AFFECTED BY THE PROJECT WILL OR MAY REQUIRE BUS DIVERSIONS. THESE ARRANGEMENTS SHALL BE MADE THROUGH:

MS. SARAH WYSS
SENIOR DIRECTOR, OPERATIONS PLANNING
NEW YORK CITY TRANSIT
2 BROADWAY, ROOM A17.82
NEW YORK, NEW YORK 10004
TELEPHONE NUMBER 646/252-5517

WHEN IMPACTING ANY BUS STOP, SPECIAL OPERATIONS MUST BE NOTIFIED TWO WEEKS IN ADVANCE.

29. DUCT LINES MUST BE MAINTAINED AND PROTECTED DURING CONSTRUCTION. ANY INTERFERENCE WITH DUCT LINES SHOULD BE REPORTED TO NYCT INSPECTOR. WHEN A DUCT LINE CONTAINING CABLES IS TO BE REMOVED, OR WHEN MASONRY ADJACENT THERETO IS TO BE REMOVED, PENETRATED, OR DRILLED, THE WORK SHALL BE DONE WITH HAND LABOR ENTIRELY, USING HAMMER AND CHISEL. JACKHAMMERS, BULL POINTS OR OTHER POWER EQUIPMENT SHALL NOT BE USED.

30. WHERE MANHOLES ARE ENCOUNTERED:

a) THEY SHALL BE PROTECTED AND RAISED OR LOWERED AS REQUIRED, TO MATCH THE NEW STREET GRADE.

b) IF MANHOLE COVERS ARE RAISED OR LOWERED, PROTECT CABLES IN MANHOLE BY WOOD SHEETING OF 2" NOMINAL THICKNESS.

c) PRIOR TO THE START OF CONSTRUCTION OPERATIONS AFFECTING MANHOLES AND DUCT LINES, SEVEN DAYS NOTICE MUST BE GIVEN TO MR. ANTHONY V. DIRUGGIERO, P.E., ASSISTANT CHIEF OFFICER, INSPECTIONS AND EMERGENCY RESPONSE, MOW ENGINEERING, AT 718/694-1499.

31. CONSTRUCTION WORK DONE NEAR VENT GRATINGS AND HATCHES SHALL BE AS FOLLOWS:

a) UNLESS APPROVED BY THE NYCT'S ENGINEER, ALL VENT GRATINGS AND HATCHES SHOULD REMAIN OUTSIDE THE CONSTRUCTION SITE, SEPARATED BY A CONSTRUCTION FENCE. PROTECTIVE SHIELDS MUST BE PROVIDED OVER VENT GRATINGS AS REQUIRED BY NYCT'S ENGINEER.

b) NO BUILDING MATERIAL, VEHICLES OR CONSTRUCTION EQUIPMENT IS TO BE STORED OR RUN OVER VENT, GRATINGS, HATCHES OR EMERGENCY EXITS.

c) DETAILS OF SIDEWALK RECONSTRUCTION AROUND VENT GRATINGS, HATCHES AND EMERGENCY EXITS ARE TO BE SUBMITTED TO NYCT FOR APPROVAL.

32. TRACTORS, CRANES, EXCAVATORS, ETC. USED IN THE VICINITY OF THE ELEVATED STRUCTURES SHALL BE ISOLATED FROM THE GROUND. SINCE THE ELEVATED STRUCTURE IS USED AS A NEGATIVE RETURN PATH, WITH A CONSEQUENT POTENTIAL BETWEEN IT AND THE GROUND, ANY CONTACT BETWEEN THE STRUCTURE AND GROUNDED EQUIPMENT COULD RESULT IN BURNING OF THE STEEL.

33. TEMPORARY CONSTRUCTION SHEDS, BARRICADES OR PLYWOOD PARTITIONS MUST BE A MINIMUM OF 5'-0" FROM EDGE OF FINISHED PLATFORM. ALL BARRICADES MUST BE SUBMITTED TO THE OFFICE OF STATION PROGRAMS FOR REVIEW AND APPROVAL.

34. STATION AREAS OR STAIRWAY/CLOSINGS: THE GENERAL REQUIREMENTS FOR STATION AREAS OR STAIRWAY/CLOSINGS ARE AS FOLLOWS:

a) ONLY ONE STAIRWAY AT EACH STATION WILL BE PERMITTED TO BE CLOSED AT THE SAME TIME. APPROVALS FOR CLOSING ANY STAIRWAY MUST BE OBTAINED FROM THE DIVISION OF STATION PROGRAMS AT LEAST THREE WEEKS IN ADVANCE.

b) MS. SUSANNAH HARRINGTON, DIRECTOR, OFFICE OF STATION PROGRAMS; TELEPHONE 718/694-4891 OF THE DIVISION OF STATIONS MUST BE NOTIFIED THREE WEEKS PRIOR TO THE ACTUAL CLOSING AND REOPENING OF THE ENTRANCE.

c) SIGNAGE MUST BE SUPPLIED AND POSTED AT LEAST TWO WEEKS IN ADVANCE, ADVISING THE PUBLIC OF THE PROPOSED SUBWAY STAIR CLOSING. HOWEVER, IF IT IS AN ENTIRE ENTRANCE CLOSING, SIGNAGE MUST BE POSTED TWO WEEKS IN ADVANCE.

d) THE STREET ENTRANCE STAIRWAY SHOULD NOT BE CLOSED UNLESS MANPOWER AND MATERIALS ARE AVAILABLE TO COMMENCE WORK ON DATES PERMITTED.

e) ONCE THE CLOSING IS EFFECTED, CONSTRUCTION SIGNS MUST BE PLACED AT APPROPRIATE LOCATIONS ON THE BARRICADES AT THE STREET AND MEZZANINE LEVELS, STATING THE CONTRACTOR'S NAME, 24 HOUR EMERGENCY TELEPHONE NUMBER, CONTRACT NUMBER, THE DURATION OF THE CLOSING, DIRECTION TO AN ALTERNATE ENTRANCE/EXIT, AND AN APOLOGY FOR THE INCONVENIENCE TO OUR CUSTOMERS.

f) EXISTING STATION SIGNAGE MUST BE ADJUSTED TO REFLECT ANY CHANGES IN ACCESS/EGRESS.

g) BARRICADES ARE TO BE PAINTED FEDERAL BLUE AND BE MADE OF FIRE RATED MATERIAL. BARRICADES MUST BE KEPT GRAFFITI FREE AT ALL TIMES. THE CONTRACTOR MUST MAINTAIN THE BARRICADED AREA CLEAN OF ALL DEBRIS.

h) ALL MATERIALS ARE TO BE PROPERLY STORED AND SECURED AWAY FROM CUSTOMER TRAFFIC.

i) THE CONTRACTOR MUST REMOVE ALL WASTE MATERIAL AND BARRICADES FROM ALL STATION AREAS WHEN CONSTRUCTION IS COMPLETED.

j) INSPECTION OF THE AREA UNDER CONSTRUCTION BY AUTHORIZED STATION DEPARTMENT EMPLOYEES SHALL NOT BE INHIBITED.

k) IF STREETLIGHTS ON THE SIDEWALKS ARE AFFECTED, TEMPORARY LIGHTS SHALL BE PROVIDED.

35. IF NEW CONCRETE CONSTRUCTION IS JOINED TO EXISTING CONCRETE, DOWELS AND KEYWAYS ARE TO BE USED IN ACCORDANCE WITH NYCT STANDARDS.

36. IF THE PROJECT INVOLVES CONSTRUCTION OR ALTERATION OF A SUBWAY FACILITY ON PRIVATE PROPERTY, THE PROPERTY OWNERS WILL BE REQUIRED TO ENTER INTO AN AGREEMENT WITH NYCT PERTAINING TO ALL WORK AFFECTING THE TRANSIT FACILITIES AND CLEARLY DEFINING LIMITS AND RESPONSIBILITY FOR MAINTENANCE AND LIABILITY.

37. WHEREVER A NEW SIDEWALK IS BEING PLACED ADJACENT TO NYCT STRUCTURES THE FOLLOWING WILL BE REQUIRED:

a) THE TOP OF THE NEW SIDEWALK SHALL BE FLUSH WITH THE SUBWAY VENT GRATINGS, HATCHES AND EMERGENCY EXITS.

b) THE SLOPE OF THE NEW SIDEWALK SHALL BE SUCH THAT THE DRAINAGE BE AWAY FROM THESE STRUCTURES.

c) A 1/2" PREMOLDED FILLER SHALL BE INSTALLED BETWEEN THE NEW SIDEWALK AND NYCT STRUCTURE.

d) WHERE SIDEWALK ELEVATIONS ARE BEING CHANGED DETAILS OF PROPOSED WORK AROUND NYCT STRUCTURES ARE TO BE SUBMITTED FOR APPROVAL.

38. BEFORE ENTERING NYCT PROPERTY, CONTRACTOR OR SUBCONTRACTOR'S PERSONNEL SHALL HAVE ATTENDED A NYCT TRACK SAFETY TRAINING AND EXPECT TO FOLLOW NYCT RULES AND REGULATIONS AS PER TRAINING AND ENGINEER INSTRUCTIONS

39. BEFORE THE START OF ANY WORK, THE CONTRACTOR SHALL MAKE AN EXAMINATION, IN THE PRESENCE OF NYCT'S ENGINEER, OF THE INTERIOR AND EXTERIOR OF NYCT SUBWAY OR OTHER STRUCTURE ADJACENT TO THE PROPOSED WORK. THE PERSON OR PERSONS AUTHORIZED BY THE CONTRACTOR TO MAKE THESE EXAMINATIONS SHALL BE APPROVED BY THE ENGINEER. THE CONTRACTOR SHALL TAKE ALL PHOTOGRAPHS AS MAY BE NECESSARY OR ORDERED TO INDICATE THE EXISTING CONDITION OF NYCT STRUCTURE. ONE COPY OF EACH PHOTOGRAPH, EIGHT INCHES BY TEN INCHES IN SIZE, AND THE NEGATIVE IS TO BE SUBMITTED TO MR. ANTHONY V. DIRUGGIERO, P.E., ASSISTANT CHIEF OFFICER, INSPECTIONS AND EMERGENCY RESPONSE, MOW ENGINEERING, 130 LIVINGSTON STREET, ROOM 8046, BROOKLYN, NEW YORK 11201, TELEPHONE 718/694-1499 BEFORE THE START OF CONSTRUCTION.

40. ALL ARCHITECTURAL DETAILS (SERVICE BOOTHS, RAILINGS, DOORS, ETC.) ARE TO CONFORM TO THE LATEST NYCT STANDARDS. THESE STANDARDS ARE AVAILABLE AT NYCT.

41. STANDARD NYCT INSURANCE CLAUSES ARE TO BE MADE PART OF THE PROJECT'S CONTRACT DRAWINGS. PROOF THAT THE NECESSARY INSURANCE IS IN EFFECT WILL BE REQUIRED BEFORE WORK CAN COMMENCE.

42. AT THE CLOSE OF ANY PROJECT INVOLVING CONSTRUCTION OR ALTERATIONS TO TRANSIT FACILITIES, ONE SET OF VELLUMS OR MYLARS, FIVE SETS OF 35MM MICROFILM, AND ELECTRONIC COPIES COMPLYING TO MICROSTATION DGN FORMAT OF "APPROVED AS-BUILTS" MUST BE PROVIDED TO NYCT FOR ITS RECORDS. FOR DETAILS OF SPECIFIC REQUIREMENTS CONTACT NYCT OUTSIDE PROJECTS.

43. AT LEAST THREE WEEKS PRIOR TO THE START OF CONSTRUCTION OPERATIONS, NOTIFICATION MUST BE GIVEN TO MR. ANTHONY V. DIRUGGIERO, P.E., ASSISTANT CHIEF OFFICER, INSPECTIONS AND EMERGENCY RESPONSE, MOW ENGINEERING. THE CONTRACTOR TO PROVIDE TEMPORARY QUARTERS NEAR THE JOB SITE FOR NYCT INSPECTORS CONTAINING A DESK AND TELEPHONE.

INSURANCE CLAUSES:

SECTION A: INSURANCE REQUIREMENTS

THE PERMITTEE AT ITS SOLE COST AND EXPENSE SHALL CARRY AND MAINTAIN POLICIES OF INSURANCE AT ALL TIMES DURING THE PERIOD OF PERFORMANCE UNDER THIS AGREEMENT AS HEREIN SET FORTH BELOW:

1. WORKERS' COMPENSATION: INSURANCE AS REQUIRED BY STATUTE IN THE STATE IN WHICH THE WORK WILL BE PERFORMED. EMPLOYER'S LIABILITY INSURANCE WITH LIMITS OF NOT LESS THAN $1,000,000 BODILY INJURY PER ACCIDENT; $1,000,000 BODILY INJURY PER DISEASE; AND $1,000,000 ANNUAL AGGREGATE. FOR WORK CONDUCTED OUTSIDE THE STATE OF NEW YORK, EMPLOYER'S LIABILITY INSURANCE REQUIRES LIMITS OF NOT LESS THAN $2,000,000 BODILY INJURY PER ACCIDENT, $2,000,000 BODILY INJURY PER DISEASE; AND $2,000,000 ANNUAL AGGREGATE AND MUST PROVIDE PROOF THAT ITS WORKERS COMPENSATION INSURANCE POLICY HAS BEEN ENDORSED TO INCLUDE "OTHER STATES COVERAGE".

   IF THE REQUESTING PARTY LEASES ONE OR MORE EMPLOYEES THROUGH THE USE OF A PAYROLL, EMPLOYEE MANAGEMENT, OR OTHER SIMILAR COMPANY, THEN THE PERMITTEE MUST PROCURE WORKER'S COMPENSATION INSURANCE WRITTEN ON AN "IF ANY" POLICY FORM, INCLUDING AN ENDORSEMENT PROVIDING COVERAGE FOR ALTERNATE EMPLOYER/LEASED EMPLOYEE LIABILITY.

2. COMMERCIAL GENERAL LIABILITY (CGL) INSURANCE: COVERING CLAIMS FOR PERSONAL AND ADVERTISING INJURY, BODILY INJURY (INCLUDING DEATH) AND PROPERTY DAMAGE ARISING OUT OF THE WORK AND IN A FORM PROVIDING COVERAGE NO LESS BROAD THAN THAT OF THE CURRENT ISO COMMERCIAL GENERAL LIABILITY INSURANCE POLICY (OCCURRENCE FORM, NUMBER CG 00 01). SUCH INSURANCE SHALL PROVIDE COVERAGE FOR ALL OPERATIONS INCLUDING THE PRODUCTS-COMPLETED OPERATIONS HAZARD, AND SHALL BE MAINTAINED FOR A PERIOD OF AT LEAST THREE (3) YEARS AFTER FINAL COMPLETION, SUBJECT TO THE LIMITATION OF ANY APPLICABLE STATUTE. THE LIMITS OF SUCH INSURANCE SHALL RENEW ANNUALLY AND NOT BE LESS THAN $2,000,000 EACH OCCURRENCE; $4,000,000 PRODUCTS AND COMPLETED OPERATIONS AGGREGATE; AND $4,000,000 PER PROJECT GENERAL AGGREGATE. THIS REQUIREMENT MAY BE SATISFIED BY A COMBINATION OF A PRIMARY CGL POLICY COVERAGE WITH LIMITS OF NOT LESS THAN $1,000,000 PER OCCURRENCE, AND FOLLOWING-FORM EXCESS OR UMBRELLA LIABILITY INSURANCE POLICY(IES) WHICH EQUAL THE TOTAL LIMITS REQUIRED ABOVE AND FOR EXCESS OR UMBRELLA LIABILITY INSURANCE IN SECTION 4 BELOW. THE CGL AND EXCESS OR UMBRELLA LIABILITY INSURANCE POLICIES MUST BE WRITTEN AN OCCURRENCE BASIS FORM, AND MUST COMPLY WITH THE FOLLOWING PROVISIONS:

   - THE POLICY SHALL INCLUDE INDEPENDENT CONTRACTOR AND CONTRACTUAL LIABILITY COVERAGES;
   - THE POLICY SHALL NOT CONTAIN ANY CONTRACTUAL EXCLUSION RELATIVE TO LABOR LAWS OR ANY OTHER EXCLUSIONS OR LIMITATIONS DIRECTED TOWARD ANY TYPES OF PROJECTS, MATERIALS OR PROCESSES INVOLVED IN THE WORK;
   - THE POLICY SHALL NOT CONTAIN ANY OF THE FOLLOWING EXCLUSIONS: SUBCONTRACTOR'S EXCLUSION; CONSTRUCTION DEFECT EXCLUSIONS; LEASED WORKER EXCLUSION; CROSS LIABILITY EXCLUSION; CRANE EXCLUSION; AND DEMOLITION EXCLUSION OR "EXPLOSION, COLLAPSE AND UNDERGROUND" EXCLUSION;
   - CONSTRUCTION WORK TAKING PLACE WITHIN 50 FEET OF A RAILROAD MUST INCLUDE:
   - CONTRACTUAL LIABILITY – RAILROADS CG 24 17 LISTING THE SCHEDULED RAILROAD AND DESIGNATED JOB SITE
   - COVERAGE FOR CLAIMS FOR BODILY INJURY ASSERTED BY A RAILROAD EMPLOYEE OF AN ADDITIONAL INSURED AND ANY EMPLOYER'S LIABILITY EXCLUSION WHICH MAY OTHERWISE OPERATE TO EXCLUDE SUCH COVERAGE SHALL BE REMOVED

3. BUSINESS AUTOMOBILE LIABILITY INSURANCE: IF ANY OWNED, NON OWNED OR HIRED VEHICLES ARE USED BY THE PERMITTEE WHETHER ON OR OFF-SITE, COVERING THE LIABILITY OF THE PERMITTEE ARISING OUT OF ANY VEHICLE THAT BEARS, OR IS REQUIRED TO BEAR, LICENSE PLATES ACCORDING TO THE LAWS OF THE JURISDICTION IN WHICH THEY ARE OPERATED, AND WHICH ARE NOT COVERED BY THE PERMITTEE'S COMMERCIAL GENERAL LIABILITY. SUCH INSURANCE SHALL PROVIDE COVERAGE AT LEAST AS BROAD AS THE STANDARD ISO COMPREHENSIVE AUTOMOBILE LIABILITY POLICY (CA 00 01, CA 00 05, CA 00 12, CA 0020), WITH LIMITS NOT LESS THAN $2,000,000 EACH ACCIDENT ON A COMBINED SINGLE BASIS. IF THE WORK INVOLVES TRANSPORTATION OF HAZARDOUS OR REGULATED MATERIALS, THE PERMITTEE SHALL PROVIDE POLLUTION AUTO COVERAGE FOR COVERED AUTOS ENDORSEMENT (CA 99 48), AND THE MOTOR CARRIER ACT ENDORSEMENT (MCS 90). ANY STATUTORILY REQUIRED NO-FAULT BENEFITS AND UNINSURED/UNDERINSURED MOTORIST COVERAGE SHALL BE INCLUDED.

4. UMBRELLA/EXCESS LIABILITY INSURANCE: WITH LIMITS NOT LESS THAN $3,000,000 PER OCCURRENCE IN EXCESS OF THE LIMITS FOR COMMERCIAL GENERAL LIABILITY, EMPLOYER'S LIABILITY, AND BUSINESS AUTOMOBILE LIABILITY INSURANCE WHICH IS AT LEAST AS BROAD AS EACH OF THE UNDERLYING POLICIES. THE UMBRELLA/EXCESS LIABILITY POLICIES SHALL BE WRITTEN ON A "DROP-DOWN" AND "FOLLOWING FORM" BASIS, WITH ONLY SUCH EXCEPTIONS EXPRESSLY APPROVED BY THE AUTHORITY/MTA.

5. RAILROAD PROTECTIVE LIABILITY: (ISO-RIMA OR EQUIVALENT FORM), IF ANY WORK WILL BE TAKING PLACE WITHIN 50 FEET OF A RAILROAD, SUBWAY OR SIMILAR TACKED CONVEYANCE OR REQUIRES FLAG OR PROTECTIVE MEASURES BY THE AUTHORITY OR ITS AFFILIATES OR THEIR RESPECTIVE EMPLOYEES, COVERING THE WORK TO BE PERFORMED AT THE DESIGNATED JOB SITE AND AFFORDING PROTECTION FOR DAMAGES ARISING OUT OF BODILY INJURY OR DEATH, PHYSICAL DAMAGE TO OR DESTRUCTION OF PROPERTY, INCLUDING DAMAGE TO THE INSURED'S OWN PROPERTY AND CONFORMING TO THE FOLLOWING:

   - THE POLICY SHALL BE ISSUED TO THE "NAMED INSUREDS" EACH OF THE INDEMNIFIED PARTIES LISTED UNDER SECTION D BELOW.
   - THE LIMIT OF LIABILITY SHALL BE NOT LESS THAN $2,000,000 PER OCCURRENCE, SUBJECT TO A $6,000,000 ANNUAL AGGREGATE;
   - POLICY MUST BE ENDORSED TO PROVIDE COVERAGE FOR CLAIMS ARISING FROM INJURY TO EMPLOYEES COVERED BY FEDERAL EMPLOYER'S LIABILITY ACT (FELA), WHEN APPLICABLE.
   - INDICATE THE NAME AND ADDRESS OF THE DESIGNATED CONTRACTOR, PROJECT LOCATION AND DESCRIPTION OF WORK, AND CONTRACT NUMBER IF APPLICABLE.

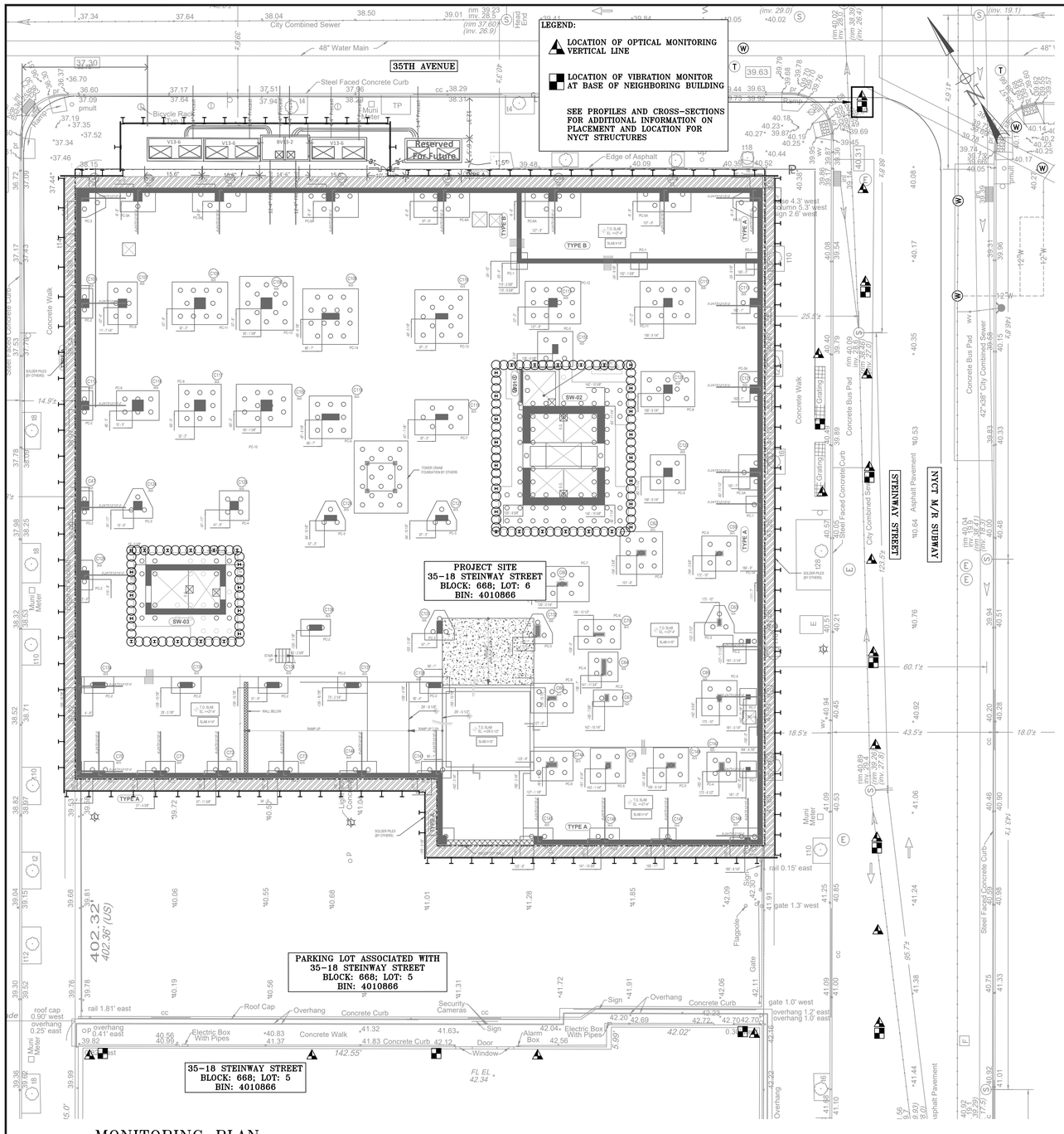
6. CONTRACTOR'S POLLUTION LIABILITY INSURANCE: IF DISPOSAL OF HAZARDOUS MATERIALS FROM THE DESIGNATED JOB SITE IS UNDERTAKEN OR IF THE WORK BEING PERFORMED IN THE IMPACT AREA INVOLVES ENVIRONMENTAL OR POLLUTION EXPOSURES, WITH LIMITS NOT LESS THAN $2,000,000 PER OCCURRENCE AND GENERAL AGGREGATE ON A PER PROJECT BASIS INCLUDING COMPLETED OPERATIONS COVERAGE TO BE MAINTAINED FOR AT LEAST THREE (3) YEARS AFTER COMPLETION OF THE WORK. POLICY SHALL COVER ENVIRONMENTAL DAMAGE RESULTING FROM POLLUTION CONDITIONS THAT ARISE FROM THE OPERATIONS OF THE PERMITTEE AND DESCRIBED UNDER THE SCOPE OF SERVICES OF THIS AGREEMENT. COVERAGE MUST APPLY TO SUDDEN AND NON-SUDDEN POLLUTION CONDITIONS INCLUDING THE DISCHARGE, DISPERSAL, RELEASE OR ESCAPE OF SMOKE, VAPORS, SOOT, FUMES, ACIDS, ALKALIS, TOXIC CHEMICALS, LIQUIDS OR GASES, WASTE MATERIALS OR OTHER IRRITANTS, CONTAMINANTS OR POLLUTANTS, SILT OR SEDIMENT INTO OR UPON LAND, THE ATMOSPHERE OR ANY WATERCOURSE OR BODY OF WATER, PROVIDED SUCH CONDITIONS ARE NOT NATURALLY PRESENT IN THE ENVIRONMENT IN THE CONCENTRATION OR AMOUNTS DISCOVERED, UNLESS SUCH NATURAL CONDITIONS(S) ARE RELEASED OR DISPERSED AS A RESULT OF THE PERFORMANCE OF COVERED OPERATIONS. SUCH INSURANCE SHALL INCLUDE BUT NOT BE LIMITED TO:

   - BODILY INJURY, SICKNESS, DISEASE, MENTAL ANGUISH OR SHOCK SUSTAINED BY ANY PERSON, INCLUDING DEATH; MEDICAL MONITORING;
   - PHYSICAL INJURY TO OR DESTRUCTION OF TANGIBLE PROPERTY OF PARTIES OTHER THAN THE INSURED INCLUDING THE RESULTING LOSS OF USE AND DIMINUTION IN VALUE THEREOF; LOSS OF USE, BUT NOT DIMINUTION IN VALUE, OF TANGIBLE PROPERTY OF PARTIES OTHER THAN THE INSURED THAT HAS NOT BEEN PHYSICALLY INJURED OR DESTROYED;
   - NATURAL RESOURCE DAMAGES;
   - CLEANUP COSTS;
   - TRANSPORTATION AND NON-OWNED DISPOSAL SITE COVERAGE (WITH NO SUNSET CLAUSE/RESTRICTED COVERAGE TERM) IF THE PERMITTEE IS DISPOSING OF CONTAMINATED MATERIAL(S);
   - NO EXCLUSIONS FOR ASBESTOS, LEAD PAINT, SILICA, OR MOLD/FUNGUS/LEGIONELLA; DEFENSE INCLUDING COSTS, CHARGES AND EXPENSES INCURRED IN THE INVESTIGATION, ADJUSTMENT OR DEFENSE CLAIMS FOR SUCH COMPENSATORY DAMAGES.

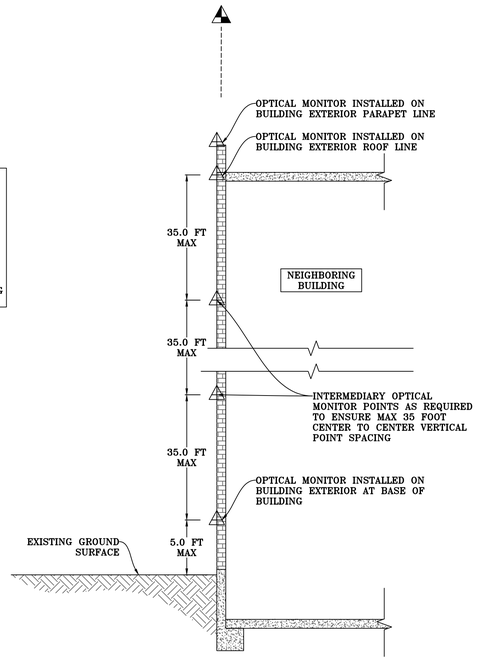
SECTION B: GENERAL INSURANCE REQUIREMENTS

THE FOLLOWING REQUIREMENTS ARE APPLICABLE TO ALL INSURANCE COVERAGES REQUIRED DURING THE PERFORMANCE OF THE WORK, EXCEPT TO THE EXTENT OTHERWISE INDICATED:

1. INSURER REQUIREMENTS: ALL POLICIES OF INSURANCE SHALL BE PLACED WITH INSURERS ACCEPTABLE TO THE AUTHORITY/MTA. THE INSURANCE UNDERWRITER(S) MUST BE DULY LICENSED OR APPROVED SURPLUS LINES INSURER



1 MONITORING PLAN
SCALE: 1":16'



MONITORING LOCATION / ADDRESS	NUMBER OF VERTICAL LINES OF OPTICAL MONITORING POINTS *	ESTIMATED TOTAL NUMBER OF OPTICAL MONITORING POINTS	PRE-CONSTRUCTION SURVEY	SURVEY THRESHOLDS ALERT LIMIT/STOP WORK LIMIT (INCHES) SEE NOTE 8	TOTAL VIBRATION SEISMOGRAPHS	VIBRATION THRESHOLDS ALERT LIMIT/STOP WORK LIMIT (INCHES PER SECOND) SEE NOTE 8
NYCT TUNNEL BENEATH STEINWAY STREET	11 VERTICAL LINES OF SURVEY POINTS	11	INTERIOR	¼" / ½"	6 VIBRATION SEISMOGRAPHS	0.5 IPS/1.0 IPS
NYCT TUNNEL VENTS	2 VERTICAL LINES OF SURVEY POINTS	2	INTERIOR & EXTERIOR	¼" / ½"	1 VIBRATION SEISMOGRAPH	0.5 IPS/1.0 IPS
35-18 STEINWAY STREET	4	8	INTERIOR & EXTERIOR	¼" / ½"	3 VIBRATION SEISMOGRAPH	0.5 IPS/1.0 IPS

NOTES:
* A VERTICAL LINE OF SURVEY MONITORING POINTS CONSISTS OF A SERIES OF OPTICAL PRISM SURVEY POINTS SPACED 35 FEET ON CENTER VERTICALLY (MIN. 2 POINTS) [TYP.]. PLEASE REFER TO THE SCHEMATIC CROSS-SECTION ON THIS PAGE FOR ADDITIONAL INFORMATION.

SURVEY AND MONITORING

1. ADJACENT STRUCTURES TO BE MONITORED DURING SOE ELEMENTS CONSTRUCTION AND EXCAVATION PER BC 3309.4.4 AND 3309.16
2. DURING THE COURSE OF SOE INSTALLATION AND GENERAL SITE EXCAVATION, THE FOLLOWING SHALL BE MONITORED PER NYC BUILDING CODE AND THESE DRAWINGS. AT MINIMUM THE FOLLOWING SHOULD BE MONITORED DURING CONSTRUCTION:
   a. STRUCTURES THAT ARE WITHIN A DISTANCE FROM THE EDGE OF THE EXCAVATION THAT IS EQUAL TO OR LESS THAN THE MAXIMUM DEPTH OF THE EXCAVATION OR WITHIN A LATERAL DISTANCE OF 25 FEET FROM THE EDGE OF THE LOT WHERE THE EXCAVATION IS OCCURRING.
3. THE OWNER SHALL HIRE A PROFESSIONAL ENGINEER LICENSED IN THE STATE OF NEW YORK TO PERFORM A PRE-CONSTRUCTION CONDITION SURVEY OF ALL APPLICABLE STRUCTURES. THE SURVEY SHALL BE COMPLETED PRIOR TO THE COMMENCEMENT OF CONSTRUCTION. "TELL-TALES" SHALL BE INSTALLED ON ANY OBSERVED EXISTING CRACKS AND OTHER CRITICAL/SENSITIVE AREAS AS IDENTIFIED BY THE OWNER'S ENGINEER WHO PERFORMED THE BUILDING PRE-CONSTRUCTION CONDITION SURVEY.
4. THE OWNER SHALL HIRE A SURVEYOR LICENSED IN THE STATE OF NEW YORK TO MONITOR MOVEMENTS AND TILTING OF NEIGHBORING STRUCTURES. THE SURVEYOR SHALL ESTABLISH HORIZONTAL AND VERTICAL BENCHMARKS AT ACCESSIBLE ADJACENT STRUCTURES AREAS PRIOR TO START OF CONSTRUCTION AND SHALL MONITOR THE ADJACENT STRUCTURES AT A MINIMUM INTERVALS SHOWN ON THE PLAN FOR VERTICAL AND LATERAL MOVEMENT. THE BASELINE READINGS OF THE MONITORING POINTS PRIOR TO EXCAVATION AND NEW CONSTRUCTION.
5. THE OWNER SHALL RETAIN A VIBRATION MONITORING AGENCY WORKING UNDER THE SUPERVISION OF A PROFESSIONAL ENGINEER LICENSED IN THE STATE OF NEW YORK TO CONDUCT VIBRATION MONITORING DURING CONSTRUCTION. THIS AGENCY SHOULD
   a. ESTABLISH VIBRATION MONITORING PROGRAM
   b. VIBRATION MONITORS (SEISMOGRAPHS) SHALL BE PLACED DURING SOE INSTALLATION AND GENERAL SITE EXCAVATION AT LOCATIONS DETERMINED BY THE VIBRATION MONITORING AGENCY AND AT MINIMUM AS INDICATED ON THESE PLANS.
   c. VIBRATION MONITORS SHALL TAKE REAL TIME READINGS.
5. FREQUENCY MONITORING WILL VARY DURING PROGRESS OF WORK. PERFORM OPTICAL SURVEYS BY A LICENSED SURVEYOR IN THE STATE OF NEW YORK AT LEAST TWICE PER WEEK DURING SOE INSTALLATION AND GENERAL EXCAVATIONS; AFTER COMPLETION OF SITE EXCAVATIONS FREQUENCY SHALL BE AT LEAST ONCE PER WEEK UNTIL BUILDING FIRST FLOOR IS COMPLETE. IF MOVEMENTS OCCUR, INCREASE THE FREQUENCY OF THE READINGS AS DIRECTED BY THE ENGINEER. PERFORM VIBRATION MONITORING CONTINUOUSLY DURING GENERAL EXCAVATION ACTIVITIES.
6. A SURVEY POINT AND VIBRATION STATION PLAN, IN ACCORDANCE WITH THESE DRAWINGS, SHALL BE SUBMITTED TO THE CONSTRUCTION MANAGER AND ENGINEER BY THE SURVEYOR/MONITORING CONTRACTOR FOR REVIEW AND APPROVAL PRIOR TO COMMENCEMENT OF WORK.
7. ALL MONITORING DATA SHALL BE PRESENTED TO AT MINIMUM TO THE FOLLOWING WITHIN 24 HOURS OF THE READINGS.
   a. PROJECT OWNER
   b. THE CONSTRUCTION MANAGER
   c. PROJECT ENGINEER
   d. INSPECTOR (IF APPLICABLE)
   e. ADJACENT PROPERTY OWNER/REP (AS AGREED PER ACCESS AGREEMENTS)
8. STRUCTURE MOVEMENT AND VIBRATION CRITERIA:
   a. THE OWNER SHALL HIRE A SURVEYOR LICENSED IN THE STATE OF NEW YORK TO MONITOR MOVEMENTS AND TILTING OF ADJACENT STRUCTURES. SETTLEMENT OF THE STREET AND OF SELECTED POINTS ON THE GROUND ARE TO BE MONITORED IN ADDITION TO THE ADJACENT STRUCTURES.
   b. OPTICAL SURVEY READINGS SHALL BE TAKEN TO AN ACCURACY OF ±0.005 FT.
   c. "TELLTALES" SHALL BE INSTALLED ACROSS EXISTING CRACKS AND IN OTHER SENSITIVE AREAS AT LOCATIONS IDENTIFIED BY THE OWNER'S ENGINEER WHO PERFORMED THE STRUCTURE PRE-CONSTRUCTION CONDITION SURVEY, IF PERMITTED BY THE ADJACENT STRUCTURE OWNER, TO PERMIT CHANGES IN CRACK WIDTH TO BE MEASURED.
   d. PHOTOGRAPHS OF THE ADJACENT STRUCTURE OF SUFFICIENT CLARITY TO VIEW THE "TELLTALES" SHALL BE TAKEN TWICE WEEKLY. THE PHOTOGRAPHS SHALL BE IDENTIFIED WITH THE BUILDING ADDRESS, DIRECTION, DATE, TIME AND PHOTOGRAPHER.
   e. IF MONITORING ALERT LIMITS ARE OBSERVED IMMEDIATELY NOTIFY THE CONSTRUCTION MANAGER AND ENGINEER.
   f. IF STOP WORK LIMITS ARE OBSERVED IMMEDIATELY INFORM THE CONSTRUCTION MANAGER AND ENGINEER AND STOP WORK. THE WORK SHALL RESUME UPON APPROVAL BY THE CONSTRUCTION MANAGER AND APPROVED REMEDIAL MEASURES AND/OR MODIFIED CONSTRUCTION PROCEDURES BY THE ENGINEER.
   g. LOCATION OF ALL SURVEY POINTS AND VIBRATION STATIONS ARE MINIMUM AND ADDITIONAL MAY BE REQUIRED AS SPECIFIED BY SURVEYOR/MONITORING CONTRACTOR. A SURVEY POINT AND VIBRATION STATION PLAN, IN ACCORDANCE WITH THESE DRAWINGS, SHALL BE SUBMITTED BY THE SURVEYOR/MONITORING CONTRACTOR FOR REVIEW AND APPROVAL PRIOR TO COMMENCEMENT OF WORK.

VICINITY MAP
N.T.S.

THE STATE OF NEW YORK REQUIRES NOTIFICATION BY EXCAVATORS, DESIGNERS, OR ANY PERSON PREPARING TO DISTURB THE EARTH'S SURFACE ANYWHERE IN THE STATE.

PREPARED BY:
JZN ENGINEERING
959 S. SPRINGFIELD AVENUE, SUITE 100
SPRINGFIELD P: (973) 218-6561
NEW JERSEY 07081

NO.	DATE	BY	DESCRIPTION	APPROVED
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3.	10/27/25	PN	50% CD SET	NEJ
2.	08/14/25	PN	100% DD SET (REVISIONS PER CLIENT COMMENTS)	NEJ
1.	08/05/25	PN	100% DD SET	NEJ

REVISIONS

PROJECT NAME:
INNOVATION QNS, BUILDING B1
35-10 STEINWAY STREET
BLOCK: 668; LOT: 6
ASTORIA, BOROUGH OF QUEENS
CITY & STATE OF NEW YORK

DRAWING TITLE:
MONITORING PLAN

SEAL & SIGNATURE
STATE OF NEW YORK NEJM EDDIN JUNDI 083095 LICENSED PROFESSIONAL ENGINEER
10/27/25
NEJM E. JUNDI DATE
NEW YORK STATE PROFESSIONAL ENGINEER #083095

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DOB NOW:	Q01275800-S6
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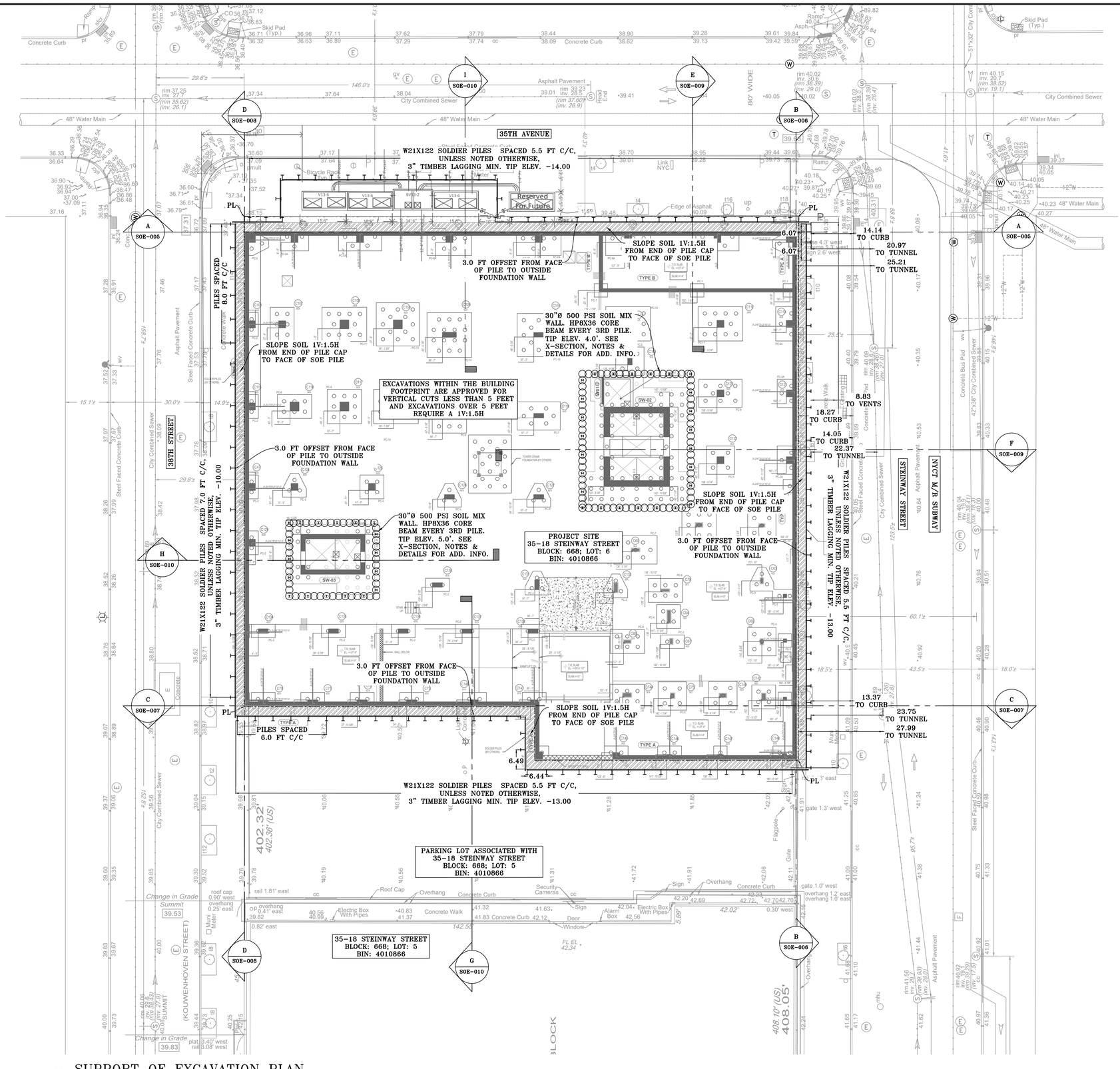
CHK BY:	GR
APPROVED BY:	NEJ
DWG No:	SOE-003.00
CAD FILE No:	24190000
PAGE No:	5 of 13



1 SUPPORT OF EXCAVATION PLAN
SCALE: 1":16'

VICINITY MAP
N.T.S.

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PREPARED BY:
JZN ENGINEERING
959 S. SPRINGFIELD AVENUE, SUITE 100
SPRINGFIELD P: (973) 218-6561
NEW JERSEY 07081

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1.	08/05/25	PN	100% DD SET	NEJ

REVISIONS

PROJECT NAME:

INNOVATION QNS, BUILDING B1
35-10 STEINWAY STREET
BLOCK: 668; LOT: 6
ASTORIA, BOROUGH OF QUEENS
CITY & STATE OF NEW YORK

DRAWING TITLE:

SUPPORT OF EXCAVATION PLAN

SEAL & SIGNATURE

10/27/25
DATE

NEJM E. JUNDI
NEW YORK STATE PROFESSIONAL ENGINEER #083095

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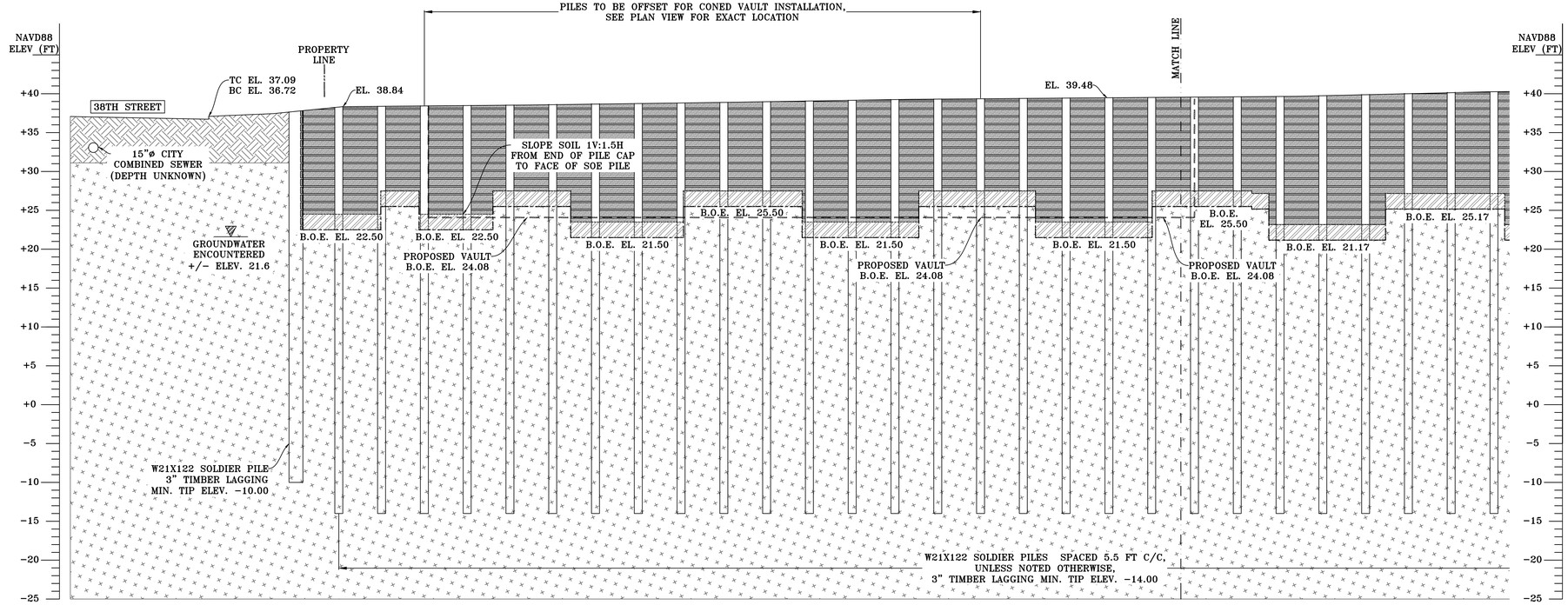
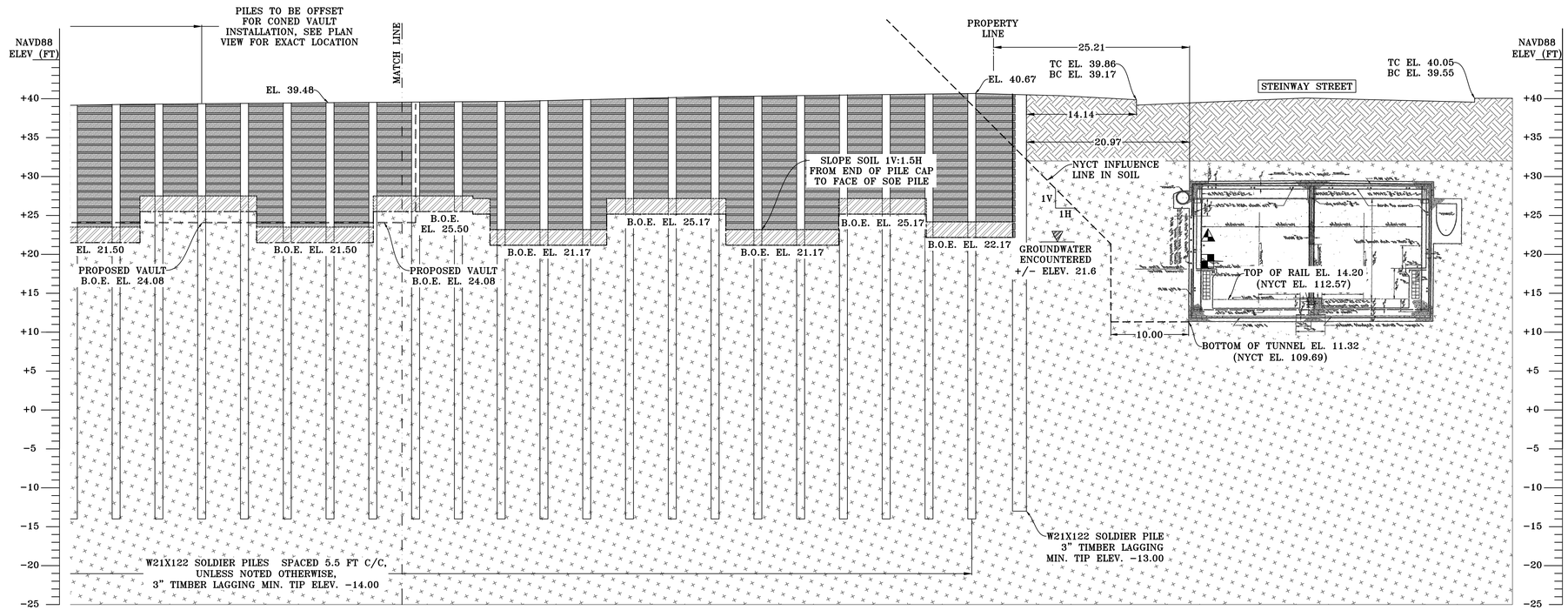


1 PROFILE A–A

SCALE: 1":8'



2 PROFILE A–A (CONT.)

SCALE: 1":8'

VICINITY MAP
N.T.S.

	SOIL SLOPING
B.O.E.	BOTTOM OF EXCAVATION
	FILL MATERIALS
	ALLUVIAL DEPOSITS (NYC CLASS 3A, 3B, & 6)

LEGEND:

- LOCATION OF OPTICAL MONITORING VERTICAL LINE
- LOCATION OF VIBRATION MONITOR AT BASE OF NEIGHBORING BUILDING

NEW YORK

CALL BEFORE YOU DIG

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PREPARED BY:

JZN ENGINEERING

959 S. SPRINGFIELD AVENUE, SUITE 100
SPRINGFIELD P: (973) 218-6561
NEW JERSEY 07081

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1.	08/05/25	PN	100% DD SET	NEJ

REVISIONS

PROJECT NAME:

INNOVATION QNS, BUILDING B1
35-10 STEINWAY STREET
BLOCK: 668; LOT: 6
ASTORIA, BOROUGH OF QUEENS
CITY & STATE OF NEW YORK

DRAWING TITLE:

PROFILE A

SEAL & SIGNATURE

STATE OF NEW YORK — NEJM EDDIN JUNDI — 083095 — REGISTERED PROFESSIONAL ENGINEER

10/27/25
NEJM E. JUNDI DATE
NEW YORK STATE PROFESSIONAL ENGINEER #083095

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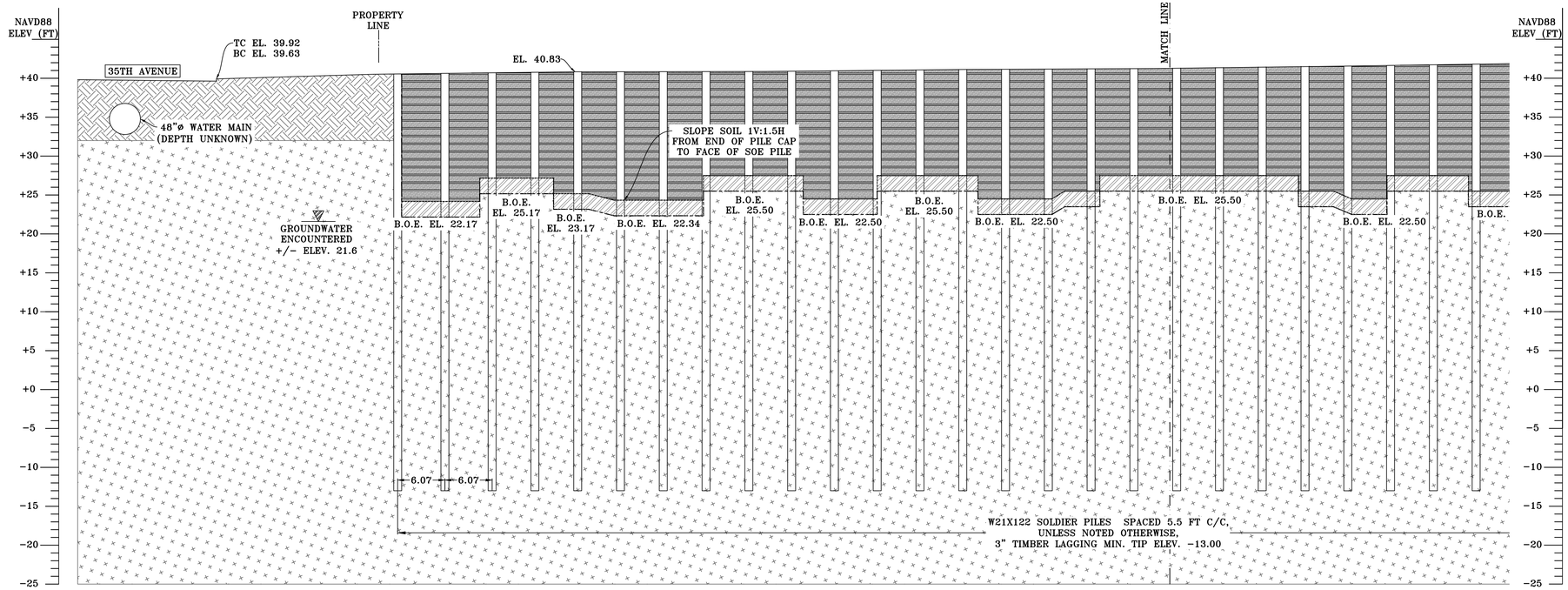
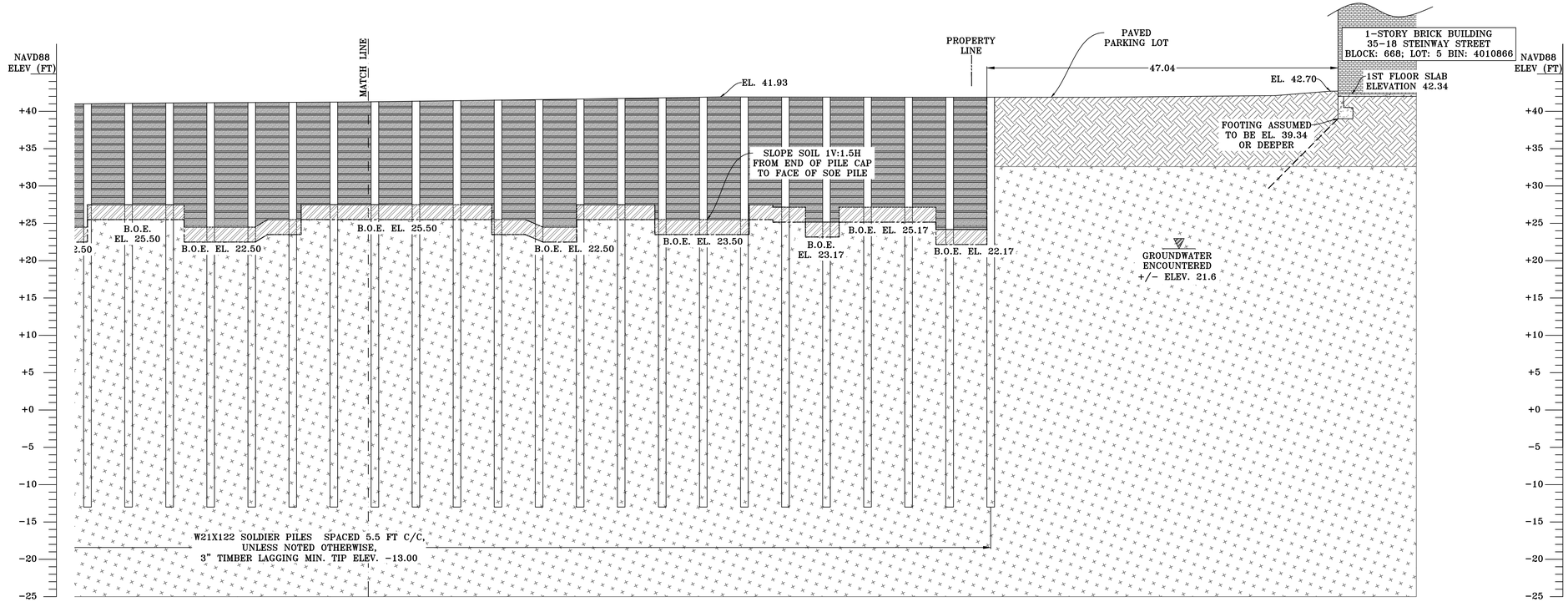
DWG No:	SOE-005.00
CAD FILE No:	24190000
PAGE No:	7 of 13



1 PROFILE B–B

SCALE: 1":8'



2 PROFILE B–B (CONT.)

SCALE: 1":8'

VICINITY MAP
N.T.S.

	SOIL SLOPING
B.O.E.	BOTTOM OF EXCAVATION
	FILL MATERIALS
	ALLUVIAL DEPOSITS (NYC CLASS 3A, 3B, & 6)

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PREPARED BY:
JZN ENGINEERING
959 S. SPRINGFIELD AVENUE, SUITE 100
SPRINGFIELD P: (973) 218-6561
NEW JERSEY 07081

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1.	08/05/25	PN	100% DD SET	NEJ

REVISIONS

PROJECT NAME:

INNOVATION QNS, BUILDING B1
35-10 STEINWAY STREET
BLOCK: 668; LOT: 6
ASTORIA, BOROUGH OF QUEENS
CITY & STATE OF NEW YORK

DRAWING TITLE:

PROFILE B

SEAL & SIGNATURE

10/27/25
NEJM E. JUNDI DATE
NEW YORK STATE PROFESSIONAL ENGINEER #083095

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DWG No:	SOE-006.00
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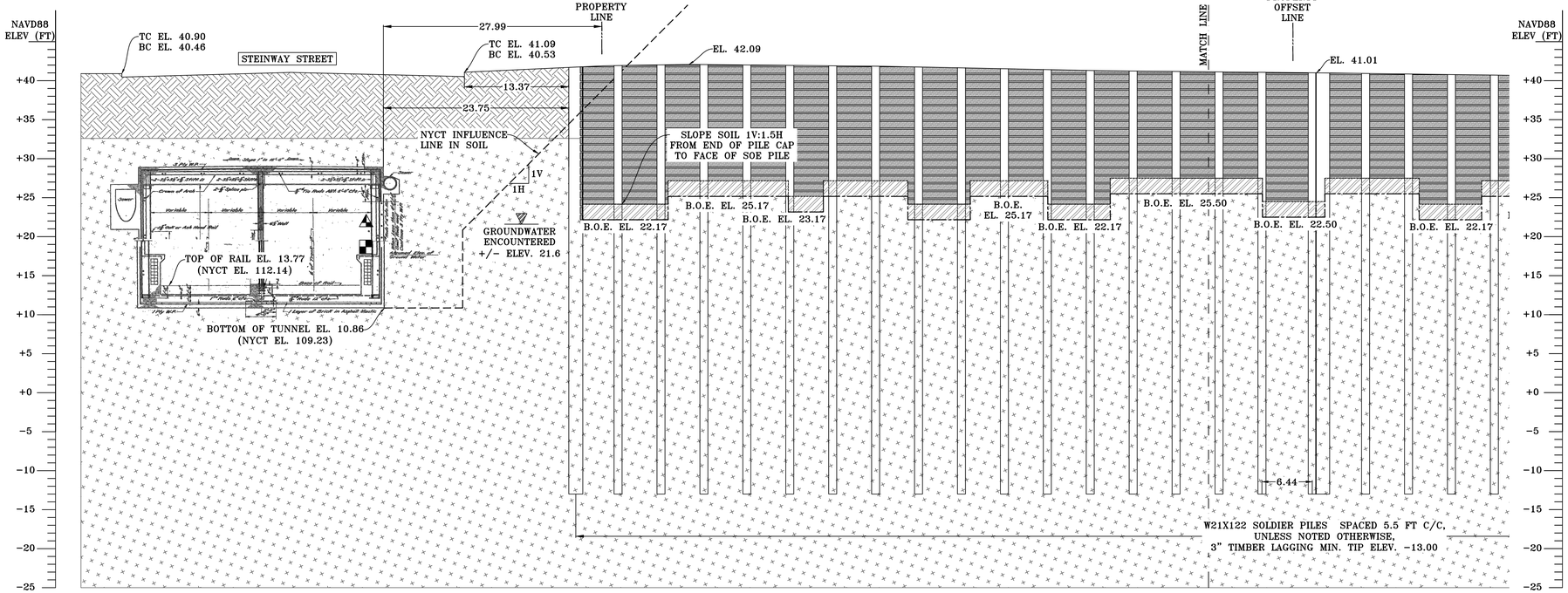
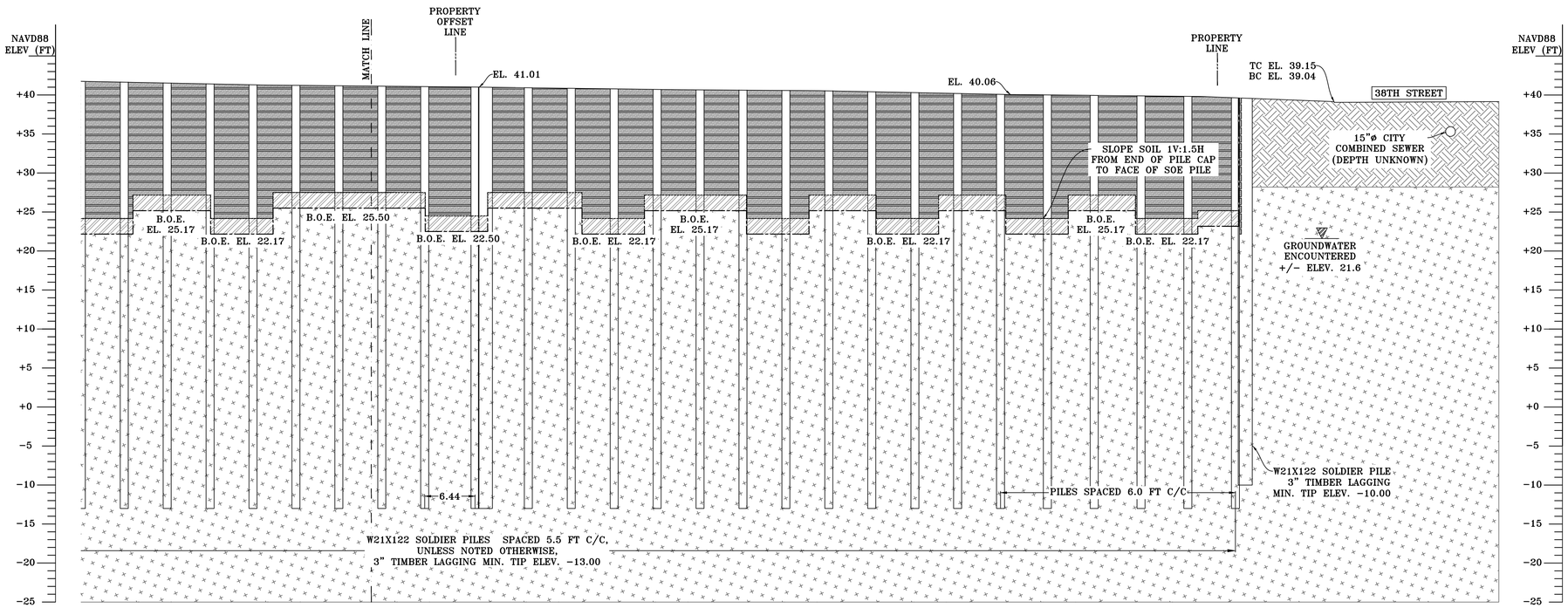
PAGE No:	8 of 13



1 PROFILE C–C

SCALE: 1":8'



2 PROFILE C–C (CONT.)

SCALE: 1":8'

VICINITY MAP
N.T.S.

	SOIL SLOPING
B.O.E.	BOTTOM OF EXCAVATION
	FILL MATERIALS
	ALLUVIAL DEPOSITS (NYC CLASS 3A, 3B, & 6)

LEGEND:

LOCATION OF OPTICAL MONITORING VERTICAL LINE

LOCATION OF VIBRATION MONITOR AT BASE OF NEIGHBORING BUILDING

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THE STATE OF NEW YORK REQUIRES NOTIFICATION BY EXCAVATORS, DESIGNERS, OR ANY PERSON PREPARING TO DISTURB THE EARTH'S SURFACE ANYWHERE IN THE STATE.

PREPARED BY:

JZN ENGINEERING

959 S. SPRINGFIELD AVENUE, SUITE 100
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2.	08/14/25	PN	100% DD SET (REVISIONS PER CLIENT COMMENTS)	NEJ
1.	08/05/25	PN	100% DD SET	NEJ

REVISIONS

PROJECT NAME:

INNOVATION QNS, BUILDING B1
35-10 STEINWAY STREET
BLOCK: 668; LOT: 6
ASTORIA, BOROUGH OF QUEENS
CITY & STATE OF NEW YORK

DRAWING TITLE:

PROFILE C

SEAL & SIGNATURE

STATE OF NEW YORK NEJM EDDIN JUNDI 083095 LICENSED PROFESSIONAL ENGINEER

10/27/25
DATE

NEJM E. JUNDI
NEW YORK STATE PROFESSIONAL ENGINEER #083095

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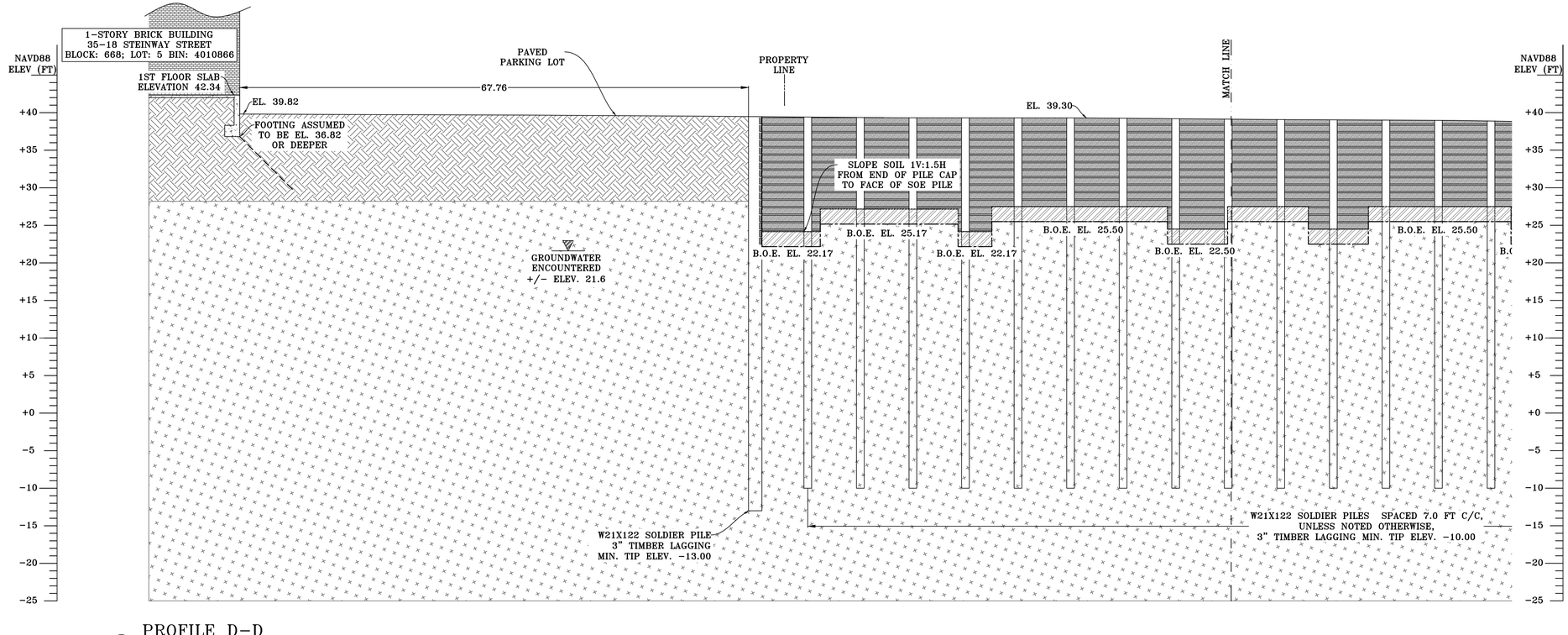
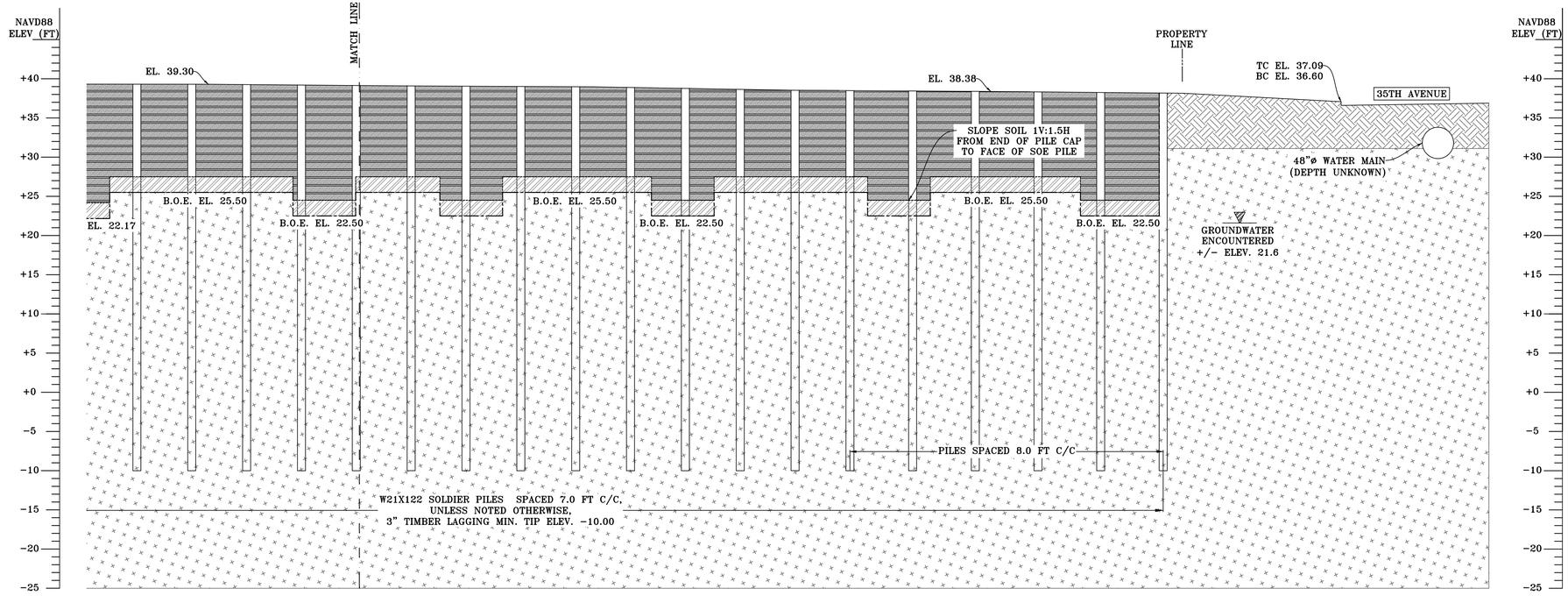
DWG No:	SOE-007.00
CAD FILE No:	24190000
PAGE No:	9 of 13



1 PROFILE D-D

SCALE: 1":8'



2 PROFILE D-D (CONT.)

SCALE: 1":8'

VICINITY MAP
N.T.S.

	SOIL SLOPING
B.O.E.	BOTTOM OF EXCAVATION
	FILL MATERIALS
	ALLUVIAL DEPOSITS (NYC CLASS 3A, 3B, & 6)

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PREPARED BY:

JZN ENGINEERING

959 S. SPRINGFIELD AVENUE, SUITE 100
SPRINGFIELD P: (973) 218-6561
NEW JERSEY 07081

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2.	08/14/25	PN	100% DD SET (REVISIONS PER CLIENT COMMENTS)	NEJ
1.	08/05/25	PN	100% DD SET	NEJ

REVISIONS

PROJECT NAME:

INNOVATION QNS, BUILDING B1
35-10 STEINWAY STREET
BLOCK: 668; LOT: 6
ASTORIA, BOROUGH OF QUEENS
CITY & STATE OF NEW YORK

DRAWING TITLE:

PROFILE D

SEAL & SIGNATURE

10/27/25
NEJM E. JUNDI DATE
NEW YORK STATE PROFESSIONAL ENGINEER #083095

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DOB NOW:	Q01275800-S6
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APPROVED BY:	NEJ
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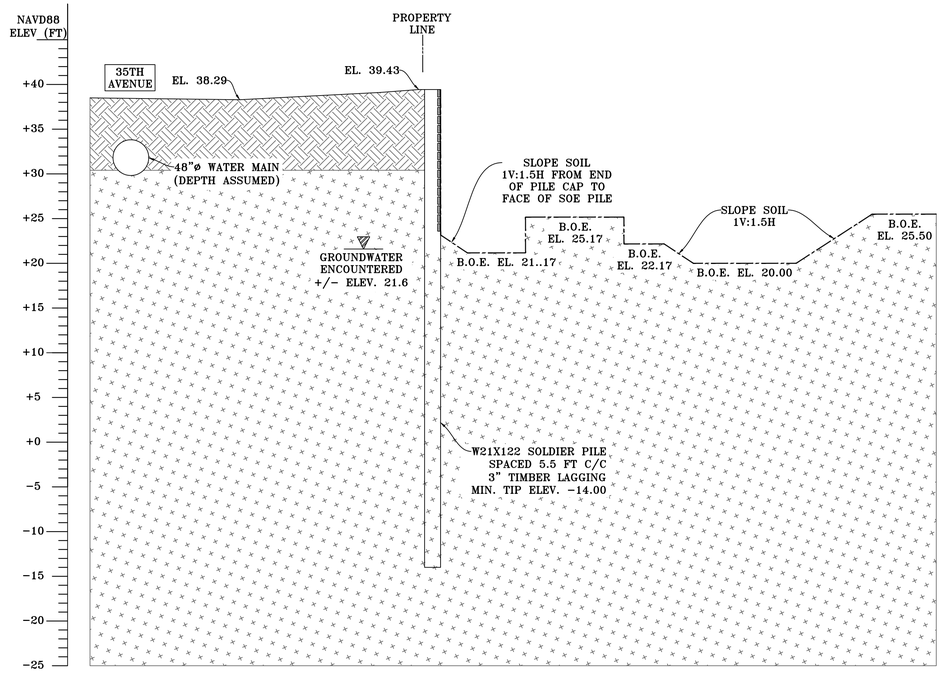
PAGE No:	10 of 13



1 SECTION E

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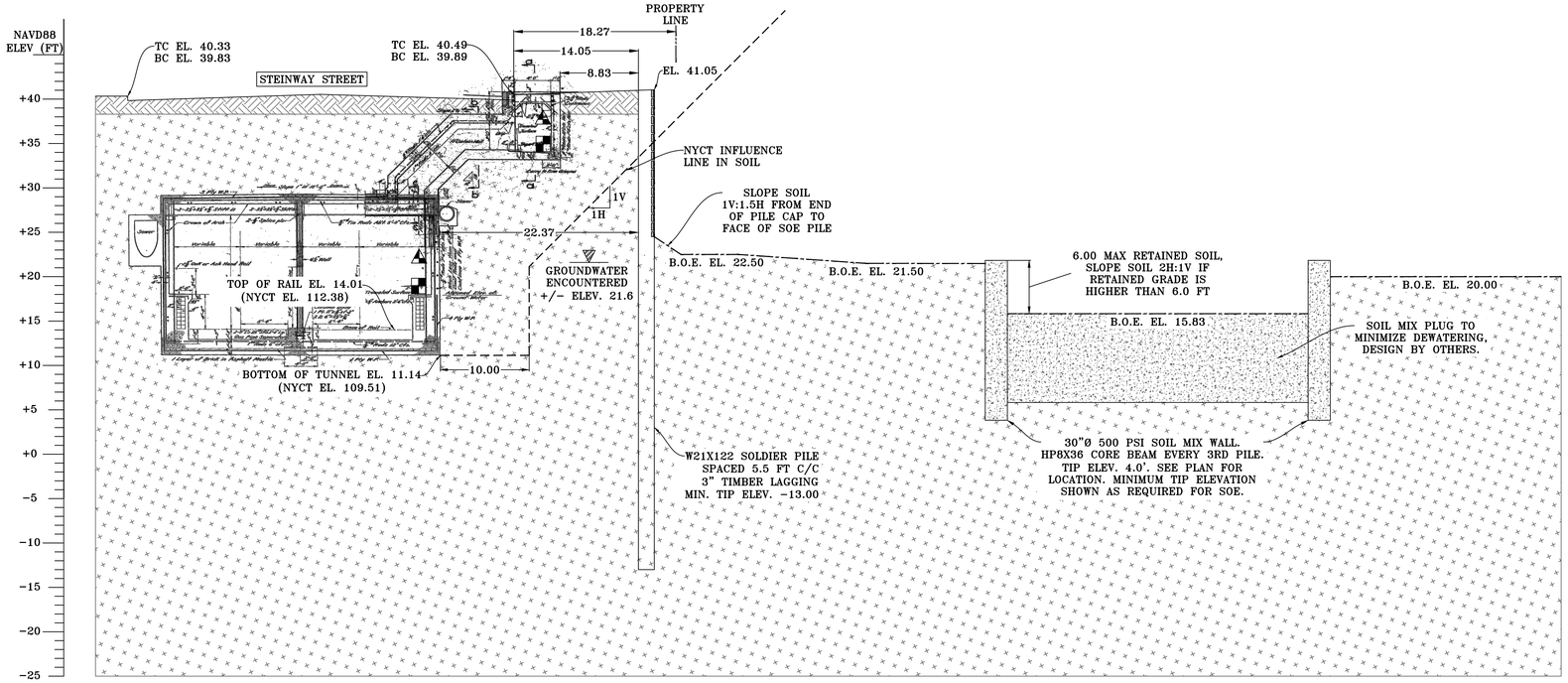

2 SECTION F

SCALE: 1":8'

VICINITY MAP
N.T.S.

B.O.E.	BOTTOM OF EXCAVATION
	FILL MATERIALS
	ALLUVIAL DEPOSITS (NYC CLASS 3A, 3B, & 6)

LEGEND:

LOCATION OF OPTICAL MONITORING VERTICAL LINE

LOCATION OF VIBRATION MONITOR AT BASE OF NEIGHBORING BUILDING

THE STATE OF NEW YORK REQUIRES NOTIFICATION BY EXCAVATORS, DESIGNERS, OR ANY PERSON PREPARING TO DISTURB THE EARTH'S SURFACE ANYWHERE IN THE STATE.

PREPARED BY:

JZN ENGINEERING

959 S. SPRINGFIELD AVENUE, SUITE 100
SPRINGFIELD P: (973) 218-6561
NEW JERSEY 07081

NO.	DATE	BY	DESCRIPTION	APPROVED
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1.	08/05/25	PN	100% DD SET	NEJ

REVISIONS

PROJECT NAME:

INNOVATION QNS, BUILDING B1
35-10 STEINWAY STREET
BLOCK: 668; LOT: 6
ASTORIA, BOROUGH OF QUEENS
CITY & STATE OF NEW YORK

DRAWING TITLE:

CROSS-SECTIONS

SEAL & SIGNATURE

STATE OF NEW YORK · NEJM EDDIN JUNDI · 083095 · LICENSED PROFESSIONAL ENGINEER

10/27/25
DATE

NEJM E. JUNDI
NEW YORK STATE PROFESSIONAL ENGINEER #083095

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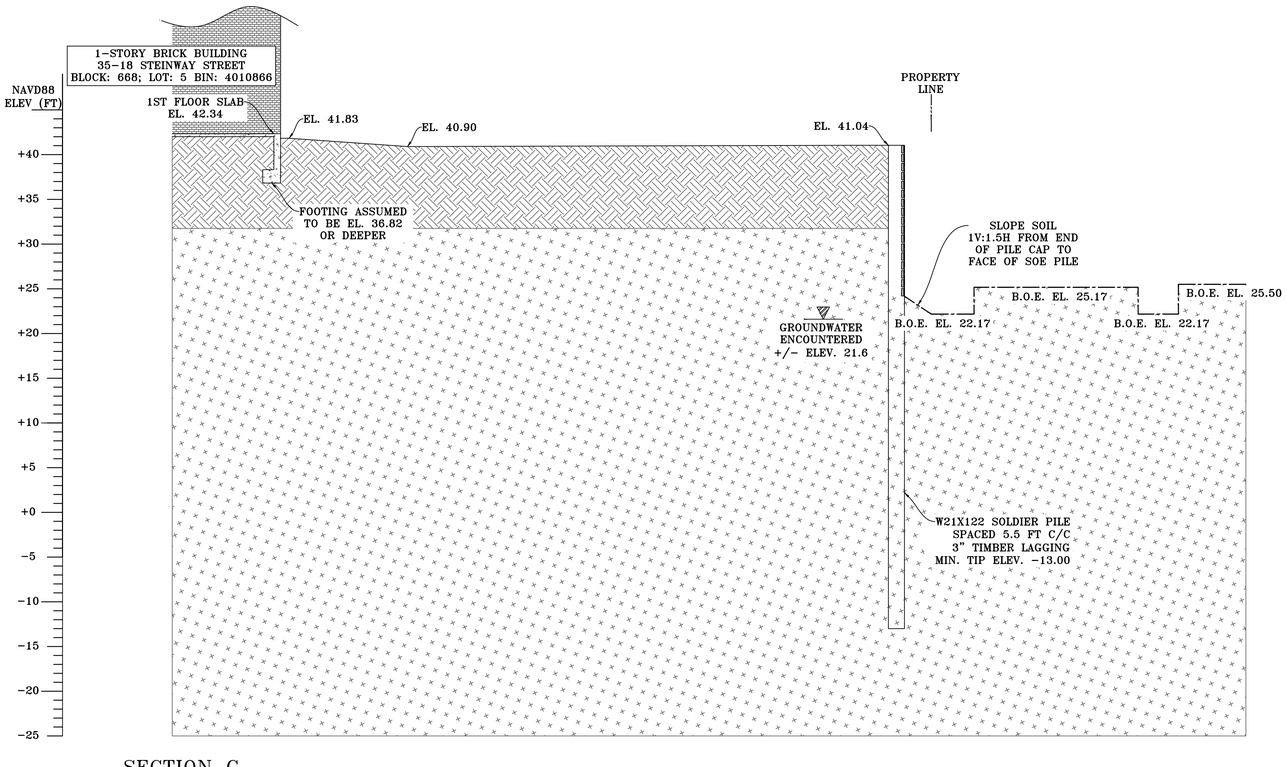
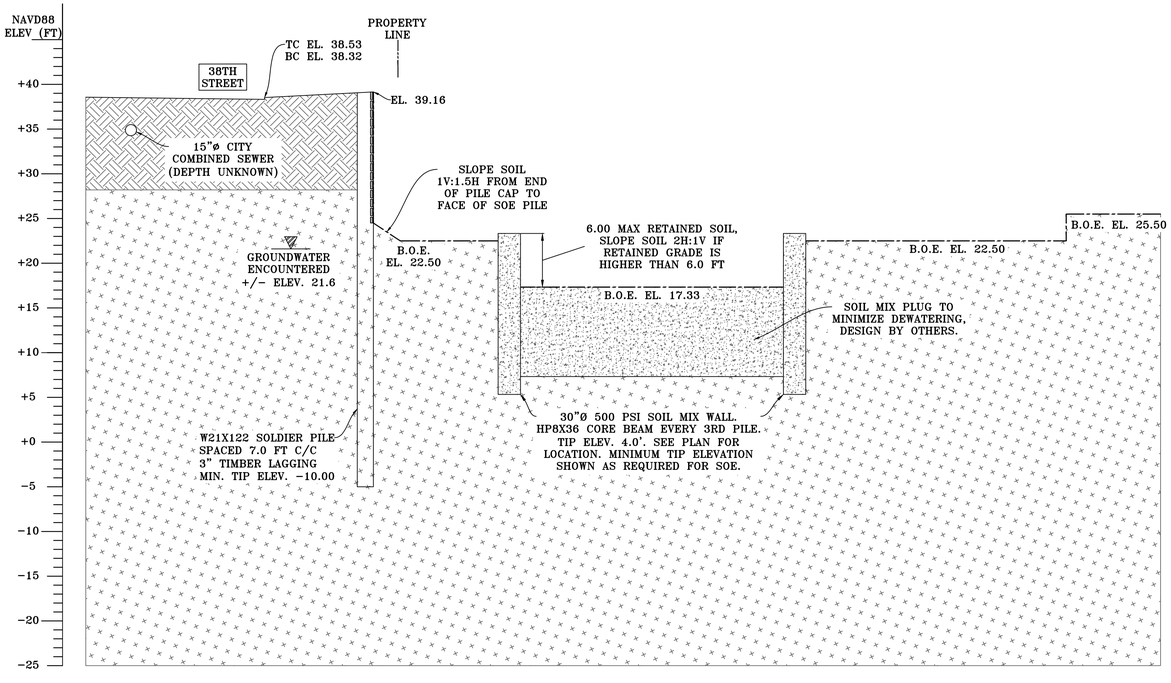
DATE:	08/05/25
SCALE:	1":8'
PROJECT No:	24190-000
DOB NOW:	Q01275800-S6
DRAWING BY:	PN
CHK BY:	GR
APPROVED BY:	NEJ
DWG No:	SOE-009.00
CAD FILE No:	24190000
PAGE No:	11 of 13



1 SECTION G

SCALE: 1":8'



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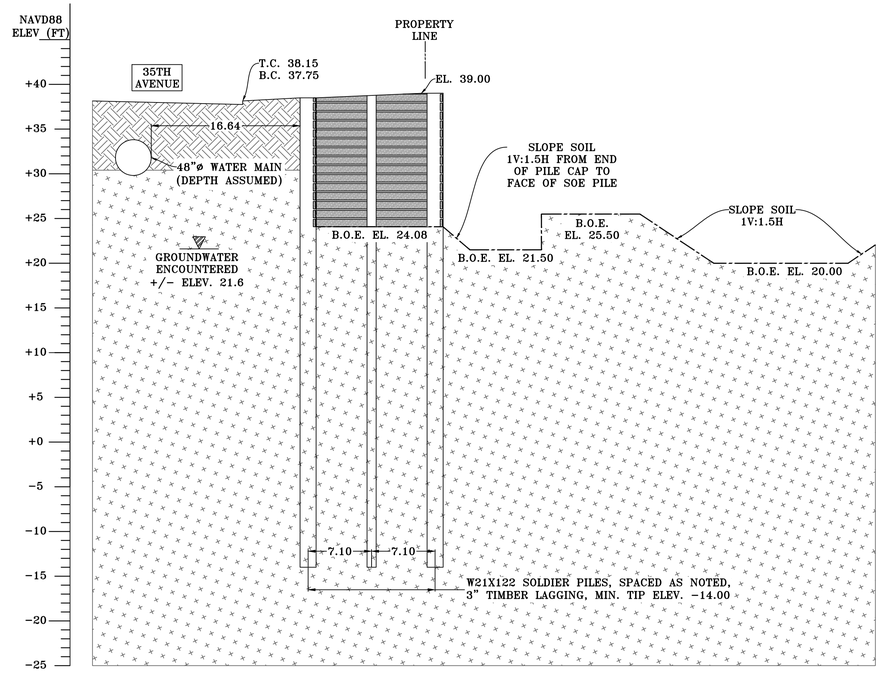

3 SECTION I

SCALE: 1":8'

VICINITY MAP
N.T.S.

B.O.E.	BOTTOM OF EXCAVATION
	FILL MATERIALS
	ALLUVIAL DEPOSITS (NYC CLASS 3A, 3B, & 6)

THE STATE OF NEW YORK REQUIRES NOTIFICATION BY EXCAVATORS, DESIGNERS, OR ANY PERSON PREPARING TO DISTURB THE EARTH'S SURFACE ANYWHERE IN THE STATE.

PREPARED BY:

JZN ENGINEERING

959 S. SPRINGFIELD AVENUE, SUITE 100
SPRINGFIELD P: (973) 218-6561
NEW JERSEY 07081

NO.	DATE	BY	DESCRIPTION	APPROVED
4.	01/20/26	PN	100% CD SET	NEJ
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2.	08/14/25	PN	100% DD SET (REVISIONS PER CLIENT COMMENTS)	NEJ
1.	08/05/25	PN	100% DD SET	NEJ

REVISIONS

PROJECT NAME:

INNOVATION QNS, BUILDING B1
35-10 STEINWAY STREET
BLOCK: 668; LOT: 6
ASTORIA, BOROUGH OF QUEENS
CITY & STATE OF NEW YORK

DRAWING TITLE:

CROSS-SECTIONS II & DETAILS

SEAL & SIGNATURE

10/27/25
NEJM E. JUNDI DATE
NEW YORK STATE PROFESSIONAL ENGINEER #083095

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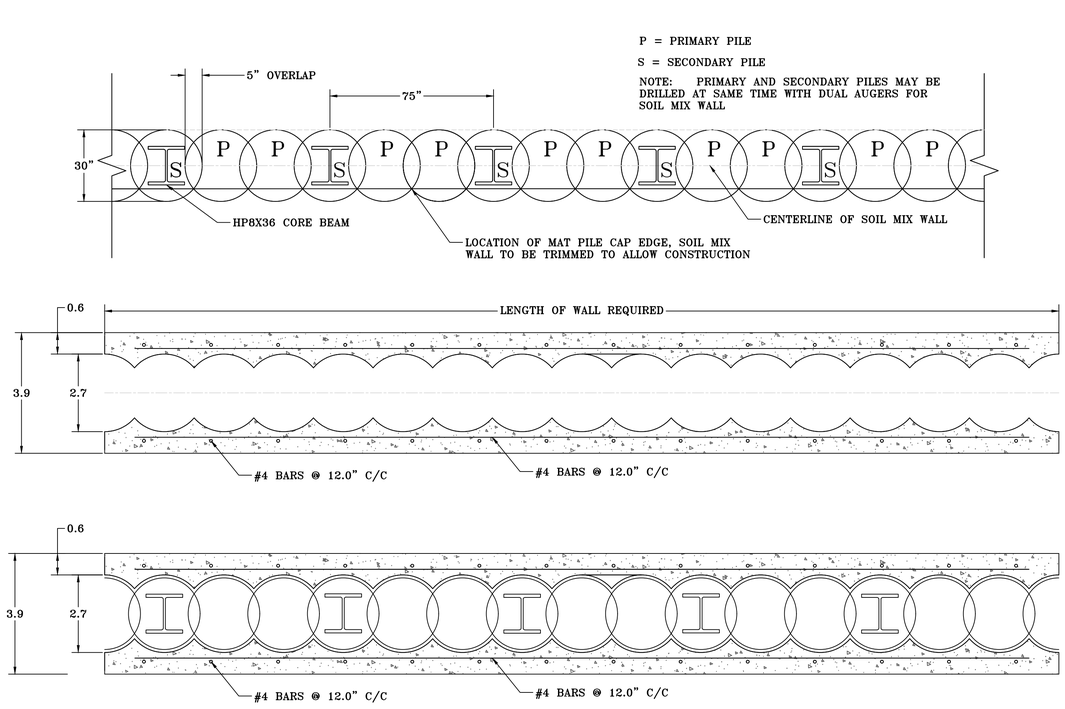
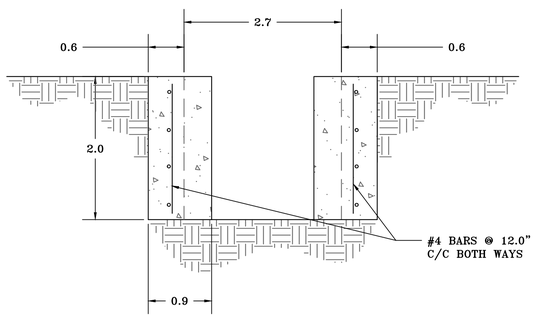
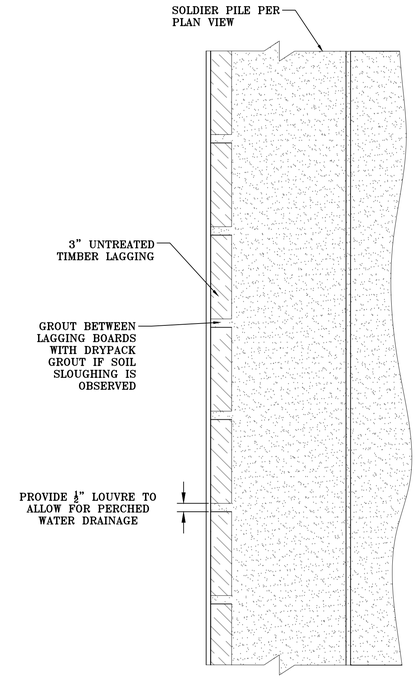
DWG No:	SOE-010.00
CAD FILE No:	24190000
PAGE No:	12 of 13



1 GUIDE WALL AND SOIL MIX SPACING DETAIL (TYP.)
N.T.S.



2 GUIDE WALL SECTION DETAIL (TYP.)
N.T.S.



3 TYPICAL LAGGING SECTION
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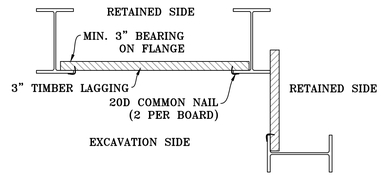
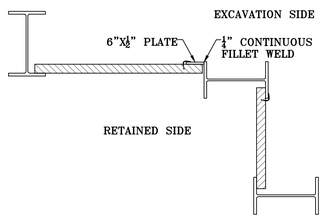


4 TYPICAL LAGGING PLAN VIEW WITH OUTSIDE CORNER
SCALE: N.T.S.



5 TYPICAL LAGGING PLAN VIEW WITH INSIDE CORNER
SCALE: N.T.S.

VICINITY MAP
N.T.S.

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PREPARED BY:
JZN ENGINEERING
959 S. SPRINGFIELD AVENUE, SUITE 100
SPRINGFIELD P: (973) 218-6561
NEW JERSEY 07081

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REVISIONS

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INNOVATION QNS, BUILDING B1
35-10 STEINWAY STREET
BLOCK: 668; LOT: 6
ASTORIA, BOROUGH OF QUEENS
CITY & STATE OF NEW YORK

DRAWING TITLE:
DETAILS

SEAL & SIGNATURE

10/27/25 DATE
NEJM E. JUNDI
NEW YORK STATE PROFESSIONAL ENGINEER #083095

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DWG No:	SOE-011.00
CAD FILE No:	24190000
PAGE No:	13 of 13

SUPPORT OF EXCAVATION PLANS

FOR

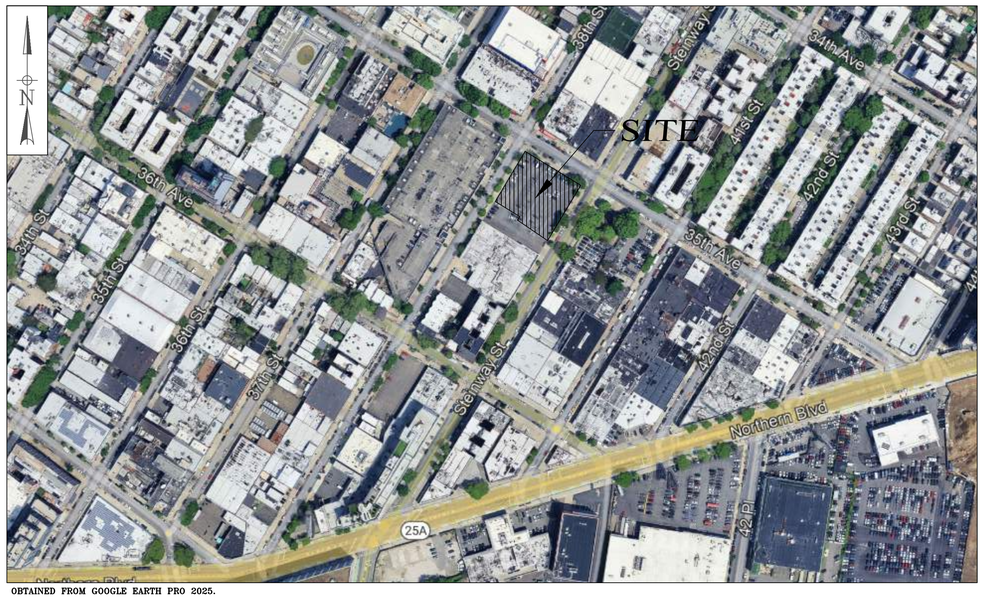
KEY CIVIL ENGINEERING, P.C.

INNOVATION QNS, BUILDING B1
35-10 STEINWAY STREET
BLOCK: 668; LOT: 6
ASTORIA, BOROUGH OF QUEENS
CITY & STATE OF NEW YORK

CENTRAL PARK QUADRANGLE NEW YORK 7.5 MINUTE SERIES OBTAINED FROM THE UNITED STATES GEOLOGICAL SURVEY

LOCATION PLAN

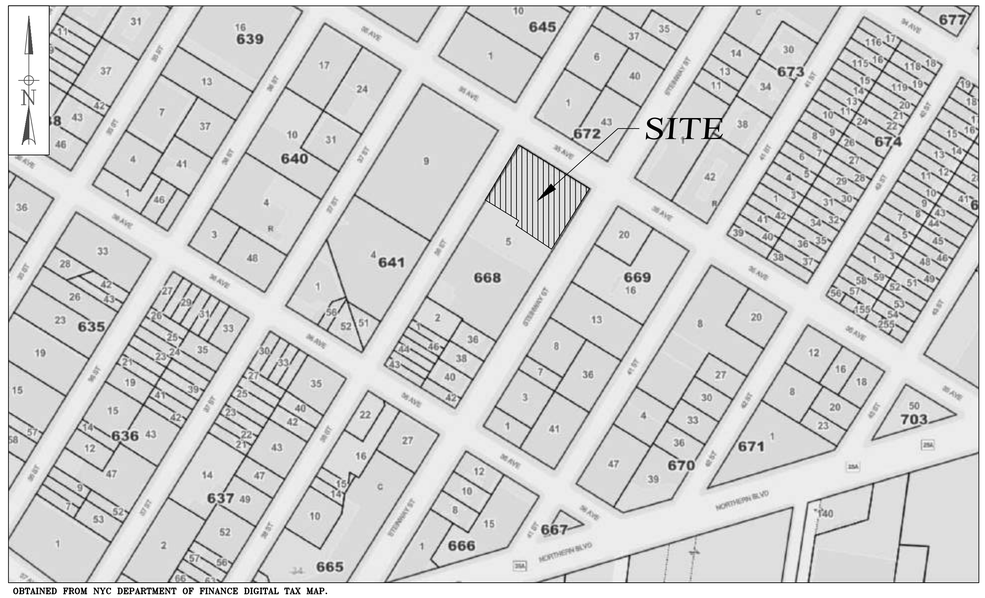
SCALE: N.T.S.



OBTAINED FROM GOOGLE EARTH PRO 2025.

AERIAL PLAN

SCALE: N.T.S.



OBTAINED FROM NYC DEPARTMENT OF FINANCE DIGITAL TAX MAP.

TAX MAP

SCALE: N.T.S.

PREPARED BY:

JZN ENGINEERING

959 S. SPRINGFIELD AVENUE, SUITE 100
SPRINGFIELD P: (973) 218-6561
NEW JERSEY 07081

TABLE OF CONTENTS	
DRAWING TITLE	DRAWING NUMBER
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PROFILE A-A	SOE-005
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COVER PAGE

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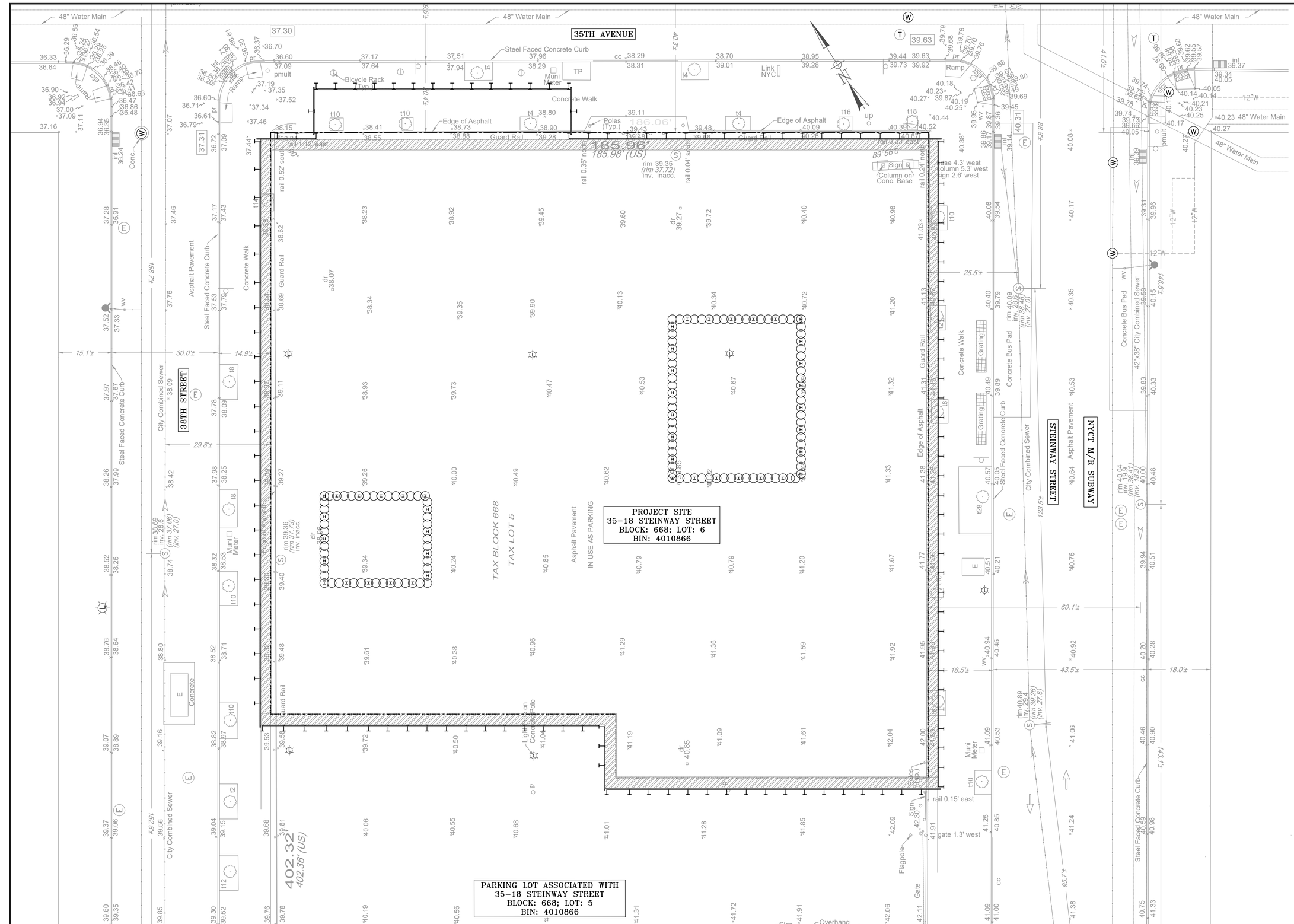
DWG No:	T-001.00
CAD FILE No:	24190000
PAGE No:	1 of 13



1 PLOT PLAN
SCALE: 1":12'

VICINITY MAP
N.T.S.

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PREPARED BY:
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SPRINGFIELD P: (973) 218-6561
NEW JERSEY 07081

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PROJECT NAME:

INNOVATION QNS, BUILDING B1
35-10 STEINWAY STREET
BLOCK: 668; LOT: 6
ASTORIA, BOROUGH OF QUEENS
CITY & STATE OF NEW YORK

DRAWING TITLE:

PLOT PLAN

SEAL & SIGNATURE

STATE OF NEW YORK NEJM EDDIN JUNDI 083095 LICENSED PROFESSIONAL ENGINEER

10/27/25
NEJM E. JUNDI DATE
NEW YORK STATE PROFESSIONAL ENGINEER #083095

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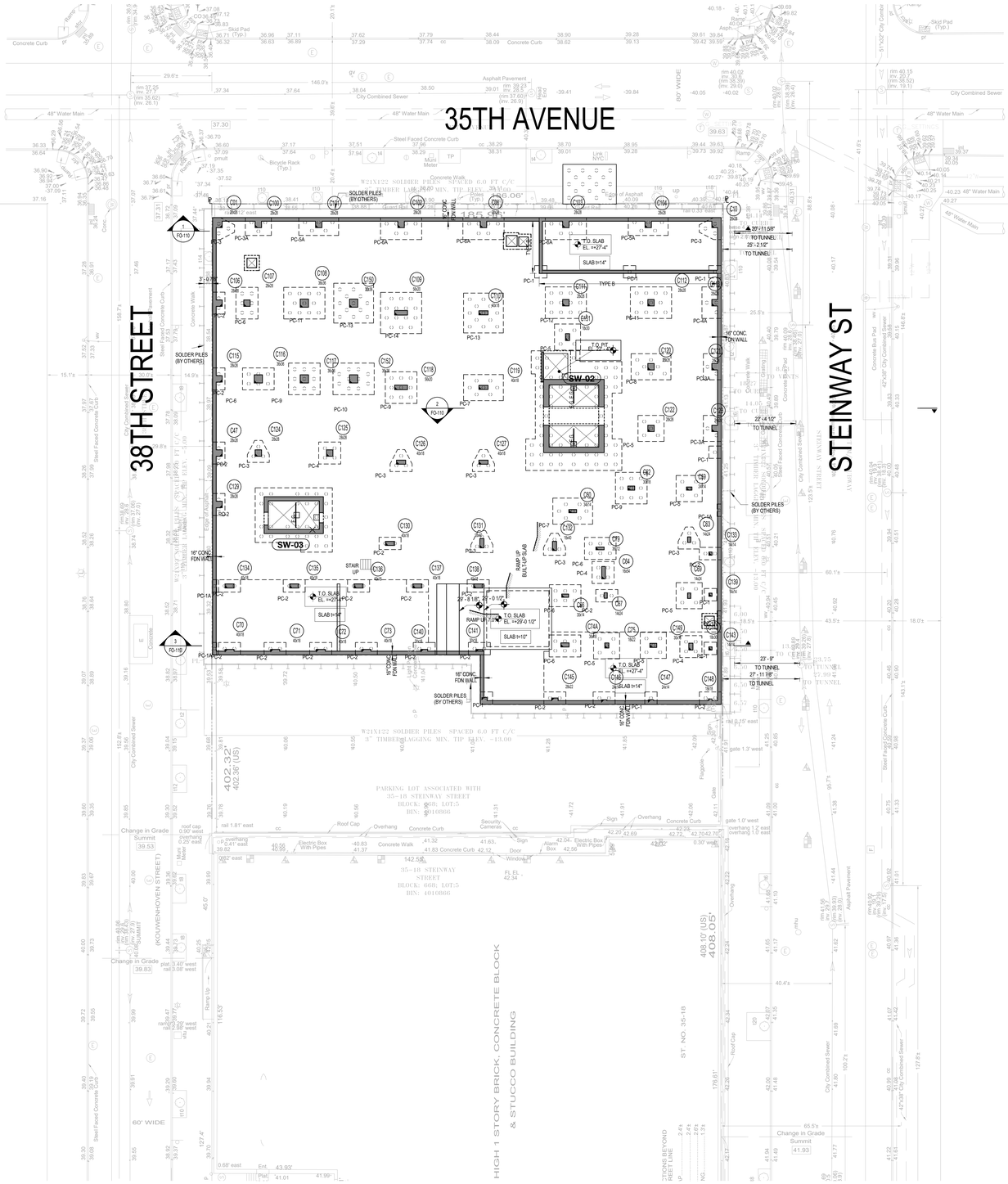
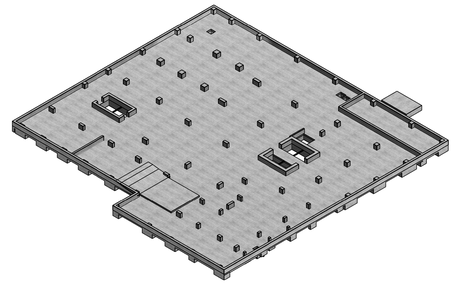
CAD FILE No:	24190000
PAGE No:	2 of 13





3D ISO - CELLAR / FOUNDATION PLAN Copy 1

CELLAR / FOUNDATION PLAN WITH MTA TUNNEL

SCALE: 1/16" = 1'-0"

1/16/2026 1:28:12 PM

35-10 STEINWAY STREET, ASTORIA, NY 11101

BEYER BLINDER BELLE

120 Broadway, 20th Fl, New York, NY 10271

CLIENT
STEINWAY 1 OWNER LLC
2 Park Avenue, 23rd Floor
New York, NY 10016

STRUCTURAL ENGINEER
DeSimone Consulting Engineers
140 Broadway, 25th Floor
New York NY 10005

MEPFP ENGINEER
EP Engineering
100 William Street, Suite 1205
New York, NY 10038

CIVIL ENGINEER
Key Civil Engineering
(631) 961-0506

VERTICAL CIRCULATION
Fortune Shepler Saling, Inc.
(862) 400-6382

GEOTECH ENGINEER
JNZ Engineering
959 S. Springfield Avenue
Springfield, NJ 07081

ACOUSTIC CONSULTANT
WSP
One Penn Plaza
New York, New York, 10119

ENVELOPE CONSULTANT
RWMUS Consulting Group, Inc
229 West 28th Street
New York, New York 10001

SUSTAINABILITY CONSULTANT
Bright Power
80 Broad Street
New York, NY 10004

ACCESSIBILITY CONSULTANT
Accessibility Services
(718) 803-3782

LOW VOLTAGE CONSULTANT
Younity Inc.
18 West 18th Street, 2nd Floor
New York, NY, 10018

LANDSCAPE CONSULTANT
Starr Whitehouse Landscape Architects
80 Broad Street, Suite 1700
New York, NY 10004

LIGHTING CONSULTANT
Light Vs. Light
12 East 49th Street - Suite 1623
New York, NY 10017

KEY PLAN

STAMP

NO	DATE	DESCRIPTION
6	01/16/2026	100% CD
5	12/05/2025	90% CD
4	10/13/2025	50% CD
3	08/22/2025	DOB/HPD SUBMISSION
2	08/01/2025	100% DD
1	04/18/2025	100% SD

REVISIONS

SUBMITTAL
100% CONSTRUCTION DOCUMENTS

DRAWING TITLE

CELLAR / FOUNDATION PLAN WITH MTA TUNNEL

SCALE	1/16" = 1'-0"
DATE	04/15/25
PROJECT NUMBER	3053.00
DRAWING NUMBER	

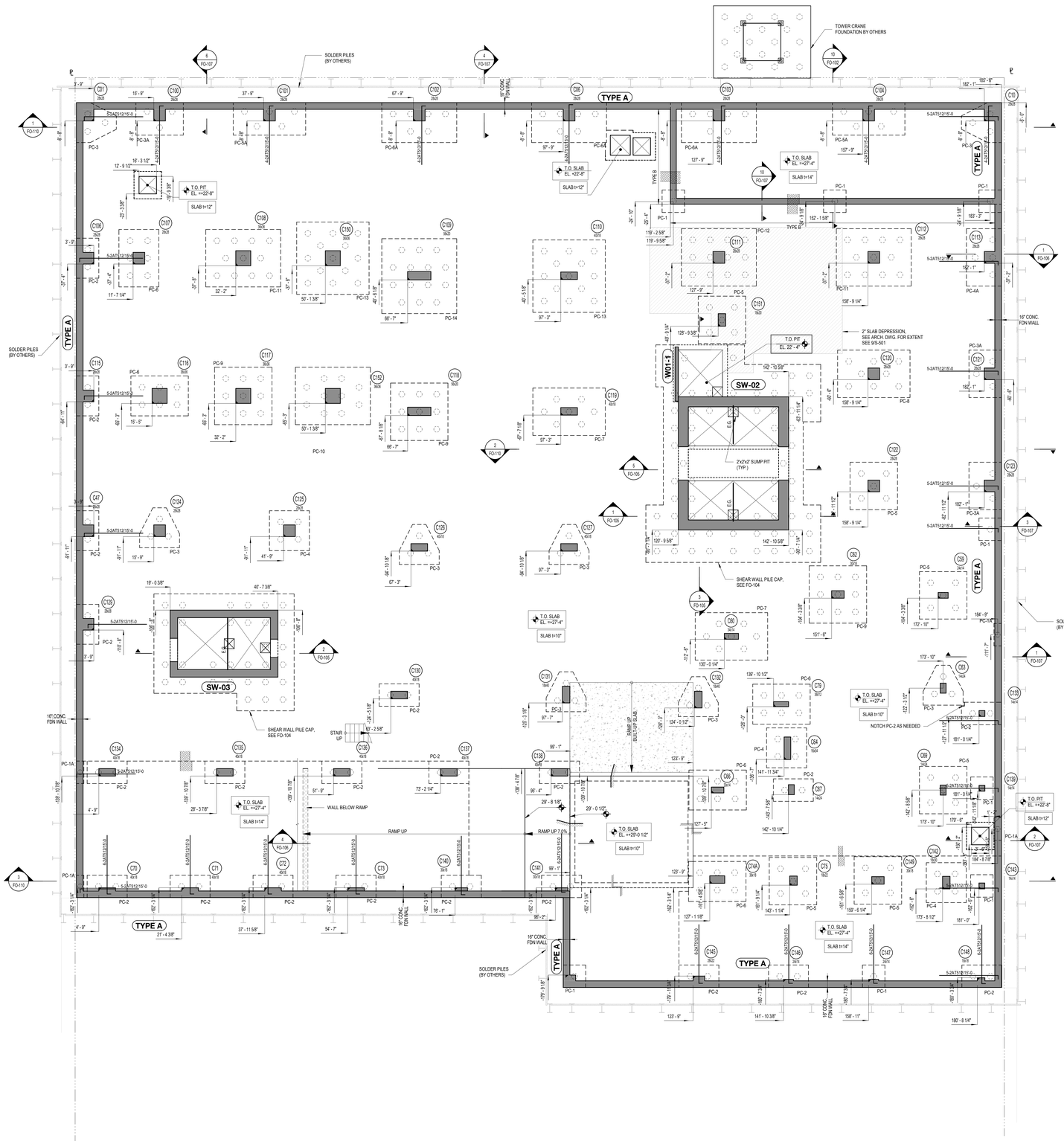
FO-100

DOB NOW JOB #

35TH AVENUE

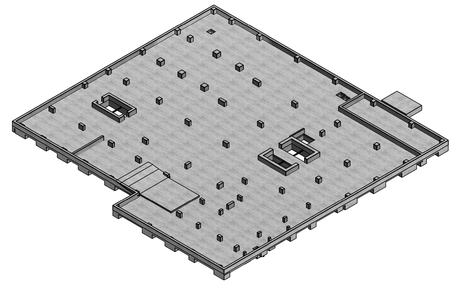
38TH STREET

STEINWAY ST



CELLAR / FOUNDATION LAYOUT PLAN

SCALE: 1/8" = 1'-0"



3D ISO - CELLAR / FOUNDATION PLAN

FOUNDATION WALL SCHEDULE

WALL TYPE	THICKNESS	HORIZONTAL REINF.	VERTICAL REINF.	REMARKS
TYPE A	16"	#5@12" O.C.	#6@12" O.C.	PROVIDE 3#8 HORIZONTAL BARS AT THE BOTTOM OF THE WALL
TYPE B	14"	#5@12" O.C.	#6@12" O.C.	PROVIDE 3#8 HORIZONTAL BARS AT THE BOTTOM OF THE WALL

CONCRETE WALL SCHEDULE AT CELLAR

WALL TYPE	THICKNESS	HORIZONTAL REINF.	VERTICAL REINF.	REMARKS
W01-1	8"	#5@12" O.C.E.F.	#5@12" O.C.E.F.	

TOP OF SLAB ELEVATION U.O.N.:	EL= +27' - 4"
SLAB THICKNESS U.O.N.:	SEE PLAN
SLAB CONCRETE STRENGTH:	6 KSI
SLAB CONT. TOP AND BOTTOM BARS U.O.N.:	10" / 14" SLAB: #5 @ 12" O.C.

FOUNDATION NOTES:

1. FOR GENERAL NOTES SEE DRAWING S-001.
2. ALL ELEVATIONS NOTED "EL" ON THE PLANS ARE NAVD 88 ELEVATIONS.
3. OUTER MOST SLAB REINFORCING RUNS IN EAST-WEST DIRECTION.
4. PC-# DENOTES PILE CAP. SEE PILE CAP LAYOUT AND DETAILS ON FO-103. TOP OF PILE CAP TO MATCH BOTTOM OF LOWEST SLAB WITHIN THE PILE CAP, U.O.N. THUS: [- "]
5. FOR FOUNDATION DETAILS SEE S-100 SERIES.
6. FOR COLUMN AND SHEAR WALL DETAILS SEE S-400 SERIES.
7. REFER TO ARCHITECTURAL DRAWINGS FOR FINISHED FLOOR SLOPES.
8. FOR CMU TYPICAL DETAILS SEE S-400 SERIES.
9. INTERIOR NON-LOAD BEARING CMU AND CURB WALLS NOT SHOWN ON PLAN. REFER TO TYPICAL CMU AND CURB DETAILS FOR REINFORCING.
10. SEE ARCHITECTURAL DRAWINGS FOR LOCATION OF CMU WALLS.
11. SEE M.E.P. DRAWINGS FOR ALL SLAB PENETRATIONS NOT SHOWN ON STRUCTURAL DRAWINGS.
12. NO CORE DRILLING FOR PIPE PENETRATIONS OR INSTALLATION OF METAL STRUCTURES IS PERMITTED. PLACEMENT OF ALL PIPE SLEEVES, SLOTS AND ANCHORS SHALL BE DIMENSIONED AND COORDINATED W/ ALL TRADES AND APPROVED BY ARCHITECT, MECHANICAL AND STRUCTURAL ENGINEERS PRIOR TO POURING CONCRETE.
13. FOUNDATION WALL IS TYPE A U.O.N. SEE FO-106 FOR FOUNDATION WALL SCHEDULE

35-10 STEINWAY STREET, ASTORIA, NY 11101

BEYER BLINDER BELLE

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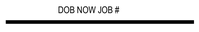

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REVISIONS

SUBMITTAL
100% CONSTRUCTION DOCUMENTS

DRAWING TITLE

CELLAR / FOUNDATION LAYOUT PLAN

SCALE	1/8" = 1'-0"
DATE	04/15/25
PROJECT NUMBER	3053.00
DRAWING NUMBER	

FO-101

DOB NOW JOB #

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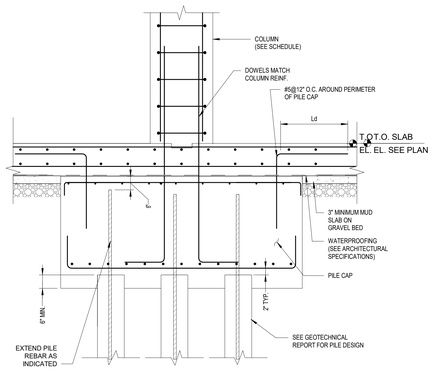
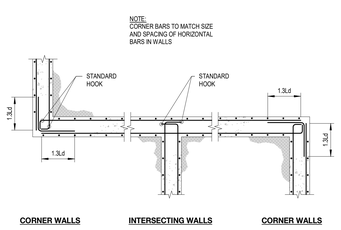
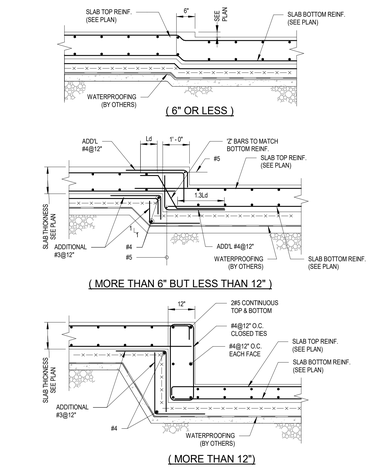


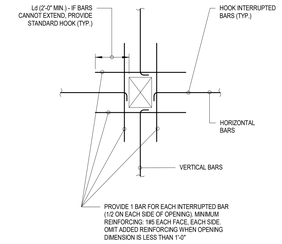
5 TYPICAL PILE CAP DETAIL AT COLUMN



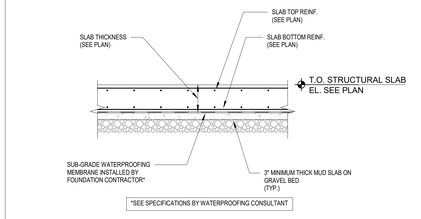
4 TYPICAL REINFORCING DETAIL AT FOUNDATION WALL CORNERS



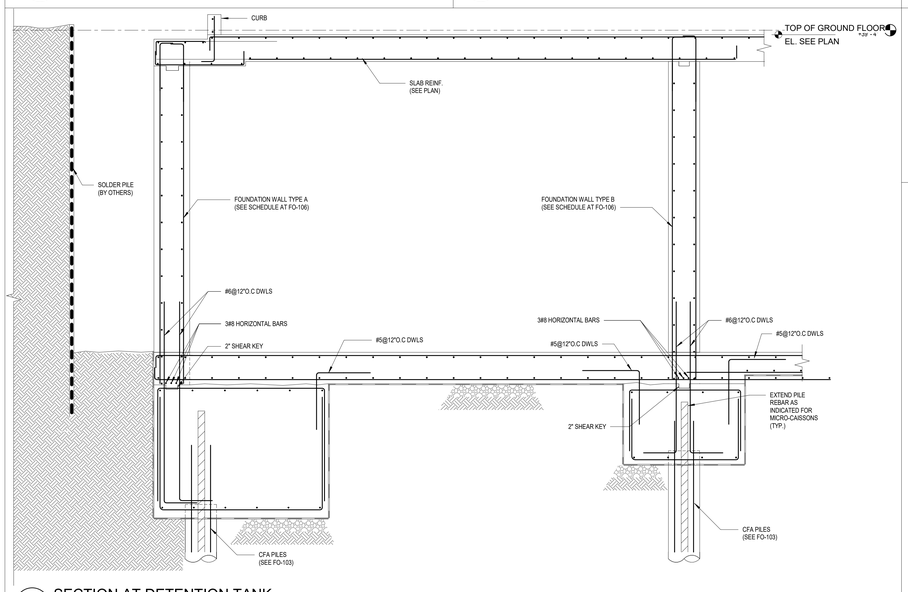
3 TYPICAL STRUCTURAL SLAB DROP DETAIL



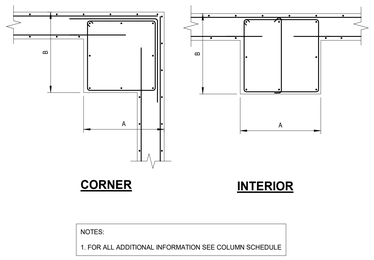
2 TYPICAL REINFORCING DETAIL AT FOUNDATION WALL OPENING



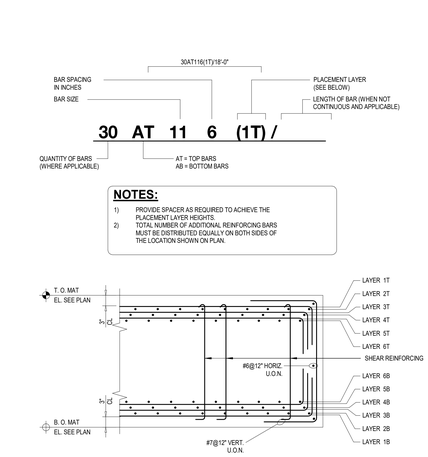
1 TYPICAL SLAB ON GROUND DETAIL



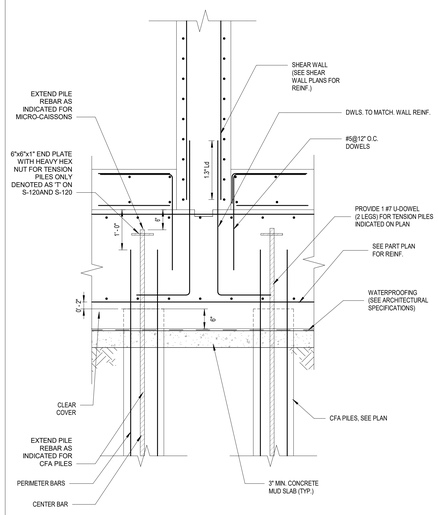
10 SECTION AT DETENTION TANK
SCALE: 1/2" = 1'-0"



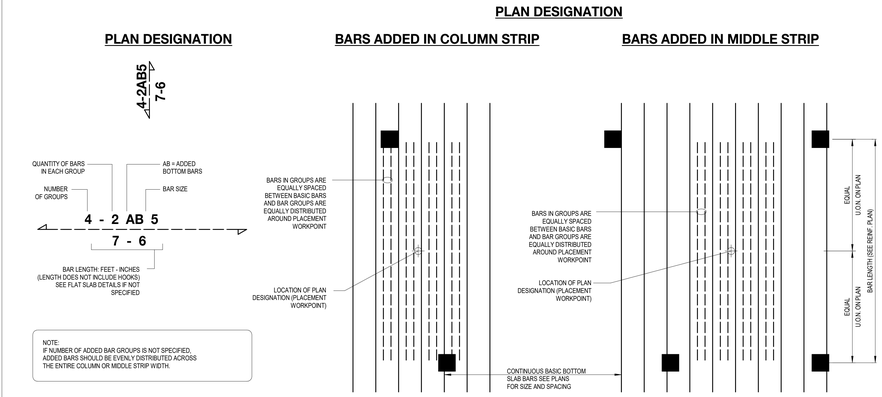
8 TYPICAL BUTTRESS DETAIL



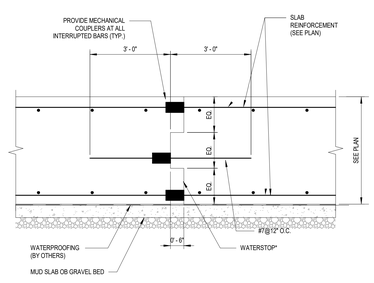
7 TYPICAL MAT REINFORCING DETAIL



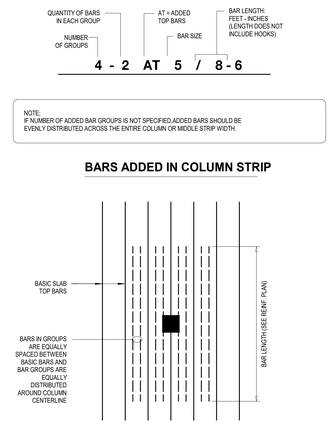
6 TYPICAL SHEAR WALL PILE CAP DETAIL



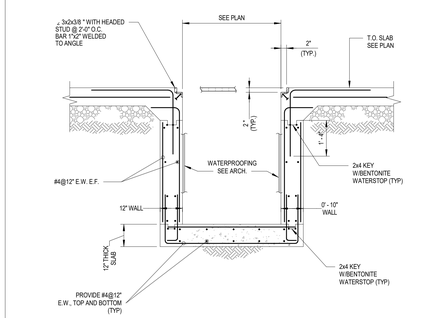
15 ADDED BOTTOM BAR REPLACEMENT



13 TYPICAL STRUCTURAL SLAB ON GROUND CONSTRUCTION JOINT DETAIL



12 ADDED TOP BARS PLACEMENT



11 TYPICAL SUMP PIT SECTION

35-10 STEINWAY STREET, ASTORIA, NY 11101

BEYER BLINDER BELLE
120 Broadway, 20th Fl, New York, NY 10271

CLIENT
STEINWAY 1 OWNER LLC
2 Park Avenue, 23rd Floor
New York, NY 10016

STRUCTURAL ENGINEER
DeSimone Consulting Engineers
140 Broadway, 25th Floor
New York NY 10005

MEPFP ENGINEER
EP Engineering
100 William Street, Suite 1205
New York, NY 10038

CIVIL ENGINEER
Key Civil Engineering
(631) 961-0506

VERTICAL CIRCULATION
Fortune Shepler Saling, Inc.
(862) 400-6382

GEOTECH ENGINEER
JNZ Engineering
959 S. Springfield Avenue
Springfield, NJ 07081

ACOUSTIC CONSULTANT
WSP
One Penn Plaza
New York, New York, 10119

ENVELOPE CONSULTANT
RWMUS Consulting Group, Inc
229 West 28th Street
New York, New York 10001

SUSTAINABILITY CONSULTANT
Bright Power
80 Broad Street
New York, NY 10004

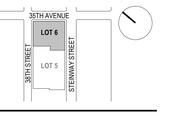
ACCESSIBILITY CONSULTANT
Accessibility Services
(718) 803-3782

LOW VOLTAGE CONSULTANT
Younity Inc.
18 West 18th Street, 2nd Floor
New York, NY, 10018

LANDSCAPE CONSULTANT
Starr Whitehouse Landscape Architects
80 Broad Street, Suite 1700
New York, NY 10004

LIGHTING CONSULTANT
Light Vs. Light
12 East 49th Street - Suite 1623
New York, NY 10017

KEY PLAN



STAMP

NO	DATE	DESCRIPTION
6	01/16/2026	100% CD
5	12/05/2025	90% CD
4	10/13/2025	50% CD
3	09/22/2025	DOB/HPD SUBMISSION
2	08/01/2025	100% DD
1	04/18/2025	100% SD

REVISIONS

SUBMITTAL
100% CONSTRUCTION DOCUMENTS

DRAWING TITLE
FOUNDATION DETAILS

SCALE	As indicated
DATE	12/08/09
PROJECT NUMBER	3053.00
DRAWING NUMBER	

FO-102

DOB NOW JOB #

1/16/2026 1:28:29 PM

APPENDIX B

In Situ Waste Characterization Data

APPENDIX C

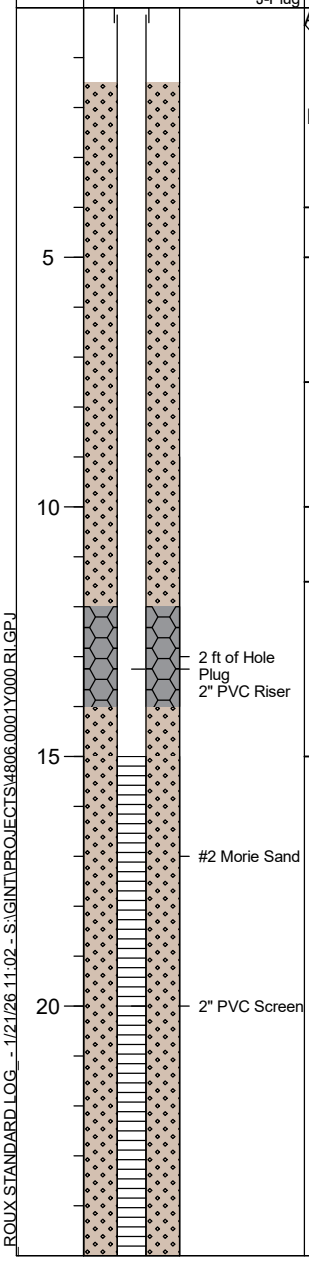
Soil Boring and Well Construction Logs

RSB-1/RMW-1

Client: LMXD INNOQ B1 LLC	Site: Former Bordens Farm Products	Project Number: 4806.0001Y000
Address: 35-18 Steinway Street	City/State: Astoria, NY	Logged By: A. Iervolino

Start to Finish Date: 12/1/2025 - 12/2/2025	Contractor: Eastern Environmental Solutions	Drill Type: Geoprobe	Sampler Type/Method: 4" Hand Auger
Borehole Depth: 25 feet	Backfill: Cuttings	Borehole Diameter: 4-inches	DTW:
Area: NM	Elevation: NM	Latitude: NM	Longitude: NM

Well Depth: 25 feet	Well Dia./Materials: 2-inch PVC	Screen Interval: 10-20 feet	Screen Slot Size: 20-Slot	Sand/Filter Pack Size: Morie #2	Annular Seal: Bentonite



Depth (ft)	USCS	Visual Description	Sample Interval	Recovery (ft)	PID	Notes
	ASPH	ASPHALT.			0.0	Soil sample RSB-1(0-2) collected between 0 and 2 feet BLS. Soil boring hand cleared to 5 feet BLS.
	MIXD	Dark Brown, fine SAND, some Silt, little fine to coarse Gravel, trace asphalt, concrete, and glass (FILL); dry.	G	5	0.0	
	SP-SM	Brown, fine SAND and SILT; dry.			0.0	Soil sample RSB-1(2-4) collected between 2 and 4 feet BLS.
5	SP-SM	Brown, fine SAND and SILT, trace fine gravel; moist.			0.0	Soil sample RSB-1(4-5) collected between 4 and 5 feet BLS.
	SP	Light brown, fine SAND, little Silt; moist.		3.5		
10	SP	Reddish brown, fine SAND; moist.			0.0	
	SW	Light brown, fine to medium SAND, trace coarse sand; moist.		3.5		
15		Light brown, fine SAND, trace medium sand; wet.			0.0	Groundwater observed at 17 feet BLS.
				3.5		
20	SP				0.0	Soil sample RSB-1(20-22) collected between 20 and 22 feet BLS.
				3.5		

Bottom of borehole at 25 feet

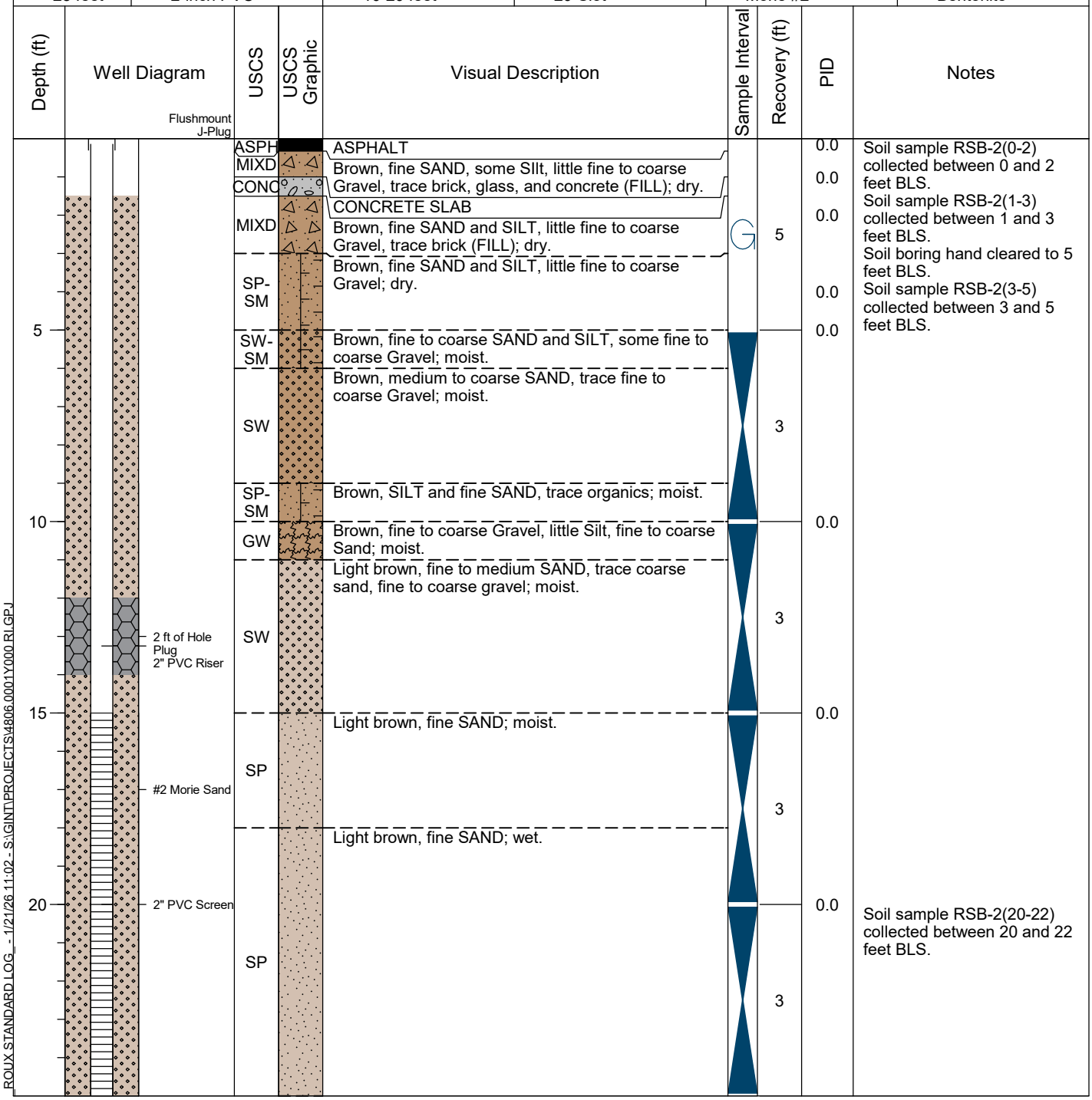
ROUX STANDARD LOG_ - 1/21/26 11:02 - S:\GINT\PROJECTS\4806.0001Y000 RI.GPJ

RSB-2/RMW-2

Client:	Site:	Project Number:
LMXD INNOQ B1 LLC	Former Bordens Farm Products	4806.0001Y000
Address:	**City/State:**	**Logged By:**
35-18 Steinway Street	Astoria, NY	A. Iervolino

Start to Finish Date:	Contractor:	Drill Type:	Sampler Type/Method:
12/1/2025 - 12/2/2025	Eastern Environmental Solutions	Geoprobe	4" Hand Auger
Borehole Depth:	**Backfill:**	**Borehole Diameter:**	**DTW:**
25 feet	Cuttings	4-inches	
Area:	**Elevation:**	**Latitude:**	**Longitude:**
NM	NM	NM	NM

Well Depth:	Well Dia./Materials:	Screen Interval:	Screen Slot Size:	Sand/Filter Pack Size:	Annular Seal:
25 feet	2-inch PVC	10-20 feet	20-Slot	Morie #2	Bentonite



Bottom of borehole at 25 feet

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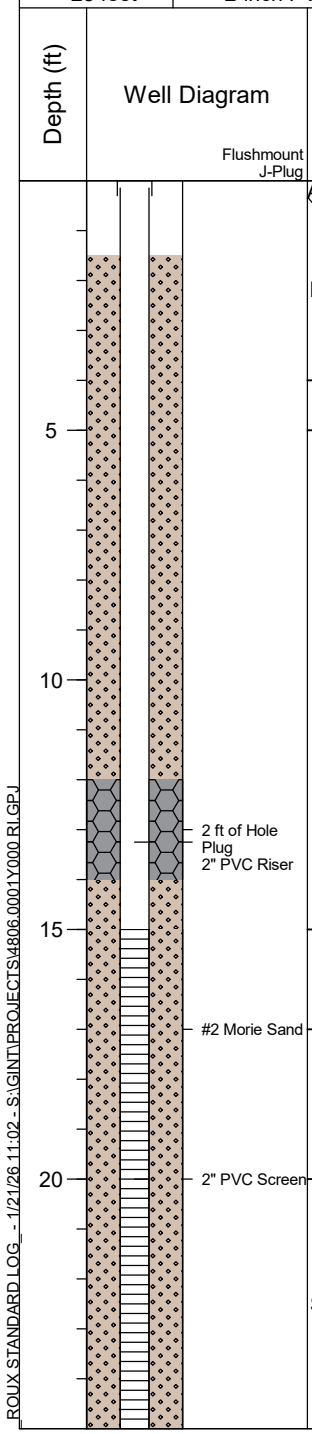
RSB-3/RMW-3

Client:	Site:	Project Number:
LMXD INNOQ B1 LLC	Former Bordens Farm Products	4806.0001Y000
Address:	**City/State:**	**Logged By:**
35-18 Steinway Street	Astoria, NY	A. Iervolino

Start to Finish Date:	Contractor:	Drill Type:	Sampler Type/Method:
12/1/2025 - 12/2/2025	Eastern Environmental Solutions	Geoprobe	4" Hand Auger
Borehole Depth:	**Backfill:**	**Borehole Diameter:**	**DTW:**
25 feet	Cuttings	4-inches	
Area:	**Elevation:**	**Latitude:**	**Longitude:**
NM	NM	NM	NM

Well Depth:	Well Dia./Materials:	Screen Interval:	Screen Slot Size:	Sand/Filter Pack Size:	Annular Seal:
25 feet	2-inch PVC	10-20 feet	20-Slot	Morie #2	Bentonite



Depth (ft)	USCS	Visual Description	Sample Interval	Recovery (ft)	PID	Notes
0	ASPH	ASPHALT			0.0	Soil sample RSB-3(0-2) collected between 0 and 2 feet BLS.
	MIXD	Brown, fine SAND, some Silt, little fine to coarse Gravel, trace concrete, brick, and asphalt (FILL); dry.	G	5	0.0	Soil boring hand cleared to 5 feet BLS.
					0.0	Soil sample RSB-3(2-4) collected between 2 and 4 feet BLS.
	SP-SM	Brown, fine SAND, some Silt, little fine to coarse Gravel; moist			0.0	Soil sample RSB-3(4-6) collected between 4 and 6 feet BLS.
5	SW	Brown, fine to medium SAND, trace coarse gravel; moist.		2	0.0	
10	SW	Brown, fine to medium SAND, trace coarse gravel; moist.		2.5	0.0	
15	SPG	Brown, fine SAND, some fine to coarse gravel; moist.			0.0	
	SW	Light brown, fine to coarse SAND; wet.		4		Groundwater observed at 18 feet.
20	SWG	Brown, fine to coarse SAND, some fine to coarse gravel, trace cobble; wet.		2	0.0	Soil sample RSB-3(20-22) collected between 20 and 22 feet BLS.

Bottom of borehole at 25 feet

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RSB-4/RMW-4

Client: LMXD INNOQ B1 LLC	Site: Former Bordens Farm Products	Project Number: 4806.0001Y000
Address: 35-18 Steinway Street	City/State: Astoria, NY	Logged By: A. Iervolino

Start to Finish Date: 12/3/2025 - 12/3/2025	Contractor: Eastern Environmental Solutions	Drill Type: Geoprobe	Sampler Type/Method: 4" Hand Auger
Borehole Depth: 30 feet	Backfill: Cuttings	Borehole Diameter: 4-inches	DTW:
Area: NM	Elevation: NM	Latitude: NM	Longitude: NM

Well Depth: 30 feet	Well Dia./Materials: 2-inch PVC	Screen Interval: 15-25 feet	Screen Slot Size: 20-Slot	Sand/Filter Pack Size: Morie #2	Annular Seal: Bentonite

Depth (ft)	Well Diagram	USCS	USCS Graphic	Visual Description	Sample Interval	Recovery (ft)	PID	Notes
	Flushmount J-Plug	ASPH		ASPHALT			0.0	Soil sample RSB-4(0-2) collected between 0 and 2 feet BLS.
		MIXD		Brown, fine SAND and SILT, some coarse Gravel, little Brick, trace glass, concrete, and medium to coarse sand (FILL); dry.	G	5	0.9	Soil boring hand cleared to 5 feet BLS.
		SP		Brown, fine SAND, some Silt, trace coarse gravel; moist.			1.9 0.0	Soil sample RSB-4(2-4) collected between 2 and 4 feet BLS.
5				Brown, fine SAND, some Silt; moist.			0.0	Soil sample RSB-4(4-6) collected between 4 and 6 feet BLS.
		SP				3.5		
10				Light brown, fine SAND and SILT; moist.			0.0	
		SP-SM				2.5		
15	2" PVC Riser			Light brown, fine SAND and SILT, trace fine to coarse gravel, and cobble; moist.			0.0	
	2 ft of Hole Plug	SP-SM				3		
20				Light brown, SILT, some fine Sand; wet.			0.0	
						3		Soil sample RSB-4(20-22) collected between 20 and 22 feet BLS.
25	2" PVC Screen #2 Morie Sand	SM						

Bottom of borehole at 30 feet

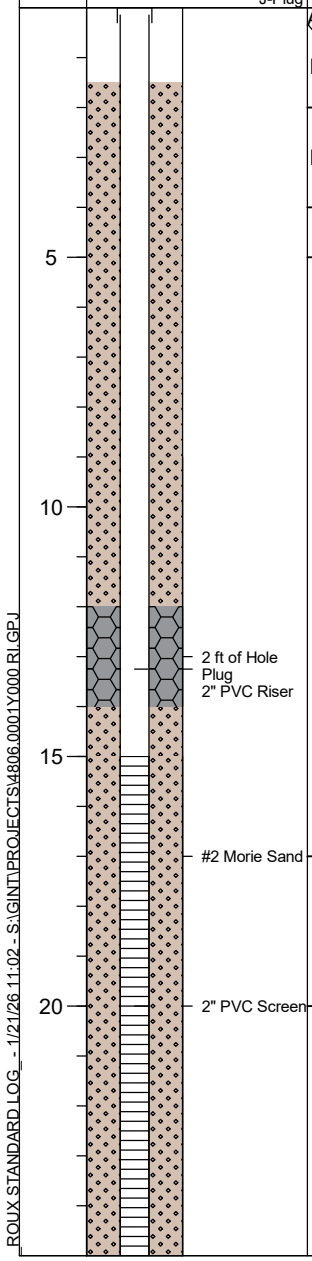
ROUX STANDARD LOG - 1/21/26 11:02 - S:\GINT\PROJECTS\4806.0001Y000 RI.GPJ

RSB-5/RMW-5

Client:	Site:	Project Number:
LMXD INNOQ B1 LLC	Former Bordens Farm Products	4806.0001Y000
Address:	**City/State:**	**Logged By:**
35-18 Steinway Street	Astoria, NY	A. Iervolino

Start to Finish Date:	Contractor:	Drill Type:	Sampler Type/Method:
12/1/2025 - 12/2/2025	Eastern Environmental Solutions	Geoprobe	4" Hand Auger
Borehole Depth:	**Backfill:**	**Borehole Diameter:**	**DTW:**
25 feet	Cuttings	4-inches	
Area:	**Elevation:**	**Latitude:**	**Longitude:**
NM	NM	NM	NM

Well Depth:	Well Dia./Materials:	Screen Interval:	Screen Slot Size:	Sand/Filter Pack Size:	Annular Seal:
25 feet	2-inch PVC	10-20 feet	20-Slot	Morie #2	Bentonite



Depth (ft)	USCS	Visual Description	Sample Interval	Recovery (ft)	PID	Notes
0	ASPH	ASPHALT			0.0	Soil sample RSB-5(0-2) collected between 0 and 2 feet BLS.
	MIXD	Brown, fine SAND and SILT, some fine to coarse Gravel, little Concrete, trace brick, glass. slight odor (FILL); dry.			0.1	Soil boring hand cleared to 5 feet BLS.
	MIXD	Brown, fine SAND and SILT, little fine to coarse Gravel, trace glass, brick, clay (FILL); dry.	G	5	0.0	Soil sample RSB-5(2-4) collected between 2 and 4 feet BLS.
	SP-SM	Brown, fine SAND, some Silt, little fine to coarse Gravel; dry.			0.0	Soil sample RSB-5(4-6) collected between 2 and 4 feet BLS.
5		Brown, fine to medium SAND, some Silt, little fine to coarse Gravel; moist.			0.0	
				5		Soil sample RSB-5(6-8) collected between 6 and 8 feet BLS.
						Soil sample RSB-5(8-10) collected between 8 and 10 feet BLS.
10	SW-SM				0.0	
				4.5		
15					0.0	
		Light brown, fine to coarse SAND, some Silt; moist.		4.5		
	SW-SM					
20		Light brown, fine to coarse SAND, some Silt; wet.			0.0	Soil sample RSB-5(20-22) collected between 20 and 22 feet BLS.
	SW-SM			4.5		

Bottom of borehole at 25 feet

ROUX STANDARD LOG_ - 1/21/26 11:02 - S:\GINT\PROJECTS\4806.0001Y000 RI.GPJ

RSB-6

Client: LMXD INNOQ B1 LLC	Site: Former Bordens Farm Products	Project Number: 4806.0001Y000
Address: 35-18 Steinway Street	City/State: Astoria, NY	Logged By: M. Villacres

Start to Finish Date: 12/12/2025 - 12/16/2025	Contractor: Eastern Environmental Solutions	Drill Type: Geoprobe	Sampler Type/Method: 4" Hand Auger
Borehole Depth: 25 feet	Backfill: Cuttings	Borehole Diameter: 2-inches	DTW:
Area: NM	Elevation: NM	Latitude: NM	Longitude: NM

Depth (ft)	USCS	Visual Description	Sample Interval	Recovery (ft)	PID	Notes
	ASPH	ASPHALT			0.0	Soil samples RSB-6(0-2) collected between 0 and 2 feet BLS.
	MIXD	Brown, fine to coarse SAND, Brick, Concrete, Asphalt (FILL); moist.			0.0	Soil boring hand cleared to 6 feet BLS.
	SW-SM	Brown, fine to coarse SAND, some Silt, little medium to coarse Gravel; moist.	G	5	0.0	Soil samples RSB-6(2-4) collected between 2 and 4 feet BLS.
5	SW-SM	Brown, fine to coarse SAND, some Silt, little medium to coarse Gravel and Clay; moist.			0.0	Soil samples RSB-6(4-6) collected between 4 and 6 feet BLS.
	SW-SM	Brown, fine to coarse SAND, some Silt, little fine to coarse Gravel; moist.				Soil samples RSB-6(6-8) collected between 6 and 8 feet BLS.
10	SW-SM	Light brown, fine to coarse SAND, some Silt, little fine to coarse Gravel; moist.		5	0.0	
15	SW-SM			5	0.0	
20	SW-SM	Light brown, fine to coarse SAND, some Silt, little fine to coarse Gravel; wet.		5	0.0	Soil samples RSB-6(20-22) collected between 20 and 22 feet BLS.
		Bottom of borehole at 25 feet				

ROUX STANDARD LOG_ - 1/21/26 11:02 - S:\GINT\PROJECTS\4806.0001Y000 RI.GPJ

RSB-7

Client: LMXD INNOQ B1 LLC	Site: Former Bordens Farm Products	Project Number: 4806.0001Y000
Address: 35-18 Steinway Street	City/State: Astoria, NY	Logged By: M. Villacres

Start to Finish Date: 12/8/2025 - 12/16/2025	Contractor: Eastern Environmental Solutions	Drill Type: Geoprobe	Sampler Type/Method: 4" Hand Auger
Borehole Depth: 30 feet	Backfill: Cuttings	Borehole Diameter: 2-inches	DTW:
Area: NM	Elevation: NM	Latitude: NM	Longitude: NM

Depth (ft)	USCS	USCS Graphic	Visual Description	Sample Interval	Recovery (ft)	PID	Notes
	ASPH		ASPHALT.			0.0	Soil samples RSB-7(0-2) collected between 0 and 2 feet BLS.
	MIXD		Brown, fine to coarse SAND, some Brick, Concrete, Asphalt, Glass, little Silt (FILL); moist.	G	5	0.0	Soil boring hand cleared to 5 feet BLS.
	SW-SM		Brown, fine to coarse SAND, some Silt, little fine to coarse Gravel; moist.			0.0	Soil samples RSB-7(2-4) collected between 2 and 4 feet BLS.
5			Brown, fine to coarse SAND, some Silt, Gravel; moist.			0.0	Soil samples RSB-7(4-6) collected between 4 and 6 feet BLS.
	SW-SM				2.5		Soil samples RSB-7(6-8) collected between 6 and 8 feet BLS.
10			Light brown, fine to coarse SAND, some Silt, Gravel; moist.			0.0	Soil samples RSB-7(8-10) collected between 8 and 10 feet BLS.
	SW-SM				3		
15			Light brown, fine to coarse SAND, some Silt, Gravel; moist.			0.0	
	SW-SM				4		
	SWG		Light brown, medium to coarse SAND, and Gravel, some Silt; wet.				
20			Light brown, medium to coarse SAND, and Gravel, some Silt; wet.			0.0	
	SWG				4		
25			Light brown, medium to coarse SAND, and Gravel, some Silt; wet.			0.0	Soil samples RSB-7(25-27) collected between 25 and 27 feet BLS.
	SWG				3.5		

Bottom of borehole at 30 feet

ROUX STANDARD LOG_ - 1/21/26 11:02 - S:\GINT\PROJECTS\4806.0001Y000 RI.GPJ

RSB-8

Client: LMXD INNOQ B1 LLC	Site: Former Bordens Farm Products	Project Number: 4806.0001Y000
Address: 35-18 Steinway Street	City/State: Astoria, NY	Logged By: M. Villacres

Start to Finish Date: 12/11/2025 - 12/15/2025	Contractor: Eastern Environmental Solutions	Drill Type: Geoprobe	Sampler Type/Method: 4" Hand Auger
Borehole Depth: 30 feet	Backfill: Cuttings	Borehole Diameter: 2-inches	DTW:
Area: NM	Elevation: NM	Latitude: NM	Longitude: NM

Depth (ft)	USCS	USCS Graphic	Visual Description	Sample Interval	Recovery (ft)	PID	Notes
	ASPH		ASPHALT.			0.0	Soil samples RSB-8(0-2) collected between 0 and 2 feet BLS.
	MIXD		Brown, fine to coarse SAND, some Brick, Concrete, Asphalt (FILL); moist.			0.0	
	CONC		CONCRETE.			0.0	Soil samples RSB-8(1-3) collected between 1 and 3 feet BLS.
	MIXD		Brown, fine to coarse SAND, some Brick, Concrete, Asphalt (FILL); moist.	G	5	0.0	
	SW-SM		Brown, fine to coarse SAND, some Silt, medium to coarse Gravel, medium Cobble; moist.			0.0	Soil boring hand cleared to 5 feet BLS.
5			Light Brown, fine to coarse SAND, some fine to coarse Gravel, Silt; moist.			0.0	Soil samples RSB-8(3-5) collected between 3 and 5 feet BLS.
					4		Soil samples RSB-8(5-7) collected between 5 and 7 feet BLS.
10	SW					0.0	
					3.5		
15			Light brown, fine to medium SAND, some Silt, little fine to coarse Gravel; moist.			0.0	
	SP-SM				5		
20						0.0	
	SWG		Light brown, fine to coarse SAND and fine to coarse GRAVEL, some Silt; moist.				
			Light brown, fine to medium SAND and fine GRAVEL, some Silt; moist.		5		
25	SWG					0.0	Soil samples RSB-8(25-27) and RSB-8(25-27)_P collected between 25 and 27 feet BLS.
					5		

Bottom of borehole at 30 feet

ROUX STANDARD LOG - 1/21/26 11:03 - S:\GINT\PROJECTS\4806.0001Y000 RI.GPJ

RSB-9

Client: LMXD INNOQ B1 LLC	Site: Former Bordens Farm Products	Project Number: 4806.0001Y000
Address: 35-18 Steinway Street	City/State: Astoria, NY	Logged By: M. Villacres

Start to Finish Date: 12/15/2025 - 12/17/2025	Contractor: Eastern Environmental Solutions	Drill Type: Geoprobe	Sampler Type/Method: 4" Hand Auger
Borehole Depth: 25 feet	Backfill: Cuttings	Borehole Diameter: 2-inches	DTW:
Area: NM	Elevation: NM	Latitude: NM	Longitude: NM

Depth (ft)	USCS	Visual Description	Sample Interval	Recovery (ft)	PID	Notes
	ASPH	ASPHALT.			0.0	Soil samples RSB-9(0-2) collected between 0 and 2 feet BLS. Soil boring hand cleared to 5 feet BLS.
	MIXD	Brown, fine to coarse SAND, Brick, Concrete, Asphalt, Tile (FILL); moist.	G	5	0.0	
5	MIXD	Brown, fine to coarse SAND, some Brick, Concrete (FILL); moist.		2.5	0.0	
10	MIXD	Brown, fine to coarse SAND, some Brick, Concrete, medium to coarse Gravel (FILL); moist.		3	0.0	
15	CONC	CONCRETE.		4	0.0	Soil samples RSB-9(16-18) collected between 16 and 18 feet BLS.
		Brown, fine to medium SAND, some Silt, fine to coarse Gravel; wet.				
20	SP-SM			3.5	0.0	Soil samples RSB-9(20-22) collected between 20 and 22 feet BLS. Soil samples RSB-9(22-24) collected between 22 and 24 feet BLS.

Bottom of borehole at 25 feet

ROUX STANDARD LOG_ - 1/21/26 11:03 - S:\GINT\PROJECTS\4806.0001Y000 RI.GPJ

APPENDIX D

Green and Sustainable Remediation Evaluation

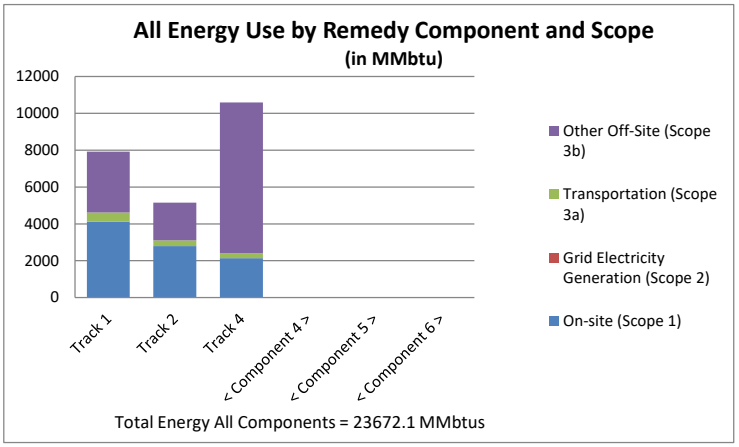
Environmental Footprint Summary

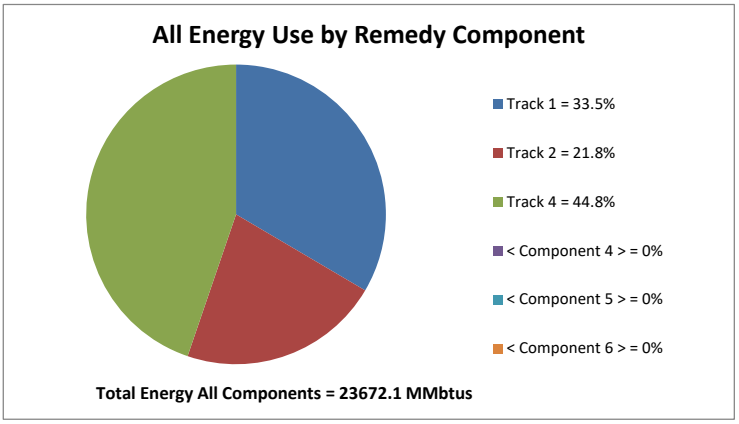
Core Element	Metric		Unit of Measure	Footprint						
				Track 1	Track 2	Track 4	< Component 4 >	< Component 5 >	< Component 6 >	Total
Materials & Waste	M&W-1	Refined materials used on-site	Tons	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	M&W-2	% of refined materials from recycled or reused material	%							
	M&W-3	Unrefined materials used on-site	Tons	333.672	73.672	1,273.672	0.000	0.000	0.000	1,681.0
	M&W-4	% of unrefined materials from recycled or reused material	%	22.1%	100.0%	5.8%				13.1%
	M&W-5	On-site hazardous waste disposed of off-site	Tons	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	M&W-6	On-site non-hazardous waste disposed of off-site	Tons	12,750.0	6,225.0	1,800.0	0.0	0.0	0.0	20,775.0
	M&W-7	Recycled or reused waste	Tons	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	M&W-8	% of total potential waste recycled or reused	%	0.0%	0.0%	0.0%				0.0%
Water (used on-site)	W-1	Public water use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-2	Groundwater use	MG	0.3	0.0	0.0	0.0	0.0	0.0	0.3
	W-3	Surface water use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-4	Reclaimed water use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-5	Storm water use	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-6	User-defined water resource #1	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-7	User-defined water resource #2	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	W-8	Wastewater generated	MG	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Energy	E-1	Total energy used (on-site and off-site)	MMBtu	7,923.1	5,154.0	10,595.0	0.0	0.0	0.0	23,672.1
	E-2	Energy voluntarily derived from renewable resources								
	E-2A	On-site renewable energy generation or use + on-site biodiesel use + biodiesel and other renewable resource use for transportation	MMBtu	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	E-2B	Voluntary purchase of renewable electricity	MWh	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	E-3	Voluntary purchase of RECs	MWh	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	E-4	On-site grid electricity use	MWh	0.000	0.000	0.000	0.000	0.000	0.000	0.0
Air	A-1	On-site NOx, SOx, and PM emissions	Pounds	3,462.5	2,348.3	1,791.2	0.0	0.0	0.0	7,602.0
	A-2	On-site HAP emissions	Pounds	1.2	0.8	0.6	0.0	0.0	0.0	2.6
	A-3	Total NOx, SOx, and PM emissions	Pounds	12,936.2	7,366.0	13,864.8	0.0	0.0	0.0	34,167.1
	A-3A	Total NOx emissions	Pounds	5,840.4	3,637.7	5,574.6	0.0	0.0	0.0	15,052.7
	A-3B	Total SOx emissions	Pounds	1,542.2	910.6	5,474.0	0.0	0.0	0.0	7,926.7
	A-3C	Total PM emissions	Pounds	5,553.7	2,817.8	2,816.3	0.0	0.0	0.0	11,187.7
	A-4	Total HAP emissions	Pounds	86.3	54.6	492.4	0.0	0.0	0.0	633.3
	A-5	Total greenhouse gas emissions	Tons CO2e*	661.8	441.8	634.4	0.0	0.0	0.0	1,738.0
Land & Ecosystems		Qualitative Description								

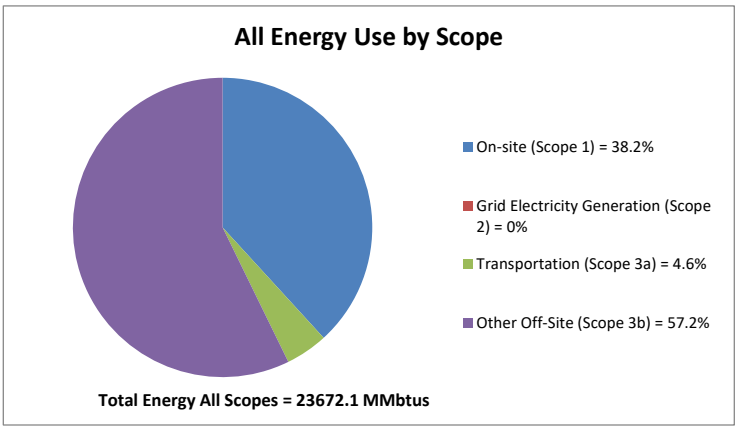
** Total greenhouse gases emissions (in CO2e) include consideration of CO2, CH4, and N2O (Nitrous oxide) emissions.*
"MMBtu" = millions of Btus
"MG" = millions of gallons
"CO2e" = carbon dioxide equivalents of global warming potential
"MWh" = megawatt hours (i.e., thousands of kilowatt-hours or millions of Watt-hours)
"Tons" = short tons (2,000 pounds)

The above metrics are consistent with EPA's Methodology for Understanding and Reducing a Project's Environmental Footprint (EPA 542-R-12-002), February 2012

Notes:


All Energy Use by Remedy Component and Scope
(in MMbtu)
12000
10000
8000
6000
4000
2000
0
Track 1
Track 2
Track 4
< Component 4 >
< Component 5 >
< Component 6 >
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
Total Energy All Components = 23672.1 MMbtus


All Energy Use by Remedy Component
Track 1 = 33.5%
Track 2 = 21.8%
Track 4 = 44.8%
< Component 4 > = 0%
< Component 5 > = 0%
< Component 6 > = 0%
Total Energy All Components = 23672.1 MMbtus


All Energy Use by Scope
On-site (Scope 1) = 38.2%
Grid Electricity Generation (Scope 2) = 0%
Transportation (Scope 3a) = 4.6%
Other Off-Site (Scope 3b) = 57.2%
Total Energy All Scopes = 23672.1 MMbtus

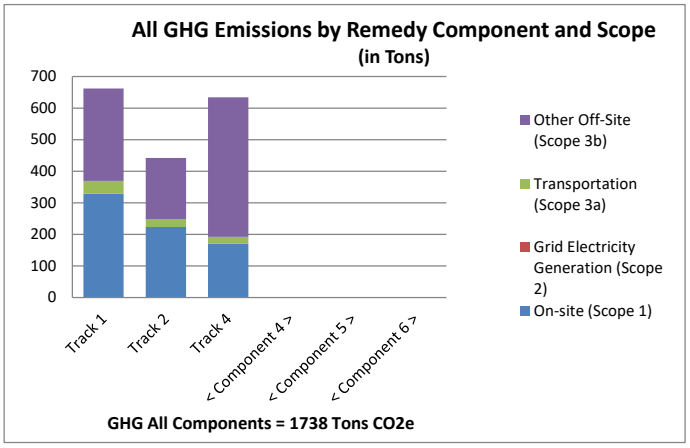
Total Energy
MMbtus

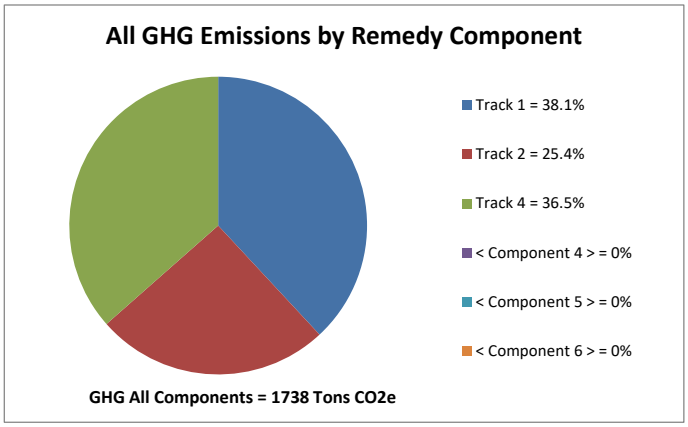
	Track 1	Track 2	Track 4	< Compon	< Compon	< Compon	Total	
On-site (Scope 1)	4,115.9	2,794.3	2,133.5	0.0	0.0	0.0	9,043.7	
Generation (Scope 2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Grid Electricity
nsportation (Scope 3a)	499.1	312.3	268.2	0.0	0.0	0.0	1,079.6	Tran
ner Off-Site (Scope 3b)	3,308.1	2,047.4	8,193.4	0.0	0.0	0.0	13,548.9	Oth
Total	7,923.1	5,154.0	10,595.0	0.0	0.0	0.0	23,672.1	

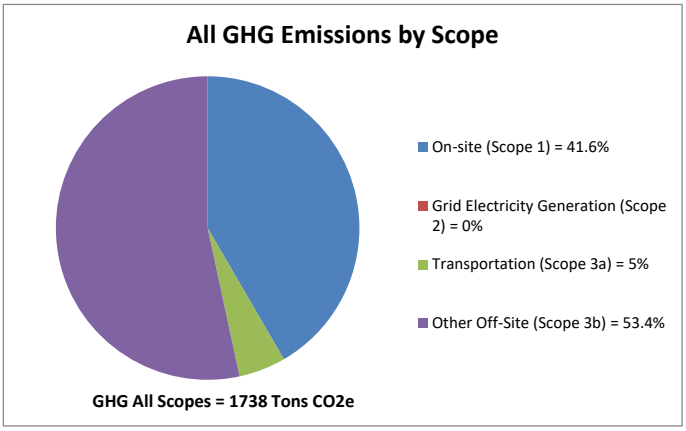
Track 1 = 33.5%
Track 2 = 21.8%
Track 4 = 44.8%
< Component 4 > = 0%
< Component 5 > = 0%
< Component 6 > = 0%

On-site (Scope 1) = 38.2%
Grid Electricity Generation (Scope 2) = 0%
Transportation (Scope 3a) = 4.6%
Other Off-Site (Scope 3b) = 57.2%

Total Energy All Components = 23672.1 MMbtus
Total Energy All Scopes = 23672.1 MMbtus


All GHG Emissions by Remedy Component and Scope
(in Tons)
700
600
500
400
300
200
100
0
Track 1
Track 2
Track 4
< Component 4 >
< Component 5 >
< Component 6 >
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
GHG All Components = 1738 Tons CO2e


All GHG Emissions by Remedy Component
Track 1 = 38.1%
Track 2 = 25.4%
Track 4 = 36.5%
< Component 4 > = 0%
< Component 5 > = 0%
< Component 6 > = 0%
GHG All Components = 1738 Tons CO2e


All GHG Emissions by Scope
On-site (Scope 1) = 41.6%
Grid Electricity Generation (Scope 2) = 0%
Transportation (Scope 3a) = 5%
Other Off-Site (Scope 3b) = 53.4%
GHG All Scopes = 1738 Tons CO2e

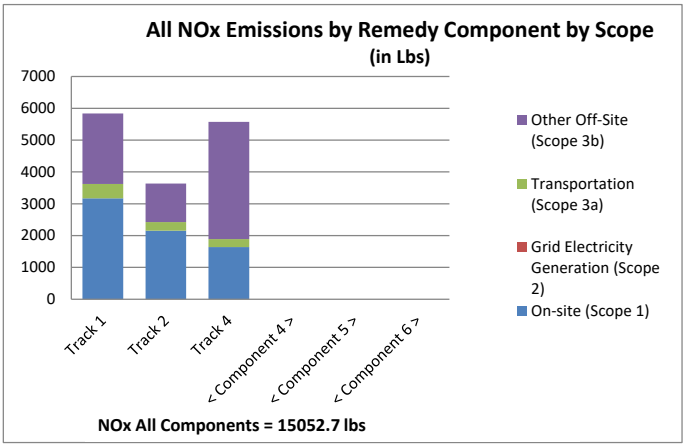
GHG
Tons CO2e

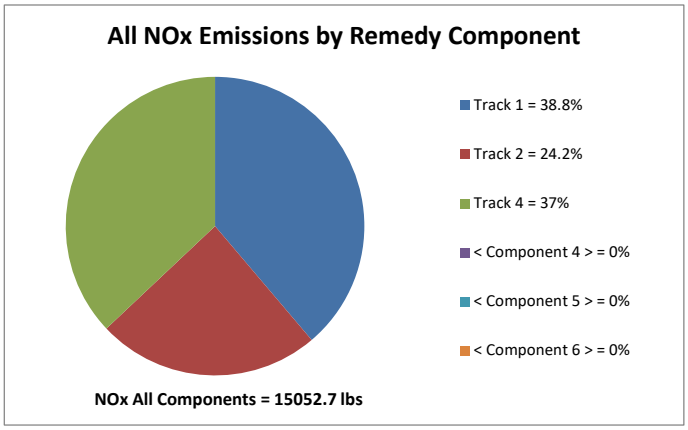
	Track 1	Track 2	Track 4	< Compon	< Compon	< Compon	Total	
On-site (Scope 1)	329.2	223.5	170.7	0.0	0.0	0.0	723.4	
Generation (Scope 2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	l Electricity
sportation (Scope 3a)	40.2	25.1	21.6	0.0	0.0	0.0	87.0	Tran
er Off-Site (Scope 3b)	292.4	193.1	442.1	0.0	0.0	0.0	927.7	Oth
Total	661.8	441.8	634.4	0.0	0.0	0.0	1,738.0	

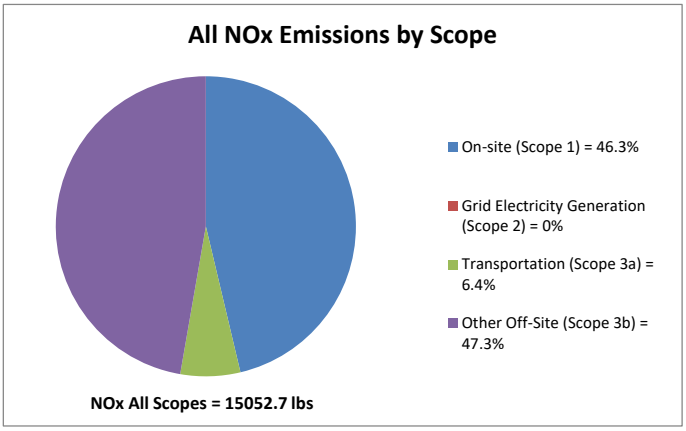
Track 1 = 38.1%
Track 2 = 25.4%
Track 4 = 36.5%
< Component 4 > = 0%
< Component 5 > = 0%
< Component 6 > = 0%

On-site (Scope 1) = 41.6%
Grid Electricity Generation (Scope 2) = 0%
Transportation (Scope 3a) = 5%
Other Off-Site (Scope 3b) = 53.4%

GHG All Components = 1738 Tons CO2e
GHG All Scopes = 1738 Tons CO2e


All NOx Emissions by Remedy Component by Scope
(in Lbs)
7000
6000
5000
4000
3000
2000
1000
0
Track 1
Track 2
Track 4
< Component 4 >
< Component 5 >
< Component 6 >
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
NOx All Components = 15052.7 lbs


All NOx Emissions by Remedy Component
Track 1 = 38.8%
Track 2 = 24.2%
Track 4 = 37%
< Component 4 > = 0%
< Component 5 > = 0%
< Component 6 > = 0%
NOx All Components = 15052.7 lbs

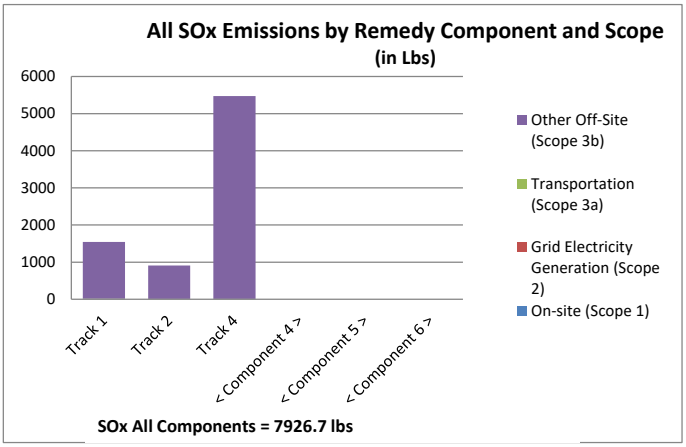

All NOx Emissions by Scope
On-site (Scope 1) = 46.3%
Grid Electricity Generation (Scope 2) = 0%
Transportation (Scope 3a) = 6.4%
Other Off-Site (Scope 3b) = 47.3%
NOx All Scopes = 15052.7 lbs

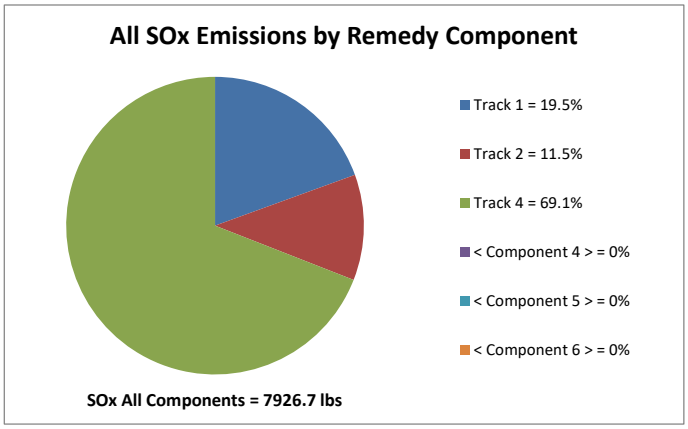
NOx lbs	Track 1	Track 2	Track 4	< Compon	< Compon	< Compon	Total	
On-site (Scope 1)	3,174.0	2,152.6	1,641.9	0.0	0.0	0.0	6,968.5	
Generation (Scope 2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Electricity
sportation (Scope 3a)	448.8	274.3	247.2	0.0	0.0	0.0	970.3	Tran
er Off-Site (Scope 3b)	2,217.6	1,210.8	3,685.5	0.0	0.0	0.0	7,113.9	Oth
Total	5,840.4	3,637.7	5,574.6	0.0	0.0	0.0	15,052.7	

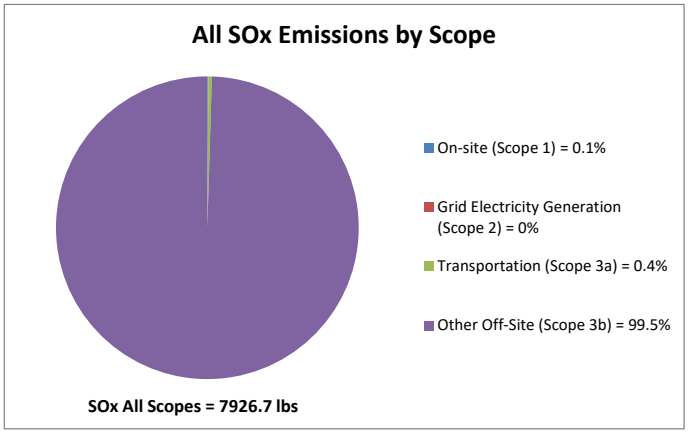
Track 1 = 38.8%
Track 2 = 24.2%
Track 4 = 37%
< Component 4 > = 0%
< Component 5 > = 0%
< Component 6 > = 0%

On-site (Scope 1) = 46.3%
Grid Electricity Generation (Scope 2) = 0%
Transportation (Scope 3a) = 6.4%
Other Off-Site (Scope 3b) = 47.3%

NOx All Components = 15052.7 lbs
NOx All Scopes = 15052.7 lbs


All SOx Emissions by Remedy Component and Scope
(in Lbs)
6000
5000
4000
3000
2000
1000
0
Track 1
Track 2
Track 4
< Component 4 >
< Component 5 >
< Component 6 >
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
SOx All Components = 7926.7 lbs


All SOx Emissions by Remedy Component
Track 1 = 19.5%
Track 2 = 11.5%
Track 4 = 69.1%
< Component 4 > = 0%
< Component 5 > = 0%
< Component 6 > = 0%
SOx All Components = 7926.7 lbs

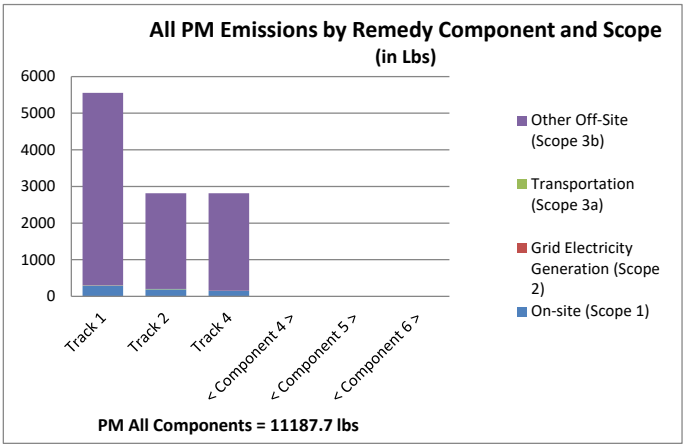

All SOx Emissions by Scope
On-site (Scope 1) = 0.1%
Grid Electricity Generation (Scope 2) = 0%
Transportation (Scope 3a) = 0.4%
Other Off-Site (Scope 3b) = 99.5%
SOx All Scopes = 7926.7 lbs

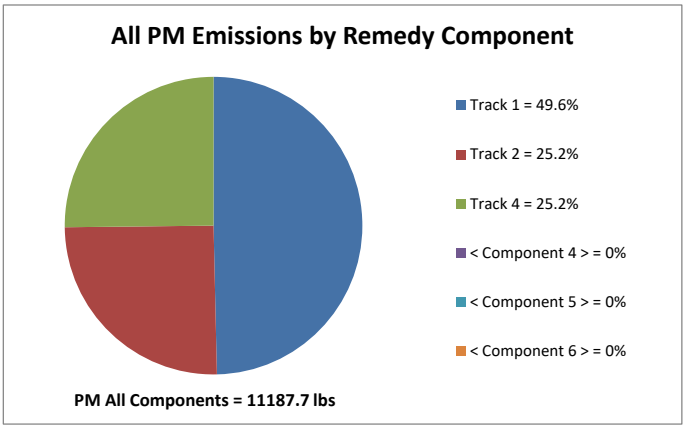
SOx lbs	Track 1	Track 2	Track 4	< Compon	< Compon	< Compon	Total	
On-site (Scope 1)	3.9	2.6	2.0	0.0	0.0	0.0	8.6	
Generation (Scope 2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	l Electricity
sportation (Scope 3a)	13.6	8.3	7.5	0.0	0.0	0.0	29.4	Tran
er Off-Site (Scope 3b)	1,524.7	899.6	5,464.4	0.0	0.0	0.0	7,888.7	Oth
Total	1,542.2	910.6	5,474.0	0.0	0.0	0.0	7,926.7	

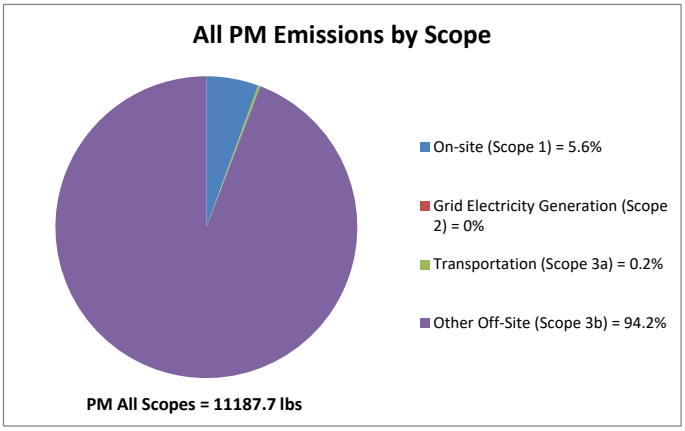
Track 1 = 19.5%
Track 2 = 11.5%
Track 4 = 69.1%
< Component 4 > = 0%
< Component 5 > = 0%
< Component 6 > = 0%

On-site (Scope 1) = 0.1%
Grid Electricity Generation (Scope 2) = 0%
Transportation (Scope 3a) = 0.4%
Other Off-Site (Scope 3b) = 99.5%

SOx All Components = 7926.7 lbs
SOx All Scopes = 7926.7 lbs


All PM Emissions by Remedy Component and Scope
(in Lbs)
6000
5000
4000
3000
2000
1000
0
Track 1
Track 2
Track 4
< Component 4 >
< Component 5 >
< Component 6 >
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
PM All Components = 11187.7 lbs


All PM Emissions by Remedy Component
Track 1 = 49.6%
Track 2 = 25.2%
Track 4 = 25.2%
< Component 4 > = 0%
< Component 5 > = 0%
< Component 6 > = 0%
PM All Components = 11187.7 lbs

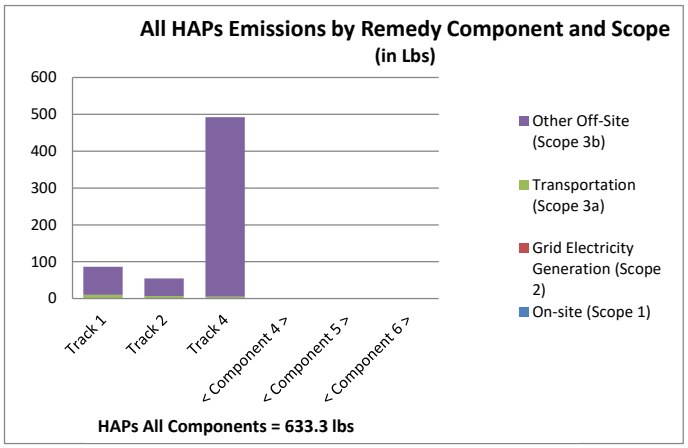

All PM Emissions by Scope
On-site (Scope 1) = 5.6%
Grid Electricity Generation (Scope 2) = 0%
Transportation (Scope 3a) = 0.2%
Other Off-Site (Scope 3b) = 94.2%
PM All Scopes = 11187.7 lbs

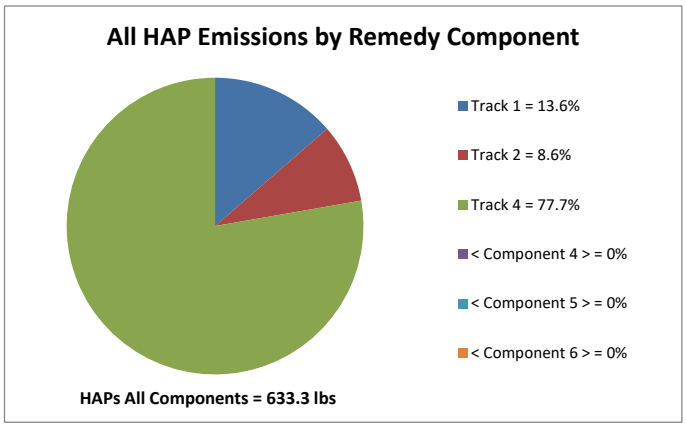
PM lbs	Track 1	Track 2	Track 4	< Compon	< Compon	< Compon	Total	
On-site (Scope 1)	284.7	193.0	147.2	0.0	0.0	0.0	624.9	
Generation (Scope 2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	l Electricity
sportation (Scope 3a)	12.2	7.6	6.5	0.0	0.0	0.0	26.3	Tran
er Off-Site (Scope 3b)	5,256.9	2,617.1	2,662.5	0.0	0.0	0.0	10,536.5	Oth
Total	5,553.7	2,817.8	2,816.3	0.0	0.0	0.0	11,187.7	

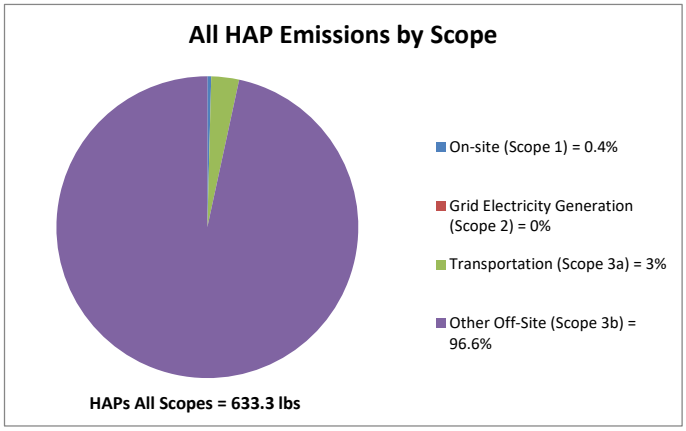
Track 1 = 49.6%
Track 2 = 25.2%
Track 4 = 25.2%
< Component 4 > = 0%
< Component 5 > = 0%
< Component 6 > = 0%

On-site (Scope 1) = 5.6%
Grid Electricity Generation (Scope 2) = 0%
Transportation (Scope 3a) = 0.2%
Other Off-Site (Scope 3b) = 94.2%

PM All Components = 11187.7 lbs
PM All Scopes = 11187.7 lbs


All HAPs Emissions by Remedy Component and Scope
(in Lbs)
600
500
400
300
200
100
0
Track 1
Track 2
Track 4
< Component 4 >
< Component 5 >
< Component 6 >
Other Off-Site (Scope 3b)
Transportation (Scope 3a)
Grid Electricity Generation (Scope 2)
On-site (Scope 1)
HAPs All Components = 633.3 lbs


All HAP Emissions by Remedy Component
Track 1 = 13.6%
Track 2 = 8.6%
Track 4 = 77.7%
< Component 4 > = 0%
< Component 5 > = 0%
< Component 6 > = 0%
HAPs All Components = 633.3 lbs


All HAP Emissions by Scope
On-site (Scope 1) = 0.4%
Grid Electricity Generation (Scope 2) = 0%
Transportation (Scope 3a) = 3%
Other Off-Site (Scope 3b) = 96.6%
HAPs All Scopes = 633.3 lbs

HAPs lbs	Track 1	Track 2	Track 4	< Compon	< Compon	< Compon	Total
On-site (Scope 1)	1.2	0.8	0.6	0.0	0.0	0.0	2.6
Generation (Scope 2)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
sportation (Scope 3a)	8.7	5.8	4.3	0.0	0.0	0.0	18.8
er Off-Site (Scope 3b)	76.5	48.0	487.4	0.0	0.0	0.0	611.9
Total	86.3	54.6	492.4	0.0	0.0	0.0	633.3

Track 1 = 13.6%
Track 2 = 8.6%
Track 4 = 77.7%
< Component 4 > = 0%
< Component 5 > = 0%
< Component 6 > = 0%

HAPs All Components = 633.3 lbs
HAPs All Scopes = 633.3 lbs

On-site (Scope 1) = 0.4%
Grid Electricity Generation (Scope 2) = 0%
Transportation (Scope 3a) = 3%
Other Off-Site (Scope 3b) = 96.6%

APPENDIX E

Draft Citizen Participation Plan

NEW YORK
STATE OF
OPPORTUNITY.

Department of
Environmental
Conservation

Brownfield Cleanup Program

Citizen Participation Plan
for
Former Bordens Farm Products

January 2026

C241294
35-18 Steinway Street
Astoria
Queens County, New York

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* * * * *

Note: The information presented in this Citizen Participation Plan was current as of the date of its approval by the New York State Department of Environmental Conservation. Portions of this Citizen Participation Plan may be revised during the site's investigation and cleanup process.

Applicant: **LMXD INNOQ B1 LLC ("Applicant")**
Site Name: **Former Bordens Farm Products ("Site")**
Site Address: **35-18 Steinway Street**
Site County: **Queens County**
Site Number: **C241294**

1. What is New York's Brownfield Cleanup Program?

New York's Brownfield Cleanup Program (BCP) works with private developers to encourage the voluntary cleanup of contaminated properties known as "brownfields" so that they can be reused and developed. These uses include recreation, housing, and business.

A *brownfield* is any real property that is difficult to reuse or redevelop because of the presence or potential presence of contamination. A brownfield typically is a former industrial or commercial property where operations may have resulted in environmental contamination. A brownfield can pose environmental, legal, and financial burdens on a community. If a brownfield is not addressed, it can reduce property values in the area and affect economic development of nearby properties.

The BCP is administered by the New York State Department of Environmental Conservation (NYSDEC) which oversees Applicants who conduct brownfield site investigation and cleanup activities. An Applicant is a person who has requested to participate in the BCP and has been accepted by NYSDEC. The BCP contains investigation and cleanup requirements, ensuring that cleanups protect public health and the environment. When NYSDEC certifies that these requirements have been met, the property can be reused or redeveloped for the intended use.

For more information about the BCP, go online at: http://www.dec.ny.gov/chemical/8450.html.

2. Citizen Participation Activities

Why NYSDEC Involves the Public and Why It Is Important

NYSDEC involves the public to improve the process of investigating and cleaning up contaminated sites, and to enable citizens to participate more fully in decisions that affect their health, environment, and social well-being. NYSDEC provides opportunities for citizen involvement and encourages early two-way communication with citizens before decision makers form or adopt final positions.

Involving citizens affected and interested in site investigation and cleanup programs is important for many reasons. These include:

- Promoting the development of timely, effective site investigation and cleanup programs that protect public health and the environment.
- Improving public access to, and understanding of, issues and information related to a particular site and that site's investigation and cleanup process.

- Providing citizens with early and continuing opportunities to participate in NYSDEC's site investigation and cleanup process.
- Ensuring that NYSDEC makes site investigation and cleanup decisions that benefit from input that reflects the interests and perspectives found within the affected community.
- Encouraging dialogue to promote the exchange of information among the affected/interested public, State agencies, and other interested parties that strengthens trust among the parties, increases understanding of site and community issues and concerns, and improves decision making.

This Citizen Participation (CP) Plan provides information about how NYSDEC will inform and involve the public during the investigation and cleanup of the site identified above. The public information and involvement program will be carried out with assistance, as appropriate, from the Applicant.

Project Contacts

Appendix A identifies NYSDEC project contact(s) to whom the public should address questions or request information about the site's investigation and cleanup program. The public's suggestions about this CP Plan and the CP program for the site are always welcome. Interested people are encouraged to share their ideas and suggestions with the project contacts at any time.

Locations of Reports and Information

The locations of the reports and information related to the site's investigation and cleanup program also are identified in Appendix A. These locations provide convenient access to important project documents for public review and comment. Some documents may be placed on the NYSDEC web site. If this occurs, NYSDEC will inform the public in fact sheets distributed about the site and by other means, as appropriate.

Site Contact List

Appendix B contains the site contact list. This list has been developed to keep the community informed about, and involved in, the site's investigation and cleanup process. The site contact list will be used periodically to distribute fact sheets that provide updates about the status of the project. These will include notifications of upcoming activities at the site (such as fieldwork), as well as availability of project documents and announcements about public comment periods.

The site contact list includes, at a minimum:

- chief executive officer and planning board chairperson of each county, city, town and village in which the site is located;
- residents, owners, and occupants of the site and properties adjacent to the site;
- the public water supplier which services the area in which the site is located;
- any person who has requested to be placed on the site contact list;

- the administrator of any school or day care facility located on or near the site for purposes of posting and/or dissemination of information at the facility; and
- location(s) of reports and information.

The site contact list will be reviewed periodically and updated as appropriate. Individuals and organizations will be added to the site contact list upon request. Such requests should be submitted to the NYSDEC project contact(s) identified in Appendix A. Other additions to the site contact list may be made at the discretion of the NYSDEC project manager, in consultation with other NYSDEC staff as appropriate.

Note: The first site fact sheet (usually related to the draft Remedial Investigation Work Plan) is distributed both by paper mailing through the postal service and through DEC Delivers, its email listserv service. The fact sheet includes instructions for signing up with the appropriate county listserv to receive future notifications about the site. See http://www.dec.ny.gov/chemical/61092.html.

Subsequent fact sheets about the site will be distributed exclusively through the listserv, except for households without internet access that have indicated the need to continue to receive site information in paper form. Please advise the NYSDEC site project manager identified in Appendix A if that is the case. Paper mailings may continue during the investigation and cleanup process for some sites, based on public interest and need.

CP Activities

The table at the end of this section identifies the CP activities, at a minimum, that have been and will be conducted during the site's investigation and cleanup program. The flowchart in Appendix D shows how these CP activities integrate with the site investigation and cleanup process. The public is informed about these CP activities through fact sheets and notices distributed at significant points during the program. Elements of the investigation and cleanup process that match up with the CP activities are explained briefly in Section 5.

- **Notices and fact sheets** help the interested and affected public to understand contamination issues related to a site, and the nature and progress of efforts to investigate and clean up a site.
- **Public forums, comment periods and contact with project managers** provide opportunities for the public to contribute information, opinions and perspectives that have potential to influence decisions about a site's investigation and cleanup.

Local document repositories have also been established at the following locations:

Queens Public Library at Broadway
40-20 Broadway
Astoria, NY 11103
Tel: 718-821-4770
lkierkosz@queenslibrary.org

Borough of Queens, Community Board 1
45-02 Ditmars Blvd., LL Suite 1025
Astoria, NY 11105
Tel: 718-786-3335
qn01@cb.nyc.gov

The public is encouraged to contact project staff at any time during the site's investigation and cleanup process with questions, comments, or requests for information.

This CP Plan may be revised due to changes in major issues of public concern identified in Section 3 or in the nature and scope of investigation and cleanup activities. Modifications may include additions to the site contact list and changes in planned citizen participation activities.

Technical Assistance Grant

NYSDEC must determine if the site poses a significant threat to public health or the environment. This determination generally is made using information developed during the investigation of the site, as described in Section 5.

If the site is determined to be a significant threat, a qualifying community group may apply for a Technical Assistance Grant (TAG). The purpose of a TAG is to provide funds to the qualifying group to obtain independent technical assistance. This assistance helps the TAG recipient to interpret and understand existing environmental information about the nature and extent of contamination related to the site and the development/implementation of a remedy.

An eligible community group must certify that its membership represents the interests of the community affected by the site, and that its members' health, economic well-being or enjoyment of the environment may be affected by a release or threatened release of contamination at the site.

As of the date the declaration (page 2) was signed by the NYSDEC project manager, the significant threat determination for the site had not yet been made.

To verify the significant threat status of the site, the interested public may contact the NYSDEC project manager identified in Appendix A.

For more information about TAGs, go online at http://www.dec.ny.gov/regulations/2590.html

Note: The table identifying the citizen participation activities related to the site's investigation and cleanup program follows on the next page:

Citizen Participation Activities	Timing of CP Activity(ies)
Application Process:	
• Prepare site contact list • Establish document repository(ies)	At time of preparation of application to participate in the BCP.
• Publish notice in Environmental Notice Bulletin (ENB) announcing receipt of application and 30-day public comment period • Publish above ENB content in local newspaper • Mail above ENB content to site contact list • Conduct 30-day public comment period	When NYSDEC determines that BCP application is complete. The 30-day public comment period begins on date of publication of notice in ENB. End date of public comment period is as stated in ENB notice. Therefore, ENB notice, newspaper notice, and notice to the site contact list should be provided to the public at the same time.
After Execution of Brownfield Site Cleanup Agreement (BCA):	
• Prepare Citizen Participation (CP) Plan	Before start of Remedial Investigation **Note:** Applicant must submit CP Plan to NYSDEC for review and approval within 20 days of the effective date of the BCA.
Before NYSDEC Approves Remedial Investigation (RI) Work Plan:	
• Distribute fact sheet to site contact list about proposed RI activities and announcing 30-day public comment period about draft RI Work Plan • Conduct 30-day public comment period	Before NYSDEC approves RI Work Plan. If RI Work Plan is submitted with application, public comment periods will be combined, and public notice will include fact sheet. Thirty-day public comment period begins/ends as per dates identified in fact sheet.
After Applicant Completes Remedial Investigation:	
• Distribute fact sheet to site contact list that describes RI results	Before NYSDEC approves RI Report
Before NYSDEC Approves Remedial Work Plan (RWP):	
• Distribute fact sheet to site contact list about draft RWP and announcing 45-day public comment period • Public meeting by NYSDEC about proposed RWP (if requested by affected community or at discretion of NYSDEC project manager) • Conduct 45-day public comment period	Before NYSDEC approves RWP. Forty-five day public comment period begins/ends as per dates identified in fact sheet. Public meeting would be held within the 45-day public comment period.
Before Applicant Starts Cleanup Action:	
• Distribute fact sheet to site contact list that describes upcoming cleanup action	Before the start of cleanup action.
After Applicant Completes Cleanup Action:	
• Distribute fact sheet to site contact list that announces that cleanup action has been completed and that NYSDEC is reviewing the Final Engineering Report • Distribute fact sheet to site contact list announcing NYSDEC approval of Final Engineering Report and issuance of Certificate of Completion (COC)	At the time the cleanup action has been completed. **Note:** The two fact sheets are combined when possible if there is not a delay in issuing the COC.

3. Major Issues of Public Concern

This section of the CP Plan identifies major issues of public concern that relate to the site. Additional major issues of public concern may be identified during the course of the site's investigation and cleanup process.

The Applicant is committed to informing and involving the public during the investigation and remediation of the project. The objective of the CP Plan is to promote communication and to assist the public in understanding the project process. Citizen participation in the project process provides the Applicant and the NYSDEC with an opportunity to obtain public input as part of the comprehensive redevelopment process.

No major issues of public concern have been identified relative to the Site as of yet. The Site may be busy during daytime working hours due to construction-related noise and vehicular traffic associated with the potential investigation and remediation activities throughout the cleanup process.

The program will include procedures for protection of public health and safety during investigation and remediation activities. During investigation and remediation, worker and community health and safety activities will be conducted, including:

- Securing the work perimeter with a NYC Department of Buildings-approved fence during remediation/construction;
- On-site air monitoring for worker protection, if warranted;
- Perimeter air monitoring for community protection; and
- Using odor, vapor, and dust controls such as water or foam sprays, as required during air monitoring, if needed.

Details on the Site Health and Safety Plan (HASP) and the Community Air Monitoring Plan (CAMP) will be included in the documents generated in support of the remediation.

4. Site Information

Appendix C contains a map identifying the location of the site.

Site Description

The Site is located at 35-18 Steinway Street, in the Astoria area of Queens, New York. The Site consists of a portion of Tax Block 668, Lot 5 and encompasses approximately 0.74 acres. An application to subdivide Lot 5 into two lots has been filed with the City of New York and the tentative lot assigned to the Site is Lot 6. The Site is presently developed with a parking lot associated with the southern adjacent P.C. Richard and Son commercial building. The Site is bounded to the north by 35th Avenue and commercial buildings, to the east by Steinway Street, the M and R-train subway (below grade), a New York City Parks Department playground, and commercial buildings, to the south by the P.C. Richard & Son commercial building and a portion of the parking lot, and to the west by 38th Street and UA Kaufman Astoria Cinemas. The Site location is shown on Appendix C.

History of Site Use, Investigation, and Cleanup

The Site was historically vacant land until at least 1915. From 1915 to 1930, residential buildings and a milk pasteurizing facility operated by Bordens Farm Products Co. Inc. occupied some of the previously vacant lots. Over time Bordens Farm Products Co. Inc. included wagon areas, pasteurizing plants, a bottle washing area, garages and offices. The Site remained in this fashion until the 1970s, when the buildings were demolished and the Site became vacant. The current parking lot was constructed in 1984.

A Phase I Environmental Site Assessment (ESA) was completed by EBI Consulting (EBI) in 2017 and BCP eligibility sampling was completed by Roux in November 2024 and February 2025. The BCP eligibility sampling was completed to investigate if soil and groundwater were contaminated and if the Site could be enrolled in the BCP. The BCP eligibility sampling found that the Site was contaminated with semivolatile organic compounds (SVOCs) and metals in soil and groundwater. These contaminants are commonly associated with the historical filling of urban sites, in which a building is demolished, and the demolition debris is used to fill in the cellar of the building to make the site level for redevelopment. Historical filling debris was encountered at the Site up to 7 feet below land surface during the BCP eligibility sampling.

5. Investigation and Cleanup Process

Application

The Applicant has applied for and been accepted into New York's Brownfield Cleanup Program as a Volunteer. This means that the Applicant was not responsible for the disposal or discharge of the contaminants or their ownership or operation of the site took place after the discharge or disposal of contaminants. The Volunteer must fully characterize the nature and extent of contamination onsite, and must conduct a "qualitative exposure assessment," a process that characterizes the actual or potential exposures of people, fish and wildlife to contaminants on the site and to contamination that has migrated from the site.

The Applicant in its Application proposes that the site will be used for restricted purposes.

To achieve this goal, the Applicant will conduct investigation and cleanup activities at the site with oversight provided by NYSDEC. The Brownfield Cleanup Agreement executed by NYSDEC and the Applicant sets forth the responsibilities of each party in conducting these activities at the site.

Investigation

The Applicant will conduct an investigation of the site officially called a "remedial investigation" (RI). This investigation will be performed with NYSDEC oversight. The Applicant must develop a remedial investigation workplan, which is subject to public comment.

The site investigation has several goals:

1) define the nature and extent of contamination in soil, surface water, groundwater and any other parts of the environment that may be affected;
2) identify the source(s) of the contamination;
3) assess the impact of the contamination on public health and the environment; and
4) provide information to support the development of a proposed remedy to address the contamination or the determination that cleanup is not necessary.

The Applicant submitted a draft "Remedial Investigation Work Plan" to NYSDEC for review and approval with the BCP application. NYSDEC made the draft plan available to the public review during a 30-day public comment period that ran from July 1, 2025 to August 1, 2025. The Remedial Investigation Work Plan was approved by NYSDEC on November 17, 2025.

When the investigation is complete, the Applicant will prepare and submit a report that summarizes the results. This report will also recommend whether cleanup action is needed to address site-related contamination. The investigation report is subject to review and approval by NYSDEC.

NYSDEC will use the information in the investigation report to determine if the site poses a significant threat to public health or the environment. If the site is a "significant threat," it must be cleaned up using a remedy selected by NYSDEC from an analysis of alternatives prepared by the Applicant and approved by NYSDEC. If the site does not pose a significant threat, the Applicant may select the remedy from the approved analysis of alternatives.

Interim Remedial Measures

An Interim Remedial Measure (IRM) is an action that can be undertaken at a site when a source of contamination or exposure pathway can be effectively addressed before the site investigation and analysis of alternatives are completed. If an IRM is likely to represent all or a significant part of the final remedy, NYSDEC will require a 30-day public comment period.

Remedy Selection

When the investigation of the site has been determined to be complete, the project likely would proceed in one of two directions:

1. The Applicant may recommend in its investigation report that no action is necessary at the site. In this case, NYSDEC would make the investigation report available for public comment for 45 days. NYSDEC then would complete its review, make any necessary revisions, and, if appropriate, approve the investigation report. NYSDEC would then issue a "Certificate of Completion" (described below) to the Applicant.

   or

2. The Applicant may recommend in its investigation report that action needs to be taken to address site contamination. After NYSDEC approves the investigation report, the Applicant may then develop a cleanup plan, officially called a "Remedial Work Plan". The Remedial Work Plan describes the Applicant's proposed remedy for addressing contamination related to the site.

When the Applicant submits a draft Remedial Work Plan for approval, NYSDEC would announce the availability of the draft plan for public review during a 45-day public comment period.

Cleanup Action

NYSDEC will consider public comments, and revise the draft cleanup plan if necessary, before approving the proposed remedy. The New York State Department of Health (NYSDOH) must concur with the proposed remedy. After approval, the proposed remedy becomes the selected remedy. The selected remedy is formalized in the site Decision Document.

The Applicant may then design and perform the cleanup action to address the site contamination. NYSDEC and NYSDOH oversee the activities. When the Applicant completes cleanup activities, it will prepare a final engineering report that certifies that cleanup requirements have been achieved or will be achieved within a specific time frame. NYSDEC will review the report to be certain that the cleanup is protective of public health and the environment for the intended use of the site.

Certificate of Completion

When NYSDEC is satisfied that cleanup requirements have been achieved or will be achieved for the site, it will approve the final engineering report. NYSDEC then will issue a Certificate of Completion (COC) to the Applicant. The COC states that cleanup goals have been achieved and relieves the Applicant from future liability for site-related contamination, subject to certain conditions. The Applicant would be eligible to redevelop the site after it receives a COC.

Site Management

The purpose of site management is to ensure the safe reuse of the property if contamination will remain in place. Site management is the last phase of the site cleanup program. This phase begins when the COC is issued. Site management incorporates any institutional and engineering controls required to ensure that the remedy implemented for the site remains protective of public health and the environment. All significant activities are detailed in a Site Management Plan.

An *institutional control* is a non-physical restriction on use of the site, such as a deed restriction that would prevent or restrict certain uses of the property. An institutional control may be used when the cleanup action leaves some contamination that makes the site suitable for some, but not all uses.

An *engineering control* is a physical barrier or method to manage contamination. Examples include: caps, covers, barriers, fences, and treatment of water supplies.

Site management also may include the operation and maintenance of a component of the remedy, such as a system that pumps and treats groundwater. Site management continues until NYSDEC determines that it is no longer needed.

Appendix A -
Project Contacts and Locations of Reports and Information

Project Contacts

For information about the site's investigation and cleanup program, the public may contact any of the following project staff:

New York State Department of Environmental Conservation (NYSDEC):

Robert Strang,
Project Manager
Central Office
Division of Environmental Remediation
625 Broadway, 12th Floor
Albany, NY 12233-7017
(518) 694-6734

Thomas V. Panzone
Citizen Participation Specialist
NYSDEC Region 2
47-40 21st Street
Long Island City, NY 11101
(718) 482-4953

New York State Department of Health (NYSDOH):

Kristin Kulow
Project Manager NYSDOH
Bureau of Environmental Exposure Investigation
Corning Tower Empire State Plaza
Albany, NY 12237
(518) 402-0836

Locations of Reports and Information

The facilities identified below are being used to provide the public with convenient access to important project documents:

Queens Public Library at Broadway
40-20 Broadway
Astoria, NY 11103
Tel: 718-821-4770
lkierkosz@queenslibrary.org

Library Hours of Operation
Sunday: Closed
Monday: 10 AM – 6 PM
Tuesday: 1 PM – 6 PM
Wednesday: 10 AM – 6 PM
Thursday: Noon – 8 PM
Friday: 10 AM – 6 PM
Saturday: 10 AM – 5 PM

Borough of Queens, Community Board 1
45-02 Ditmars Blvd., LL Suite 1025
Astoria, NY 11105
Tel: 718-366-1834
qn05@cb.nyc.gov

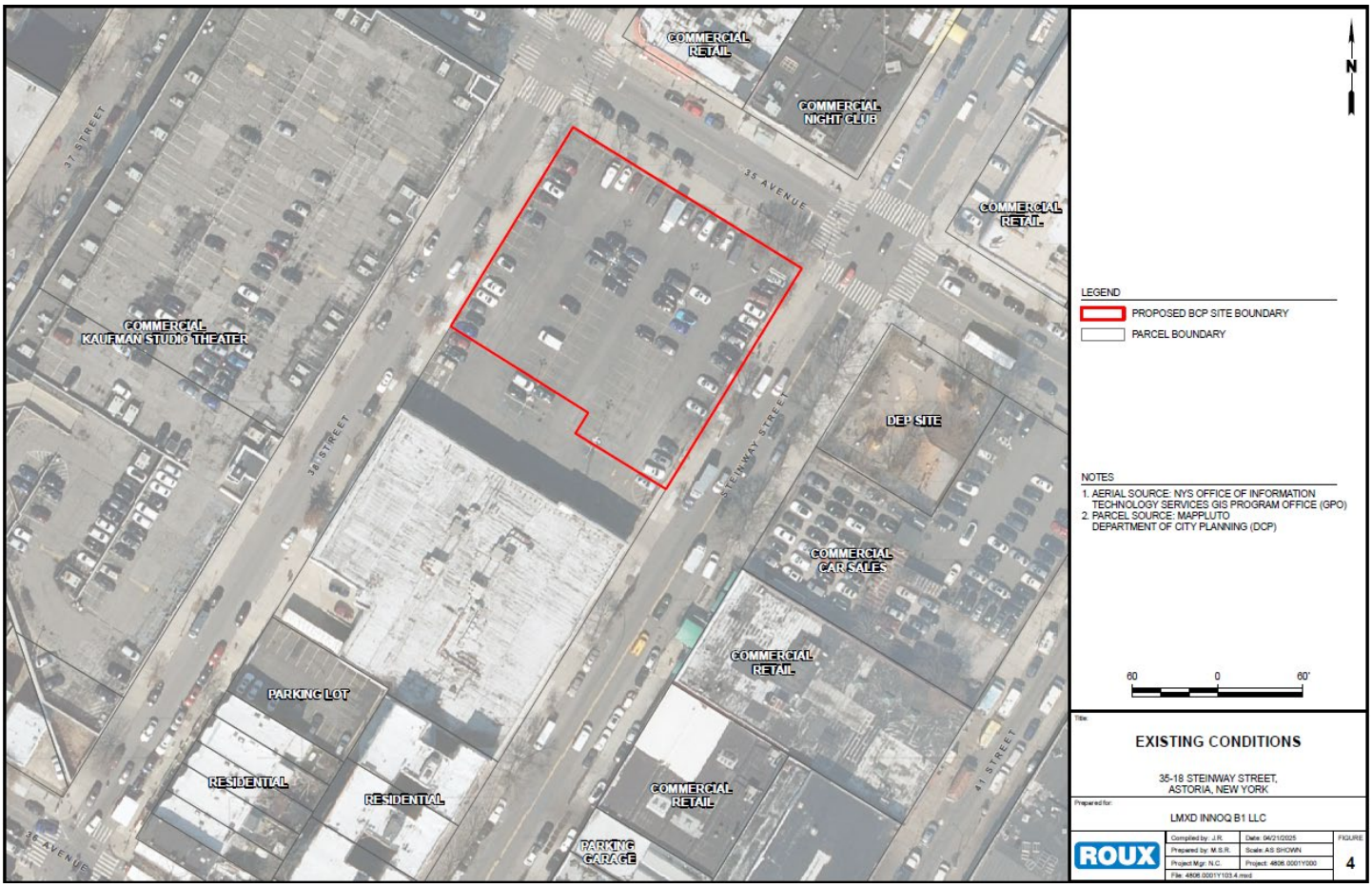
Community Board Hours of Operation
Sunday: Closed
Monday: 9 AM – 5 PM
Tuesday: 9 PM – 5 PM
Wednesday: 9 AM – 5 PM
Thursday: 9 AM – 5 PM
Friday: 9 AM – 5 PM
Saturday: Closed

NYSDEC Region 2 Office
47-40 21st Street
Long Island City, NY 11101
Attn: Jane O'Connell
Tel: 718-482-6405 (Call for appointment)

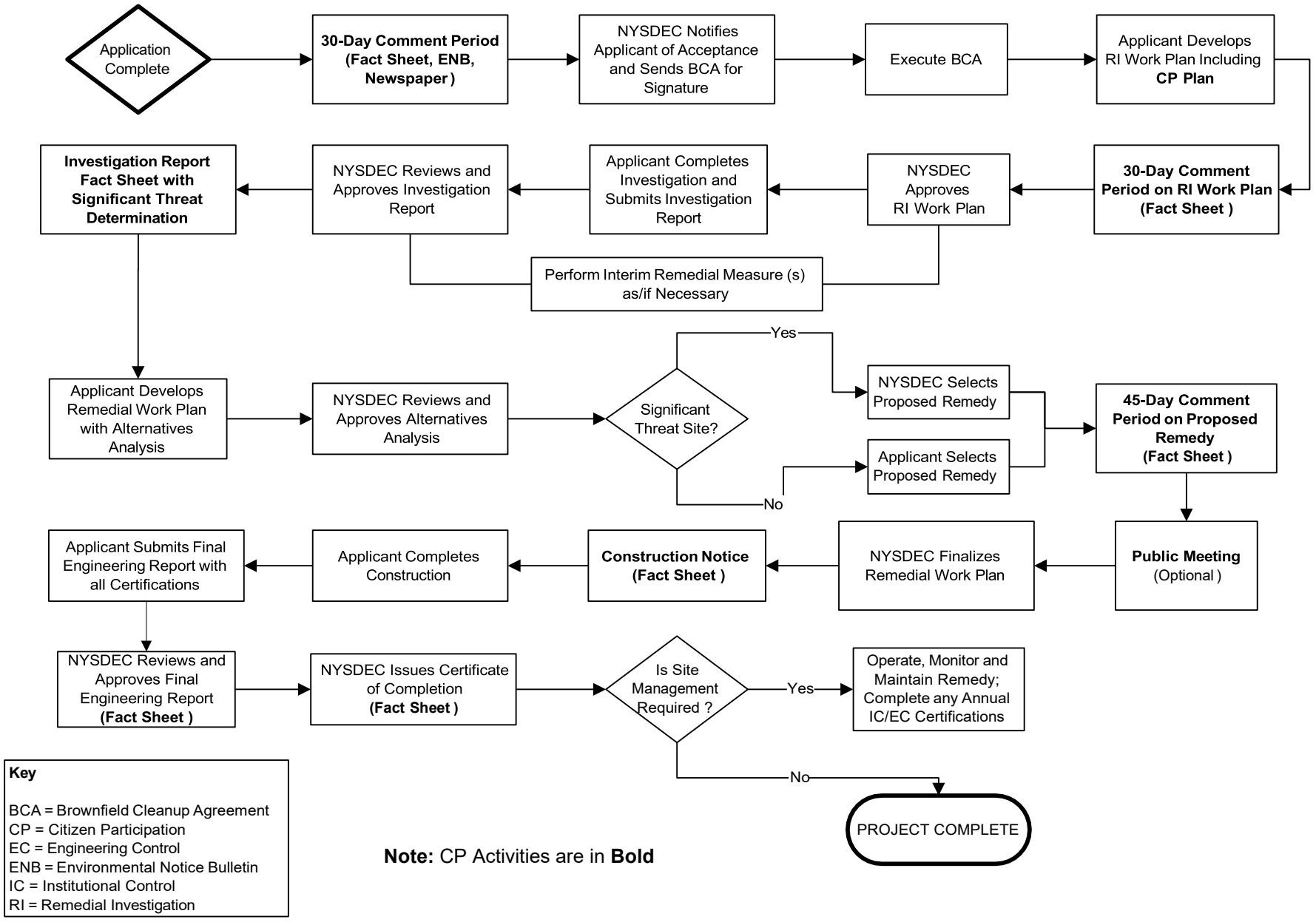
Appendix B - Site Contact List

	A	B	C	D	E	F	G	H	I	J
2										
3	Site Contact List									
4	Site #: C241294									
5	Site Name: Former Bordens Farm Products, 35-18 Steinway Street, Astoria, Queens, NY			List Last Updated: 12-24-25						
6		Name, Title				Street Address	City	State	Zip	Site Name (County)
7	**Local Government Officials**	Hon. Zohran Mamdani - Incoming Mayor	NYC Mayor			City Hall	New York	NY	10007	
8		Hon. Mark Levine - Incoming Comptroller	NYC Comptroller			1 Centre Street	New York	NY	10007	
9		Hon. Jumaane D. Williams	Public Advocate			1 Centre Street 15th Floor North	New York	NY	10007	
10		David Gold, Esq.	Commissioner, NYC Dept. of City Planning			120 Broadway, 31st Floor	New York	NY	10271	
11		Dan Garodnick	Director, NYC Dept. of City Planning			120 Broadway, 31st Floor	New York	NY	10271	
12		Rohit Aggarwala	Commissioner, NYC Dept. of Environmental Protection			59-17 Junction Boulevard	Flushing	NY	11373	
13		Shaminder Chawla, Director	NYC Office of Environmental Remediation			100 Gold Street - 2nd Floor	New York	NY	10038	
14		Donovan Richards, Jr.	Queens Borough President			120-55 Queens Boulevard	Kew Gardens	NY	11424	
15		Evie Hantzopoulos	Chairperson, Queens Community Board 1			45-02 Ditmars Blvd., LL Suite 1025	Astoria	NY	11105	
16		Thomas V. Panzone	NYSDEC Citizen Public Participation Specialist			47-40 21st Street	Long Island City	NY	11101	
17		Steven Berninger	NYSDOH Public Health Specialist			Coninq Tower, Room 1787	Albany	NY	12237	
18		Hon Charles Schumer	U.S. Senator			780 Third Avenue, Suite 2301	New York	NY	10017	
19		Hon. Kirsten Gillibrand	U.S. Senator			780 Third Avenue, Suite 2601	New York	NY	10017	
20		Hon. Rep. Nydia Velazquez (CD-7)	U.S. House of Representatives			39-16 47th Avenue	Sunnyside	NY	11104	
21		Julie Won	NYC Councilmember – District 26			37-04 Queens Boulevard, Suite 205	Long Island City	NY	11101	
22		Hon. Michael Gianaris	NYS Senator – District 12			22-07 45th Street, Suite 1008	Astoria	NY	11105	
23		Audrey I. Pheffer	Queens County Clerk			8811 Sutphin Boulevard	Jamaica	NY	11435	
24										
25	**Public Water Supplier**	NYCDEP – NYC Water Department				1250 Broadway	New York	NY	10001	
26										
27	**Community Board**	Florence Koulouris, District Manager	Queens Community Board 1			45-02 Ditmars Blvd., LL Suite 1025	Astoria	NY	11105	
28		Chairperson	Community Board					NY		
29		Environmental Committee Chairperson	Community Board					NY		
30		New York City Municipal Water Finance Authority	Philip Wasserman - Executive Director			255 Greenwich Street, 6th Floor	New York	NY	10007	
31		New York City Water Board	NYC Department of Environmental Protection	Arlene M. Shaw, Chairperson		59-17 Junction Boulevard, 8th Floor	Flushing	NY	11373	
32										
33	**County Clerk**		County Clerk							
34										
35	**Consolidated Edison**		Consolidated Edison Corporate Affairs							
36										
37	**NYPD**	NYPD 114 Precinct	Police Precinct Council			34-16 Astoria Boulevard	Astoria	NY	11103	
38										
39	**FDNY**	FDNY Engine 261/Ladder 116	FDNY			37-20 29th Street	Long Island City	NY	11101	
40										
41	**Local Media Outlets**	Queens Gazette				42-16 34th Ave	Queens	NY	11101	
42		Time Television				36-50 38th St	Long Island City	NY	11101	
43		ABC7 New York				7 Lincoln Square	New York	NY	10011	
44		El Diario NY				15 Metrotech Center, 7th Floor	Brooklyn	NY	11201	
45										
46	**Parks and Recreation**	NYC Dept. of Parks & Recreation	Playground Thirty-Five			The Arsenal, Central Park, 830 Fifth Avenue	New York	NY	10065	
47										
48	**School and Daycare Facilities**	Babyland Daycare Astoria				35-10 35th Street B21	Astoria	NY	11106	
49		Zachery's Familycare Center				3525 34th Street				
50		Children Blossom Daycare				3525 34th Street	Astoria	NY	11106	
51		All about Kids Therapy and Education Services				37-11 35th Avenue Suite 3C	Long Island City	NY	11106	
52		District 30 Pre-K Center				32-52 37th Street	Astoria	NY	11103	
53		P.S. 166Q The Henry Gradstein School				33-09 35th Avenue	Astoria	NY	11106	
54		Q580 The Baccalaureate School for Global Education				34-12 36th Ave	Long Island City	NY	11106	
55		A Child's Daycation				35-25 34th Street	Long Island City	NY	11106	
56		Frank Sinatra School of the Arts High School				35-12 35th Ave	Astoria	NY	11106	
57		OWN 1 Elementary School				36-12 35th Avenue	Astoria	NY	11106	
58		Joint Apprentice Committee Ironworks Locals 40 & 361				3523 36th Street	Astoria	NY	11106	
59		P.S. Q993				35-12 35th Ave	Astoria	NY	11106	
60		Miami Ad School New York				35-37 36th St 3rd Floor	Astoria	NY	11106	
61		Beautiful Mandarin				3537 36th St	Astoria	NY	11106	
62		All About Kids Therapy and Education Services				37-11 35th Ave Suite 3C	Long Island City	NY	11101	
63		Dorika Oskin Esthetic Holistic Academy				34-27 Steinway Street	Long Island City	NY	11101	
64		Darul Ihsan Cultural Center USA				34-14 44th Street	Long Island City	NY	11101	
65		Diki Daycare Center				30-81 Steinway Street	Astoria	NY	11103	
66		The Learning Experience				31-57 31st Street	Astoria	NY	11106	
67		A Learning Odyssey Daycare				30-83 30th Street	Astoria	NY	11102	
68		Adventureland Child Care Center				32-04 31st Avenue	Astoria	NY	11106	
69		Kisses & Smiles Daycare				31-14 34th Street	Astoria	NY	11106	
70		Happinest Daycare				31-41 37th Street	Astoria	NY	11103	
71		The Learning Station				31-32 47th Street	Astoria	NY	11103	
72										
73	**Community, Civic, Religious and Other Environmental Organizations**	Centro Mundial de Avivamiento NY				35-35 Steinway Street	Astoria	NY	11101	
74		Hope Astoria Church				36-14 35th Street	Astoria	NY	11106	
75		Emmanuel Charismatic Church				3109 35th Avenue	Astoria	NY	11106	
76		Most Precious Blood Roman Catholic Church				32-23 36th Street	Astoria	NY	11106	
77		CityLight Church				44-01 Broadway	Long Island City	NY	11103	
78		New York Presbyterian Church				43-23 37th Avenue	Long Island City	NY	11101	
79		Al-Amin Jame Masjud & Islamic Center				35-19 36th Avenue	Long Island City	NY	11106	
80		Igreia Pentecostal Missionaria de Lingua Portuguesa				36-13 36th Avenue	Long Island City	NY	11106	
81		Iglesia De Dios Pentecostal El Renuevo, Inc.				34-08 36th Avenue	Astoria	NY	11106	
82		Trinity Lutheran Church				31-18 37th Street	Astoria	NY	11106	
83		Korean Central Church of New York				32-71 41st Street	Long Island City	NY	11103	
84		St. Joseph Roman Catholic Church				43-19 30th Avenue	Astoria	NY	11106	
85										
86										
87	**Current Site Owner**	35-18 Steinway Street LLC				185 Central Avenue	Bethpage	NY	11714	
88										
89	**Current Site Operators**	P.C. Richard & Son				35-18 Steinway Street	Astoria	NY	11101	
90										
91	**Adjacent Properties**	Standard Motor Products Inc.			Block 668 – Lot 2	37-18 Northern Boulevard	Long Island City	NY	11101	
92		Maryann Terrero			Block 668 – Lot 1	149-43 22nd Avenue	Whitestone	NY	11357	
93		3549 LLC			Block 668 - Lot 46	35-49 38th Street	Astoria	NY	11101	
94		Luis Urueta Montes			Block 668 – Lot 45	35-51 38th Street	Long Island City	NY	11101	
95		Tarequr Rahman			Block 668 – Lot 44	35-53 38th Street	Long Island City	NY	11101	
96		Kemal Dervisevic			Block 668 – Lot 143	35-55 38th Street	Astoria	NY	11101	
97		Astoria OLE REO LLC			Block 668 – Lot 43	215-48 Jamaica Avenue	Queens Village	NY	11428	
98		Steven Rigogiannis			Block 668 – Lot 42	16 Hollywood Avenue	Douglaston	NY	11363	
99		Dimitrios Pistikos			Block 668 – Lot 40	23-67 36th Street	Astoria	NY	11105	
100		EERA Properties, LLC			Block 668 – Lot 38	30-05 30th Avenue, Suite 300	Long Island City	NY	11102	
101		3544 Steinway Street, LLC			Block 668 – Lot 36	28-46 215th Place	Bayside	NY	11360	
102		Kaufman Bedrock Astoria I LLC			Block 641 – Lot 9	34-12 36th Street	Astoria	NY	11106	
103		Kaufman Bedrock Astoria I LLC			Block 641 – Lot 4	34-12 36th Street	Astoria	NY	11106	
104		Kaufman Bedrock Astoria I LLC			Block 641 – Lot 51	34-12 36th Street	Astoria	NY	11106	
105		Sultan Bacchus and Bibi R. Bacchus Living Trust			Block 641 – Lot 52	36-25 37th Street	Long Island City	NY	11101	
106		HHB 53, LLC			Block 669 – Lot 1	P.O. BOX 397	Locust Valley	NY	11560	
107		HHB 49, LLC			Block 669 – Lot 3	P.O. BOX 397	Locust Valley	NY	11560	
108		Sydney Taylor Properties, LLC			Block 669 – Lot 7	2 Kaiser Hill	Huntington Bay	NY	11743	
109		HHB 35, LLC			Block 669 – Lot 8	P.O. BOX 397	Locust Valley	NY	11560	
110		Wilbee Corporation			Block 669 – Lot 13	P.O. Box 5375	West Babylon	NY	11707	
111		Queensboro Farm Products Inc			Block 669 – Lot 16	51-20 59th Street	Woodside	NY	11377	
112		Dept of Environmental Protection	NYC Dept. of Parks & Recreation		Block 669 – Lot 20	The Arsenal, Central Park, 830 Fifth Avenue	New York	NY	10065	
113		Paramount Astoria Assets LLC			Block 645 – Lot 1	98 Cuttermill Road, Suite 444 South	Great Neck	NY	11021	
114		Werwaiss Properties Company LLC			Block 672 – Lot 1	230 Park Avenue Suite 945	New York	NY	10169	
115		Ridge Associates, LLC			Block 672 – Lot 43	4 Pam Lane	Huntington Bay	NY	11743	
116		ZDJ Steinway LLC			Block 673 – Lot 1	60 Cuttermill Road Suite 405	Great Neck	NY	11021	
117		M. Kally's Corp.			Block 673 – Lot 42	24-02 23rd Avenue	Astoria	NY	11105	
118		Metropolitan Transportation Authority	M/R-train Subway in Steinway St			347 Madison Avenue	New York	NY	10017	
119										
120	**Document Repository**	Lubomira Lierkosz	Queens Public Library at Broadway	lkierkosz@queenslibrary.org		40-20 Broadway	Astoria	NY	11103	
121		Florence Koulouris	District Manager, Queens Community Board 1	qn01@cb@nyc.gov		45-02 Ditmars Blvd., LL Suite 1025	Astoria	NY	11105	

Appendix C - Site Location Map



Appendix D – Brownfield Cleanup Program Process



Key

BCA = Brownfield Cleanup Agreement
CP = Citizen Participation
EC = Engineering Control
ENB = Environmental Notice Bulletin
IC = Institutional Control
RI = Remedial Investigation

Note: CP Activities are in **Bold**

Division of Environmental Remediation

Remedial Programs
Scoping Sheet for Major Issues of Public Concern (see instructions)

Site Name: Former Bordens Farm Products

Site Number: C241294

Site Address and County: 35-18 Steinway Street, Astoria, Queens County, New York

Remedial Party(ies): LMXD INNOQ B1 LLC

Note: For Parts 1. – 3., the individuals, groups, organizations, businesses and units of government identified should be added to the site contact list as appropriate.

Part 1. List major issues of public concern and information the community wants. Identify individuals, groups, organizations, businesses and/or units of government related to the issue(s) and information needs. **Use this information as an aid to prepare or update the Major Issues of Public Concern section of the site Citizen Participation Plan.**
No major issues of public concern have been identified relative to the Site as of yet. The Site may be busy during daytime working hours due to construction-related noise and vehicular traffic associated with the potential investigation and remediation activities throughout the cleanup process.

The program will include procedures for protection of public health and safety during investigation and remediation activities. During investigation and remediation, worker and community health and safety activities will be conducted, including:
• Securing the work perimeter with a NYC Department of Buildings-approved fence during remediation/construction;
• On-site air monitoring for worker protection, if warranted;
• Perimeter air monitoring for community protection, if warranted; and
• Using odor, vapor, and dust controls such as water or foam sprays, as required during air monitoring, if needed.

How were these issues and/or information needs identified?
This data was identified through historical environmental documents at the Site and ongoing environmental activities.

Part 2. List important information needed **from** the community, if applicable. Identify individuals, groups, organizations, businesses and/or units of government related to the information needed.
None.

How were these information needs identified?
N/A.

Part 3. List major issues and information that need to be communicated **to** the community. Identify individuals, groups, organizations, businesses and/or units of government related to the issue(s) and/or information.
There were no major issues that need to be communicated to the community. Throughout the project as BCP milestones are achieved the community will be updated through fact sheets and public comment periods at select milestones. Fact sheets will be issued for the Remedial Investigation Work Plan, the Remedial Investigation, the Remedial Work Plan, before the remedial action begins, when the remediation is complete, and when the Final Engineering Report is approved and Certificate of Completion is issued. A 30-day public comment period will be held before the Remedial Investigation Work Plan is approved and a 45-day public comment period will be held before the Remedial Work Plan is approved. The reports and information on the project will be posted online at the DEC's website and at the document repositories. The two repositories are the Queens Public Library at Broadway and the Borough of Queens Community Board 1.

How were these issues and/or information needs identified?
N/A.

Part 4. Identify the following characteristics of the affected/interested community. This knowledge will help to identify and understand issues and information important to the community, and ways to effectively develop and implement the site citizen participation plan (mark all that apply):

a. Land use/zoning at and around site:
☒ **Residential** ☐ **Agricultural** ☐ **Recreational** ☐ **Commercial** ☐ **Industrial**

b. Residential type around site:
☒ **Urban** ☐ **Suburban** ☐ **Rural**

c. Population density around site:
☒ **High** ☐ **Medium** ☐ **Low**

d. Water supply of nearby residences:
☒ **Public** ☐ **Private Wells** ☐ **Mixed**

e. Is part or all of the water supply of the affected/interested community currently impacted by the site?
☐ **Yes** ☒ **No**

Provide details if appropriate:
N/A.

f. Other environmental issues significantly impacted/impacting the affected community?
☐ **Yes** ☒ **No**

Provide details if appropriate:
N/A.

g. Is the site and/or the affected/interested community wholly or partly in an Environmental Justice Area?
☒ **Yes** ☐ **No**

h. Special considerations:
☒ **Language** ☐ **Age** ☐ **Transportation** ☐ **Other**

Explain any marked categories in **h:**
Because the Site is located in an Environmental Justice Area with a large Hispanic-American, Chinese-American, and Indian-American population, all fact sheets will be translated into Spanish, Chinese, and Hindi.

Part 5. The site contact list must include, at a minimum, the individuals, groups, and organizations identified in the instructions for **Part 5.** Are other individuals, groups, organizations, and units of government affected by, or interested in, the site, or its remedial program? (Mark and identify all that apply, then adjust the site contact list as appropriate.)

☐ **Non-Adjacent Residents/Property Owners:** Click here to enter text.

☒ **Local Officials:** Provided in CPP.

☒ **Media:** Provided in CPP.

☒ **Business/Commercial Interests:** Provided in CPP.

☐ **Labor Group(s)/Employees:** Click here to enter text.

☐ **Indian Nation:** Click here to enter text.

☒ **Citizens/Community Group(s):** Provided in CPP.

☐ **Environmental Justice Group(s):** Click here to enter text.

☐ **Environmental Group(s):** Click here to enter text.

☒ **Civic Group(s):** Provided in CPP.

☐ **Recreational Group(s):** Click here to enter text.

☐ **Other(s):** Click here to enter text.

Prepared/Updated By: Jack Rusk **Date:** 12/10/2025

ReviewedApproved By: Noelle Clarke **Date:** 12/10/2025

APPENDIX F

Health and Safety Plan (and Community Air Monitoring Plan)

Site-Specific Health and Safety Plan

35-30 Steinway Street
Astoria, New York

January 29, 2026

Prepared for:

LMXD INNOQ B1 LLC

Prepared by:

Roux Environmental Engineering and Geology, D.P.C.
209 Shafter Street
Islandia, New York 11749

4806.0001Y115/CV

Environmental Consulting
& Management
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Site-Specific Emergency Information

Emergency Phone Numbers

Most emergency services can be obtained by calling 911. Where 911 service is not available, use the telephone numbers provided in the below table. The following is a master emergency phone list for use by the project management personnel. A more condensed version of the emergency numbers listed below will be posted throughout project work areas. Emergencies encountered on the site will be responded to by a combination of off-site emergency services and on-site personnel.

Emergency Contact Information			
Site Personnel			
Title	**Contact**		**Telephone**
Operations Manager (OM)	Jeffrey Wills		516-637-0213
Project Principal (PP)	Noelle Clark		631-807-6523
Project Manager (PM)	Jack Rusk		845-905-6286
Site Supervisor (SS)	TBD		TBD
Site Health and Site Safety Officer (SHSO)	Jack Rusk		845-905-6286
Office Health and Safety Manager (OHSM)	Nevin Pahlad		347-885-6930
Corporate Health and Safety Director (CHSD)	Brian Hobbs, CIH, CSP		631-807-0193
WorkCare, Inc.	Occupational Health Care Management Provider		888-449-7787
Client Emergency Contact	Katherine Kelman Reed Jones		914-833-3000
Outside Assistance			
Agency	**Contact**	**Telephone**	**Address/Location**
Police	New York City Police Department 94th Precinct	718-383-3879	100 Meserole Ave, Brooklyn, NY 11222
Fire	FDNY Ladder 116	212-683-4832	37-20 29th St, Long Island City, NY 11101
Site Address	35-30 Steinway Street, Atoria, New York		

Name and Address: NYC Health+ Hospital Elmhurst, 79-01 Broadway, Elmhurst, New York

Hospital Route:

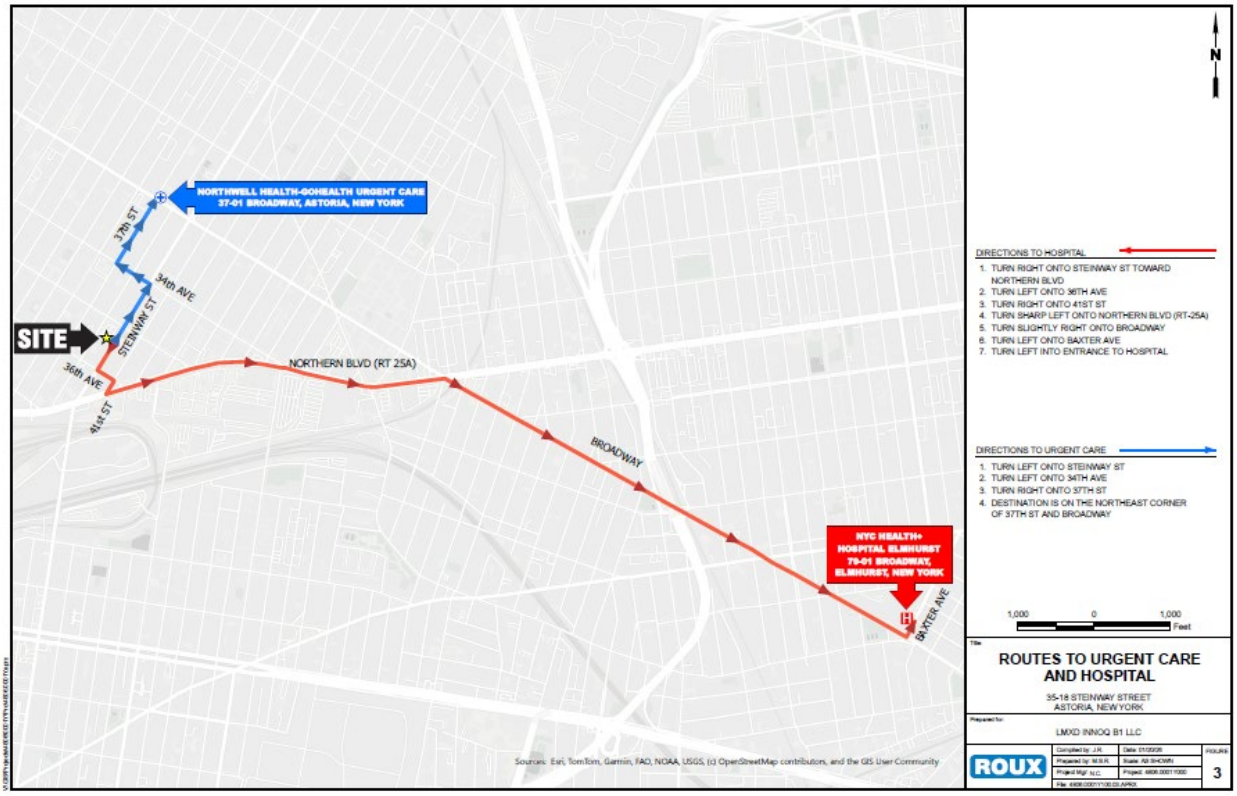
↑	1.	Head **southwest** on **Steinway St** toward 36th Ave	243 ft
↰	2.	Turn **left** onto **36th Ave**, then immediately turn **right** onto **41st St**	430 ft
↰	3.	Turn **left** onto **NY-25A / Northern Blvd**	0.7 mi
↱	4.	Turn **right** onto **Woodside Ave** 7-Eleven on the corner	0.3 mi
↰	5.	Turn **left** onto **39th st**	0.6 mi
↱	6.	Turn **right** onto **65th St**, then immediately turn **left** onto **Roosevelt Ave** Red Ribbon Bakeshop on the corner	0.4 mi
↗	7.	Bear **right** onto **Broadway** Meat Market on the corner	0.3 mi
	8.	Arrive at **Broadway** on the left The last intersection before your destination is 78th St If you reach Baxter Ave, you've gone too far	

Urgent Care Name and Address: Northwell Health-GoHealth Urgent Care, 37-01 Broadway, Astoria, New York

Urgent Care Route:

↑	1.	Head **northeast** on **Steinway St** toward 35th Ave	0.4 mi
↰	2.	Turn **left** onto **Broadway**	466 ft
	3.	Arrive at **Broadway** on the right The last intersection before your destination is 38th st If you reach 37th st, you've gone too far	

Emergency Response Site Map:



1. Introduction

This Site-specific Health and Safety Plan (HASP) has been prepared by Roux Environmental Engineering and Geology, D.P.C. (Roux) for use during the remedial action activities being performed by Roux at the Former Bordens Farm Products Site, located at 35-18 Steinway Street, Astoria, New York (Site; **Figure 1**). This HASP was prepared in general accordance with the requirements of the Occupational Safety and Health Administration (OSHA) standards promulgated at 29 CFR 1910.120 and 29 CFR 1926.65, both commonly referred to as the Hazardous Waste Operations and Emergency Response (HAZWOPER) Standard. In accordance with the HAZWOPER Standard, this Site-specific HASP was prepared to address the safety and health hazards associated with the eligibility sampling activities being performed at the Site by Roux and to provide requirements and procedures for the protection of Roux employees, subcontractor personnel, government oversight personnel, Site personnel, and the general public. It also addresses client- and Site-specific requirements for health and safety. Additionally, subcontractors may be required to submit their own HASP as it relates to their specific work activities and will be kept onsite during such work.

Implementation of this HASP is the joint responsibility of the Project Manager (PM), the Site Health and Safety Officer (SHSO), and all field staff, with assistance from the Project Principal (PP), Office Health and Safety Manager (OHSM), and Corporate Health and Safety Director (CHSD). The PM for this project is Noelle Clark. The Site Supervisor (SS) is TBD and Site Health and Safety Officer (SHSO) is Jack Rusk.

This HASP will be introduced to, reviewed, and signed off on by all Roux personnel through a formal training session prior to commencing work. A copy of the HASP will be kept at the Site at all times. The Roux SHSO or PM will be responsible for posting any changes, amendments, memos, etc. to the HASP. Any revisions to this HASP will be signed by appropriate personnel, which can include Roux's PP, CHSD, and SS. Any changes will be announced to all workers at the next safety meeting.

1.1 Roles and Responsibilities

Overall Roles and Responsibilities (R&Rs) of Roux personnel are provided in Roux's Policies and Procedures Manual. Only those R&Rs specific to HASP requirements are listed below.

Project Manager (PM)

The PM has responsibility and authority to direct all work operations. The PM coordinates safety and health functions with the Site Health and Safety Officer (SHSO), has the authority to oversee and monitor the performance of the SHSO, and bears ultimate responsibility for the proper implementation of this HASP. The specific duties of the PM are:

- Preparing and coordinating the Site work plan;
- Providing Site supervisor(s) with work assignments and overseeing their performance; Coordinating safety and health efforts with the SSHO;
- Ensuring effective emergency response through coordination with the Emergency Response Coordinator (ERC); and
- Serving as primary Site liaison with public agencies and officials and Site contractors.

Site Health and Safety Officer (SHSO)

The SHSO has the full responsibility and authority to develop and implement this HASP and to verify compliance. The SHSO reports to the Project Manager. The SHSO is on Site or readily accessible to the Site during all work operations and has the authority to halt Site work if unsafe conditions are detected. The specific responsibilities of the SHSO include:

- Managing the safety and health functions on this Site;
- Serving as the Site's point of contact for safety and health matters;
- Ensuring Site monitoring, worker training, and effective selection and use of PPE;
- Assessing Site conditions for unsafe acts and conditions and providing corrective action;
- Assisting the preparation and review of this HASP;
- Maintaining effective safety and health records as described in this HASP; and
- Coordinating with the SS and others as necessary for safety and health efforts.

Site Supervisor (SS)

The Site Supervisor (SS) is responsible for field operations and reports to the Project Manager (PM). The SS ensures the implementation of the HASP requirements and procedures in the field. The specific responsibilities of the Site Supervisor include:

- Executing the work plan and schedule as detailed by the PM;
- Coordination with the SHSO on safety and health; and
- Ensuring Site work compliance with the requirements of this HASP.

Employees

All Roux employees are responsible for reading and following all provisions of the Corporate Health and Safety Manual, including this HASP. Employees report to the SS at the project Site. Each employee is also responsible for the following:

- Wearing all appropriate PPE as outlined within this HASP;
- Attending all safety meetings;
- Inspecting tools and equipment prior to use, and taking any defective tools or equipment out of service;
- Appropriately documenting field events as they occur within a logbook or equivalent;
- Properly operating machinery and/or equipment only if trained to do so;
- Stopping work operations if unsafe conditions exist;
- Identifying and mitigating hazards when observed;
- Reporting all incidents and near misses to the Roux SHSO and SS immediately; and
- Knowing where emergency equipment is located (e.g. first aid kit, fire extinguisher).

Subcontractors and Visitors

Subcontractors and visitors are responsible for complying with the same health and safety requirements. It is the responsibility of all to make sure subcontractors and visitors comply and uphold the HASP. Subcontractors and visitors have the following additional responsibilities:

- Designating a qualified safety representative for the project that can make the necessary changes in work practices, as necessary;
- Attending all safety meetings while participating in Roux Site work activities;
- Reporting all incidents and near misses to Roux SHSO and SS immediately;
- Conducting initial and periodic equipment inspections in accordance with manufacturer and regulatory guidelines; and
- Providing copies of all Safety Data Sheets (SDS) to Roux SHSO for materials brought to the Site.

2. Background

Relevant background information is provided below, including a general description of the Site; a brief review of the Site's history with respect to hazardous material use, handling, and/or storage; and a review of known and potential releases of hazardous substances at the Site.

2.1 Site Description

The Site is located in the county of Queens, city and state of New York. The Site is currently occupied by an at-grade asphalt paved parking lot for the P.C. Richard & Son (P.C. Richard) retail store located to the south of the Site. New York City Transit Authority/Metropolitan Transit Authority (NYCTA/MTA) subway tunnel (M and R Lines) runs beneath Steinway Street, adjacent to the Site. The areas surrounding the Site are developed with commercial and residential properties.

2.2 Site History

Based on review of historical topographic maps, the Site was historically vacant land and was first developed between 1898 and 1915. From 1915 to 1930, residential dwellings and a milk pasteurizing facility operated by Bordens Farm Products Co. Inc. occupied some of the previously vacant lots. Over time Bordens Farm Products Co. Inc. included wagon areas, pasteurizing plants, bottle washing area, garages and offices. The Site remained in this configuration until the 1970s, when the buildings were demolished and the Site became vacant. The current parking lot was constructed in 1984.

2.3 Known and Potential Releases of Hazardous Substances at the Site

Based on the Site-wide detections and exceedances of New York State Department of Environmental Conservation (NYSDEC) Soil Cleanup Objectives (SCOs) (and/or guidance values for PFAS), shallow soil throughout the Site is primarily impacted with semivolatile organic compounds (SVOCs) and metals likely due to historical fill materials. Groundwater concentrations of metals and PFAS exceeded the NYSDEC Groundwater Quality Standards. Based on the Site-wide detections, petroleum-related and chlorinated volatile organic compounds (VOCs) were detected in soil vapor at the Site at relatively low levels.

3. Scope of Work

Roux will complete or oversee the following remedial actions at the Site:

1. Installation of support of excavation (SOE) to reach the proposed remedial excavation depths to meet Track 1 and prevent damage to adjacent offsite structures, including the NYCT subway tunnel.
2. Excavation and offsite disposal of soil (i.e., all soil exceeding UUSCOs) over the entire Site.
3. Implementation of the Community Air Monitoring Plan (CAMP) during all soil intrusive activities.
4. Dewatering, in compliance with city, state, and federal laws and regulations required to reach the remedial excavation depths. Extracted groundwater will either be containerized for offsite licensed or permitted disposal or will be treated on-Site as necessary and discharged to the municipal sewer system under a permit from New York City Department of Environmental Protection (NYCDEP), if applicable.
5. Collection and analysis of excavation bottom endpoint samples at a frequency of at least one per 900 square feet to evaluate the performance of the remedy with respect to attainment of Track 1 SCOs at the remedial excavation depth and to properly document the remaining onsite soil quality.
6. Collection and analysis of excavation sidewall endpoint samples at a frequency of one per 30 linear feet (and at least one per sidewall) in any areas in the interior portion of the Site where the remedial excavation depth is deeper than surrounding soils to evaluate the performance of the remedy with respect to attainment of Track 1 SCOs at these sidewalls and to properly document the remaining onsite soil quality. Sidewall samples are not required where excavations extend to the BCP site boundary, as there is no soil remaining on-Site.
7. Clean fill meeting the UUSCOs will be brought in to replace the excavated soil and establish the designed grades at the Site, if required.
8. A soil vapor intrusion evaluation will be completed based on the previously collected soil vapor data collected onsite. The evaluation will be summarized in the FER and include a desktop review of all onsite analytical data relative to the future uses of the property. Soil vapor intrusion is not a concern for the Site due to the relatively low concentrations observed during the RI and since the future building foundation will be within the water table, active vapor mitigation measures are not required.

If there are any changes with the scope a revision of the HASP will be required to address any new hazards.

4. Site Control

This Site control program is designed to reduce the spread of hazardous substances from contaminated areas to clean areas, to identify and isolate contaminated areas of the Site, to facilitate emergency evacuation and medical care, to prevent unauthorized entry to the Site, and to deter vandalism and theft.

4.1 Site Map

A map of this Site, showing Site boundaries, designated work zones, and points of entry and exit is provided in Figure 2.

4.2 Site Access

Access to the work areas at the Site is restricted to reduce the potential for exposure to its safety and health hazards. During hours of Site operation, Site entry and exit is authorized only at locked gates in the construction fencing. When the Site is not operating, access to the Site is controlled by the following: locked gates in the construction fencing.

4.3 Buddy System

This section is not applicable for all components of the SOW described in Section 3. Some Site inspections and soil sampling are completed by a single Roux employee. However, when completing these tasks, the single Roux employee is accompanied either by a Roux subcontractor or the Site caretaker/other representative from Kaufman RedRock Astoria LLC c/ L+M development Partners. Any time Roux is on-site, Kaufman RedRock Astoria LLC c/ L+M development Partners is made aware and communication with Kaufman RedRock Astoria LLC c/ L+M development Partners and the Roux PM is maintained via cellular phone.

If applicable, while working in the Exclusion Zone, Site workers use the buddy system. The buddy system means that personnel work in pairs and stay in close visual contact to be able to observe one another and summon rapid assistance in case of an emergency. The responsibilities of workers using the buddy system include:

- Remaining in close visual contact with partner;
- Providing partner with assistance as needed or requested;
- Observing partner for signs of heat stress, chemical overexposure or other difficulties;
- Periodically checking the integrity of partner's PPE; and
- Notifying the SS or other Site personnel if emergency assistance is needed.

4.4 Site Communications

The following communication equipment is used to support on-site communication: cell phone and hand signals.

As applicable, hand signals will be used according to the following:

Hand Signals

SIGNAL	MEANING
Hand gripping throat	Out of air; I cannot breathe
Grip partner's wrist	Leave area immediately
Hands on top of head	Need assistance
Thumbs up	I am all right; okay
Thumbs down	No; negative

A current list of emergency contact numbers is included in the Site-Specific Emergency Information at the beginning of this HASP.

4.5 Site Work Zones

The SOW does not require the implementation of work zones; however, should the need arise, this section provides details for the proper execution of work zones at this Site.

This Site is divided into three (3) major zones, described below. These zones are characterized by the likely presence or absence of biological, chemical, or physical hazards and the activities performed within them. Zone boundaries are clearly marked at all times and the flow of personnel among the zones is controlled. The Site is monitored for changing conditions that may warrant adjustment of zone boundaries. Zone boundaries are adjusted as necessary to protect personnel and clean areas. Whenever boundaries are adjusted, zone markings are also changed and workers are immediately notified of the change.

Exclusion Zone

The area where contamination exists is the Exclusion Zone (EZ). All areas where excavation and handling of contaminated materials take place are considered part of the EZ. This zone will be clearly delineated by chain link fencing, caution tape, cones or other effective barriers, as necessary. Safety tape may be used as a secondary delineation within the EZ. The zone delineation markings may be opened in areas for varying lengths of time to accommodate equipment operation or specific construction activities. The SHSO may establish more than one EZ where different levels of protection may be employed or where different hazards exist. Personnel are not allowed in the EZ without:

- A buddy (co-worker);
- Required minimum level PPE;
- Medical authorization;
- Training certification; and
- Requirement to be in the zone.

Contamination Reduction Zone

A Contamination Reduction Zone (CRZ) is established between the exclusion zone and the support zone. The CRZ contains the Contamination Reduction Corridor (CRC) and provides an area for decontamination of personnel and equipment. The CRZ will be used for general Site entry and egress in addition to access for heavy equipment and emergency support services. Personnel are not allowed in the CRZ without:

- A buddy (co-worker);
- Appropriate PPE;
- Medical authorization;
- Training certification; and
- Requirement to be in the zone.

Support Zone

The Support Zone (SZ) is an uncontaminated area that will be the field support area for the Site operations. The SZ will contain the temporary project trailers and provides for field team communications and staging for emergency response. Appropriate sanitary facilities and safety equipment will be located in this zone. Potentially contaminated personnel or materials are not allowed in this zone. The only exception will be appropriately packaged/decontaminated and labeled samples.

5. Job Hazard Evaluation

Roux's work at the Site is expected to entail a variety of physical, chemical, and biological hazards, all of which must be sufficiently managed to allow the work to be performed safely. Some of the hazards are Site-specific (i.e., they are associated with the nature, physical characteristics, and/or routine operation of the Site itself), while others are activity-specific (i.e., they are associated with [or arise from] the particular activity being performed). The various hazards can be grouped into the following categories:

- **Caught/Crushed** – the potential to become caught in, under, between, or by an object or parts of an object, such as equipment with parts that open and close or move up and down ("pinch points") or equipment that rotates, and the accompanying potential to have body parts cut, mangled, or crushed thereby.
- **Contact** – the potential to be struck by or against moving or stationary objects that can cause physical injury, such as heavy machinery, overhead piping, moving vehicles, falling objects, and equipment (including tools and hand-held equipment) or infrastructure with the ability to cut or impale.
- **Energy Sources** – the potential for bodily harm associated with energy sources, most notably electricity, but also including latent energy sources such as compressed air and equipment under tension (which when released could cause injurious contact or a fall).
- **Ergonomics** – the potential for musculoskeletal injury associated with lifting/carrying, pushing/pulling, bending, reaching, and other physical activity attributable to poor body position/mechanics, repetitive motion, and/or vibration.
- **Exposure** – the potential for injury/illness due to physical, chemical, or biological exposures in the work environment, including, but not limited to, temperature extremes, solar radiation, and noise (physical), chemical splashes and hazardous atmospheres (chemical), and animal/insect bites and poisonous plants (biological).
- **Falls** – the potential to slip or trip and thus fall or drop a load, resulting in bodily injury to oneself or others.

The foregoing is intended to provide Roux employees with a general awareness of the hazards involved with Site work. A more detailed review of the potential hazards associated with each specific activity planned for the Site (or on-going activity, as the case may be) is provided in the activity-specific Job Safety Analysis (JSA) forms in **Appendix A**. As can be seen in the JSA forms, the hazards are identified by category per the above, and specific measures designed to mitigate/manage those hazards are also identified. In preparing the JSA forms, all categories of hazards were considered, and all anticipated potential hazards were identified to the extent possible based on the experience of the personnel preparing and reviewing the JSA forms. However, there is always the possibility for an unanticipated hazard to arise, potentially as condition change over the course of the workday. Roux personnel must maintain a continual awareness of potential hazards in the work zone, regardless of whether the hazard is identified in the JSA form. Particular attention should be paid to hazards associated with exposure to hazardous substances (see **Table 1** for a listing of the hazardous substances most likely to be encountered in environmental media at the Site) and to Site personnel being located "in the line of fire" with respect to moving equipment, pinch points, and latent energy (e.g., being located or having body parts located within the swing radius of an excavator, between two sections of pipe being connected, below a piece of suspended equipment, or adjacent to a compressed air line).

5.1 Hazard Communication and Overall Site Information Program

The information in the JSAs and SDSs is made available to all employees and subcontractors who could be affected by it prior to the time they begin their work activities.

Modifications to JSAs are communicated during routine pre-work briefings, and periodically updated as needed in the HASP. SDSs will be maintained by the SHSO/SS for new chemicals brought on-site as needed. Copies of SDSs can be found in **Appendix B**.

5.2 Noise

Noise is associated with the operation of heavy equipment, power tools, pumps, and generators. Noise is also a potential hazard when working near operating equipment such as excavators, drill rigs or pole drivers. High noise (i.e., < 85 dBA) operations may be evaluated by the SHSO utilizing a type 2 handheld sound level meter (SLM) operating on the "A"-weighted scale with slow response because this scale most closely resembles human response to noise and complies with OSHA 29 CFR 1910.95. Hearing protection is required in areas with noise exposure greater than 85 dBA. Double hearing protection (ear plugs and earmuffs) should be donned in areas where the noise exposure is more than 95 dBA. Noise exposure will be controlled by hearing protection as described above or by maintaining set-backs from high-noise equipment, as warranted. Personnel handling heavy equipment and using power tools that produce noise levels exceeding those described levels above are required by OSHA 29 CFR 1910.95 to wear the appropriate Noise Reduction Rating (NRR) level of hearing protection. Appropriate hearing protection will be evaluated by the SHSO as necessary in consultation with the OHSM and CHSD.

5.3 Slip, Trip, and Fall Hazards

Slip, trip, and fall hazards may include, but are not limited to, general slip and trip hazards associated with uneven ground, possible debris, wet grass, and equipment. Prior to work, walking paths will be assessed for solid footings, any ground penetrations that may cause a tripping hazard will be appropriately marked, and other areas will be noted and discussed with the field team.

Personnel shall be aware of their surroundings and footings at all time, and all accommodations should be made for proper housekeeping and organized equipment placement at the Site, where possible, to help prevent any slip, trip, and fall-related incidents. All tools and materials should be appropriately stored when not in use and placed in appropriate storage containers.

5.4 Biological Hazards

Biological hazards that may potentially be present at a Site, include poisonous plants, insects (ticks, spiders, bees), animals (snakes, dogs), etc. Information on biological hazards can be found within Roux's Biological Hazard Awareness Management Program located within Roux's Corporate Health and Safety Manual. There is also potential for transmission and/or exposure to SARS-CoV-2, the virus that causes COVID-19. Prior to beginning work, on-Site protocols shall be established by the project team, including subcontractors, in accordance with federal, state, county, city, and/or other guidance, as applicable.

6. Emergency Response Plan

This emergency response plan details actions to be taken in the event of Site emergencies. The PM and SHSO is responsible for the implementation of emergency response procedures onsite. The SHSO/PM provides specific direction for emergency action based upon information available regarding the incident and response capabilities and initiates emergency procedures and notification of appropriate authorities. In the event of an emergency, Site personnel are evacuated and do not participate in emergency response activities, response is facilitated through external emergency services.

6.1 Emergency Response

The SHSO, after investigating the incident and relevant information, shall determine the level of response required for containment, rescue and medical care. Limited on-site emergency response activities could occur therefore the SHSO is responsible for notifying external emergency response agencies. The SHSO provides relevant information to the responding organizations, including, but not limited to, the hazards associated with the emergency incident, potential containment problems, and missing Site personnel.

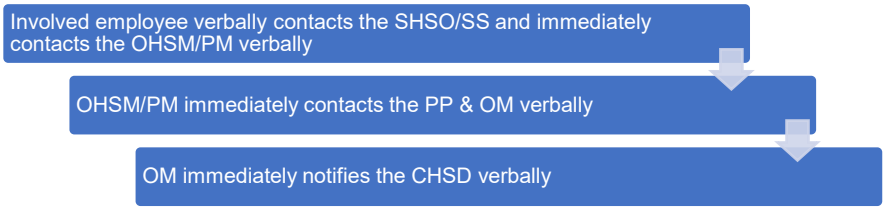
6.2 Emergency Alerting and Evacuation

If evacuation notice is given, Site workers leave the worksite, if possible, by way of the nearest exit. Appropriate primary and alternate evacuation routes and assembly areas have been identified and are shown on the Site Plan with Emergency Muster Area (**Figure 2**). The routes and assembly area will be determined by conditions at the time of the evacuation based on wind direction, the location of the hazard source, and other factors as determined by SHSO/PM.

Personnel exiting the Site gather at a designated assembly point. To determine that everyone has successfully exited the Site, personnel will be accounted for at the assembly point. If any worker cannot be accounted for, notification is given to the SHSO, PM, and any arriving response authorities so that appropriate action can be initiated. Subcontractors on this Site have coordinated their emergency response plans to ensure that these plans are compatible and potential emergencies are recognized, alarm systems are clearly understood, and evacuation routes are accessible to all personnel relying upon them.

6.3 Emergency Medical Treatment and First Aid

In the event of a work-related injury or illness, employees are required to follow the procedures outlined below. All work-place injury and illness situations require Roux's Project and Corporate Management Team to be notified when an injury/illness incident occurs, and communication with the contracted Occupational Health Care Management Provider, WorkCare, Inc., is initiated, as necessary. The Injury/Illness Notification Flowchart is provided below and within Roux's Incident Investigation and Reporting program included within Roux's Corporate Health and Safety Manual.



If on-Site personnel require any medical treatment, the following steps will be taken:

a. Notify Roux's Project and Corporate Management Team for any work-related injury and/or illness occurrence, and communicate with the contracted Occupational Health Care Management Provider, WorkCare, immediately following the notifications provided above.

b. Based on discussions with the Project Team, Corporate Management and the WorkCare evaluation, if medical attention beyond onsite first aid is warranted, transport the injured / ill person (IP) to the Urgent Care Center, or notify the Fire Department or Ambulance Emergency service and request an ambulance or transport the victim to the hospital, and continue communications with Corporate Management Team. An Urgent Care/Hospital Route map with location to Northwell Health-GoHealth Urgent care and NYC Health+ Hospital is included as **Figure 3**.

c. Decontaminate to the extent possible prior to administration of first aid or movement to medical or emergency facilities.

d. First aid medical support will be provided by onsite personnel trained and certified in First Aid, Cardio Pulmonary Resuscitation (CPR), Automatic External Defibrillation (AED), and Blood-Borne Pathogens (BBP) Awareness, until relieved by emergency medical services (EMS).

e. The SHSO and PM will perform a Loss Investigation (LI) and the Project Team will complete the final Loss Report. If a Roux employee is involved in a vehicular incident, the employee must also complete the Acord Automobile Loss Notice.

7. Environmental Conditions and Response

7.1 Adverse Weather Conditions

In the event of adverse weather conditions, the SHSO or project principal will determine if work can continue without jeopardizing the health and safety of field workers. Some of the items related to adverse weather conditions to be considered prior to determining if work should continue include:

- Potential for heat stress and heat-related injuries;
- Potential for cold stress and cold-related injuries;
- Treacherous weather-related conditions. If wind speed is greater than 15 mph averaged over a 15-minute period or wind gusts over 25 mph, earthmoving operations will be ceased
- Limited visibility; and
- Electrical storm potential.

Site activities will be limited to daylight hours and acceptable weather conditions. Inclement working conditions may include heavy rain, fog, high winds, and lightning. The SHSO and/or PM shall observe daily weather reports and evacuate, if necessary, in case of inclement weather conditions.

7.2 Electrical Storm Guidelines

In the event that lightning and/or thunder are observed while working onsite, all onsite activities shall stop and personnel shall seek proper shelter (e.g., substantial building, enclosed vehicle, etc.). Work shall not resume until the threat of lighting has subsided and no lightning or thunder has been observed for 30 minutes. If the possibility of lightning is forecast for the day, advise the onsite personnel on the risks and proper procedure at the pre-work safety briefing. Continuously monitor for changing weather conditions and allow enough time to properly stop work if lightning is forecast.

7.3 Environmental Stressors, Heat Stress, Heat Exhaustion, and Heat Stroke

It is the employer's responsibility to monitor weather forecasts and ambient air temperatures, both prior to the work shift and during the shift. The National Oceanic and Atmospheric Administration records average minimum/maximum temperatures of 86 degrees Fahrenheit during the year in Astoria, NY.

To prevent potential heat illness, the following strategies will be implemented:

- Adjusting personnel work/rest intervals;
- Monitoring for symptoms of heat illness;
- Providing shaded rest areas;
- Providing cool potable water so that each employee has access to at least one quart per hour for the entire shift, free of charge;
- Allowing for employees to acclimatize to the weather conditions and work demands;
- Observe workers during a heat wave (i.e., when the temperature is at least 80oF, and 10 degrees hotter than the average temperature of the five preceding days); and
- Implementing high heat procedures when the temperature reaches 95oF.

Roux's Heat Illness Prevention Plan is implemented when the when ambient temperatures exceed 80oF. Roux's Heat Illness Prevention Program can be found within **Appendix C**. Additional information regarding heat illnesses is provided below. This can include, but is not limited to, access to shade that is sufficient in size to fit all workers who are on break; a car with air conditioning is acceptable, too. Preventative cool-down breaks shall be allowed at any time, and anyone taking such a break will be monitored for heat illness symptoms and not required to return to work until all symptoms (if present) of heat illness have disappeared. If necessary, first aid will be offered, but if symptoms are severe, emergency response procedures will be implemented per Section 6.3. Anyone who has shown symptoms of severe heat illness will not be sent home without being offered first aid or medical treatment.

High heat procedures must be implemented when temperatures reach 95oF. These procedures include:

- Ensuring that effective communication by voice, observation, or electronic means is maintained so that employees at the work site can contact a supervisor when necessary. An electronic device, such as a cell phone or text messaging device, may be used for this purpose only if the reception in the area is reliable.
- Observing employees for alertness and signs or symptoms of heat illness. The employer shall ensure effective employee observation/monitoring by implementing one or more of the following:
    - Supervisor or designee observation of 20 or fewer employees;
    - Mandatory buddy system; and
    - Regular communication with sole employee such as by radio or cellular phone, or other effective means of observation.
- Designating one or more employees on each worksite as authorized to call for emergency medical services and allowing other employees to call for emergency services when no designated employee is available.
- Encouraging employees throughout the work shift to drink plenty of water.
- A review of the high heat procedures during the daily tailgate meeting and remind employees of their right to take a cool-down rest when necessary.

7.3.1 Heat Stress

Heat stress is the body's response to excessive heat and can be a significant potential hazard. The risk of heat stress can be increased with heavy physical activity and/or the use of personal protective equipment in hot, humid weather environments. There are also personal risk factors that can contribute to the risk of suffering from heat stress, such as obesity, water intake, alcohol and caffeine consumption, pregnancy, age, medication, etc. Heat illness includes heat cramps, heat exhaustion, heat syncope, and heat stroke.

7.3.2 Heat Cramps

Heat cramps may be brought on by prolonged exposure to heat. As an individual sweats, water and salts are lost by the body resulting in painful muscle cramps, typically in the legs.

First aid treatment includes, but is not limited to, shade, rest, and fluid replacement. Typically, the individual should recover within one-half hour while being monitored constantly. If the individual has not improved substantially within 30 minutes and the body temperature has not decreased, the individual should be transported to a hospital for medical attention.

Per Roux's Heat Illness Prevention Plan, employees shall have access to potable drinking water that is fresh, pure, suitably cool, free of charge and in sufficient quantities. Access to shade shall be present when temperatures exceed 80 degrees Fahrenheit and shall be available when temperatures do not exceed 80 degrees Fahrenheit.

7.3.3 Heat Exhaustion

Heat exhaustion may occur in an individual who has been exposed to excessive heat while working or exercising. The circulatory system of the individual fails as blood collects near the skin to rid the body of excess heat through transference. The signs and symptoms of heat exhaustion are as follows:

- Rapid and shallow breathing;
- Weak pulse;
- Cold and clammy skin with heavy perspiration;
- Skin appears pale;
- Fatigue and weakness;
- Dizziness; and
- Elevated body temperature.

First aid treatment includes, but is not limited to, cooling the victim, elevating the feet, and replacing fluids.

If the individual is not substantially improved within 30 minutes and the body temperature has not decreased, the individual should be transported to the hospital for medical attention.

7.3.4 Heat Stroke

Heat stroke occurs when an individual is exposed to excessive heat and stops sweating. This condition is classified as a MEDICAL EMERGENCY requiring immediate cooling of the victim and transport to a medical facility. The signs and symptoms of heat stroke are as follows:

- Dry, hot, red skin;
- Body temperature approaching or above 105oF;
- Confusion, altered mental state, slurred speech;
- Seizures;
- Large (dilated) pupils; and
- Loss of consciousness – the individual may go into a coma.

First aid treatment requires immediate cooling and transportation to a medical facility. Heat stress is a significant hazard if any type of protective equipment (semi-permeable or impermeable) that prevents evaporative cooling when worn in hot weather environments.

7.4 Cold Stress

Cold stress is a danger at low temperatures and when the wind-chill factor is low. Prevention of cold-related illnesses is a function of whole-body protection. Adequate insulating clothing must be used when the air temperature is below 60°F. A work/rest regimen will be initiated when ambient temperatures and protective

clothing cause a stressful situation. In addition, reduced work periods followed by rest in a warm area may be necessary in extreme conditions. The signs and symptoms of cold stress include the following:

- Severe shivering;
- Abnormal behavior;
- Slowing;
- Weakness;
- Stumbling or repeated falling;
- Inability to walk;
- Collapse; and/or
- Unconsciousness.

First aid requires removing the victim from the cold environment and seeking medical attention immediately. Also, prevent further body heat loss by covering the victim lightly with blankets. Do not cover the victim's face. If the victim is still conscious, administer hot drinks and encourage activity such as walking, wrapped in a blanket.

8. Safety Procedures

This section of the HASP presents the specific safety procedures to be implemented during Roux's activities at the Site in order to protect the health and safety of various on-site personnel. Minimum OSHA-mandated procedures are presented first, followed by client- and Site-specific procedures. Lastly, activity-specific procedures are discussed. These Site and activity-specific procedures supplement the general safety procedures included in Roux's Corporate Health and Safety Manual, which also must be followed in their entirely.

8.1 Training

At a minimum, Site personnel who will perform work in areas where there exists the potential for toxic exposure will be health and safety-trained prior to performing work onsite per OSHA 29 CFR 1910.120(e) and 29 CFR 1926.65(e). More specifically, all Roux, subcontractor, and other personnel engaged in sampling and remedial activities at the Site and who are exposed or potentially exposed to hazardous substances, health hazards, or safety hazards must have received at a minimum the 40 hour initial HAZWOPER training consistent with the requirements of 29CFR 1910.120(e)(3)(i) training and a minimum of 3 days' actual field experience under the direct supervision of a trained experienced supervisor, plus 8 hours of refresher training on an annual basis. Depending on tasks performed, less training may be permitted. Evidence of such training must be maintained at the Site at all times. Furthermore, all on-Site management and supervisory personnel directly responsible for or who supervise the employees engaged in Site remedial operations, must have received an additional 8 hours of specialized training at the time of job assignment on topics including, but not limited to, the employer's safety and health program and the associated employee training program, personal protective equipment program, spill containment program, and health hazard monitoring procedure and techniques, plus 8 hours of refresher training on an annual basis. Additionally, all workers who will be required to don a respirator will be properly trained on their employer's Respiratory Protection Program, which also includes being medically cleared to wear a respirator and passed a fit test, at least initially prior to use, and then annually thereafter in accordance with 29 CFR 1910.134, Respiratory Protection.

Roux personnel training records are maintained in a corporate database with records available upon request from either the OHSM/SHSO/CHSD or Human Resources Department.

8.2 Site-Specific Safety Briefings for Visitors

A site-specific briefing is provided to all site visitors who enter this site beyond the site entry point. For visitors, the site-specific briefing provides information about site hazards, the site lay-out including work zones and places of refuge, the emergency alarm system and emergency evacuation procedures, and other pertinent safety and health requirements as appropriate.

8.3 HASP Information and Site-Specific Briefings for Workers

Site personnel review this HASP and are provided a Site-specific tailgate briefing prior to the commencement of work to ensure employees are familiar with this HASP and the information and requirements it contains, as well as the relevant JSAs included in **Appendix A**. Additional briefings are provided as necessary to notify employees of any changes to this HASP as a result of information gathered during on-going Site characterization and analysis of changing conditions. Conditions for which we

schedule additional briefings include, but are not limited to: changes in site conditions, changes in the work schedule/plan, newly discovered hazards, and incidents occurring during Site work.

8.4 Medical Surveillance

The medical surveillance section of the Health and Safety Plan describes how worker health status is monitored at this site. Medical surveillance is used when there is the potential for worker exposure to hazardous substance at levels above OSHA Permissible Exposure Limits (PEL) or other published limits. The purpose of a medical surveillance program is to medically monitor worker health to ensure that personnel are not adversely affected by site hazards. The provisions for medical surveillance at this site are based on the site characterization and job hazard analysis found in Section 4 of this HASP and are consistent with OSHA requirements in 29 CFR 1910.120(f) as applicable.

8.4.1 Site Medical Surveillance Program

Medical surveillance requirements are based on a worker's potential for exposure as determined by the site characterization and job hazard analysis documented in Section 4 and JSAs within **Appendix A** of this HASP and in compliance with the requirements of 29 CFR 1910.120(f)(2). Based on site information and use of direct reading instruments, limited use of respirators (less than 30 days per year), and the absence of an employee-staffed HAZMAT team, a limited medical surveillance program is required and implemented at this site. The medical surveillance program provides that:

1. Workers assigned to tasks requiring the use of respirators receive medical examinations in accordance with 29 CFR 1910.134(e) to ensure they are physically capable to perform the work and use the equipment, and
2. If a worker is injured, becomes ill, or develops signs or symptoms of possible over-exposure to hazardous substance or health hazards, medical examinations are provided to that worker as soon as possible after the occurrence and as required by the attending physician.
3. These medical examinations and procedures are performed by or under the supervision of a licensed physician and are provided to workers free of cost, without loss of pay, and at a reasonable time and place. In addition, the need to implement a more comprehensive medical surveillance program will be re-evaluated after any apparent over-exposure.

8.4.2 Medical Recordkeeping Procedures

Medical recordkeeping procedures are consistent with the requirements of 29 CFR 1910.1020 and are described in the company's overall safety and health program. A copy of that program is available at our Islandia, New York office.

The following items are maintained in worker medical records:

- Respirator fit test and selection;
- Physician's medical opinion of fitness for duty (pre-placement, periodic, termination);
- Physician's medical opinion of fitness for respirator protection (pre-placement, periodic); and
- Exposure monitoring results.

8.4.3 Program Review

The medical program is reviewed to ensure its effectiveness. The Corporate Health and Safety Manager in coordination with the Human Resources Director is responsible for this review. At minimum, this review consists of:

- Review of accident and injury records and medical records to determine whether the causes of accidents and illness were promptly investigated and whether corrective measures were taken wherever possible;
- Evaluation of the appropriateness of required medical tests based on site exposures; and
- Review of emergency treatment procedures and emergency contacts list to ensure they were site specific, effective, and current.

8.5 Personnel Protection

Site safety and health hazards are eliminated or reduced to the greatest extent possible through engineering controls and work practices. Where hazards are still present, a combination of engineering controls, work practices and PPE are used to protect employees. Appropriate personal protective equipment (PPE) shall be worn by Site personnel when there is a potential exposure to chemical, biological or physical hazards (e.g., falling objects, flying particles, sharp edges, electricity, and noise), as determined by the SHSO. The level of personal protection, type and kind of equipment selected will depend on the hazardous conditions and in some cases cost, availability, compatibility with other equipment, and performance. An accurate assessment of all these factors will be made before work can be safely executed.

Roux maintains a comprehensive written PPE program that addresses proper PPE selection, use, maintenance, storage, fit and inspection. Roux's PPE program can be found within **Appendix D**. PPE to be used at the Site will meet the appropriate American National Standards Institute (ANSI) standards and the following OSHA (General/Construction Industry) standards for minimum PPE requirements.

The minimum level of PPE for entry onto the Site is Level D. The following equipment shall be worn:

- Work uniform (long pants, sleeved shirt);
- Hard hat;
- Steel or composite toe work boots (must comply with American Society for Testing and Materials [ASTM]) F 2412-05, Standard Test Methods for Foot Protection and ASTM F 2413-05, Standard Specification for Performance Requirements for Foot Protection);
- Safety Glasses (must comply with one of the following ANSI/ISEA Z87.1-2010, ANSI Z87.1-2003, ANSI Z87.1-2003);
- Boot Covers (as needed);
- Hearing protection (as needed);
- High visibility clothing (shirt/vest); and
- Hand protection (e.g., minimum cut resistance meeting ANSI 105-2000 Level 2).

Note that jewelry shall be removed or appropriately secured to prevent it from becoming caught in rotating equipment or unexpectedly snagged on a fixed object (e.g., wrist watches, bracelets, rings, chains and necklaces, open earrings). Do not wear loose clothing and all shoulder-length hair should be tied back.

Site specific PPE ensembles and materials are identified within task specific JSAs located within **Appendix A**, and any upgrades or downgrades of the level of protection (i.e., not specified in the JSA) must be approved by the PP and immediately communicated to all Roux personnel and subcontractors as applicable. PPE is used in accordance with manufacturer's recommendations.

8.5.1 Hearing Conservation

Hearing protection is made available when noise exposures equal or exceed an 8-hour time-weighted average sound level of 85 dBA. Hearing protection is required when the 8-hour time weighted average sound level > 85 dBA, or when noise levels exceed 140 dBA at any point or exceeds 115 dBA for at least 15 minutes. Where noise exposure meets or exceeds this level, noise is listed as a physical hazard in the JSA for the tasks/operation, and hearing protection is included as one of the control measures (PPE).

8.6 Monitoring

An air monitoring program is important to the safety of on- and off-Site personnel, and the surrounding area. A preliminary survey, to establish background conditions in the immediate sampling area, may be made prior to the initiation of Site work including, but not limited to, monitoring wind direction (e.g., wind socks) and approximate temperature during all invasive Site activities. This survey will be conducted with the appropriate pre-calibrated air monitoring instrument(s), as warranted by the field activity. Once this survey has been complete, any changes in the type of PPE will be determined and relayed to those working on Site.

Work zone air monitoring will be performed to verify that the proper level of PPE is used, and to determine if increased protection or work stoppage is required. The following equipment shall be used to monitor conditions:

- A Photoionization Detector (PID) with a lamp energy of 10.6 eV will be used to provide direct readings of organic vapor concentrations during intrusive activities to determine that personnel protection is adequate. Concentrations shall be recorded during intrusive activities with the potential to encounter contaminant vapors.

Personal exposure monitoring utilizing activated charcoal tubes may be considered based on whether or not the area sample results are at or above half of the PEL. The decision to perform the monitoring will be made by, and under the control of, the CHSD.

Below are monitoring action levels for Site-specific chemicals of concern. In the event PID readings above the thresholds identified below are sustained for 5 minutes in the breathing zone, worker protection will require upgrading following notification to the OHSM and applicable parties.

8.6.1 Action Levels for Air Monitoring

PPE can remain at Level D if breathing zone VOC concentrations are less than 5 ppm and benzene is non detect. Personnel are required to evacuate the Site when breathing zone VOC readings exceed 25 ppm.

The following tables include summaries of the air monitoring, work practices, and action levels for the expected contaminants. The action levels to initiate testing with colorimetric tubes for airborne volatiles is 1 ppm (PID reading) and is based on the Permissible Exposure Limit (PEL) for benzene (1 ppm). The colorimetric tubes are used to confirm the presence or absence of specific constituents, and they do not provide a measured concentration.

PPE can remain at Level D if breathing zone VOC concentrations are less than 5 ppm and specific compounds, such as benzene, vinyl chloride, or formaldehyde, is non-detect. Personnel are required to evacuate the Site when breathing zone VOC readings exceed 25 ppm.

The following tables include summaries of the air monitoring, work practices, and action levels for the expected contaminants.

Air Monitoring Summary and Action Levels Organic Vapors	
PID Reading in Breathing Zone (ppm)	**Action**
0-1 ppm above background	Continue monitoring
>1-5 ppm sustained 60 seconds	Continue monitoring; if applicable initiate additional collection of benzene/vinyl chloride/formaldehyde using colorimetric tubes.
<5 ppm and no presence of benzene/vinyl chloride/formaldehyde	Continue Monitoring, ventilate space
≥ 5 ppm - ≤ 25 ppm and no presence of benzene/vinyl chloride/formaldehyde	Ventilate space until PID reads < 5 ppm. If < 5 ppm cannot be achieved, upgrade to Level C[1].
≥ 25 ppm	Ventilate space and evacuate area. Consult with CHSD.

Background concentrations should be established at the beginning of each work day. It may be necessary to re-establish background concentrations and ambient conditions vary through the day.

1 Measured air concentrations of known organic vapors will be reduced by the respirator to one half of the PEL or lower, and the individual and combined compound concentrations shall be within the service limit of the respirator cartridge.

8.6.2 Air Monitoring Equipment and Calibration

A PID calibrated to an appropriate calibration mixture will be used to detect organic vapors in and around the work areas. Monitoring will be conducted in and around all work areas and at the workers breathing zone before activities commence to establish a background level, then at 15-minute intervals throughout the day. All equipment will be calibrated according to the manufacturer's recommendation. A calibration log will be maintained and will include the name of the person who performed the calibration, the date and time calibrated, and the instrument reading at the time of calibration. A manual bellows pump or equivalent with colorimetric tubes for specific compounds will be utilized to determine the course of action related to upgrading or downgrading the level of respiratory protection, as applicable.

If air monitoring data indicate safe levels of potentially harmful constituents at consistent intervals (5-minute intervals), then monitoring can be conducted less frequently (every 30 minutes). This determination will be made by the onsite SHSO. Monitoring data, including background readings and calibration records, will be documented. Work to be performed on-Site will conform to Roux's Standard Operating Procedures (SOPs). Conformance with these guidelines as well as the guidelines described in this HASP will aid in mitigating the physical and chemical hazards mentioned throughout this HASP.

8.7 Tailgate Safety Meetings

A designated Site worker will provide daily safety briefings (e.g., tailgate meetings) including, but not limited to, the following scenarios:

- When new operations are to be conducted;
- Whenever changes in work practices must be implemented; and
- When new conditions are identified and/or information becomes available.

Daily safety briefings shall be recorded on the Roux Daily Tailgate Health and Safety Meeting Log/Daily Site Safety Checklist, and all completed forms will become a part of the project file.

8.8 Spill Containment

Spill containment equipment and procedures should, at a minimum, meet the requirements of the facility's Spill Prevention, Control and Countermeasure Plan, if applicable. Otherwise, spill containment equipment and procedures must be considered depending on the task, including, but not limited to, chemical/product transfer points and handling.

8.8.1 Initial Spill Notification and Response

Any worker who discovers a hazardous substance spill will immediately notify the SHSO. The worker will, to his/her best ability, report the hazardous substance involved, the location of the spill, the estimated quantity of material spilled, the direction/flow of the spill material, related fire/explosion incidents, and any associated injuries without compromising their own safety.

8.8.2 Spill Evaluation and Response

The SHSO is responsible for evaluating spills and determining the appropriate response. When this evaluation is being made, the spill area will be isolated and demarcated to the extent possible. If necessary to protect nearby community members, notification of the appropriate authorities is made by the PM as appropriate. On-Site response is limited to small spills (e.g., <10 gallons); large spills require external emergency responders who will be contacted by the SHSO.

8.9 Decontamination

The decontamination section of the HASP describes how personnel and equipment are decontaminated when they leave the Exclusion Zone. This section also describes how residual waste from decontamination processes is disposed. The site decontamination procedures are designed to achieve an orderly, controlled removal or neutralization of contaminants that may accumulate on personnel or equipment. These procedures minimize worker contact with contaminants and protect against the transfer of contaminants to clean areas of the site and off-site. They also extend the useful life of PPE by reducing the amount of time that contaminants contact and can permeate PPE surfaces. Decontamination is facilitated within the CRZ at this site, if applicable.

8.9.1 Decontamination Procedures for Personnel and PPE

The following are general decontamination procedures established and implemented at this site.

1. Decontamination is required for all workers exiting a contaminated area. Personnel may re-enter the SZ only after undergoing the decontamination procedures described below in the next section.

2. Protective clothing is decontaminated, cleaned, laundered, maintained and/or replaced as needed to ensure its effectiveness.
3. PPE used at this site that requires maintenance or parts replacement is decontaminated prior to repairs, or
4. PPE used at this site is decontaminated or prepared for disposal on the premises. Personnel who handle contaminated equipment have been trained in the proper means to do so to avoid hazardous exposure.
5. This site uses an off-site laundry for decontamination of PPE. The site has informed that facility of the hazards associated with contaminated PPE from this site.
6. The site requires and trains workers that if their permeable clothing is splashed or becomes wetted with a hazardous substance, they will immediately exit the work zone, perform applicable decontamination procedures, shower, and change into uncontaminated clothing.
7. Procedures for disposal of decontamination waste meet applicable local, State, and Federal regulations.

8.9.2 Decontamination Procedures for Equipment

All tools, equipment, and machinery from the EZ or CRZ are decontaminated in the CRZ prior to removal to the SZ. Equipment decontamination procedures are designed to minimize the potential for hazardous skin or inhalation exposure and to avoid cross-contamination and chemical incompatibilities.

General Equipment Decontamination Procedures:

1. Decontamination is required for all equipment exiting a contaminated area. Equipment may re-enter the SZ only after undergoing the equipment decontamination procedures.
2. Vehicles that travel regularly between the contaminated and clean areas of the site are carefully decontaminated each time they exit the EZ and the effectiveness of that decontamination is monitored to reduce the likelihood that contamination will be spread to other parts of the site.
3. Particular attention is given to decontaminating tires, scoops, and other parts of heavy equipment that are directly exposed to contaminants and contaminated soil.
4. Procedures for disposal of decontamination waste shall meet applicable local, State, and Federal regulations.

The following items may be used to decontaminate equipment:

- Fresh water rinse;
- Non-phosphorus detergent wash;
- Acetone rinse;
- Distilled water rinse; and
- A steam cleaner or pressure washer (heavy equipment only).

8.9.3 Monitoring the Effectiveness of Decontamination Procedures

Visual examination and sampling are used to evaluate the effectiveness of decontamination procedures. Visual examination is used to ensure that procedures are implemented as described and that they appear to control the spread of contaminants under changing site conditions. Visual examination is also used to inspect for signs of residual contamination or for contaminant permeation of PPE.

Personnel who work in contaminated areas of the site, either the Contamination Reduction Zone (CRZ) or the Exclusion Zone, are trained in the principles and practices of decontamination described in this section of the HASP and in related SOPs. If site procedures are changed as a result of inspection and monitoring, all affected employees are notified of these changes.

8.10 Confined Space Entry

Confined space entry will not be performed.

The following is a list of the safety requirements for confined space entry at the Site:

- **ROUX PERSONNEL ARE NOT AUTHORIZED TO ENTER AN OSHA PERMIT REQUIRED CONFINED SPACE;**
- Currently the scope of work **DOES NOT** require personnel to enter permitted confined space for this project; and
- Any changes to the field activities that may necessitate confined space entry will be reported to the Project Principal and OHSM.

Confined space is defined as any space, depression, or enclosure that:

- Has limited opening for entry and egress;
- Is large enough for and employee to enter and perform assigned work; and
- Is not intended for continuous occupancy.

A permit required confined space is one that meets the definition of a confined space and has one or more of the following characteristics:

- May contain or produce life-threatening atmospheres due to oxygen deficiency the presence of toxic, flammable, or corrosive contaminants;
- Contains a material that has the potential for engulfment;
- Has an internal configuration that may cause an entrant to be trapped or asphyxiated by inwardly converging walls or by a floor that slopes downward and tapers to a smaller cross-section; and
- Contains any other serious safety or health hazards.

Although Roux personnel will not perform confined space entry, it is expected that subcontractors performing cleaning and mitigation and/or remedial measures activities may be required to enter structures that are considered to be a permit required confined space. Permitting of the confined space as well as hazard mitigation for entry will be completed by the subcontractor in accordance with 29 CFR 1910.146 or 1926.1201-1213 and/or applicable local/client requirements.

8.11 Client and Site-Specific

In addition to the OSHA-specific procedures discussed above, there may be client and site-specific safety procedures that must be adhered to during the performance of remedial activities at the Site.

8.12 Unusual or Significant Risks

Field activities that appear to have unusual or significant risks that cannot be adequately managed with existing risk tools such as LPS, HASPs, traffic safety plans, work permits, design and O&M practices,

equipment HAZOPS or other safety tools must be referred to the CHSD to help with the assessment and management of the associated potential safety risks. Examples include the use of explosives for demolition, use of firearms to control wildlife, rappelling, demolition over water, diving, etc.

8.13 Activity-Specific Hazards

In addition to the general hazards discussed above, there are activity-specific hazards associated with each work activity planned for the Site. An activity-specific JSA has been completed for each of the activities planned for the Site. JSAs are provided in **Appendix A**. In the event that new work activities or tasks are planned, JSAs will be developed and implemented prior to performing the new activities. In the absence of a JSA, the personnel performing work must prepare a field JSA and receive clearance from a designated competent safety official prior to performing any task with significant risk. In emergency situations where time is critical SPSAs will be utilized to identify the task, associated hazards and mitigative actions to take. For lower risk activities (as deemed by the discretion of a Competent Person) where a JSA is determined to not be needed, the individual(s) conducting the activities must perform SPSAs prior to and during the work.

8.13.1 Electrical and Other Utility Assessment and Accommodations

Roux shall perform a site walk to identify any potential overhead electrical or utility lines. All applicable guidelines will be followed in the vicinity of overhead power and utility lines (see Section 8.13.3 below).

All borings will be completed using hand tools.

Roux has also reviewed all available Site maps showing buried utility lines to identify potential hazards, which revealed that no underground hazards are known to exist in the vicinity of the areas of the Site pertinent to this HASP.

8.13.2 Subsurface Work

Subsurface work activities will require adherence to Roux's Corporate Subsurface Utility Clearance Management program found within Appendix E.

8.13.3 Heavy Equipment

Use of heavy equipment at the Site will require adherence to Roux's Corporate Heavy Equipment Exclusion Zone Management Program found within Appendix F. Additionally, operation of the drill rig/other heavy equipment will maintain clearances from overhead power lines in accordance with 29 CFR 1926.1408 Table A Minimum Clearance Distances provided below.

Minimum Required Clearances for Energized Overhead Power Lines

Nominal System Voltage of Power Line (K V)	Minimum Required Clearance (feet)
0-50	10
51-100	12
101-200	15
201-300	20
301-500	25
501-750	35
751-1000	45

1 kilovolt (KV) = 1,000 volts

8.14 Traffic Control

If Site operations encroach upon public streets or highways and a hazard exists to Site personnel because of traffic conditions, a traffic control plan will be implemented in accordance with the United States Department of Transportation's (DOT's) "Manual on Uniform Traffic Control Devices."

8.15 Sanitation

Sanitation facilities will be provided in accordance with the sanitation standards (29 CFR 1910.141, 29 CFR 1926.51 and 29 CFR 1928.110). Sanitation facilities will be maintained and kept in good conditions at all times.

9. Field Team Review

Each person performing work at or visiting this site shall sign this section after site-specific training is completed and before being permitted to access the CRZ or Exclusion Zone.

I have read and understand this Site-Specific Health and Safety Plan. I will comply with the provision contained therein.

Site/Project: Former Bordens Farm Products

Name & Company	Signature	Date

10. Approvals

By their signature, the undersigned certify that this HASP is approved and will be utilized at the Former Bordens Farm Products Site.

TBD – Site Health and Safety Officer	Date
Nevin Pahlad – Office Health and Safety Manager	Date
Jack Rusk – Project Manager	Date
Noelle Clark – Project Principal	Date

TABLES

1. Toxicological Properties of Hazardous Substances Present at the Site

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at the Site.

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
ORGANOCHLORINE PESTICIDES (OCP)									
DDT	50-29-3	TWA 1 mg/m3	TWA 0.5 mg/m3	TWA 1 mg/m3	500 mg/m3	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin; paresthesia tongue, lips, face; tremor; anxiety, dizziness, confusion, malaise (vague feeling of discomfort), headache, lassitude (weakness, exhaustion); convulsions; paresis hands; vomiting; [potential occupational carcinogen]	Eyes, skin, central nervous system, kidneys, liver, peripheral nervous system	White, odorless and tasteless, very stable, water-insoluble, synthetic BP: 260°F Fl.Pt. = 162-171°F LEL: NA UEL: NA
Aldrin	309-00-2	TWA 0.1 mg/m3	TWA 0.25 mg/m3	TWA 0.25 mg/m3	25 mg/m3	Inhalation, ingestion, skin and/or eye contact	headache, dizziness; nausea, vomiting, malaise (vague feeling of discomfort); myoclonic jerks of limbs; clonic, tonic convulsions; coma; hematuria (blood in the urine), azotemia; [potential occupational carcinogen]	Developmemntal, Endocrine, Liver, Immune System, Nervous System,	Colorless to dark-brown crystalline solid with a mild chemical odor. BP: 293°F Fl.Pt. = 150°F LEL: NA UEL: NA
Lindane (gamma-BHC)	58-89-9	TWA 0.5 mg/m3	TWA 0.5 mg/m3	TWA 0.5 mg/m3	50 mg/m3	Inhalation, ingestion, skin and/or eye contact	irritation eyes, skin, nose, throat; headache; nausea; clonic convulsions; resp difficulty; cyanosis; aplastic anemia; muscle spasm; In Animals: liver, kidney damage	Eyes, skin, respiratory system, central nervous system, blood, liver, kidneys	White to yellow, crystalline powder with a slight, musty odor. BP: 614°F Fl.Pt. = 150°F LEL: NA UEL: NA
Dieldrin	860-57-1□	TWA 0.1 mg/m3	TWA 0.25 mg/m3	TWA 0.25 mg/m3	25 mg/m3	Inhalation, ingestion, skin and/or eye contact	headache, dizziness; nausea, vomiting, malaise (vague feeling of discomfort), sweating; myoclonic limb jerks; clonic, tonic convulsions; coma; ; In Animals: liver, kidney damage [potential occupational carcinogen]	Developmemntal, Endocrine, Liver, Immune System, Nervous System,	Colorless to light-tan crystals with a mild, chemical odor. BP: NA (Decomposes) Fl.Pt. = NA LEL: NA UEL: NA
VOLATILE ORGANIC COMPOUNDS (VOCs)									
1,1,1-Trichloroethane	71-55-6	TWA 350 ppm STEL 450 ppm	C 350 ppm (1900 mg/m^3) [15-minute]	TWA 350 ppm (1900 mg/m^3)	700 ppm	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin; headache, lassitude (weakness, exhaustion), central nervous system depression, poor equilibrium; dermatitis; cardiac arrhythmias; liver damage	Eyes, skin, central nervous system, cardiovascular system, liver	Colorless liquid with a mild, chloroform-like odor. BP: 165°F Fl.Pt. = NA LEL: 7.5% UEL: 12.5% Combustible Liquid, but burns with difficulty
1,1,2,2-Tetrachloroethane	79-34-5	TWA 1 ppm [skin]	Ca TWA 1 ppm (7 mg/m^3) [skin]	TWA 5 ppm (35 mg/m^3) [skin]	Ca [100 ppm]	Inhalation, skin absorption, ingestion, skin and/or eye contact	Nausea, vomiting, abdominal pain; tremor fingers; jaundice, hepatitis, liver tenderness; dermatitis; leukocytosis (increased blood leukocytes); kidney damage; [potential occupational carcinogen]	Skin, liver, kidneys, central nervous system, gastrointestinal tract	Colorless to pale-yellow liquid with a pungent, chloroform-like odor BP: 296°F Fl.Pt. = NA LEL: NA UEL: NA Noncombustible Liquid
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	TWA 1000 ppm STEL 1250 ppm	TWA 1000 ppm (7600 mg/m3) ST 1250 ppm (9500 mg/m3)	TWA 1000 ppm (7600 mg/m3)	2000 ppm	Inhalation, ingestion, skin and/or eye contact	Irritation skin, throat, drowsiness, dermatitis; central nervous system depression; In Animals: cardiac arrhythmias, narcosis	Skin, heart, central nervous system, cardiovascular system	Colorless to water-white liquid with an odor like carbon tetrachloride at high concentrations. [Note: A gas above 118°F.] BP: 118°F Fl.Pt. = NA LEL: NA UEL: NA
1,1,2-Trichloroethane	79-00-5	TWA 10 ppm [skin]	Ca TWA 10 ppm (45 mg/m3) [skin]	TWA 10 ppm (45 mg/m3) [skin]	Ca [100 ppm]	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, nose; central nervous system depression; liver, kidney damage; dermatitis; [potential occupational carcinogen]	Eyes, respiratory system, central nervous system, liver, kidneys	Colorless liquid with a sweet, chloroform-like odor BP: 237°F Fl.Pt. = NA LEL: 6% UEL: 15.5% Combustible Liquid, forms dense soot
1,1-Dichloroethane	75-34-3	TWA 100 ppm	TWA 100 ppm (400 mg/m^3)	TWA 100 ppm (400 mg/m^3)	3,000 ppm	Inhalation, ingestion, skin and/or eye contact	Irritation skin; central nervous system depression; liver, kidney, lung damage	Skin, liver, kidneys, lungs, central nervous system	Colorless, oily liquid with a chloroform-like odor. BP: 135°F Fl.Pt. = 2°F LEL: 5.4% UEL: 11.4% Class IB Flammable Liquid Fl.P. below 73°F and BP at or above 100°F.

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at the Site.

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
1,1-Dichloroethene	75-35-4	TWA 5 ppm	Ca	None	Ca	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, throat; dizziness, headache, nausea, dyspnea (breathing difficulty); liver, kidney disturbance; pneumonitis; [potential occupational carcinogen]	Eyes, skin, respiratory system, central nervous system, liver, kidneys	Colorless liquid or gas (above 89°F) with a mild, sweet, chloroform-like odor BP: 89°F Fl.Pt. = -2°F LEL: 6.5% UEL: 15.5% Class IA Flammable Liquid: Fl.P. below 73°F and BP below 100°F
1,2,3-Trichlorobenzene	87-61-6	Cameo Chemicals Source https://cameochemicals.noaa.gov/chemical/10051	NA	NA	NA	Inhalation, skin absorption, ingestion, skin and/or eye contact	Inhalation may cause irritation of respiratory tract. Irritating to the eyes. May redden skin on contact. Ingestion may cause liver damage.	Skin, eyes, respiratory tract, liver	A white solid with a sharp chlorobenzene odor. Insoluble in water and denser than water. Hence sinks in water Fl.Pt. = 234.9°F
1,2,4-Trichlorobenzene	120-82-1	C 5 ppm	C 5 ppm (40 mg/m3)	None	N.D.	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation eyes, skin, mucous membrane; In Animals: liver, kidney damage; possible teratogenic effects	Eyes, skin, respiratory system, liver, reproductive system	Colorless liquid or crystalline solid (below 63°F) with an aromatic odor BP: 416°F Fl.Pt. = 222°F LEL (302°F): 2.5% UEL (302°F): 6.6% Class IIIB Combustible Liquid: Fl.P. at or above 200°F. Combustible Solid
1,2-Dibromo-3-chloropropane	96-12-8	NA	Ca	TWA 0.001 ppm	Ca	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat; drowsiness; nausea, vomiting; pulmonary edema; liver, kidney injury; sterility; [potential occupational carcinogen]	Eyes, skin, respiratory system, central nervous system, liver, kidneys, spleen, reproductive system, digestive system	Dense yellow or amber liquid with a pungent odor at high concentrations. [pesticide] [Note: A solid below 43°F.] BP: 384°F Fl.Pt. = (oc) 170°F LEL: NA UEL: NA Class IIIA Combustible Liquid: Fl.P. at or above 140°F and below 200°F.
1,2-Dibromoethane	106-93-4	None listed Skin	Ca TWA 0.045 ppm C 0.13 ppm [15-minute]	TWA 20 ppm C 30 ppm 50 ppm [5-minute maximum peak]	Ca [100 ppm]	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, respiratory system; dermatitis with vesiculation; liver, heart, spleen, kidney damage; reproductive effects; [potential occupational carcinogen]	Eyes, skin, respiratory system, liver, kidneys, reproductive system	Colorless liquid or solid (below 50°F) with a sweet odor. [fumigant] BP: 268°F Fl.Pt. = 50°F LEL: NA UEL: NA Noncombustible Liquid
1,2-Dichlorobenzene	95-50-1	TWA 25 ppm STEL 50 ppm	C 50 ppm (300 mg/m3)	C 50 ppm (300 mg/m3)	200 ppm	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, nose; liver, kidney damage; skin blisters	Eyes, skin, respiratory system, liver, kidneys	Colorless to pale-yellow liquid with a pleasant, aromatic odor. [herbicide] BP: 357°F Fl.Pt. = 1°F LEL: 2.2% UEL: 9.2% Class IIIA Combustible Liquid: Fl.P. at or above 140°F and below 200°F.
1,2-Dichloroethane	107-06-2	TWA 10 ppm	Ca TWA 1 ppm (4 mg/m3) ST 2 ppm (8 mg/m3)	TWA 50 ppm C 100 ppm 200 ppm [5-minute maximum peak in any 3 hours]	Ca [50 ppm]	Inhalation, ingestion, skin absorption, skin and/or eye contact	Irritation eyes, corneal opacity; central nervous system depression; nausea, vomiting; dermatitis; liver, kidney, cardiovascular system damage; [potential occupational carcinogen]	Eyes, skin, kidneys, liver, central nervous system, cardiovascular system	Colorless liquid with a pleasant, chloroform-like odor. [Note: Decomposes slowly, becomes acidic & darkens in color.] BP: 182°F Fl.Pt. = 56°F LEL: 6.2% UEL: 16% Class IB Flammable Liquid Fl.P. below 73°F and BP at or above 100°F.
1,2-Dichloropropane	78-87-5	TWA 10 ppm Dermal Sensitizer (DSEN)	Ca	TWA 75 ppm (350 mg/m3)	Ca [400 ppm]	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, respiratory system; drowsiness, dizziness; liver, kidney damage; In Animals: central nervous system depression; [potential occupational carcinogen]	Eyes, skin, respiratory system, liver, kidneys, central nervous system	Colorless liquid with a chloroform-like odor. [pesticide] BP: 206°F Fl.Pt. = 60°F LEL: 3.4% UEL: 14.5% Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.
1,3-Dichlorobenzene	541-73-1	https://cameochemicals.noaa.gov/chemical/8514				Inhalation, skin absorption, ingestion, skin and/or eye contact	INHALATION: Causes headache, drousiness, unsteadiness. Irritating to mucous membranes. EYES: Severe irritation. SKIN: Severe irritation. INGESTION: Irritation of gastric mucosa, nausea, vomiting, diarrhea, abdominal cramps and cyanosis.		Colorless liquid. Sinks in water. BP: 343°F Fl.Pt. = 146°F LEL: 2.02% UEL: 9.2%
1,4-Dichlorobenzene	106-46-7	TWA 10 ppm	Ca	TWA 75 ppm (450 mg/m3)	Ca [150 ppm]	Inhalation, skin absorption, ingestion, skin and/or eye contact	Eye irritation, swelling periorbital (situated around the eye); profuse rhinitis; headache, anorexia, nausea, vomiting; weight loss, jaundice, cirrhosis; In Animals: liver, kidney injury; [potential occupational carcinogen]	Liver, respiratory system, eyes, kidneys, skin	Colorless or white crystalline solid with a mothball-like odor. [insecticide] BP: 345°F Fl.Pt. = 150°F LEL: 2.5% UEL: NA Combustible Solid, but may take some effort to ignite.

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at the Site.

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
1,4-Dioxane	123-91-1	TWA 20 ppm [skin]	Ca C 1 ppm (3.6 mg/m3) [30-minute]	TWA 100 ppm (360 mg/m3) [skin]	Ca [500 ppm]	Inhalation, skin absorption, ingestion, skin and/or eye contact	irritation eyes, skin, nose, throat; drowsiness, headache; nausea, vomiting; liver damage; kidney failure; [potential occupational carcinogen]	Eyes, skin, respiratory system, liver, kidneys	Colorless liquid or solid (below 53°F) with a mild, ether-like odor. BP: 214°F Fl.Pt. = 55°F LEL: 2.0% UEL: 22% Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F
2-Butanone	78-93-3	TWA 200 ppm STEL 300 ppm	TWA 200 ppm (590 mg/m3) ST 300 ppm (885 mg/m3)	TWA 200 ppm (590 mg/m3)	3000 ppm	inhalation, ingestion, skin and/or eye contact	irritation eyes, skin, nose; headache; dizziness; vomiting; dermatitis	Eyes, skin, respiratory system, central nervous system	Colorless liquid with a moderately sharp, fragrant, mint- or acetone-like odor BP: 175°F Fl.Pt. = 16°F LEL (200°F): 1.4% UEL (200°F): 11.4% Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F
2-Hexanone	591-78-6	TWA 5 ppm STEL 10 ppm [skin]	TWA 1 ppm (4 mg/m3)	TWA 100 ppm (410 mg/m3)	1600 ppm	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, nose; peripheral neuropathy: lassitude (weakness, exhaustion), paresthesia; dermatitis; headache, drowsiness	Eyes, skin, respiratory system, central nervous system, peripheral nervous system	Colorless liquid with an acetone-like odor BP: 262°F Fl.Pt. = 77°F LEL: NA UEL: 8.0% Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F
4-Methyl-2-pentanone	108-10-1	TWA 20 ppm STEL 75 ppm	TWA 50 ppm (205 mg/m3) ST 75 ppm (300 mg/m3)	TWA 100 ppm (410 mg/m3)	500 ppm	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, mucous membrane; headache, narcosis, coma; dermatitis; In Animals: liver, kidney damage	Eyes, skin, respiratory system, central nervous system, liver, kidneys	Colorless liquid with a pleasant odor BP: 242°F Fl.Pt. = 64°F LEL (200°F): 1.2% UEL (200°F): 8.0% Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F
Acetone	67-64-1	TWA 250 ppm STEL 500 ppm	TWA 250 ppm (590 mg/m^3)	TWA 1000 ppm (2400 mg/m^3)	2500 ppm [10% LEL]	Inhalation, ingestion, skin and/or eye contact	irritation eyes, nose, throat; headache, dizziness, central nervous system depression; dermatitis	Eyes, skin, respiratory system, central nervous system	Colorless liquid with a fragrant, mint-like odor BP: 133°F Fl.Pt. = 0°F LEL: 12.8% UEL: 2.5% Class IB Flammable liquid: Fl.P. below 73°F and BP at or above 100°F.
Benzene	71-43-2	TWA 0.5 ppm STEL 2.5 ppm	Ca TWA 0.1 ppm ST 1 ppm	TWA 1 ppm ST 5 ppm	Ca [500 ppm]	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude (weakness, exhaustion); dermatitis; bone marrow depression; [potential occupational carcinogen]	Eyes, skin, respiratory system, blood, central nervous system, bone marrow	Colorless to light yellow liquid with an aromatic odor [Note: Solid below 42 °F] BP: 176°F Fl.Pt. = 12°F LEL: 1.2% UEL: 7.8% Class IB Flammable liquid. Fl.P. below 73°F and BP at or above 100°F
Bromochloromethane	74-97-5	TWA 200 ppm	TWA 200 ppm (1050 mg/m3)	TWA 200 ppm (1050 mg/m3)	2000 ppm	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, throat; confusion, dizziness, central nervous system depression; pulmonary edema	Eyes, skin, respiratory system, liver, kidneys, central nervous system	Colorless to pale-yellow liquid with a chloroform-like odor. [Note: May be used as a fire extinguishing agent.] BP: 155°F Fl.Pt. = NA LEL: NA UEL: NA Noncombustible Liquid
Bromodichloromethane	75-27-4	https://cameochemicals.noaa.gov/chemical/16064				Inhalation, ingestion, skin and/or eye contact	Symptoms of exposure to this compound may include irritation of the skin, eyes, mucous membranes and respiratory tract. It may also cause narcosis. Other symptoms may include nausea, dizziness and headache.	Liver and kidney damage. Central nervous system effects may also occur.	Clear colorless liquid BP: 189°F Fl.Pt. = NA LEL: NA UEL: NA
Bromoform	75-25-2	TWA 0.5 ppm	TWA 0.5 ppm (5 mg/m3) [skin]	TWA 0.5 ppm (5 mg/m3) [skin]	850 ppm	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, respiratory system; central nervous system depression; liver, kidney damage	Eyes, skin, respiratory system, central nervous system, liver, kidneys	Colorless to yellow liquid with a chloroform-like odor. [Note: A solid below 47°F.] BP: 301°F Fl.Pt. = NA LEL: NA UEL: NA Noncombustible Liquid
Bromomethane	74-83-9	TWA 1 ppm [skin]	Ca	C 20 ppm (80 mg/m3) [skin]	Ca [250 ppm]	Inhalation, skin absorption (liquid), skin and/or eye contact (liquid)	Irritation eyes, skin, respiratory system; muscle weak, incoordination, visual disturbance, dizziness; nausea, vomiting, headache; malaise (vague feeling of discomfort); hand tremor; convulsions; dyspnea (breathing difficulty); skin vesiculation; liquid: frostbite; [potential occupational carcinogen]	Eyes, skin, respiratory system, central nervous system	Colorless gas with a chloroform-like odor at high concentrations. [Note: A liquid below 38°F. Shipped as a liquefied compressed gas.] BP: 38°F Fl.Pt. = NA (Gas) LEL: 10% UEL: 16.0% Flammable Gas, but only in presence of a high energy ignition source.

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at the Site.

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Carbon disulfide	75-15-0	TWA 1 ppm [skin]	TWA 1 ppm (3 mg/m3) ST 10 ppm (30 mg/m3) [skin]	TWA 20 ppm C 30 ppm 100 ppm (30-minute maximum peak)	500 ppm	Inhalation, skin absorption, ingestion, skin and/or eye contact	Dizziness, headache, poor sleep, lassitude (weakness, exhaustion), anxiety, anorexia, weight loss; psychosis; polyneuropathy; Parkinson-like syndrome; ocular changes; coronary heart disease; gastritis; kidney, liver injury; eye, skin burns; dermatitis; reproductive effects	Central nervous system, peripheral nervous system, cardiovascular system, eyes, kidneys, liver, skin, reproductive system	Colorless to faint-yellow liquid with a sweet ether-like odor. [Note: Reagent grades are foul smelling.] BP: 116°F Fl.Pt. = -22°F LEL: 1.3% UEL: 50.0% Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.
Carbon tetrachloride	56-23-5	TWA 5 ppm STEL 10 ppm [skin]	Ca ST 2 ppm (12.6 mg/m3) [60-minute]	TWA 10 ppm C 25 ppm 200 ppm (5-minute maximum peak in any 4 hours)	Ca [200 ppm]	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; central nervous system depression; nausea, vomiting; liver, kidney injury; drowsiness, dizziness, incoordination; [potential occupational carcinogen]	Central nervous system, eyes, lungs, liver, kidneys, skin	Colorless liquid with a characteristic ether-like odor BP: 170°F Fl.Pt. = NA LEL: NA UEL: NA Noncombustible Liquid
Chlorobenzene	108-90-7	TWA 10 ppm	NA	TWA 75 ppm (350 mg/m3)	1000 ppm	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose; drowsiness, incoordination; central nervous system depression; In Animals: liver, lung, kidney injury	Eyes, skin, respiratory system, central nervous system, liver	Colorless liquid with an almond-like odor BP: 270°F Fl.Pt. = 82°F LEL: 1.3% UEL: 9.6% Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.
Chloroethane	75-00-3	TWA 100 ppm [skin]	Handle with caution in the workplace	TWA 1000 ppm (2600 mg/m3)	3800 ppm [10%LEL]	Inhalation, skin absorption (liquid), ingestion (liquid), skin and/or eye contact	Incoordination, inebriation; abdominal cramps; cardiac arrhythmias, cardiac arrest; liver, kidney damage	Liver, kidneys, respiratory system, cardiovascular system, central nervous system	Colorless gas or liquid (below 54°F) with a pungent, ether-like odor. [Note: Shipped as a liquefied compressed gas.] BP: 54°F Fl.Pt. = NA (gas), -58°F (liquid) LEL: 3.8% UEL: 15.4% Flammable Gas
Chloroform	67-66-3	TWA 10 ppm	Ca ST 2 ppm (9.78 mg/m3) [60-minute]	C 50 ppm (240 mg/m3)	Ca [500 ppm]	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; dizziness, mental dullness, nausea, confusion; headache, lassitude (weakness, exhaustion); anesthesia; enlarged liver; [potential occupational carcinogen]	Liver, kidneys, heart, eyes, skin, central nervous system	Colorless liquid with a pleasant odor BP: 143°F Fl.Pt. = -82°F LEL: NA UEL: NA Noncombustible Liquid
Chloromethane	74-87-3	TWA 50 ppm STEL 100 ppm	Ca	TWA 100 ppm C 200 ppm 300 ppm (5-minute maximum peak in any 3 hours)	Ca [2000 ppm]	Inhalation, skin and/or eye contact (liquid)	Dizziness, nausea, vomiting; visual disturbance, stagger, slurred speech, convulsions, coma; liver, kidney damage; liquid: frostbite; reproductive, teratogenic effects; [potential occupational carcinogen]	Central nervous system, liver, kidneys, reproductive system	Colorless gas with a faint, sweet odor which is not noticeable at dangerous concentrations. [Note: Shipped as a liquefied compressed gas.] BP: -12°F Fl.Pt. = NA (Gas) LEL: 8.1% UEL: 17.4% Flammable Gas
cis-1,2-Dichloroethene	156-59-2	TWA 200 ppm (All isomers)	TWA 200 ppm (790 mg/m3)	TWA 200 ppm (790 mg/m3)	1000 ppm	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, respiratory system; central nervous system depression	Eyes, respiratory system, central nervous system	Colorless liquid (usually a mixture of the cis & trans isomers) with a slightly acrid, chloroform-like odor. BP: 118-140°F Fl.Pt. = 36-39°F LEL: 5.6% UEL: 12.8% Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F
cis-1,3-Dichloropropene	10061-01-5	https://cameochemicals.noaa.gov/chemical/20168				Inhalation, ingestion, skin and/or eye contact	Symptoms of exposure to this compound may include local irritation of the eyes skin and respiratory tract; dermatitis, gasping, coughing, substernal pain, extreme respiratory distress, lacrimation, central nervous system depression, skin irritation, acute gastrointestinal distress with pulmonary congestion and edema. It also may cause injury to the liver, kidneys and heart.	Skin, eyes, mucous membranes, liver, kidney, heart	Colorless to amber liquid with a sweetish odor. BP: 219.7°F Fl.Pt. = NA LEL: NA UEL: NA
Cyclohexane	110-82-7	TWA 100 ppm	TWA 300 ppm (1050 mg/m3)	TWA 300 ppm (1050 mg/m3)	1300 ppm [10%LEL]	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, respiratory system; drowsiness; dermatitis; narcosis, coma	Eyes, skin, respiratory system, central nervous system	Colorless liquid with a sweet, chloroform-like odor. [Note: A solid below 44°F.] BP: 177°F Fl.Pt. = 0°F LEL: 1.3% UEL: 8.0% Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.
Dibromochloromethane	124-48-1	https://cameochemicals.noaa.gov/chemical/16183				Inhalation, ingestion, skin and/or eye contact	Symptoms of exposure to this compound may include irritation of the skin, eyes, mucous membranes and upper respiratory tract. It may also cause fatigue. Other symptoms may include central nervous system effects, lung and cornea irritation and liver and kidney damage. Prolonged exposure can cause nausea, dizziness, headache and narcosis.	Skin, eyes, mucous membranes, upper respiratory tract	Clear colorless to yellow-orange liquid BP: 246-248°F Fl.Pt. = Greater than 200°F LEL: NA UEL: NA

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at the Site.

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Dichlorodifluoromethane	75-71-8	TWA 1000 ppm	TWA 1000 ppm (4950 mg/m3)	TWA 1000 ppm (4950 mg/m3)	15,000 ppm	Inhalation, skin and/or eye contact (liquid)	Dizziness, tremor, asphyxia, unconsciousness, cardiac arrhythmias, cardiac arrest; liquid: frostbite	Cardiovascular system, peripheral nervous system	Colorless gas with an ether-like odor at extremely high concentrations. [Note: Shipped as a liquefied compressed gas.] BP: -22°F Fl.Pt. = NA LEL: NA UEL: NA Nonflammable Gas
Ethyl benzene	100-41-4	TWA 20 ppm	TWA 100 ppm (435 mg/m^3) ST 125 ppm (545 mg/m^3)	TWA 100 ppm (435 mg/m^3)	800 ppm [10%LEL]	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, mucous membrane; headache; dermatitis; narcosis, coma	Eyes, skin, respiratory system, central nervous system	Colorless liquid with an aromatic odor. BP: 277°F Fl.Pt. = 55°F LEL: 0.8% UEL: 6.7% Class IB Flammable Liquid below 73°F and BP at or above 100°F.
Isopropyl benzene	98-82-8	TWA 5 ppm	TWA 50 ppm (245 mg/m3) [skin]	TWA 50 ppm (245 mg/m3) [skin]	900 ppm [10%LEL]	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, mucous membrane; dermatitis; headache, narcosis, coma	Eyes, skin, respiratory system, central nervous system	Colorless liquid with a sharp, penetrating, aromatic odor BP: 306°F Fl.Pt. = 96°F LEL: 0.9% UEL: 6.5% Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F
Methyl Acetate	79-20-9	TWA 200 ppm STEL 250 ppm	TWA 200 ppm (610 mg/m3) ST 250 ppm (760 mg/m3)	TWA 200 ppm (610 mg/m3)	3100 ppm [10%LEL]	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat; headache, drowsiness; optic nerve atrophy; chest tightness; In Animals: narcosis	Eyes, skin, respiratory system, central nervous system	Colorless liquid with a fragrant, fruity odor BP: 135°F Fl.Pt. = 14°F LEL: 3.1% UEL: 16% Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.
Methylcyclohexane	108-87-2	TWA 400 ppm	TWA 400 ppm (1600 mg/m3)	TWA 500 ppm (2000 mg/m3)	1200 ppm [LEL]	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat; dizziness, drowsiness; In Animals: narcosis	Eyes, skin, respiratory system, central nervous system	Colorless liquid with a faint, benzene-like odor BP: 214°F Fl.Pt. = 25°F LEL: 1.2% UEL: 6.7% Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.
Methylene chloride	75-09-2	TWA 50 ppm [skin] STEL 100 ppm	Ca	[1910.1052] TWA 25 ppm ST 125 ppm	Ca [2300 ppm]	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; lassitude (weakness, exhaustion), drowsiness, dizziness; numb, tingle limbs; nausea; [potential occupational carcinogen]	Eyes, skin, cardiovascular system, central nervous system	Colorless liquid with a chloroform-like odor. [Note: A gas above 104°F.] BP: 104°F Fl.Pt. = NA LEL: 13% UEL: 23% Combustible Liquid
Methyl-t-butyl ether	1634-04-4	TWA 50 ppm	NA	NA	NA	Inhalation, skin absorption, ingestion, skin and/or eye contact	May cause dizziness or suffocation. Contact may irritate or burn eyes or skin. May be harmful if swallowed.	Eyes, skin	A colorless liquid with a distinctive anesthetic-like odor. BP: 131°F Fl.Pt. = -14°F LEL: NA UEL: NA
o-Xylene	95-47-6	TWA 20 ppm (All isomers)	TWA 100 ppm (435 mg/m3) ST 150 ppm (655 mg/m3)	TWA 100 ppm (435 mg/m3)	900 ppm	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis	Eyes, skin, respiratory system, central nervous system, gastrointestinal tract, blood, liver, kidneys	Colorless liquid with an aromatic odor BP: 292°F Fl.Pt. = 90°F LEL: 0.9% UEL: 6.7% Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F
Styrene	100-42-5	TWA 10 ppm STEL 20 ppm OTO (ototoxicant)	TWA 50 ppm (215 mg/m3) ST 100 ppm (425 mg/m3)	TWA 100 ppm C 200 ppm 600 ppm (5-minute maximum peak in any 3 hours)	700 ppm	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, nose, respiratory system; headache, lassitude (weakness, exhaustion), dizziness, confusion, malaise (vague feeling of discomfort), drowsiness, unsteady gait; narcosis; defatting dermatitis; possible liver injury; reproductive effects	Eyes, skin, respiratory system, central nervous system, liver, reproductive system	Colorless to yellow, oily liquid with a sweet, floral odor BP: 293°F Fl.Pt. = 88°F LEL: 0.9% UEL: 6.8% Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F
Tetrachloroethene	127-18-4	TWA 25 ppm STEL 100 ppm	Ca Minimize workplace exposure concentrations	TWA 100 ppm C 200 ppm (for 5 minutes in any 3-hour period), with a maximum peak of 300 ppm	Ca [150 ppm]	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, incoordination; headache, drowsiness; skin erythema (skin redness); liver damage; [potential occupational carcinogen]	Eyes, skin, respiratory system, liver, kidneys, central nervous system	Colorless liquid with a mild, chloroform-like odor BP: 250°F Fl.Pt. = NA LEL: NA UEL: NA Noncombustible Liquid, but decomposes in a fire to hydrogen chloride and phosgene

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at the Site.

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Sodium Hydroxide	1310-73-2	Ceiling 2 mg/m^3	C 2 mg/m^3	TWA 2 mg/m^3	10 mg/m^3	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, mucous membrane; pneumonitis; eye, skin burns; temporary loss of hair	Eyes, skin, respiratory system	Colorless to white, odorless solid (flakes, beads, granular form). BP: 2534°F Fl.Pt. = NA LEL: NA UEL: NA Noncombustible Solid, but when in contact with water may generate sufficient heat to ignite combustible materials.
Sulfuric Acid	7664-93-9	TWA 0.2 mg/m^3 (as thoracic particulate mass)	TWA 1 mg/m^3	TWA 1 mg/m^3	15 mg/m^3	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat; pulmonary edema, bronchitis; emphysema; conjunctivitis; stomatis; dental erosion; eye, skin burns; dermatitis	Eyes, skin, respiratory system, teeth	Colorless to dark-brown, oily, odorless liquid.[Note: Pure compound is a solid below 51°F. Often used in an aqueous solution.] BP = 554°F Fl.Pt. = NA LEL = NA UEL = NA Noncombustible Liquid, but capable of igniting finely divided combustible materials.
trans-1,2-Dichloroethene	156-60-5	200 ppm (All isomers)	TWA 200 ppm (790 mg/m3)	TWA 200 ppm (790 mg/m3)	1000 ppm	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, respiratory system; central nervous system depression	Eyes, respiratory system, central nervous system	Colorless liquid (usually a mixture of the cis & trans isomers) with a slightly acrid, chloroform-like odor. BP: 118-140°F Fl.P: 36-39°F LEL: 5.6% UEL: 12.8% Class IB Flammable Liquid Fl.P. below 73°F and BP at or above 100°F.
trans-1,3-Dichloropropene	10061-02-6	https://cameochemicals.noaa.gov/chemical/18110				Inhalation, ingestion, skin and/or eye contact	Symptoms of exposure to this compound may include local irritation of the eyes skin and respiratory tract, dermatitis, gasping, coughing, substernal pain, extreme respiratory distress, lacrimation, central nervous system depression, acute gastrointestinal distress with pulmonary congestion and edema. It may also cause injury to the liver, kidneys and heart	Skin, eyes, mucous membranes, liver, kidney, heart	A clear colorless liquid with chloroform odor BP: 234°F Fl.P: NA LEL: NA UEL: NA
Toluene	108-88-3	TWA 20 ppm (ototoxicant)	TWA 100 ppm (375 mg/m^3) ST 150 ppm (560 mg/m^3)	TWA 200 ppm C 300 ppm 500 ppm (10-minute maximum peak)	500 ppm	Inhalation, skin absorption, ingestion, skin and/or eye contact	irritation eyes, nose; lassitude (weakness, exhaustion), confusion, euphoria, dizziness, headache; dilated pupils, lacrimation (discharge of tears); anxiety, muscle fatigue, insomnia; paresthesia; dermatitis; liver, kidney damage	Eyes, skin, respiratory system, central nervous system, liver, kidneys	Colorless liquid with a sweet, pungent, benzene-like odor. BP: 232°F Fl.P: 40°F LEL: 1.1% UEL: 7.1% Class IB Flammable Liquid Fl.P. below 73°F and BP at or above 100°F.
Trichloroethene (TCE)	79-01-6	TWA 10 ppm STEL 25 ppm	Ca	TWA 100 ppm C 200 ppm 300 ppm (5-minute maximum peak in any 2 hours)	Ca [1000 ppm]	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury; [potential occupational carcinogen]	Eyes, skin, respiratory system, heart, liver, kidneys, central nervous system	Colorless liquid (unless dyed blue) with a chloroform-like odor. BP: 189°F Fl.Pt. = NA LEL(77°F): 8.0% UEL(77°F): 10.5% Combustible Liquid, but burns with difficulty
Trichlorofluoromethane	75-69-4	STEL C 1000 ppm	C 1000 ppm (5600 mg/m3)	TWA 1000 ppm (5600 mg/m3)	2000 ppm	Inhalation, ingestion, skin and/or eye contact	Incoordination, tremor; dermatitis; cardiac arrhythmias, cardiac arrest; asphyxia; liquid: frostbite	Skin, respiratory system, cardiovascular system	Colorless to water-white, nearly odorless liquid or gas (above 75°F) BP: 75°F Fl.P: NA LEL: NA UEL: NA Noncombustible Liquid Nonflammable Gas
Vinyl Chloride (chloroethylene)	75-01-4	TWA 1 ppm	Ca	TWA 1 ppm C 5 ppm [15-minute]	Ca (ND)	Inhalation, skin and/or eye contact (liquid)	Lassitude (weakness, exhaustion); abdominal pain, gastrointestinal bleeding; enlarged liver; pallor or cyanosis of extremities; liquid: frostbite; [potential occupational carcinogen]	Liver, central nervous system, blood, respiratory system, lymphatic system	Colorless gas or liquid (below 7°F) with a pleasant odor at high concentrations.[Note: Shipped as a liquefied compressed gas.] BP: 7°F Fl.Pt. = NA (Gas) LEL: 3.6% UEL: 33.0% Flammable Gas
Xylene (m, o & p isomers)	108-38-3, 95-47-6, 106-42-3	TWA 20 ppm	NA	NA	NA	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis	Eyes, skin, respiratory system, central nervous system, gastrointestinal tract, blood, liver, kidneys	Colorless liquid with an aromatic odor BP: 282°F, 292°F, 281°F Fl. Pt. 82°F, 90°F, 81°F LEL: 1.1%, 0.9%, 1.1% UEL: 7.0%, 6.7%, 7.0% Class IC Flammable Liquid at or above 73°F and below 100°F.
Zinc Oxide (dust)	7440-66-6	TWA 2 mg/m3 (repsirable) STEL 10 mg/m^3 (respirable)	TWA 5 mg/m^3 C 15 mg/m^3	TWA 15 mg/m^3 (total dust) TWA 5 mg/m^3 (resp dust) TWA 5 mg/m^3 (fume)	500 mg/m^3	Inhalation	Metal fume fever: chills, muscle ache, nausea, fever, dry throat, cough; lassitude (weakness, exhaustion); metallic taste; headache; blurred vision; low back pain; vomiting; malaise (vague feeling of discomfort); chest tightness; dyspnea (breathing difficulty), rales, decreased pulmonary function	Respiratory system	White, odorless solid. BP: NA Fl.Pt. = NA LEL: NA UEL: NA Noncombustible Solid
SEMI-VOLATILE ORGANIC COMPOUNDS (SVOCs)									

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at the Site.

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
2-Chloronaphthalene	91-58-7	https://cameochemicals.noaa.gov/chemical/16185				Inhalation, ingestion, skin and/or eye contact	Chloracne, cysts, headache, fatigue, vertigo, anorexia and jaundice		Monoclinic plates or off-white crystalline powder BP: NA Fl.Pt. = NA LEL: NA UEL: NA
2-Methylnaphthalene	91-57-6	TWA 0.5 ppm TLV-SL 3 mg/100 cm2 [skin]	https://cameochemicals.noaa.gov/chemical/20668			Inhalation, ingestion, skin and/or eye contact	Headaches, nausea, vomiting, diarrhea, anemia, jaundice, euphoria, dermatitis, visual disturbances, convulsions and comatose	Skin, eyes, mucous membranes and upper respiratory tract	White crystalline solid Combustible solid BP: 466-468 ° F Fl.Pt. = 208 ° F LEL: NA UEL: NA
Acenaphthene	83-32-9	https://cameochemicals.noaa.gov/chemical/10358				Inhalation, ingestion, skin and/or eye contact	Irritation of the skin, eyes, mucous membranes and upper respiratory tract, vomiting	Skin, eyes, mucous membranes and upper respiratory tract	White needles BP: 534 ° F Fl.Pt. = NA LEL: 0.6% UEL: NA
Acenaphthylene	208-96-8	https://cameochemicals.noaa.gov/chemical/16157				Inhalation, ingestion, skin and/or eye contact			Colorless crystalline solid BP: 509 to 527 ° F at 760 mm Hg Fl.Pt. = NA LEL: NA UEL: NA
Anthracene (as coal tar pitch volatiles)	120-12-7	TWA 0.2 mg/m3 (as Benzene solubles)	Ca TWA 0.1 mg/m3 (cyclohexane-extractable fraction)	TWA 0.2 mg/m3 (benzene-soluble fraction) [1910.1002]	Ca [80 mg/m3]	Inhalation, skin and/or eye contact	Dermatitis, bronchitis, [potential occupational carcinogen]	Respiratory system, skin, bladder, kidneys	Black or dark-brown amorphous residue BP: NA Fl.Pt. = NA LEL: NA UEL: NA Combustible Solids
Benzo[a]anthracene	56-55-3	https://cameochemicals.noaa.gov/chemical/16171				Inhalation, injestion, skin and/or eye contact			Colorless leaflets or plates or coarse gold powder with a greenish-yellow fluorescence. May reasonably be expected to be a carcinogen. BP: 815° F at 760 mm Hg Fl.Pt. = NA LEL: NA UEL: NA
Benzo[a]pyrene (as coal tar pitch volatiles)	50-32-8	TWA 0.2 mg/m3 (as Benzene solubles)	Ca TWA 0.1 mg/m3 (cyclohexane-extractable fraction)	TWA 0.2 mg/m3 (benzene-soluble fraction) [1910.1002]	Ca [80 mg/m3]	Inhalation, skin and/or eye contact	Dermatitis, bronchitis, [potential occupational carcinogen]	Respiratory system, skin, bladder, kidneys	Black or dark-brown amorphous residue BP: NA Fl.Pt. = NA LEL: NA UEL: NA Combustible Solids
Benzo[b]fluoranthene	205-99-2	None listed	https://cameochemicals.noaa.gov/chemical/16172			Inhalation, injestion, skin and/or eye contact			Needles or yellow fluffy powder BP: NA Fl.Pt. = NA LEL: NA UEL: NA
Benzo[g,h,i]perylene	191-24-2	https://cameochemicals.noaa.gov/chemical/16174				Inhalation, injestion, skin and/or eye contact	Inhalation of material may be harmful. Contact may cause burns to skin and eyes. Inhalation of Asbestos dust may have a damaging effect on the lungs. Fire may produce irritating, corrosive and/or toxic gases. Some liquids produce vapors that may cause dizziness or suffocation. Runoff from fire control may cause pollution.	Lungs, skin, eyes	Colorless to white crystalline solid. Water insoluble. BP: NA Fl.Pt. = NA LEL: NA UEL: NA
Benzo[k]fluoranthene	207-08-9	https://cameochemicals.noaa.gov/chemical/16173				Inhalation, injestion, skin and/or eye contact	When heated to decomposition this compound emits acrid smoke and irritating fumes.		Pale yellow needles or yellow crystalline solid BP: 896° F Fl.Pt. = NA LEL: NA UEL: NA
Chrysene (as coal tar pitch volatiles	218-01-9	TWA 0.2 mg/m3 (as Benzene solubles)	Ca TWA 0.1 mg/m3 (cyclohexane-extractable fraction)	TWA 0.2 mg/m3 (benzene-soluble fraction) [1910.1002]	Ca [80 mg/m3]	Inhalation, skin and/or eye contact	Dermatitis, bronchitis, [potential occupational carcinogen]	Respiratory system, skin, bladder, kidneys	Black or dark-brown amorphous residue BP: NA Fl.Pt. = NA LEL: NA UEL: NA Combustible Solids
Dibenzo(a,h)anthracene	53-70-3	https://cameochemicals.noaa.gov/chemical/16192				Inhalation, injestion, skin and/or eye contact	Symptoms of exposure to this compound may include irritation. This compound is harmful if swallowed or inhaled. It may cause irritation. When heated to decomposition it emits acrid smoke, irritating fumes and toxic fumes of carbon monoxide and carbon dioxide.	Lungs	White crystals or pale yellow solid. Sublimes BP: 975° F Fl.Pt. = NA LEL: NA UEL: NA
Fluoranthene	206-44-0	https://cameochemicals.noaa.gov/chemical/16213				Inhalation, injestion, skin and/or eye contact	When heated to decomposition this compound emits acrid smoke and fumes.		Light yellow fine crystals BP: 482° F Fl.Pt. = NA LEL: NA UEL: NA

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at the Site.

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Fluorene	86-73-7	https://cameochemicals.noaa.gov/chemical/16214				Inhalation, injestion, skin and/or eye contact			White leaflets. Sublimes easily under a vacuum. Fluorescent when impure. BP: 563° F Fl.Pt. = NA LEL: NA UEL: NA
Indeno[1,2,3-cd]pyrene	193-39-5	https://cameochemicals.noaa.gov/chemical/16218				Inhalation, injestion, skin and/or eye contact			Yellow crystals BP: 997° F Fl.Pt. = NA LEL: NA UEL: NA
Naphthalene	91-20-3	TWA 10 ppm [skin]	TWA 10 ppm (50 mg/m3) ST 15 ppm (75 mg/m3)	TWA 10 ppm (50 mg/m3)	250 ppm	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes; headache, confusion, excitement, malaise (vague feeling of discomfort); nausea, vomiting, abdominal pain; irritation bladder; profuse sweating; jaundice; hematuria (blood in the urine), renal shutdown; dermatitis, optical neuritis, corneal damage	Eyes, skin, blood, liver, kidneys, central nervous system	Colorless to brown solid with an odor of mothballs. [Note: Shipped as a molten solid.] BP: 424°F Fl.P: 174°F LEL: 0.9% UEL: 5.9% Combustible Solid, but will take some effort to ignite
Phenanthrene	85-01-8	https://cameochemicals.noaa.gov/chemical/16236				Inhalation, injestion, skin and/or eye contact	Symptoms following exposure to this compound may include skin sensitization, dermatitis, bronchitis, cough, dyspnea, respiratory neoplasm, kidney neoplasm, skin irritation, and respiratory irritation.	Skin, respiratory tract	Colorless monoclinic crystals with a faint aromatic odor. Solutions exhibit a blue fluorescence. BP: 642° F Fl.Pt. = 340° F LEL: NA UEL: NA
Pyrene (see coal tar pitch volatiles)	129-00-0	TWA 0.2 mg/m3 (as Benzene solubles)	Ca TWA 0.1 mg/m3 (cyclohexane-extractable fraction)	TWA 0.2 mg/m3 (benzene-soluble fraction) [1910.1002]	Ca [80 mg/m3]	Inhalation, skin and/or eye contact	Dermatitis, bronchitis, [potential occupational carcinogen]	Respiratory system, skin, bladder, kidneys	Black or dark-brown amorphous residue BP: NA Fl.Pt. = NA LEL: NA UEL: NA Combustible Solids
METALS									
Aluminum	7429-90-5	TWA 1 mg/m3	TWA 10 mg/m^3 (total) TWA 5 mg/m^3 (resp)	TWA 15 mg/m^3 (total) TWA 5 mg/m^3 (resp)	N.D.	Inhalation, skin and/or eye contact	Irritation eyes, skin, respiratory system	Eyes, skin, respiratory system	Silvery-white, malleable, ductile, odorless metal BP: 4221°F Fl.Pt. = NA LEL: NA UEL: NA Combustible Solid, finely divided dust is easily ignited; may cause explosions
Antimony	7440-36-0	TWA 0.5 mg/m3 (as Sb)	TWA 0.5 mg/m3 [*Note: The REL also applies to other antimony compounds (as Sb).]	TWA 0.5 mg/m3 [*Note: The PEL also applies to other antimony compounds (as Sb).]	50 mg/m3 (as Sb)	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat, mouth; cough; dizziness; headache; nausea, vomiting, diarrhea; stomach cramps; insomnia; anorexia; unable to smell properly	Eyes, skin, respiratory system, cardiovascular system	Silver-white, lustrous, hard, brittle solid; scale-like crystals; or a dark-gray, lustrous powder BP: 2975°F Fl.Pt. = NA LEL: NA UEL: NA Noncombustible Solid in bulk form, but a moderate explosion hazard in the form of dust when exposed to flame.
Arsenic	7440-38-2	TWA 0.01 mg/m3	Ca C 0.002 mg/m3 [15-minute]	[1910.1018] TWA 0.010 mg/m3	Ca [5 mg/m3 (as As)]	Inhalation, skin absorption, skin and/or eye contact, ingestion	Ulceration of nasal septum, dermatitis, gastrointestinal disturbances, peripheral neuropathy, resp irritation, hyperpigmentation of skin, [potential occupational carcinogen]	Liver, kidneys, skin, lungs, lymphatic system	Metal: Silver-gray or tin-white, brittle, odorless solid BP: Sublimes Fl.Pt. = NA LEL: NA UEL: NA Metal: Noncombustible Solid in bulk form, but a slight explosion hazard in the form of dust when exposed to flame
Barium	7440-39-3	TWA 0.5 mg/m3	0.5 mg Ba/m3 TWA	0.5 mg Ba/m3 TWA	50 mg Ba/m3	Inhalation, ingestion, skin and/or eye contact	Inhalation or contact with vapors, substance or decomposition products may cause severe injury or death. Contact may cause burns to skin, eyes, and mucous membranes. May be toxic by ingestion, inhalation and skin absorption. Used to make other chemicals.	Lungs, skin, eyes, and mucous membrane	A silver to white metallic solid BP: 1337°F Fl.Pt. = NA LEL: NA UEL: NA
Beryllium	7440-41-7	TWA 0.00005 mg/m^3	Ca C 0.0005 mg/m^3	TWA 0.002 mg/m^3 C 0.005 mg/m^3 0.025 mg/m3 [30-minute maximum peak]	Ca [4 mg/m^3 (as Be)]	Inhalation, skin and/or eye contact	Berylliosis (chronic exposure): anorexia, weight loss, lassitude (weakness, exhaustion), chest pain, cough, clubbing of fingers, cyanosis, pulmonary insufficiency; irritation eyes; dermatitis; [potential occupational carcinogen]	Eyes, skin, respiratory system	Hard, brittle, gray-white solid BP: 4532°F Fl.Pt. = NA LEL: NA UEL: NA Noncombustible Solid in bulk form, but a slight explosion hazard in the form of a powder or dust

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at the Site.

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Cadmium	7440-43-9	TWA 0.01 mg/m^3 total dust TWA 0.002 mg/m^3 (as Cd) respirable fraction	Ca	TWA 0.005 mg/m^3	Ca [9 mg/m3 (as Cd)]	Inhalation, ingestion	Pulmonary edema, dyspnea (breathing difficulty), cough, chest tightness, substernal (occurring beneath the sternum) pain; headache; chills, muscle aches; nausea, vomiting, diarrhea; anosmia (loss of the sense of smell), emphysema, proteinuria, mild anemia; [potential occupational carcinogen]	Respiratory system, kidneys, prostate, blood	Silver-white/blue tinged lustrous, odorless solid. BP: 1409°F Fl.Pt. = NA LEL: NA UEL: NA Noncombustible - will burn in powder form
Calcium	7440-70-2	https://cameochemicals.noaa.gov/chemical/309				Inhalation, ingestion, skin and/or eye contact	Contact with eyes or skin produces caustic burns.	Eyes, skin	A silvery, soft metal that turns grayish white on exposure to air. BP: 2714°F Fl.Pt. = NA LEL: NA UEL: NA
Chromium	7440-47-3	TWA 0.5 mg/m^3 (metal) TWA 0.003 mg/m^3 (water-soluble Cr III compounds) TWA 0.0002 mg/m^3 (water-soluble Cr VI compounds) STEL 0.0005 mg/m3 (water-soluble Cr VI compounds)	TWA 0.5 mg/m^3	TWA 1 mg/m^3	250 mg/m^3 (as Cr)	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin; lung fibrosis (histologic)	Eyes, skin, respiratory system	Blue-white to steel-gray, lustrous, brittle, hard, odorless solid. BP: 4788°F Fl.Pt. = NA LEL: NA UEL: NA Noncombustible - will burn in dust form if heated in a flame
Cobalt	7440-48-4	TWA 0.02 mg/m3 [DSEN] [RSEN]	TWA 0.05 mg/m3	TWA 0.1 mg/m3	20 mg/m3 (as Co)	Inhalation, ingestion, skin and/or eye contact	Cough, dyspnea (breathing difficulty), wheezing, decreased pulmonary function; weight loss; dermatitis; diffuse nodular fibrosis; resp hypersensitivity, asthma	Skin, respiratory system	Odorless, silver-gray to black solid BP: 5612°F Fl.Pt. = NA LEL: NA UEL: NA Noncombustible Solid in bulk form, but finely divided dust will burn at high temperatures.
Copper	7440-50-8	TWA 0.2 mg/m^3 (fume) TWA 1 mg/m3 (dusts and mists)	TWA 1 mg/m^3	TWA 1 mg/m^3	100 mg/m^3 (as Cu)	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, nose, pharynx; nasal septum perforation; metallic taste; dermatitis; In Animals: lung, liver, kidney damage; anemia	Eyes, skin, respiratory system, liver, kidneys (increased risk with Wilson's disease)	Reddish, lustrous, malleable, odorless solid. BP: 4703°F Fl.Pt. = NA LEL: NA UEL: NA Noncombustible - powdered form may ignite
Iron (as iron oxide)	7439-89-6	TWA 5 mg/m3 (respirable particulate mass)	TWA 1 mg/m^3	NA	NA	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, mucous membrane; abdominal pain, diarrhea, vomiting; possible liver damage	Eyes, skin, respiratory system, liver, gastrointestinal tract	Appearance and odor vary depending upon the specific soluble iron salt. BP: NA Fl.Pt. = NA LEL: NA UEL: NA Noncombustible Solids
Lead	7439-92-1	TWA 0.05 mg/m3	TWA (8-hour) 0.050 mg/m3	[1910.1025] TWA 0.050 mg/m3	100 mg/m3 (as Pb)	Inhalation, ingestion, skin and/or eye contact	Lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation eyes; hypertension	Eyes, gastrointestinal tract, central nervous system, kidneys, blood, gingival tissue	A heavy, ductile, soft, gray solid BP: 3164°F Fl.Pt. = NA LEL: NA UEL: NA Noncombustible Solid in bulk form
Magnesium	7439-95-4	https://cameochemicals.noaa.gov/chemical/6949				Eye and/or skin contact	Dust irritates eyes in same way as any foreign material. Penetration of skin by fragments of metal is likely to produce local irritation, blisters, and ulcers which may become infected.	Eyes	A light silvery metal BP: 1202°F Fl.Pt. = NA LEL: NA UEL: NA
Manganese	7439-96-5	TWA 0.02 mg/m3 [R] TWA 0.1 mg/m3 [I]	TWA 1 mg/m3 ST 3 mg/m3	C 5 mg/m3	500 mg/m3 (as Mn)	inhalation, ingestion	Manganism; asthenia, insomnia, mental confusion; metal fume fever: dry throat, cough, chest tightness, dyspnea (breathing difficulty), rales, flu-like fever; low-back pain; vomiting; malaise (vague feeling of discomfort); lassitude (weakness, exhaustion); kidney damage	respiratory system, central nervous system, blood, kidneys	A lustrous, brittle, silvery solid BP: 3564°F Fl.Pt. = NA LEL: NA UEL: NA Metal: Combustible Solid
Mercury	7439-97-6	TWA 0.1 mg/m3, as Hg Aryl compounds TWA 0.025 mg/m3 as Hg, inorganic forms including metallic mercury	Hg Vapor: TWA 0.05 mg/m3 [skin] Other: C 0.1 mg/m3 [skin]	TWA 0.1 mg/m3	10 mg/m3 (as Hg)	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; cough, chest pain, dyspnea (breathing difficulty), bronchitis, pneumonitis; tremor, insomnia, irritability, indecision, headache, lassitude (weakness, exhaustion); stomatitis, salivation; gastrointestinal disturbance, anorexia, weight loss; proteinuria	Eyes, skin, respiratory system, central nervous system, kidneys	Metal: Silver-white, heavy, odorless liquid. [Note: "Other" Hg compounds include all inorganic & aryl Hg compounds except (organo) alkyls.] BP: 674°F Fl.Pt. = NA LEL: NA UEL: NA Metal: Noncombustible Liquid
Nickel	7440-02-0	TWA 1.5 mg/m^3 [elemental] TWA 0.1 mg/m^3 [soluble inorganic compound] TWA 0.2 mg/m^3 [insoluble inorganic compound] TWA 0.1 mg/m^3 [Nickel subsulfide]	Ca TWA 0.015 mg/m^3	TWA 1 mg/m^3	Ca [10 mg/m3 (as Ni)]	Inhalation, ingestion, skin and/or eye contact	Sensitization dermatitis, allergic asthma, pneumonitis; [potential occupational carcinogen]	Nasal cavities, lungs, skin	Lustrous, silvery, odorless solid. BP: 5139°F Fl.Pt. = NA LEL: NA UEL: NA Combustible Solid; nickel sponge catalyst may ignite spontaneously in air.

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at the Site.

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Potassium	9/7/7440	https://cameochemicals.noaa.gov/chemical/4289				Eye and/or skin contact	Will burn skin and eyes	Skin, eyes	Potassium is a soft silvery metal though normally grayish white due to oxidation BP: 1425°F Fl.Pt. = NA LEL: NA UEL: NA
Selenium	7782-49-2	TWA 0.2 mg/m3	TWA 0.2 mg/m3	TWA 0.2 mg/m3	1 mg/m3 (as Se)	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat; visual disturbance; headache; chills, fever; dyspnea (breathing difficulty), bronchitis; metallic taste, garlic breath, gastrointestinal disturbance; dermatitis; eye, skin burns; In Animals: anemia; liver necrosis, cirrhosis; kidney, spleen damage	Eyes, skin, respiratory system, liver, kidneys, blood, spleen	Amorphous or crystalline, red to gray solid. [Note: Occurs as an impurity in most sulfide ores.] BP: 1265°F Fl.Pt. = NA LEL: NA UEL: NA Combustible Solid
Silver	7440-22-4	TWA 0.1 mg/m3 [Metal, dust, and fume] TWA 0.01 mg/m3 [Soluble compounds, as Ag]	TWA 0.01 mg/m3	TWA 0.01 mg/m3	10 mg/m3 (as Ag)	Inhalation, ingestion, skin and/or eye contact	Blue-gray eyes, nasal septum, throat, skin; irritation, ulceration skin; gastrointestinal disturbance	Nasal septum, skin, eyes	Metal: White, lustrous solid BP: 3632°F Fl.Pt. = NA LEL: NA UEL: NA Metal: Noncombustible Solid, but flammable in form of dust or powder
Sodium	7440-23-5	https://cameochemicals.noaa.gov/chemical/7794				Skin contact	Severe burns caused by burning metal or by caustic soda formed by reaction with moisture on skin	Skin	A silvery soft metal that becomes grayish white upon exposure to air BP: 1621°F Fl.Pt. = NA LEL: NA UEL: NA
Thallium	7440-28-0	0.02 mg/m3 inhallable particulate matter	TWA 0.1 mg/m3 [skin]	TWA 0.1 mg/m3 [skin]	15 mg/m3 (as Tl)	Inhalation, skin absorption, ingestion, skin and/or eye contact	Nausea, diarrhea, abdominal pain, vomiting; ptosis, strabismus; peri neuritis, tremor; retrosternal (occurring behind the sternum) tightness, chest pain, pulmonary edema; convulsions, chorea, psychosis; liver, kidney damage; alopecia; paresthesia legs	Eyes, respiratory system, central nervous system, liver, kidneys, gastrointestinal tract, body hair	Appearance and odor vary depending upon the specific soluble thallium compound BP: NA Fl.Pt. = NA LEL: NA UEL: NA
Vanadium	7440-62-2	https://cameochemicals.noaa.gov/chemical/16147				Inhalation, skin absorption, ingestion, skin and/or eye contact	Highly toxic, may be fatal if inhaled, swallowed or absorbed through skin. Avoid any skin contact. Effects of contact or inhalation may be delayed. Fire may produce irritating, corrosive and/or toxic gases. Runoff from fire control or dilution water may be corrosive and/or toxic and cause pollution	Skin	Silvery-whitish powder BP: NA Fl.Pt. = NA LEL: NA UEL: NA
Zinc	7440-66-6	https://cameochemicals.noaa.gov/chemical/4814				Inhalation, skin absorption, ingestion, skin and/or eye contact	Inhalation or contact with vapors, substance or decomposition products may cause severe injury or death. May produce corrosive solutions on contact with water. Fire will produce irritating, corrosive and/or toxic gases. Runoff from fire control may cause pollution	Lungs	A grayish powder BP: NA Fl.Pt. = NA LEL: NA UEL: NA
PCBs									
PCBs (total)	11097-69-1, 53469-21-9	TWA 0.5 mg/m3 [skin] TWA 1 mg/m3 [skin]	Ca TWA 0.001 mg/m3 Ca TWA 0.001 mg/m3	TWA 0.5 mg/m3 [skin] TWA 1 mg/m3 [skin]	Ca [5 mg/m3] Ca [5 mg/m3]	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, chloracne; liver damage; reproductive effects; [potential occupational carcinogen]	Skin, eyes, liver, reproductive system	Colorless to pale-yellow, viscous liquid or solid (below 50°F) with a mild, hydrocarbon odor BP: 689-734°F, 617-691°F Fl.Pt. = NA, NA LEL: NA UEL: NA Nonflammable Liquid, but exposure in a fire results in the formation of a black soot containing PCBs, polychlorinated dibenzofurans, and chlorinated dibenzo-p-dioxins.
Petroleum Hydrocarbons									
Gasoline	86290-81-5	TWA 300 ppm STEL 500 ppm	Ca	None	Ca [N.D.]	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, mucous membrane; dermatitis; headache, lassitude (weakness, exhaustion), blurred vision, dizziness, slurred speech, confusion, convulsions; chemical pneumonitis (aspiration liquid); possible liver, kidney damage; [potential occupational carcinogen]	Eyes, skin, respiratory system, central nervous system, liver, kidneys	Clear liquid with a characteristic odor BP: 102°F Fl.Pt. = -45°F LEL: 1.4% UEL: 7.6%

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Abbreviations:

ACGIH – American Conference of Governmental Industrial Hygienists.
BP – boiling point at 1 atmosphere, °F
C – Ceiling, is a concentration that should not be exceeded during and part of the working exposure.
Ca – Carcinogenic.
CAS# - Chemical Abstracts Service registry number which is unique for each chemical.

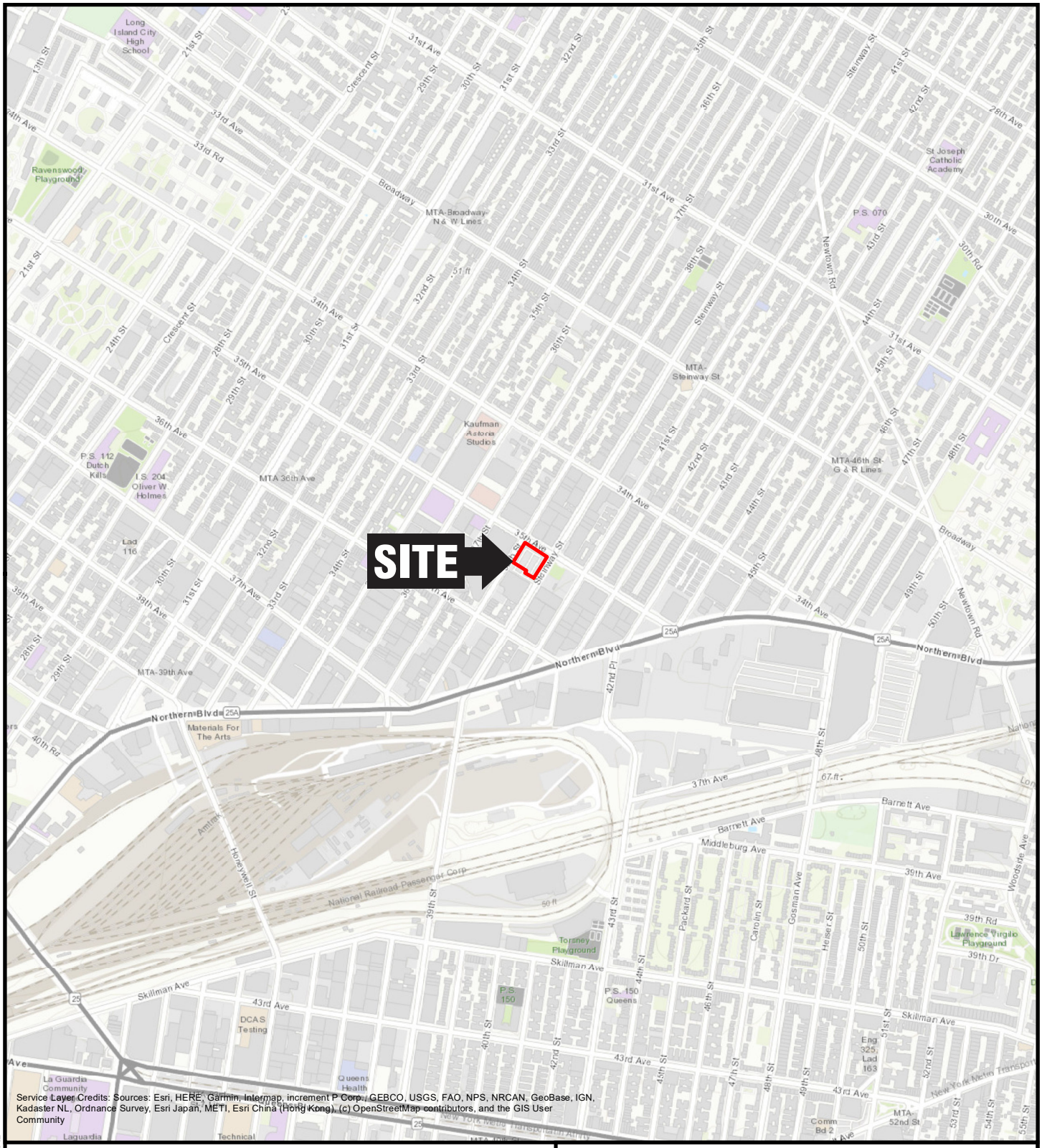
Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at the Site.

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties

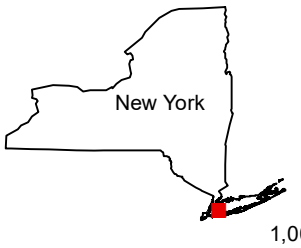
DSEN - Dermal Sensitization
Ft Pt. – Flash point
IDLH - Immediately Dangerous to Life and Health concentrations represent the maximum concentration from which, in the event of respirator failure, one could escape within 30 minutes without a respirator and without experiencing any escape-impairing or irreversible health effects.
LEL – Lower explosive (flammable) limit in air, % by volume (at room temperature)
mg/m^3 – Milligrams of substance per cubic meter of air
NIOSH - National Institute for Occupational Safety and Health.
OSHA – Occupational Safety and Health Administration
OTO - Ototoxicant
PEL - OSHA Permissible Exposure Limit (usually) a time weighted average concentration that must not be exceeded during any 8 hour work shift of a 40 hr work week.
ppm – parts per million
REL – NIOSH Recommended Limit indicated a time weighted average concentration that must not be exceeded during any 10 hour work shift of a 40 hr work week
RSEN - Respiratory Sensitization
SG - Specific Gravity
STEL – ACGIH Short-term exposure limit (ST)
TLV - ACGIH Threshold Limit Values (usually 8 hour time weighted average concentrations).
TWA – 8-hour, time-weighted average
UEL – Upper explosive (flammable) limit in air, % by volume (at room temperature)
VP - Vapor Pressure

FIGURES

1. Site Location Map
2. Site Plan with Emergency Muster Area
3. Routes to Urgent Care and Hospital



QUADRANGLE LOCATION



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1,000 0 1,000'

Title:

SITE LOCATION MAP

35-18 STEINWAY STREET
ASTORIA, NEW YORK

Prepared for:

LMXD INNOQ B1 LLC

ROUX

Compiled by: J.R.	Date: 04/08/2025
Prepared by: M.S.R.	Scale: AS SHOWN
Project Mgr: N.C.	Project: 4806.0001Y000
File: 4806.0001Y103.1.mxd	

FIGURE 1

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LEGEND

- EMERGENCY MUSTER AREA
- SITE BOUNDARY

NOTES

1. AERIAL SOURCE: NYS OFFICE OF INFORMATION TECHNOLOGY SERVICES GIS PROGRAM OFFICE (GPO)

45 0 45'

Title:

SITE PLAN WITH EMERGENCY MUSTER AREA

35-18 STEINWAY STREET
ASTORIA, NEW YORK

Prepared for:

LMXD INNOQ B1 LLC

ROUX

Compiled by: J.R.	Date: 01/20/26	FIGURE
Prepared by: M.S.R.	Scale: AS SHOWN	2
Project Mgr: N.C.	Project: 4806.0001Y000	
File: 4806.0001Y100.02.APRX		

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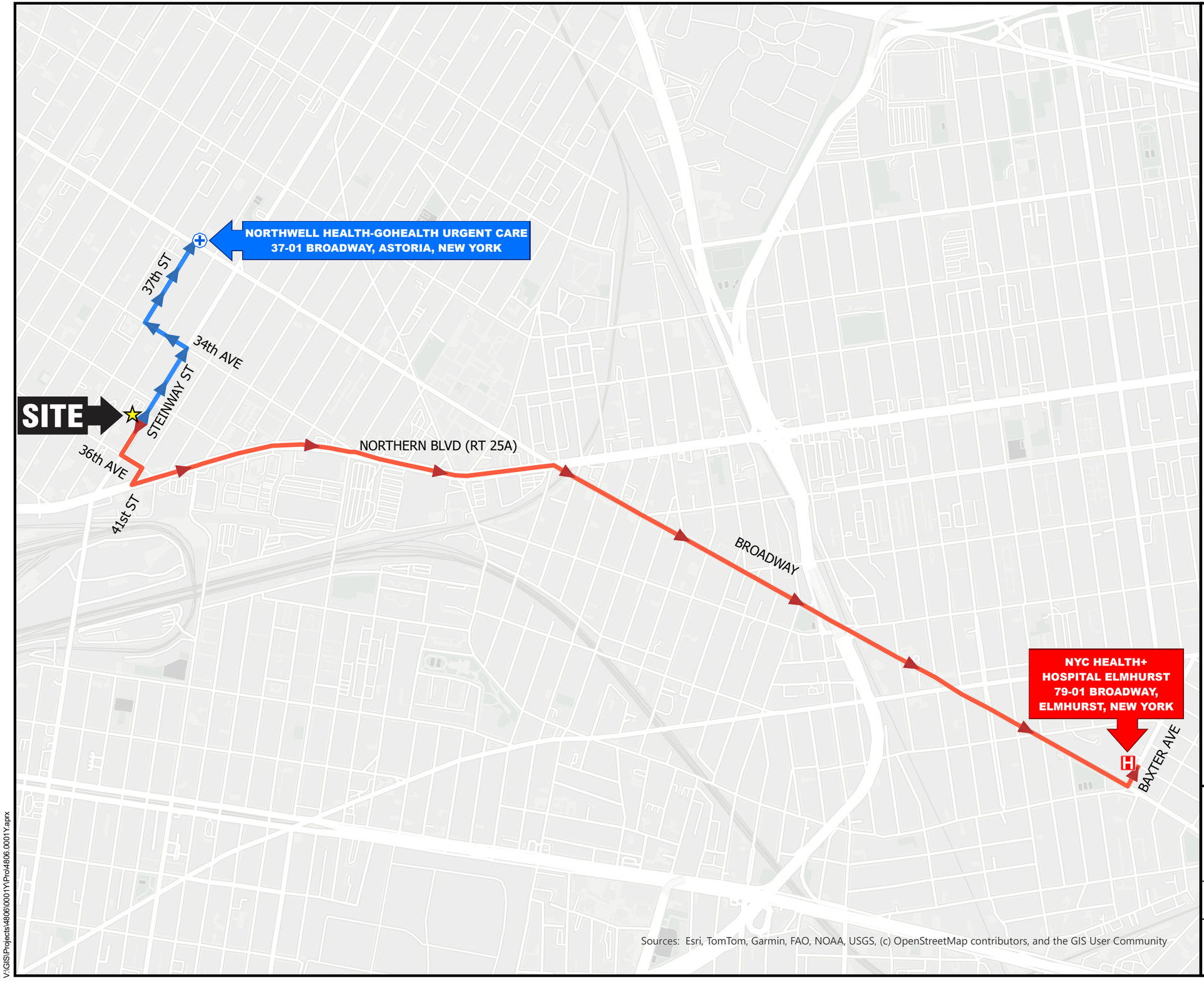

N

DIRECTIONS TO HOSPITAL

1. TURN RIGHT ONTO STEINWAY ST TOWARD NORTHERN BLVD
2. TURN LEFT ONTO 36TH AVE
3. TURN RIGHT ONTO 41ST ST
4. TURN SHARP LEFT ONTO NORTHERN BLVD (RT-25A)
5. TURN SLIGHTLY RIGHT ONTO BROADWAY
6. TURN LEFT ONTO BAXTER AVE
7. TURN LEFT INTO ENTRANCE TO HOSPITAL

DIRECTIONS TO URGENT CARE

1. TURN LEFT ONTO STEINWAY ST
2. TURN LEFT ONTO 34TH AVE
3. TURN RIGHT ONTO 37TH ST
4. DESTINATION IS ON THE NORTHEAST CORNER OF 37TH ST AND BROADWAY

1,000 0 1,000 Feet

Title:

ROUTES TO URGENT CARE AND HOSPITAL

35-18 STEINWAY STREET
ASTORIA, NEW YORK

Prepared for:

LMXD INNOQ B1 LLC

ROUX

Compiled by: J.R.	Date: 01/20/26	FIGURE
Prepared by: M.S.R.	Scale: AS SHOWN	3
Project Mgr: N.C.	Project: 4806.0001Y000	
File: 4806.0001Y100.03.APRX		

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APPENDICES

A. Job Safety Analysis (JSA) Forms
B. Safety Data Sheets (SDSs) for Chemicals Used
C. Heat Illness Prevention Program
D. Personal Protective Equipment (PPE) Management Program
E. Subsurface Utility Clearance Management Program

APPENDIX A

Job Safety Analysis (JSA) Forms

JOB SAFETY ANALYSIS	Ctrl. No. CVD-19	DATE: 04/10/2023	☐ NEW ☒ REVISED	PAGE 1 of 2

JSA TYPE CATEGORY	WORK TYPE	WORK ACTIVITY (Description)
Generic	**Fieldwork**	**Working in Areas Affected by Coronavirus**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
Kristina DeLuca	Health and Safety Specialist	Brian Hobbs	CHSD
		Ray Greenidge	Sr. Compliance Mgr.

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST	☐ GOGGLES	☐ AIR PURIFYING RESPIRATOR	☒ GLOVES – Leather/cut-resistant in field and nitrile as needed
☒ HARD HAT – In field	☐ FACE SHIELD	☐ SUPPLIED RESPIRATOR	
☐ LIFELINE / BODY HARNESS	☐ HEARING PROTECTION	☒ PPE CLOTHING – High visibility vest in field	☒ Face Covering
☒ SAFETY GLASSES – In field	☒ SAFETY SHOES – Steel/composite toe in fie		

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Cloth face covering, nitrile gloves, hand soap, water source, hand sanitizer, disinfectant spray and disinfectant wipes.

Commitment to Safety – All personnel onsite will actively participate in SPSA performance by verbalizing SPSAs throughout the day.

SOCIAL DISTANCING: Maintain 6' of distance between yourself and all other people at all times. If you do not believe the scope of work can be conducted while maintaining this distance, contact your Project Manager immediately.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Project Preplanning	N/A	• Review and follow COVID-19 CDC, Roux, Client and local orders/protocols. • Ensure all workers are fit for duty - anyone feeling sick should remain at home even if symptoms do not align with COVID-19. If a worker has been in contact with someone potentially positive or positive for COVID-19, contact your Office Manager. • Determine PPE needs and ensure adequate supply of disinfectant wipes/spray, soap and water or hand sanitizer at Site. Due to high demands and limited supply, plan ahead. • Use the minimum number of employees necessary to safely complete the work.
2. Mobilization	**Exposure:** Becoming infected or infecting co-workers	**Personal/Rental/Roux Owned Vehicle** • Do not carpool, unless all individuals are fully vaccinated. • Verify workers/other people are not approaching vehicle prior to exiting the vehicle. Maintain 6' of distance from general public, as appropriate. **Public Transportation** • Public transit should not be used unless absolutely necessary. Consider renting a car rather than taking public transit. If public transit is required, wear appropriate face covering/mask and apply social distancing (6 ft). Wash hands or use hand sanitizer immediately after. **Hotel Stay (Refer to COVID-19 H&S Guidance for more info)** • If a hotel stay is deemed necessary for the given field work, ensure that you clean your room upon initial arrival. • Place the "Do Not Disturb" placard on the room while away and limit housekeeping services to the extent feasible during your stay to minimize the reintroduction and spread of the virus from others. Wash hands or use hand sanitizer often.
3. Tailgate Meeting	**Exposure:** Becoming infected or infecting co-workers	• Perform outside or indoors in areas with ample ventilation. • If unvaccinated, maintain at least a 6+ ft distance between you and others. • Discuss primary infection prevention measures listed below. • Discuss COVID-19 symptoms with coworkers and subcontractors to ensure fitness for duty. Anyone exhibiting signs or symptoms should be instructed to leave the Site, contact your Project Manager.

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.
[2] A hazard is a potential danger. Break hazards into six types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards, energy source; Energy Source – electricity, pressure, compression/tension.
[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

4. Site Activities	**Exposure:** Becoming infected or infecting co-workers	• Coordinate field activities at the beginning of the day (i.e. Tailgate meeting) to minimize time spent in crowded spaces or overlap while completing job tasks. • Don cloth face coverings as appropriate. • Apply social distancing (6+ ft) when interacting with others if unvaccinated. If anyone comes within 6 ft of you while conducting work and your work prevents you from moving away, politely ask them to move back. If others are unable to move from your space, stop work and leave area. • Minimize shaking hands or touching others. • Minimize sharing of equipment or other items with co-workers and subcontractors unless wearing appropriate PPE (e.g. nitrile gloves), as appropriate. • If anyone is experiencing COVID-19 signs or symptoms in your vicinity, stop work and leave the area. • Do not work in areas with limited ventilation with others. • Cover your mouth and nose with tissue or paper towel or with your elbow when coughing or sneezing and wash hands or use hand sanitizer immediately after. If sick contact SHSO/PM and leave Site immediately. • Clean work surfaces/areas with approved cleaners you're responsible for (ex: desk, office doorknob, computer, etc.) at least daily. • Avoid public spaces and going out to eat by bringing your own lunch to the Site. If performing work in high density urban areas, it is recommended all food must be consumed at or in your vehicle or within designated work trailer. Wash hands or use hand sanitizer before eating and immediately after.

Primary Infection Prevention Measures

- Wash your hands often with soap and water for at least 20 seconds.
  - If soap and water are not available, use an alcohol-based sanitizer that contains at least 60% alcohol. Key times to wash hands include after blowing your nose, coughing or sneezing, after using the restroom, and before eating or preparing food.
- Do not touch your eyes, face, nose and mouth with unwashed hands.
- Cover your mouth and nose with a tissue when you cough or sneeze or use the inside of your elbow. Throw potentially contaminated items (e.g. used tissues) in the trash.
- Avoid close contact/secondary contact with people and potentially contaminated surfaces.
  - Apply appropriate social distance (6+ feet).
  - Minimize handshaking/touching others and use caution when accessing public spaces.
- Clean frequently touched surfaces daily. Commonly touched items can include but are not limited to tables, doorknobs, light switches, countertops, handles, desks, phones, keyboard, toilets, sinks and field equipment. If surfaces are dirty, they should be cleaned with soap and water prior to disinfection. If surface cannot be cleaned/disinfected, then wash hands or use sanitizer as soon as possible.

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[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

JOB SAFETY ANALYSIS	Ctrl. No. GEN-001	DATE: 04/10/2023	☐ NEW ☒ REVISED	PAGE 1 of 2

JSA TYPE CATEGORY	WORK TYPE	WORK ACTIVITY (Description)
GENERIC	**Construction – Concrete and Asphalt**	**Asphalt Paving**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
David Kaiser	Senior Engineer	Brian Hobbs	Corporate Health & Safety Director
		Ray Greenidge	Sr. Compliance Manager

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST	☐ GOGGLES	☐ AIR PURIFYING RESPIRATOR	☒ GLOVES: Cut Restant / Leather / Nitrile / Chemical resistant
☒ HARD HAT	☐ FACE SHIELD	☐ SUPPLIED RESPIRATOR	☐ OTHER
☐ LIFELINE / BODY HARNESS	☐ HEARING PROTECTION	☒ PPE CLOTHING: Long-sleeved high visibility clothing	
☒ SAFETY GLASSES	☒ SAFETY SHOES: Steel or composite toed		

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Required Equipment: Hand Tools, Spreader Box, Dump Truck, Asphalt Cement Kettle, Traffic Control (36" cones, flags, caution tape), vehicle chocks, 20-lb. Type ABC Fire Extinguisher

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs.

EXCLUSION ZONE (EZ): Maintain Minimum Heavy Equipment Exclusion Zone (HEEZ) around equipment and loads while it is in motion. The HEEZ must be greater than the swing zone of any moving part of the equipment, tip zone of the equipment, fall zone of the equipment and contents, distance that debris may travel during demolition activities and/or foot print of a structure to be demolished.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Position dump truck and offload asphalt.	**1a. CONTACT:** With Site traffic and unauthorized personnel.	1a. **Maintain and enforce the EZ**. Equipment being moved into position must have spotters to guide it into position. Never position vehicle with the bed raised.
	1b. CAUGHT: In pinch points of tailgate chutes.	1b. Don leather or Kevlar gloves prior to opening tailgate chutes. Keep hands clear of potential pinch points between tailgate chute and scuttle doors, tailgate, pin latch, etc. Spotter to remain in line-of-sight of driver at all times. If the driver cannot see the spotter, stop immediately.
	1c. FALL: From trip hazards (i.e. rocks, broken asphalt, tools, etc.)	1c. Identify and avoid trip hazards prior to starting work. Remove stones, tools not in use, etc. Equipment not in use to be stored out of the work area.
	1d. CONTACT: With overhead lines and structures.	1d. Identify and avoid overhead hazards prior to raising bed. Maintain EZ between truck/bed and overhead structures.
	1e. EXPOSURE: To hot asphalt.	1e. Do not handle hot asphalt using your hand. Only use hand tools (i.e., shovel, garden hoe, etc.) to handle asphalt. Personnel to stand clear of scuttle doors and maintain EZ. Personnel to stand at side of truck using truck tailgate as barrier and stay out of the line-of-fire of the asphalt being dumped.
	1f. OVEREXERTION: From opening tailgate chutes.	1f. Use proper body positioning while lifting and opening tailgate (back straight, shoulders square, feet secure on ground).
2. Paving operation with asphalt paving spreader box and/or hand tools.	**2a. EXPOSURE/CONTACT:** To hot asphalt.	2a. Workers will avoid contact with spreader box (if used) and hot asphalt during operation and take breaks to limit exposure to high heat radiating from asphalt mix. Workers will avoid walking on asphalt when not necessary to keep exposure to heat to a minimum. Wear long sleeves and cut-resistant gloves.
	2b. CONTACT: Moving truck back against spreader (if used).	2b. Maintain EZ. Spotters will keep personnel out of path of trucks and keep workers away until truck is backed up against spreader. Workers will not stand between truck and spreader; wear long sleeve high visibility clothing.
	2c. CAUGHT: In pinch points.	2c. Workers will keep hands and limbs away from potential pinch points between truck and spreader (if used).
	2d. OVEREXERTION: Muscle strain.	2d. Workers using rakes and shovels will use correct posture with their back straight and knees bent. Keep load close to body. Loads over 45-lbs. shall be lifted by 2 or more workers or by mechanical means.

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Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
3. Compacting and sealing new asphalt using a plate compactor or vibratory roller.	**3a. OVEREXERTION:** From handling and using equipment	3a. Use proper body positioning while lifting (knees bent, back straight, shoulders square). Loads over 45-lbs. shall be lifted by 2 or more workers or by mechanical means. Take frequent breaks to rest arms and hands or 10-15 minute shifts between 2 operators.
	3b. FALL: From trip hazards.	3b. See 1c. above.
	3c. EXPOSURE: To faulty equipment and fuel.	3c. Inspect the compactor/roller for proper operation prior to use (i.e., cracked housing, exposed wires, broken handle, etc.). When refueling is necessary verify that the engine is cool prior to fueling. Deploy sorbent pads around compactor to capture any residual fuel; wear chemical resistant gloves while refueling.
	3d. CAUGHT: In pinch points or between equipment and site structures.	3d. Keep hands clear of potential pinch points while operating compactor. Do not stand between compactor/roller and structure. Use of mechanical walk-behind tamper is to be used when within 2'-0" of building or structure so as to limit possible contact with building/structure.
4. Leave work zone.	**4a. EXPOSURE:** To hot asphalt.	4a Paving work zone will remain isolated until asphalt is cool enough to open to vehicle and pedestrian traffic.
	4b. CONTACT: With excess asphalt and debris.	4b. Work zone will be cleaned up to remove excess asphalt and any debris which could be "spit" out of tires of vehicles.
	4c. FALL: To tools and debris.	4c. Tools will be stored in designated areas and debris cleaned up to remove any slip, trip and fall hazards.

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JOB SAFETY ANALYSIS	Ctrl. No. GEN-019	DATE: 4/10/2023	☐NEW ☒REVISED	PAGE 1 of 2

JSA TYPE CATEGORY	WORK TYPE	WORK ACTIVITY (Description)
GENERIC	**Site Reconnaissance**	**Site Walk and Inspection**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
Sara Barrientos	Project Geologist	Brian Hobbs	Corporate Health and Safety Director
Tim Unalp	SHSO	Joe Duminuco	Executive Vice President

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST ☒ HARD HAT ☐ LIFELINE / BODY HARNESS ☒ SAFETY GLASSES	☐ GOGGLES ☐ FACE SHIELD ☒ HEARING PROTECTION: ear plugs as necessary ☒ SAFETY SHOES: Steel or composite toed	☐ AIR PURIFYING RESPIRATOR ☐ SUPPLIED RESPIRATOR ☒ PPE CLOTHING: High-visibility vest or high-vis outerwear	☒ GLOVES: Leather/cut-resistant/chemical resistant ☒ OTHER: Tyvek and rubber boots as necessary, dust mask as necessary

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Required Equipment: Site map, emergency contact list, documentation of urgent care/hospital routes and / or guide familiar with Site, operating cell phone or walkie-talkie if Site allows, and bug spray.

Commitment to Safety – All personnel onsite will actively participate in SPSA performance by verbalizing SPSAs throughout the day.

EXCLUSION ZONE (EZ): Maintain Minimum Heavy Equipment Exclusion Zone around equipment and loads while it is in motion. The HEEZ must be greater than the swing zone of any moving part of the equipment, tip zone of the equipment, fall zone of the equipment and contents, distance that debris may travel during demolition activities and/or foot print of a structure to be demolished.

SITE SECURITY: Prior to site inspection verify appropriate method to address Site Security concerns as it relates to potential criminal activity, homeless population, and/or isolation concerns. Work with the Project Principal and/or Project Manager to address appropriately.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Check in with Site contact.	**1a. CONTACT/EXPOSURE/FALL:** Personal injury caused by lack of awareness of site-specific hazards.	1a. Inquire about hazards and other activities taking place at the Site. 1a. Inform Site contact of work scope, timeline and location(s). 1a. Discuss emergency evacuation procedures and muster points with Site contact.
2. Traversing the Site	**2a. CONTACT:** Property damage and personal injury caused by obstructions/vehicles or unauthorized personnel at remote Sites. **2b. FALL:** Uneven terrain and weather conditions. Overgrown shrubs and vines. Equipment in the work zone. **2c. OVEREXERTION:** Muscle strain while carrying equipment. **2d. EXPOSURE:** Biological hazards – ticks; bees/wasps; poison ivy; insects; (Ticks are most active any time the temperature is above freezing, typically from March to November.)	2a. All equipment must be stowed and secured prior to moving. 2a. Maintain speed limit as posted on-site. 2a. When possible, drive on established roadways. 2a. Yield to all pedestrians. 2a. Use pull-through spots or back into parking spots. 2a. Don high visibility clothing/safety vest. If working at remote Site, add orange accessories during hunting season. 2b. Inspect walking path for uneven terrain, weather-related hazards (i.e., ice, puddles, snow, etc.), and obstructions prior to mobilizing equipment. 2b. When possible, use established pathways and walk on stable, secure ground. 2b. Communicate traversing hazards with others. 2c. When carrying equipment to/from work area, use proper lifting techniques; keep back straight, lift with legs, keep load close to body, never reach with a load. Ensure that loads are balanced to reduce the potential for muscle strain. Use the buddy system or mechanical means to maneuver items heavier than 50-lb. If necessary, make multiple trips to carry equipment. 2d. Inspect area to avoid contact with biological hazards. 2d. Ticks: • Treat outer clothing including pants, shirts, socks, boots and hats the evening before with Permethrin (allowing at least two hours before use). • Apply DEET to exposed skin before travelling to the Site and reapply after two hours. • Check for ticks during and after work. 2d. Bees: • Use bee spray as appropriate to deter/eliminate bees.

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	2e. EXPOSURE: Heat Stress & Cold Stress. Personal injury from working in inclement weather conditions.	• Protect exposed skin with insect repellent. 2d. Poison Ivy: • Identify areas of poison ivy and spray with weed killer. Don Tyvek and rubber boots while traversing poison ivy areas. • If skin contacts poison ivy, wash skin thoroughly with soap and water. 2e. Wear sunscreen with SPF 15 or greater on exposed skin whenever 30 minutes or more of sun exposure is expected. 2e. Watch for heat stress symptoms (muscle cramping, exhaustion, dizziness, rapid and shallow breathing). Take breaks as needed. 2e. Watch for cold stress symptoms (severe shivering, slowing of body movement, weakness, stumbling or inability to walk, collapse). Take breaks as needed. 2e. Wear appropriate rain gear as needed. 2e. Take frequent breaks if tired, wet, or cold/hot. Drink water. 2e. If lightning is observed, wait 30 minutes after last thunder boom/lightning bolt in a sheltered location (car acceptable) before starting work again.
3. Walking near heavy equipment and machinery.	**3a. CONTACT:** Personal injury from Site and roadway traffic. Personal injury from flying debris **3b. OVEREXERTION:** Personal injury from lifting/moving/rotating equipment. **3c. EXPOSURE:** Hearing damage from noise generating equipment/processes. Inhalation/exposure to hazardous vapors and or dust. **3d. EXPOSURE:** Working in a remote area.	3a. See 2a. 3a. Maintain an exclusion zone of at least 10'-25' feet from all engaged equipment. 3a. Keep body parts out of the line-of-fire of pinch points. 3a. Wear appropriate PPE always. 3b. See 2c. 3c. Wear hearing protection if >85 dBA. (i.e. noise levels which require you to raise your voice to communicate) 3c. Always wear leather gloves when handling any tools or equipment. 3c. Always wear appropriate PPE based off chemicals present. 3d. Use the "buddy system" whenever possible. If working alone, contact PM upon arrival/departure, as well as during work activities prior to commencing work if applicable. 3d. Always carry a communication device (i.e., cell phone, walkie-talkie) or directional (i.e., map, compass, etc.) when traversing remote areas. 3d. If available, follow Lone Worker Protocol/Procedure.
4. Working in adverse weather conditions.	**4a. EXPOSURE:** Heat Stress & Cold Stress. Personal injury from working in inclement weather conditions.	4a. Watch for heat stress symptoms (muscle cramping, exhaustion, dizziness, rapid and shallow breathing). Take breaks as needed. 4a. Watch for cold stress symptoms (severe shivering, slowing of body movement, weakness, stumbling or inability to walk, collapse). Take breaks as needed. 4a. Wear appropriate rain gear as needed. 4a. Take frequent breaks if tired, wet, or cold/hot. Drink water. 4a. If lightning is observed, wait 30 minutes after last thunder boom/lightning bolt in a sheltered location (car acceptable) before starting work again.
5. Departing Site.	**5a. EXPOSURE:** Exposure to unnecessary hazards should personnel believe Roux is on-Site during an emergency and conduct a search.	5a. Sign out or notify Site contact and Roux Project Manager of your departure.

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JOB SAFETYANALYSIS Ctrl. No. GEN-020	DATE: 04/11/2023	☐NEW ☒REVISED	PAGE 1 of 2

JSA TYPE CATEGORY:	WORK TYPE:	WORK ACTIVITY (Description):	
GENERIC	**Gauging & Sampling**	**Soil Sampling**	
DEVELOPMENT TEAM	**POSITION / TITLE**	**REVIEWED BY:**	**POSITION / TITLE**
MaryBeth Lyons	Project Scientist	Brian Hobbs	CHSD
Tim Unalp	SHSO		

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST	☐ GOGGLES	☐ AIR PURIFYING RESPIRATOR	☒ GLOVES: Leather, Nitrile and cut resistant
☒ HARD HAT	☐ FACE SHIELD:	☐ SUPPLIED RESPIRATOR	
☐ LIFELINE / BODY HARNESS	☒ HEARING PROTECTION: (as needed)	☒ PPE CLOTHING: Fluorescent reflective vest or high visibility clothing	☒ OTHER: Insect repellant, sunscreen (as needed)
☒ SAFETY GLASSES			
☒ FLAME RESISTANT CLOTHING (as needed)	☒ SAFETY SHOES: Composite-toe or steel toe boots		

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Recommended Equipment: 42” traffic cones, caution tape, trowel

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs.

EXCLUSION ZONE (EZ): Maintain Minimum Heavy Equipment Exclusion Zone around equipment and loads while it is in motion. The HEEZ must be greater than the swing zone of any moving part of the equipment, tip zone of the equipment, fall zone of the equipment and contents, distance that debris may travel during demolition activities and/or foot print of a structure to be demolished.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Secure location	**1a. CONTACT:** Personnel and vehicular traffic may enter the work area.	1a. If in an area with foot or vehicle traffic, delineate the work area with 42” traffic cones and/or caution tape to prevent exposure to traffic and inform others of work activity. 1a. Wear reflective vest and/or high visibility clothing. 1a. Face the direction of any vehicular traffic. Position vehicle to protect worker from traffic. 1a. Communicate work activity with adjacent work areas.
	1b. FALL: Tripping/falling due to uneven terrain or entry/exit from excavations.	1b. Inspect pathways and work area for uneven terrain, weather-related hazards (i.e., ice, puddles, snow, etc.), and obstructions. 1b. Use established pathways and walk on stable, secure ground. 1b. Stage equipment and tools in a convenient, stable, and orderly manner. Store equipment at lowest potential energy. 1b. Roux employees should stay 5 feet from in-progress excavations and trenches. Should entry to an excavation be required (when stabilization is complete), ladders must be employed for steep embankments, excavations, pits, and trenches.
	1c. EXPOSURE: Exposure to sun and excessive heat, possibly causing sunburn, heat exhaustion or heat stroke. Exposure to cold temperatures possibly causing cold stress. Skin burn as a result of fire, if applicable. Exposure to explosive vapors due to tank farm operations. Exposure to airborne dust due to high wind speeds. Biological hazards - ticks, bees/wasps, poison ivy, thorns, insects, etc.	1c. Wear sunscreen with an SPF 15 or greater whenever 30 minutes or more of exposure is expected. 1c. Use a tent to shade the work area from direct sunlight particularly when warm temperatures are expected. 1c. Be aware of the location of all Site personnel. 1c. Watch for heat stress symptoms (muscle cramping, exhaustion, dizziness, rapid and shallow breathing). 1c. Watch for cold stress symptoms (severe shivering, slowing of body movement, weakness, stumbling or inability to walk, collapse). 1c. Take breaks for rest and water as necessary. Move to an area that is well shaded or a climate controlled area (i.e., car, site trailer, etc.). 1c. No open flames/heat sources. 1c. Conduct air monitoring and ensure that harmul vapor concentrations are within the levels detailed in the Site Specific HASP. Follow procedures detailed in HASP for exceedances. 1c. Flame retardant clothing must be worn when specified by Site policy. 1c. Cell phones should be disabled when specified by Site policy. 1c. Pre-treat field clothing with Permethrin prior to site visit to kill ticks and insects. 1c. Wear long sleeved shirts and tuck in (or tape) pant legs into socks or boots to prevent ticks from reaching skin. 1c. Spray insect repellant containing DEET on exposed skin when working in overgrown areas of the Site. 1c. Inspect area to avoid contact with biological hazards. 1c. Wear cut-resistant gloves when handling branches, shrubs, etc. that may lie within the walking path. 1c. Wear spoggles if the average wind speeds are above 15 mph. 1c. Personnel shall examine themselves and co-worker’s outer clothing for ticks periodically when onsite. 1c. If skin comes in contact with poison ivy, wash skin thoroughly with soap and water. If rash persists after washing, immediately notify your supervisor, the OM and OHSM for possible consultation with a physician at an approved Occupational Health Clinic.

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Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
2. Collect Soil Sample	**2a. CONTACT:** Personal injury from pinch points, cuts, and abrasions from sampling equipment tools, and material within soil sample. Personal injury from contact with moving equipment while sampling. Personal injury from contact with glass sample jars.	2a. Wear cut-resistant (i.e., Kevlar) gloves under chemical-resistant (nitrile) disposable gloves when handling soil samples and sampling jars. 2a. Where possible, use trowel or equivalent tool to avoid contact with soil. 2a. If sampling from bucket of heavy equipment, ensure all equipment is off and operator utilizes the “show me your hands” policy. 2a. See 1a.
	2b. EXPOSURE: Exposure to contamination (impacted soil) and/or lab preservatives.	2b. Wear chemical-resistant (nitrile) disposable gloves over cut resistant gloves to protect hands when handling samples; use containment material or plastic sheeting to protect surrounding areas. 2b. Wear safety glasses to protect eyes from dust or air-borne contaminants that may results from disturbing the soil. 2b. Where possible, remain upgradient from sample location if collecting soil sample from stockpile, drill rig, etc. to avoid breathing contaminant vapors, if they are present. 2b. When collecting soil sample from hand auger, put large zip lock bag over entire auger to prevent spillage of soil on to the ground. 2b. Open sample jars slowly and fill carefully to avoid contact with preservatives.
	2c. EXERTION: Exertion due to repetitive motion and ergonomics.	2c. Utilize a table or raised surface for soil sampling if multiple soil samples are going to be taken to minimize repetitive bending motion.
3. Decontaminate equipment	**3a. EXPOSURE/CONTACT:** Contamination (e.g., Separate Phase Hydrocarbons (SPH), contaminated vapors and/or soil). **3b. EXPOSURE:** Chemicals in cleaning solution including ammonia.	3a. Wear chemical-resistant (nitrile) disposable gloves and safety glasses. 3a. Use an absorbent pad to clean spills. 3a. Properly dispose of used materials/PPE in provided drums in designated drum storage area. 3a. Remain upwind of sample and avoid breathing contaminant vapors, if they are present. 3b. Wear chemical-resistant (nitrile) disposable gloves and safety glasses. 3b. Work on the upwind side of decontamination area. 3b. Use an absorbent pad to clean spills. 3b. Properly dispose of used materials/PPE in provided drums in designated drum storage area. Ensure that all drums are properly labeled and secured.

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JOB SAFETY ANALYSIS	Ctrl. No. GEN-029	DATE: 4/11/2023	☐ NEW ☒ REVISED	PAGE 1 of 2

JSA TYPE CATEGORY	WORK TYPE	WORK ACTIVITY (Description)	
GENERIC	**Preclearing/Sampling**	**Hand Augering**	
DEVELOPMENT TEAM	**POSITION / TITLE**	**REVIEWED BY:**	**POSITION / TITLE**
Sean Owens	Senior Health & Safety Specialist	Brian Hobbs	Corporate Health & Safety Director

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST	☐ GOGGLES	☐ AIR PURIFYING RESPIRATOR	☒ GLOVES: Cut Resistant / Leather / Nitrile / Chemical resistant
☒ HARD HAT	☐ FACE SHIELD	☐ SUPPLIED RESPIRATOR	☐ OTHER
☐ LIFELINE / BODY HARNESS	☐ HEARING PROTECTION	☒ PPE CLOTHING: Long sleeve high visibility clothing	
☒ SAFETY GLASSES	☒ SAFETY SHOES: Steel or composite toed		

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Hand Auger Tools (buckets, rods), 5-gallon buckets, hand tools (hammer, etc)

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Drive/walk to hand clearing/hand augering location	**1a. CONTACT:** Property damage and personal injury caused by obstructions/vehicles	1a. Maintain speed limit on-site. 1a. All equipment must be stowed and secured prior to moving. 1a. Drive on established roadways. 1a. Do not back up vehicle without spotter where visibility is limited; use pull-through spots or back into parking spots; use an audible signal (horn/back-up alarm) when backing up vehicles.1c.
	1b. FALL: Personal injury from tripping/falling due to uneven terrain, weather conditions, and materials/equipment stored at portions of the Site	1b. Inspect walking path for uneven terrain, weather-related hazards (i.e., ice, puddles, snow, etc.), and obstructions prior to mobilizing equipment. 1b. Do not climb over stored materials/equipment; walk around. Use established pathways and walk on stable, secure ground. 1b. Use established ramp when descending into/ascending from impoundment areas. 1b. Keep tools and equipment in a designated area. When not in use, tools and equipment must be returned to their proper storage location. Keep work area clear of obstructions.
	1c. EXERTION: Muscle strain/exhaustion while carrying equipment (i.e., hand auger, post-hole digger, shovel, pry bar)	1c. When carrying equipment to/from work area, use proper lifting techniques; keep back straight, lift with legs, keep load close to body, never reach with a load. Ensure that loads are balanced to reduce the potential for muscle strain. Use mechanical assistance or make multiple trips to carry equipment.
	1d. EXPOSURE: Exposure to sun, possibly causing sunburn Biological hazards - bees/wasps, poison oak, thorns, insects, etc.	1d. Wear sunscreen with an SPF of at least 15 whenever 30 minutes or more of exposure is expected. 1d. Inspect area to avoid contact with biological hazards. 1d. Wear cut resistant gloves when handling branches, shrubs, etc. that may lie within the walking path. 1d. Avoid any areas onsite that have poison oak.
2. Secure location	**2a. CONTACT:** Personnel and vehicular traffic may enter the work area.	2a. Delineate the work area with traffic cones and/or caution tape to prevent exposure to traffic and inform others of work activity. 2a. Wear reflective vest and/or fluorescent clothing. 2a. Face the direction of vehicular traffic. Position vehicle to protect worker from traffic. 2a. Communicate work activity with adjacent work areas.
	2b. FALL: Tripping/falling due to uneven terrain, and materials /equipment stored within the work area	2b. Inspect walking path for uneven terrain, weather-related hazards (i.e., ice, puddles, snow, etc.), and obstructions prior to mobilizing equipment to the impoundments. 2b. Equipment and tools will be staged in a convenient, stable, and orderly manner. 2b. Equipment and tools will be stored at the lowest point of potential energy and out of the walkway and immediate work area (i.e. tools should not be propped against walls or nearby equipment or vehicles). 2b. Equipment and tools that are not anticipated to be used will be returned to an appropriate storage area that is out of the immediate work area.

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[2] A hazard is a potential danger. Break hazards into six types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards; Energy Source – electricity, pressure, compression/tension.
[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift." Avoid general statements such as, "be careful."

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
3. Verify pre-clearance protocol; review completed Subsurface Utility Checklist and utility verification site walkthrough.	**3a. ENERGY SOURCE:** Underground utility damage; property damage; personal injury	3a. Confirm that "Call Before You Dig" and local utility companies were contacted prior to hand augering. 3a. Walk the Site to evaluate utility markings and review maps.
4. Augering/advancing borehole	**4a. EXPOSURE:** Contaminated soil/water/vapor **4b. EXERTION:** Muscle strain from lifting, bending, repetitive motion. **4c. CAUGHT:** Personal injury as a result of jewelry/loose clothing caught on equipment, well covers, machinery, hand auger, pry bar etc.. **4d. CONTACT/CAUGHT:** Pinch points, abrasions	4a. Monitor breathing zone with a PID when VOCs area concern. If vapors sustain > 5 ppm, upgrade PPE as per HASP. 4a. Wear chemical-resistant disposable gloves and safety glasses when handling impacted materials. 4a. Place excavated soil on plastic sheeting and store soil waste in designated area. 4a. Work on the upwind side of the boring. 4b. Body positioning and rotating with the auger to reduce strain. Don't twist back. 4c. No form of jewelry should be worn while on-site. 4c. Clothing must be appropriately sized so it is not loose fitting. 4d. Keep head and upper body clear when lifting hand auger, pry bar/post-hole digger. Ensure to not be overly aggressive when using pry bar. 4d. Ensure all jewelry is removed, loose clothing is secured, and PPE is secured close to the body.
5. Lithologic observation and soil sampling	**5a. EXPOSURE:** Contact with contamination (impacted soil and/or lab preservatives)	5a. Wear chemical-resistant disposable gloves to protect hands when handling samples; wear safety glasses when handling any preservatives; use containment material or plastic sheeting to protect surrounding areas. 5a. When collecting soil sample from hand auger, put large zip lock bag over entire auger to prevent spillage of soil on to the ground. 5a. Open sample jars slowly and fill carefully to avoid contact with preservatives.
6. Decontaminate equipment	**6a. EXPOSURE:** Contact with contamination (impacted soil and/or lab preservatives, decontamination solution) **6b. CONTACT/CAUGHT:** pinch points and cuts/abrasions	6a. Wear chemical-resistant disposable gloves and safety glasses. 6a. Use an absorbent pad to clean spills. 6a. Properly dispose of used materials/PPE trash bags. 6b. Keep fingers/hands out of pinch points when dis-assembling hand auger during decontamination.

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JOB SAFETY ANALYSIS	Ctrl. No. GEN-032	DATE: 04/11/2023	☒ NEW ☐ REVISED	PAGE 1 of 2

JSA TYPE CATEGORY	WORK TYPE	WORK ACTIVITY (Description)
Generic	**Construction**	**Spotting Third-Party Traffic**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
Douglas Ferraiolo	Project Geologist	Brian Hobbs	CHSD
Jerry Tolosko	VP Principal Hydrogeologist	Rafhael Gandolff	Sr. H&S Specialist

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST	☐ GOGGLES	☐ Particulate Respirator	☒ GLOVES: Cut resistant / leather
☒ HARD HAT	☐ FACE SHIELD	☐ SUPPLIED RESPIRATOR	☐ OTHER:
☒ LONG SLEEVED SHIRT	☐ HEARING PROTECTION	☒ PPE CLOTHING: Fluorescent reflective clothing	
☐ LIFELINE / BODY HARNESS	☒ SAFETY SHOES: Steel-/Composite-toe boots/shoes		
☒ SAFETY GLASSES			

REQUIRED EQUIPMENT

Handheld fluorescent warning flags (1 per spotter), two-way radios.

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs

EXCLUSION ZONE (EZ): Maintain Minimum Heavy Equipment Exclusion Zone around equipment, active operations (e.g., excavation, truck loading ,etc.) and loads while it is in motion. The HEEZ must be greater than the swing zone of any moving part of the equipment, tip zone of the equipment, fall zone of the equipment and contents, distance that debris may travel during demolition activities and/or foot print of a structure to be demolished. The HEEZ should not be compromised in any way by third party traffic.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Prepare for heavy equipment operations and/or job activity which require traffic stoppage.	**1a. CONTACT:** Third-party traffic in and/or adjacent to the work area may create contact hazards with machinery and site personnel. **1b. Fall :** Slip/Trip/Fall	1a. Cordon off the work area with safety barrels/cones and a rigid barrier (snow fence, traffic bar, etc.). Communicate that only necessary personnel should be in the work area. Spotter and equipment operator shall enforce the **EZ.** Operator will not operate but shall remain in the hands-off mode while personnel are within the exclusion zone. • Spotters must agree on communication via voice and hand signals before the activity begins. • Spotters must be visible and maintain contact with other spotters. • If contact is lost with either spotter, work operations should stop until communication has been re-established. • Spotters should never have additional duties while they are spotting. 1a. Spotters must analyze traffic patterns adjacent to the site to assess which traffic direction will need to be re-directed and what issues must be resolved prior to spotting traffic. 1a. The “Traffic Control Point” is a specific location where the spotter is positioned to direct traffic. 1a. **Spotters should select an appropriate Traffic Control Point where visibility, directions and personal safety will be maximized.** 1b. Ensure that the Traffic Control Point is flat, level and clear of any obstructions or debris before beginning spotting operations.

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Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
2. Spotting third-party traffic during site operations.	**2a. CONTACT:** Machine or load contact with third party traffic.	2a. Discuss the specifics of the work, limits of the assigned work area, and the machine's Exclusion Zone. Maintain the Exclusion Zone while spotting third-party traffic. 2a. **Spotters and equipment operators shall have 2-way radios/cellular devices on their persons** to ensure audible communication in the event any changes or new hazards may arise. 2a. Spotters must make eye contact with the machine operations and third-party traffic, or all movement ceases until visual contact can be reestablished. 2a. Spotter shall keep an eye out for any traffic issues the operator may not see and communicate with other work crews and spotters accordingly. 2a. If the spotter needs to take a break, he must find a replacement before leaving or stop operations. **Operations which may contact third-party traffic shall not be performed without a spotter under any circumstances.** 2a. Wear fluorescent clothing/safety vest. **Handheld fluorescent warning flags (1 per spotter) are required for spotting third party traffic.** 2a. Establish traffic control by performing all signals / movements with precision and ensuring drivers obey signals. • Break traffic at natural gaps whenever possible to direct opposite sides of traffic • Maintain consistency in the time you allow each direction of traffic to travel. Prioritize major routes over secondary routes. • If breaks do not occur, allow traffic to accumulate on opposite sides of the road before directing it to move. • Allow right turns whenever they do not interfere with traffic and pedestrians. • Make sure opposite lanes are stopped before allowing left turns to be made. 2a. **Do not multitask. Only perform Spotting.**
	2b. FALL: Slip/Trip/Fall	2b. Look where walking to identify and avoid slip/trip/fall hazards. Avoid icy and/or wet surfaces. Remove obstacles if possible. 2b. Use designated walkways during spotting whenever possible. 2b. **Do not walk backwards. Always face the direction you are walking towards.**
	2c. CAUGHT: Caught between machinery and nearby objects.	2c. **Maintain Exclusion Zone.** Do not stand between large, loose or fixed objects or structures and the machinery while it is in motion. Keep in sight of operator at all times while being aware of surrounding structures.
	2d. EXPOSURE: Inhalation of exhaust from machinery.	2d. The spotter will position him/herself upwind of the working machinery, when possible. Spotter will also inform others working within the vicinity of the EZ of proper positioning, if applicable.

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APPENDIX B

Safety Data Sheets (SDSs) for Chemicals Used

SAFETY DATA SHEET

Isobutylene

Section 1. Identification

GHS product identifier : Isobutylene

Chemical name : 2-methylpropene

Other means of identification : 1-Propene, 2-methyl-; Isobutene; Isobutylene; 1-Propene, 2-methyl- (isobutene); 1, 1-Dimethylethylene; Isopropylidenemethylene; iso-Butene; i-Butene; 2-Methylpropylene; 2-Methyl-2-propene; 2-Methyl-1-propene

Product type : Gas.

Product use : Synthetic/Analytical chemistry.

Synonym : 1-Propene, 2-methyl-; Isobutene; Isobutylene; 1-Propene, 2-methyl- (isobutene); 1, 1-Dimethylethylene; Isopropylidenemethylene; iso-Butene; i-Butene; 2-Methylpropylene; 2-Methyl-2-propene; 2-Methyl-1-propene

SDS # : 001031

Supplier's details : Airgas USA, LLC and its affiliates
259 North Radnor-Chester Road
Suite 100
Radnor, PA 19087-5283
1-610-687-5253

24-hour telephone : 1-866-734-3438

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : FLAMMABLE GASES - Category 1
GASES UNDER PRESSURE - Liquefied gas

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : Extremely flammable gas.
May form explosive mixtures with air.
Contains gas under pressure; may explode if heated.
May displace oxygen and cause rapid suffocation.

Precautionary statements

General : Read and follow all Safety Data Sheets (SDS'S) before use. Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. Always keep container in upright position. Approach suspected leak area with caution.

Prevention : Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

Response : Leaking gas fire: Do not extinguish, unless leak can be stopped safely. Eliminate all ignition sources if safe to do so.

Storage : Protect from sunlight. Store in a well-ventilated place.

Disposal : Not applicable.

Hazards not otherwise classified : In addition to any other important health or physical hazards, this product may displace oxygen and cause rapid suffocation.

Section 3. Composition/information on ingredients

Substance/mixture : Substance

Chemical name : 2-methylpropene

Other means of identification : 1-Propene, 2-methyl-; Isobutene; Isobutylene; 1-Propene, 2-methyl- (isobutene); 1, 1-Dimethylethylene; Isopropylidenemethylene; iso-Butene; i-Butene; 2-Methylpropylene; 2-Methyl-2-propene; 2-Methyl-1-propene

Product code : 001031

CAS number/other identifiers

CAS number : 115-11-7

Ingredient name	%	CAS number
Isobutylene	100	115-11-7

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention if irritation occurs.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Skin contact : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Get medical attention if symptoms occur. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : As this product is a gas, refer to the inhalation section.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : No known significant effects or critical hazards.

Inhalation : No known significant effects or critical hazards.

Skin contact : No known significant effects or critical hazards.

Frostbite : Try to warm up the frozen tissues and seek medical attention.

Ingestion : As this product is a gas, refer to the inhalation section.

Over-exposure signs/symptoms

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Specific treatments : No specific treatment.

Section 4. First aid measures

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

Specific hazards arising from the chemical : Contains gas under pressure. Extremely flammable gas. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Contact supplier immediately for specialist advice. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool. If involved in fire, shut off flow immediately if it can be done without risk. If this is impossible, withdraw from area and allow fire to burn. Fight fire from protected location or maximum possible distance. Eliminate all ignition sources if safe to do so.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : Accidental releases pose a serious fire or explosion hazard. No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Small spill : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment.

Large spill : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Contains gas under pressure. Avoid breathing gas. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

Use only non-sparking tools. Avoid contact with eyes, skin and clothing. Empty containers retain product residue and can be hazardous. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a segregated and approved area. Store away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Eliminate all ignition sources. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F). Keep container tightly closed and sealed until ready for use. See Section 10 for incompatible materials before handling or use.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
Isobutylene	**ACGIH TLV (United States, 3/2017).** TWA: 250 ppm 8 hours.

Appropriate engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields.

Skin protection

Section 8. Exposure controls/personal protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. When there is a risk of ignition from static electricity, wear anti-static protective clothing. For the greatest protection from static discharges, clothing should include anti-static overalls, boots and gloves.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Section 9. Physical and chemical properties

Appearance

Physical state : Gas. [Compressed gas.]

Color : Colorless.

Odor : Characteristic.

Odor threshold : Not available.

pH : Not available.

Melting point : -140.7°C (-221.3°F)

Boiling point : -6.9°C (19.6°F)

Critical temperature : 144.75°C (292.6°F)

Flash point : Closed cup: -76.1°C (-105°F)

Evaporation rate : Not available.

Flammability (solid, gas) : Extremely flammable in the presence of the following materials or conditions: open flames, sparks and static discharge and oxidizing materials.

Lower and upper explosive (flammable) limits : Lower: 1.8%
Upper: 9.6%

Vapor pressure : 24.3 (psig)

Vapor density : 1.94 (Air = 1)

Specific Volume (ft ^{3}/lb) : 6.6845

Gas Density (lb/ft ^{3}) : 0.1496 (25°C / 77 to °F)

Relative density : Not applicable.

Solubility : Not available.

Solubility in water : 0.26 g/l

Partition coefficient: n-octanol/water : 2.34

Auto-ignition temperature : 465°C (869°F)

Decomposition temperature : Not available.

Viscosity : Not applicable.

Flow time (ISO 2431) : Not available.

Molecular weight : 56.12 g/mole

Aerosol product

Heat of combustion : -45029034 J/kg

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition.

Incompatible materials : Oxidizers

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Isobutylene	LC50 Inhalation Vapor	Rat	550000 mg/m³	4 hours

Irritation/Corrosion

Not available.

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Not available.

Aspiration hazard

Not available.

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : No known significant effects or critical hazards.

Section 11. Toxicological information

Inhalation : No known significant effects or critical hazards.

Skin contact : No known significant effects or critical hazards.

Ingestion : As this product is a gas, refer to the inhalation section.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : No specific data.

Inhalation : No specific data.

Skin contact : No specific data.

Ingestion : No specific data.

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Not available.

General : No known significant effects or critical hazards.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Not available.

Section 12. Ecological information

Toxicity

Not available.

Persistence and degradability

Not available.

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
Isobutylene	2.34	-	low

Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Section 12. Ecological information

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Empty Airgas-owned pressure vessels should be returned to Airgas. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.

Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1055	UN1055	UN1055	UN1055	UN1055
UN proper shipping name	ISOBUTYLENE	ISOBUTYLENE	ISOBUTYLENE	ISOBUTYLENE	ISOBUTYLENE
Transport hazard class(es)	2.1	2.1	2.1	2.1	2.1
Packing group	-	-	-	-	-
Environmental hazards	No.	No.	No.	No.	No.

"Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product."

Additional information

DOT Classification : **Limited quantity** Yes.
Quantity limitation Passenger aircraft/rail: Forbidden. Cargo aircraft: 150 kg.
Special provisions 19, T50

TDG Classification : Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.13-2.17 (Class 2).
Explosive Limit and Limited Quantity Index 0.125
ERAP Index 3000
Passenger Carrying Ship Index Forbidden
Passenger Carrying Road or Rail Index Forbidden
Special provisions 29

IATA : **Quantity limitation** Passenger and Cargo Aircraft: Forbidden. Cargo Aircraft Only: 150 kg.

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to Annex II of MARPOL and the IBC Code : Not available.

Section 15. Regulatory information

U.S. Federal regulations : **TSCA 8(a) CDR Exempt/Partial exemption**: Not determined

Clean Air Act (CAA) 112 regulated flammable substances: Isobutylene

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Not listed

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 302/304

Composition/information on ingredients

No products were found.

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : Refer to Section 2: Hazards Identification of this SDS for classification of substance.

State regulations

Massachusetts : This material is listed.

New York : This material is not listed.

New Jersey : This material is listed.

Pennsylvania : This material is listed.

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol (Annexes A, B, C, E)

Not listed.

Stockholm Convention on Persistent Organic Pollutants

Not listed.

Rotterdam Convention on Prior Informed Consent (PIC)

Not listed.

UNECE Aarhus Protocol on POPs and Heavy Metals

Not listed.

Inventory list

Australia : This material is listed or exempted.

Canada : This material is listed or exempted.

China : This material is listed or exempted.

Europe : This material is listed or exempted.

Japan : **Japan inventory (ENCS)**: This material is listed or exempted.
Japan inventory (ISHL): Not determined.

Malaysia : Not determined.

New Zealand : This material is listed or exempted.

Philippines : This material is listed or exempted.

Republic of Korea : This material is listed or exempted.

Section 15. Regulatory information

Taiwan : This material is listed or exempted.

Thailand : Not determined.

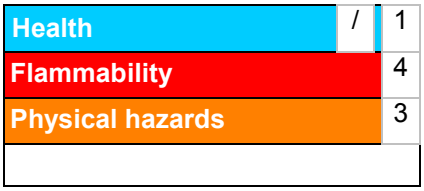
Turkey : Not determined.

United States : This material is listed or exempted.

Viet Nam : Not determined.

Section 16. Other information

Hazardous Material Information System (U.S.A.)



Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings and the associated label are not required on SDSs or products leaving a facility under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered trademark and service mark of the American Coatings Association, Inc.

The customer is responsible for determining the PPE code for this material. For more information on HMIS® Personal Protective Equipment (PPE) codes, consult the HMIS® Implementation Manual.

National Fire Protection Association (U.S.A.)

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Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

Procedure used to derive the classification

Classification	Justification
FLAMMABLE GASES - Category 1 GASES UNDER PRESSURE - Liquefied gas	Expert judgment Expert judgment

History

Date of printing : 5/10/2018

Date of issue/Date of revision : 5/10/2018

Date of previous issue : 7/11/2016

Version : 0.02

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL = International Convention for the Prevention of Pollution From Ships, 1973

Section 16. Other information

as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United Nations

References : Not available.

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

APPENDIX C

Heat Illness Prevention Program

HEAT ILLNESS
PREVENTION PROGRAM

CORPORATE HEALTH AND SAFETY DIRECTOR	:	**Brian Hobbs, CIH, CSP**
EFFECTIVE DATE	:	**10/2019**
REVISION DATE	:	**03/2024**
REVISION NUMBER	:	**3**

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1. PURPOSE

Roux Associates, Inc. and its affiliated **companies**, Roux Environmental Engineering and Geology, D.P.C, and Remedial Engineering (collectively, "Roux") has established this heat illness prevention program to assist in preventing workplace accidents, injuries, and illnesses associated with temperature extremes. Roux is committed to taking every precaution to protect employees who might be exposed to heat stress, including establishing safe work practices, heat illness prevention controls, and emergency preparedness, which will be detailed in this plan.

2. SCOPE AND APPLICABILITY

Roux's Heat Illness Prevention Program applies to all employees who may be exposed to heat stress in the field.

3. ROLES AND RESPONSIBILITIES

The Heat Illness Prevention Program Administrator for Roux is the Corporate Health and Safety Director (CHSD), Brian Hobbs, CIH, CSP. The daily administration of the program is delegated to the Operations Manager (OM) and Office Health and Safety Manager (OHSM). The CHSD has the authority, responsibility, and overall accountability for the comprehensive implementation of this program.

All managers and supervisors shall implement and maintain the heat illness prevention program in work areas where there is a potential for heat stress.

Management Responsibilities

Management (i.e., Project Managers, Project Principals, OM) must provide the following to promote compliance and foster a good safety culture:

- Comply with applicable standards.
- Inform employees of the provisions of the heat illness prevention program and ensure understanding.
- Provide sufficient water, shade, rest areas, and other heat illness controls for employees.
- Assist with establishing work practices to minimize heat stress risks, such as acclimatization, required rest periods, employee monitoring, and strategic scheduling.
- Encourage employees to report hazardous conditions or heat illness symptoms.
- Provide training to any employee who could possibly be exposed to the risk of heat illness.

Employee Responsibilities

Employees are expected to actively participate in the organization's heat illness prevention program, which includes the following responsibilities:

- Receive appropriate training with regard to heat stress.
- Understand core concepts of heat illness prevention and follow guidelines to mitigate risks.
- Recognize the signs and symptoms of heat illness and immediately report them.
- Cooperate with workplace inspections and incident investigations.

Effective Communication

All Roux employees shall be accountable for ensuring there is effective communication with both the field team and their subcontractors. Communication between Roux employees project leads (e.g., Project Principal, Project Managers) and subcontractors (if applicable) will be established and maintained so that employees can quickly

contact should there be a change in condition or someone at the Site exhibits signs/symptoms of heat stress. These types of incidents would follow Roux's Incident Investigation and Reporting Management Program 2.12 and Roux's Injury Illness Prevention Program 2.22.

4. HAZARD IDENTIFICATION AND ASSESSMENT

Prior to scheduled fieldwork, the project team shall ensure a hazard assessment is conducted as it relates to heat stress. This will include a determination of how much heat and exertion employees are likely to be exposed to based on the work activity.

Factors that can increase heat stress include the following:

- Temperatures at the work site;
- Humidity;
- A lack of air movement or exchange;
- The amount of time employees spend working in the heat;
- The time of day work takes place;
- Sources of radiant heat (e.g., sunlight, fire, or hot furnace);
- Work activities that produce heat (e.g., welding);
- Physical contact with warm or hot objects or liquids;
- The clothing and PPE employees are required to wear; and/or
- Physically strenuous work.

Results of the hazard analysis should be used to determine appropriate controls for mitigating heat stress, whenever possible, for planning acclimatization, and for developing work schedules that rotate workers to limit employee exposure. Typically, the Site Supervisor (SS) or Site Health and Safety Officer (SHSO) shall conduct worksite observations to ensure all employees follow heat illness prevention procedures and that hazards are sufficiently controlled. However, all employees should be continuously evaluating work site conditions and be able to recognize heat stressors in order to prevent heat illnesses.

5. TRAINING

All Roux employees shall be trained on the topics listed below prior to beginning work, which may potentially expose workers to heat stress.

Training Topics

- The environmental, behavioral, and personal risk factors for heat illness, such as radiant heat sources, exertion, clothing and PPE, and use of alcohol or drugs.
- Types of heat illnesses, common symptoms, and appropriate emergency response for each.
- The knowledge that mild symptoms may quickly become more severe or life-threatening.
- The importance of immediately reporting any signs or symptoms of heat illness to the supervisor.
- The employer's responsibility to provide shade, water, access to first aid, and cool-down rests during work and the employee's freedom to exercise their rights under this standard without fear of retaliation.

- The employer's heat stress plan and its procedures:
  - Procedures for employees who are newly assigned to work in high-heat areas.
  - The organization's acclimatization methods, as applicable.
  - Heatwave procedures.
  - Heat illness and emergency response, including contact information.
- The importance of frequent consumption of water and the taking of rest breaks.
- How heat illness prevention applies to employees' specific tasks.

Increasing Training Effectiveness:

- The SS/SHSO will hold daily tailgates with the field team to go over daily work tasks and basic safety information including Job Safety Analysis (JSA) review as well as incorporate elements such as current weather and effects on the work activities for the day.
- If a heat wave or high heat is anticipated, OHSMs and/or OMs will provide communications to Roux employees prior to their shifts and remind them of any special high heat procedures.

6. DRINKING WATER

Employees shall be given access to potable drinking water. Access to water will be provided as near as possible to where employees are working, and there shall be enough locations so employees will have sufficient water. Water should be fresh and pure, free of taste or smell that would discourage employees from drinking, comfortably cool, and obtained from an approved source.

The recommendation is that during warm or hot weather, employees drink four 8-ounce glasses of water, or a total of one quart per hour, throughout the entire work shift. Easy access to sufficient potable drinking water throughout the work shift encourages employees to drink.

During a heat wave, water shall be replenished more often to keep available and cool. Water containers (and all spouts and levers) must be kept clean. If able, provide single-use drinking cups with appropriate waste receptacles. Accessible sanitation facilities shall also be maintained at work Sites as appropriate.

SS/SHSO is responsible for the following:

- Drink sufficient water before, during, and after work shifts to maintain hydration.
- Encourage frequent drinking of small amounts of water throughout the shift. In high-heat environments, remind field staff and subcontractors that drinking extra water may be necessary.
- Discourage the choice of drinks with caffeine or sugar that may possibly dehydrate employees instead of water. Also, discourage the drinking of alcohol.
- Monitor the water supply.
- If employees become dehydrated and are unable to alleviate symptoms with the steps below, get them immediate medical attention.

Field Staff/Subcontractors are responsible for the following:

- Drink sufficient water before, during, and after work shifts to maintain hydration. Drink up to 4 cups of water per hour, especially during hot weather.
- Be aware that in high-heat situations, you may need to drink more water.

- Monitor yourself and others for signs of dehydration. If you feel dehydrated:
  - Follow Roux's Incident Notification Flowchart;
  - Rest in the shaded resting area; and
  - Drink water in small amounts, but frequently.

7. ACCESS TO SHADE

Access to shaded areas will be provided to Roux staff, as needed. Employees are encouraged to use these areas when they feel overheated. Roux's SS/SHSO shall oversee the proper implementation of shaded areas and will communicate these locations on a daily basis with the Field Team.

Depending on the Site, shaded areas can include the following:

- Pop-up Tents
- Canopies
- Umbrellas
- Structures mechanically ventilated or open to air movement
  - Garage
- Conex-mounted RV canopies
- Full and thick tree canopies that block direct sunlight
- Buildings
- Enclosed areas only if they provide cooling comparable to shade in open-air
  - Vehicles with air conditioning

Shaded Area Requirements

The shade shall be strong enough to cool employees down and other shadows should not be visible in the shade. The shade will be provided by Roux when the air temperature exceeds 80°F. If the temperature is less than 80°F, shade will be available and provided upon request. The SS/SHSO will monitor conditions to determine when the air will exceed (and is exceeding) 80°F. For most Sites, air will be monitored hourly and shade will be set up immediately if 80°F is exceeded.

Shade shall be located as close as practical to areas where employees are working and is easily accessible. These areas will be considered safe and free from other hazards. Shaded areas should be large enough to accommodate all employees who are on a break, resting, or recovering without crowding. Should natural vegetation be used for shade, the SS/SHSO will evaluate shade for effectiveness.

Field Staff Responsibilities

Field Staff should take ordinary rest breaks in the shaded areas and monitor themselves for signs of heat stress, and go to the shaded area when they need to cool down. Any issues or problems with shaded areas should be reported to the SS/SHSO for the Site.

If shaded areas are used for a preventative cool-down, the SS/SHSO will ensure the affected employees will remain in the shade until they begin to feel better. The SS/SHSO will continue to monitor the employees and ask them if

they are experiencing symptoms of a heat illness. Employees shall not be sent back to work before symptoms have ended and at a minimum at least 10 minutes of rest.

8. MONITORING AND SCHEDULING

Monitoring

The SS/SHSO and Field Team will continue to monitor themselves and others for signs of heat illness. The SS/SHSO will monitor when the air temperature exceeds 80°F. Throughout the summer, weather and temperature will be monitored at least two weeks ahead, and the work schedule will be planned to accommodate the expected weather.

Scheduling

Scheduling accommodations may include:

- Working during cooler hours of the day
- Working at night
- Stopping work early
- Rescheduling work activities
- Increasing frequency of breaks

In general, strenuous work activities shall be rescheduled to the coolest parts of the day.

Special precautions are required for temperatures above 80°F, 95°F, and heat waves. These precautions are provided in the sections below.

9. ACCLIMATIZATION AND NEW EMPLOYEE PROCEDURES

Roux requires employees to be acclimatized in order for them to better tolerate heat in the workplace. Acclimatization is the physical process of adapting to a different thermal environment, allowing a better toleration of heat. Acclimatization procedures require gradual exposure that gives the employee time to adjust to each level of exposure. Acclimatization is essential for new employees but is necessary for all employees when the temperature significantly changes. Heat stress is much more likely if these procedures are not followed.

The SS/SHSO is responsible for observing new employees during their first 14 days of employment in high-heat areas.

Re-acclimatization is necessary if employees are absent from high-heat environments for a week or more or the temperature increases significantly.

10. HEATWAVE AND EXTREME HEAT PROCEDURES

Heat Wave Procedures

A heat wave is defined as consistent temperatures over 80°F or if the temperature is 10° higher than the average daily temperatures in the preceding 5 days.

SS/SHSO and Project Management (e.g., PP, PM) shall closely observe and monitor employees during a heat wave. The Field Teams should institute a ratio of one SS to 20 or fewer employees, a mandatory buddy system, or

a consistent practice for supervisors to check on employees. Pre-shift meetings to review high-heat procedures with employees will be carried out to emphasize work-rest schedules, drinking water, shade, etc.

Extreme Heat Procedures

When work-site temperatures equal or exceed 95°F, the employer will enact extreme heat procedures:

- Employees will be closely observed by the SS/SHSO for signs of heat illness. New employees will be supervised for acclimatization.
- Effective communication and monitoring will be assured through the use of periodic check-ins with the SS/SHSO via phone. Communications between employees and Project Management (e.g., PP/PM) will be established and maintained. Mandatory 10-minute break periods are required for every two hours worked. SS/SHSO must enforce this rule.
- Pre-shift safety tailgate meetings will occur to review procedures and to remind employees to drink water and take cool-down rests if needed. SS/SHSO shall remind employees to rest and drink water. Employees should drink more water than usual.

11. EMERGENCY RESPONSE PROCEDURES

Roux is dedicated to providing prompt appropriate care for all employees who report or show symptoms of heat illness. If an employee shows signs of heat illness, they will be monitored and shall not be left alone or sent home without being offered first aid or emergency medical services. If on-Site personnel require any medical treatment, the following steps will be taken:

1. Notify Roux's Project and Corporate Management Team for any work-related injury and/or illness occurrence, and communicate with the contracted Occupational Health Care Management Provider, AllOne Health (AOH), immediately following the notifications provided above.
2. Based on discussions with the Project Team, Corporate Management, and the AOH evaluation, if medical attention beyond onsite First Aid is warranted, transport the injured / ill person (IP) to the Urgent Care Center, or notify the Fire Department or Ambulance Emergency service and request an ambulance or transport the victim to the hospital, and continue communications with Corporate Management Team. An Urgent Care/Hospital Route map with locations and directions is provided within Site Specific Health and Safety Plans.
3. First aid medical support will be provided by onsite personnel trained and certified in First Aid, Cardio Pulmonary Resuscitation (CPR), Automatic External Defibrillation (AED), and Blood-Borne Pathogens (BBP) Awareness, until relieved by emergency medical services (EMS).
4. The SHSO and Project Manager will perform a Loss Investigation (LI) and the Project Team will complete the final Loss Report.

12. HEAT-RELATED ILLNESSES

Heat Stress

Heat stress is a significant potential hazard and can be associated with heavy physical activity and/or the use of personal protective equipment (PPE) in hot-weather environments. For these reasons, the company will provide potable drinking water and access to shade or other areas of relief (i.e., air-conditioned vehicles and work trailers). Supervisors, prior to supervising personnel in the field as well as all personnel involved with the fieldwork of a project, are trained in this HASP that includes preventing heat-related illnesses and the below procedures in response to heat-related symptoms and illness. Since much of our work is dependent upon environmental factors beyond our control, we must closely monitor air temperature and humidity and be aware of avoiding radiant heat sources and providing as much air circulation as possible wherever we work. Physical factors that need to be evaluated as part of our Job Safety Analysis (JSA) reviews include the level of physical activity and duration of work

and the type (i.e., color, weight breathability) of the clothing we select. In addition, personal factors such as age, weight, fitness, drug/alcohol use, and prior history of heat-related illness need to be considered.

Heat cramps are brought on by prolonged exposure to heat. As an individual sweats, water and salts are lost by the body, resulting in painful muscle cramps. The signs and symptoms of heat stress are as follows:

- Severe muscle cramps, usually in the legs and abdomen;
- Exhaustion, often to the point of collapse; and
- Dizziness or periods of faintness.

First aid treatment includes, but is not limited to, shade, rest, and fluid replacement. Typically, the individual should recover within one-half hour while being monitored constantly. If the individual has not improved substantially within 30 minutes and the body temperature has not decreased, the individual should be transported to a hospital for medical attention.

Heat Exhaustion

Heat exhaustion may occur in a healthy individual who has been exposed to excessive heat while working or exercising. The circulatory system of the individual fails as blood collects near the skin to rid the body of excess heat through transference. The signs and symptoms of heat exhaustion are as follows:

- Rapid and shallow breathing;
- Weak pulse;
- Cold and clammy skin with heavy perspiration;
- Skin appears pale;
- Fatigue and weakness;
- Dizziness; and
- Elevated body temperature.

First aid treatment includes, but is not limited to, cooling the victim, elevating the feet, and replacing fluids. If the individual is not substantially improved within 30 minutes and the body temperature has not decreased, the individual should be transported to the hospital for medical attention.

Heat Stroke

Heat stroke occurs when an individual is exposed to excessive heat and stops sweating. This condition is classified as a MEDICAL EMERGENCY requiring immediate cooling of the victim and transport to a medical facility. The signs and symptoms of heat stroke are as follows:

- Dry, hot red skin;
- Body temperature approaching or above 105 degrees F;
- Confusion, altered mental state, slurred speech;
- Seizures;
- Large (dilated) pupils; and
- Loss of consciousness – the individual may go into a coma.

First aid treatment requires immediate cooling and transportation to a medical facility. Heat stress is a significant hazard if any type of protective equipment (semi-permeable or impermeable) that prevents evaporative cooling is worn in hot-weather environments.

13. OTHER HEAT CONTROLS

Clothing and PPE

Employees should choose clothing that is reflective, light-colored, lightweight, loose-fitting, and breathable. Clothing should cover the exposed parts of the body. In direct sun, hard hats with a brim or bill may be helpful. Should specialized cooling garments be applicable, please consult with your OM/OHSM/CHSD.

Managing Employee Risk Factors

It is recommended that employees are aware of how their health can affect their risk of heat stress. The following increases ones risk for a heat related illness:

- A poor level of physical fitness
- Obesity
- Chronic or acute illnesses
- Conditions such as diabetes, heart disease, or high blood pressure
- Certain medications, such as diuretics
- Age (60+)

Employees should:

- Maintain their health outside of work
- Be aware of the effects of medications
- Drink adequate amounts of water
- Eat light, cool meals during work shifts and save heavy meals until after the shift is over
- Do not skip meals: food helps replace electrolytes when sweating
- Take breaks as needed
- Do not consume alcohol prior to working in a hot environment

APPENDIX D

Personal Protective Equipment (PPE) Management Program

PERSONAL PROTECTIVE EQUIPMENT MANAGEMENT PROGRAM

CORPORATE HEALTH AND SAFETY DIRECTOR	:	**Brian Hobbs, CIH, CSP**
EFFECTIVE DATE	:	**01/2019**
REVIEW DATE	:	**03/2024**
REVISION NUMBER	:	**5**

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1. PURPOSE

Roux Associates, Inc. and its affiliated companies, Roux Environmental Engineering and Geology, D.P.C., and Remedial Engineering (collectively, "Roux") has instituted the following program to establish guidelines for the selection of personal protective equipment (PPE) for use by Roux personnel performing field activities in hazardous environments. PPE is not meant to be a substitute for engineering, work practice, and/or administrative controls, but PPE should be used in conjunction with these controls to protect employees in the workplace. Clothing, body coverings, and other accessories designed to prevent worker exposure to workplace hazards are all types of PPE. To ensure adequate PPE employee-owned PPE is evaluated on a case-by-case basis to insure its adequacy, maintenance and sanitation.

2. SCOPE AND APPLICABILITY

These guidelines apply to all PPE selection decisions to be made in implementing the Roux program. The foundations for this program are the numerous Occupational Health and Safety Administration (OSHA) standards related to PPE cited in 29 CFR 1910 Subpart I, 29 CFR 1926 Subpart E, and the hazardous environment work employee protection requirements under the OSHA Hazardous Waste Operations and Emergency Response (HAZWOPER) standard at 29 CFR 1910.120 and 1926.65. To ensure hazard assessments are documented, the levels of protection, types of protection, and tasks requiring protection are covered in site-specific Health and Safety Plans (HASPs) and Job Safety Analyses (JSAs).

3. PROCEDURES

Due to the varied nature of site activities and the different potential hazards associated with different sites, several aspects must be considered when selecting PPE. The following text describes PPE selection logic and provides guidelines and requirements for the appropriate selection and use of PPE.

3.1 Introduction

To harm the body, chemicals must first gain entrance. The intact skin and respiratory tract are usually the first body tissues that are exposed to chemical contaminants. These tissues provide barriers to some chemicals but, in many cases, are damaged themselves or are highly permeable by certain chemical compounds. PPE, therefore, is used to minimize or eliminate chemical compounds from coming into contact with these first barrier tissues.

Proper PPE selection is essential in preventing exposures. The Project Manager (PM) or health and safety personnel making the selection will have to consider several factors. The level of protection, type, and kind of equipment selected depends on the hazardous conditions. In some cases, additional selection factors include cost, availability, compatibility with other equipment, and performance. All these factors must be accurately assessed before work can be safely carried out.

3.1.1 Training

Training shall be provided to all field-based employees in properly using and caring for PPE. Training shall include, but not be limited to, the initial 40-hour HAZWOPER training, annual 8-hour HAZWOPER refresher training, and site-specific PPE training. The training program includes when PPE is necessary, what types of PPE are required; how to don, doff, adjust, and wear PPE; the limitations of PPE; the proper care, maintenance, useful life, signs of PPE failure and emergency procedures to follow in the event of PPE failure and disposal of PPE. In addition, retraining shall be conducted when workplace changes require a change in PPE when an employee demonstrates a lack of knowledge or improper use of PPE is identified.

3.2 Types of PPE

The type and selection of PPE must meet certain general criteria and requirements as required under OSHA 29 CFR 1910.132 (General Industry) and 1926.95 (Construction). In addition to these general requirements, specific requirements and specifications exist for some types of PPE that form the basis of the protective clothing scheme. All manufacturer's recommendations for PPE care and use shall be followed. All PPE shall be maintained in a sanitary and reliable condition. Additionally, proper fit and size shall be evaluated to ensure adequate employee protection. Should PPE become defective, it shall be immediately removed from service and discarded.

The following is a list of the common types of specific PPE and the specific requirements for the PPE type, where applicable:

1. Hard Hats - Regulated by 29 CFR 1910.135 and 1926.100; and specified in ANSI Z89.1.
2. Face Shields and Safety Glasses - Regulated by 29 CFR 1910.133 and 1926.102; and specified in ANSI Z87.1.
3. Respiratory Protection - Regulated by 29 CFR 1910.134 and 1926.103.
4. Hand Protection - Regulated by 29 CFR 1910.138
5. Foot Protection - Regulated by 29 CFR 1910.136 and 1926.96; and specified in ANSI Z41.1.
6. Protective Clothing (e.g., fully encapsulated suits, aprons) - Specified in NFPA 1991/1992/1994.

3.2.1 PPE Inspection, Cleaning Maintenance, and Storage

The Office Health and Safety Manager (OHSM) or their designee is responsible for procuring PPE, in accordance with this management program. Single-use/disposable PPE should be purchased and used whenever practicable.

3.2.1.1 PPE Inspection

Roux employees must inspect PPE regularly, before and after each use, to check for defects and damage. Garments and other PPE in central storage must be inspected at least annually or as recommended by the manufacturer by the OHSM, Equipment Manager and/or their designee. Defective or damaged equipment must be tagged as out-of-service, immediately removed from the work site and discarded.

3.2.1.2 PPE Cleaning and Maintenance

All Roux employees are responsible for routine cleaning of their assigned PPE. Decontamination of PPE is addressed within Roux's Site Control and Decontamination Program as well as specified within site-specific health and safety plans. As appropriate, Roux employees should be issued single-use PPE when practicable to minimize the requirement for decontamination. When performing routine cleaning of reusable PPE:

- Always follow the manufacturer's recommendations to avoid damaging the PPE. For example, some cleaning solutions compromise the integrity of protective helmets' shells.
- Clean and maintain PPE according to the manufacturer's recommendations. Before being re-issued, PPE should be thoroughly sanitized.
- Disassemble, wash, and sanitize reusable respirators after each use, refer to Roux's Respiratory Protection Management Program.

Employees are not authorized to repair PPE without prior approval from the Health and Safety Department. Reusable PPE may require maintenance by the manufacturer to maintain integrity and certification. Many

manufacturers specify which repairs, if performed by the end-user, will void product warranty, therefore Roux employees are not typically authorized to perform such maintenance or repairs.

3.2.1.3 PPE Storage

Certain equipment failures can be directly attributed to improper storage. The OHSM or Equipment Manager (or another designated person) is responsible for implementing procedures for appropriate PPE storage, for equipment that is centrally stored. Both central storage and dedicated PPE provided to employees should be stored using the following:

- Store goggles and safety glasses in protective cases.
- Store PPE (such as helmets, boots, etc.) in clean, dust-proof containers or bags out of direct sunlight.
- PPE should ideally be stored under climate-controlled conditions. PPE, stocked gear bags, and/or go-kits should not be stored in hot, cold, or other extreme environmental conditions, and they should not be stored in vehicles (government-owned or rentals) for even short periods of time. Do not store helmets on the rear window shelf of a vehicle.
- Store different kinds of clothing and gloves separately to prevent errors in selection.
- Hang or fold protective clothing in accordance with manufacturers' recommendations.
- Never store contaminated PPE near new protective clothing or street clothing. Potentially contaminated, reusable clothing must be stored (usually bagged) away from new PPE, in a well-ventilated area, with good air flow around each item, until the garment is decontaminated or disposed.
- See Roux's Respiratory Protection Management Program for detailed procedures on storing respirators.

3.3 Fitting, Donning and Doffing PPE

Roux shall provide appropriately sized PPE for Roux employees. Improper fitting such as tight-fitting garments, can tear, especially at the knees, crotch, shoulders, back, and elbows due to movement. Protective clothing that is too large can easily snag and/or limit a user's dexterity. The Roux PM shall ensure site/project-specific PPE is kept in a sufficient stock of appropriately sized PPE (e.g., Level C ensembles). The OHSM, Equipment Manager and/or their designee shall ensure a sufficient stock of appropriately sized PPE is maintained in central storage locations.

The Site Supervisor (SS)/Site Health and Safety Officer (SHSO) is responsible for ensuring that site-specific procedures for donning and doffing PPE are incorporated into site-specific HASPs. Donning and doffing procedures may differ depending on the type of PPE and clothing (e.g., Level D, Modified Level D, Level C) utilized. Figures 1-4, provide examples of procedures that can be used to don and doff Levels A through D and are provided as a reference. Site-specific conditions may warrant adjustments to such procedures. Consult the CHSD for additional information.

Site-specific donning and doffing procedures should include the use of an assistant where necessary. Donning and doffing certain types of PPE without assistance could risk PPE failure or damage. Care must be taken to prevent the spread of contaminants on the PPE. Decontamination procedures should limit the potential for cross contamination and may include gross decontamination of outer boots, gloves, and suits as necessary to prevent tracking of contaminants into the contamination reduction zone (CRZ) and clean zone(s).

3.4 Controlling Hazards Associated with PPE Use

PPE use can pose potential health and safety hazards, which range from minor discomfort to life-threatening height stroke. The magnitude of the potential hazard can vary and will depend on various factors, including an individual's fitness level, the type of PPE worn, the work demands, individual work practices, duration of work and environmental conditions. The use of PPE can also lead to reduced efficiency and work performance.

Among hazards associated with PPE use, heat stress emerges as a prevalent and significant hazard. Particularly, the use of substantial and/or impermeable attire, such as heavy coveralls, Tyvek suits, splash suits, or Level A or B suits, alongside strenuous work, amplifies the risk of heat stress. Regular monitoring for indications of heat stress is imperative for workers operating in such conditions. Roux's Heat Illness Prevention Program lays out requirements for signs and symptoms as well as preventative measures to mitigate the potential for heat illness. In addition, cold environments can pose adverse risk, such examples include use of non-insulated steel-toe safety shoes in frigid conditions which has the potential to increase the risk of frostbite, while safety gloves worn for chemical protection may inadequately insulate hands from the cold.

It is the responsibility of Project Teams to integrate site-specific protocols to manage PPE hazards into such site-specific HASPs. These protocols can encompass considerations like work/rest ratios, crew rotations, and other accommodations for exceptionally demanding conditions.

The following measures are recommended for controlling hazards posed by PPE use:

- Prioritize through the hierarchy of controls with a focus on elimination, substitution, engineering, work practice and administrative control implementation rather than sole reliance on PPE. PPE shall be considered the last line of worker protection.
- Workers should maintain physical fitness to be able to withstand the potential physical strain of PPE use. A physically fit individual will endure less physiological strain, manifesting in a lower heart rate, reduced body temperature (indicating diminished retained body heat), more effective sweating, slightly lower oxygen consumption, and carbon dioxide production. Furthermore, acclimatization to extreme environmental conditions, such as high temperatures, can influence work performance and physical capacity.
- Understand the symptoms of PPE failure. Workers encountering any of these symptoms while donning PPE should promptly notify their onsite SHSO and/or SS:
    - Perception of odors when wearing a respirator
    - Skin irritation
    - Acute discomfort
    - Difficulty breathing
    - Unusual fatigue
    - Dizziness
    - Inability to see, hear, or speak clearly
    - Uncomfortable restriction of movement
    - Rapid pulse, nausea, or chest pain
- Implement a buddy system. Especially in situations where there is a need for increased level of protection (e.g. Level A-C) workers should work in pairs or teams, and are instructed to monitor the integrity of their team/partners gear and remain alert for symptoms of PPE failure.

3.5 PPE Selection

For site-specific work, the Project Manager in consultation with the Health and Safety Department has overall responsibility for coordinating the selection and distribution of PPE to field staff and for ensuring that the selected PPE is appropriate for the site-specific hazards. Generally speaking Roux employees are not engaged in emergency response or perform work at uncontrolled hazardous waste sites, if the case the CHSD shall be made aware of the work and consult with the Project Team on appropriate PPE selection. Most work falls under environmental sampling of low concentration water/soil/perimeter air. Therefore work is carried out in Level D PPE. Upgrades would be based on more information as it becomes available. The United States Environmental Protection Agency (EPA) has created Guidelines for PPE Ensemble Selection to assist workers in selecting PPE ensembles for specific activities and tasks and determining which ensembles and air monitoring equipment should be used to address specific chemicals. Guidelines to Ensembles for Specific Activities/Tasks Where Chemical Exposure is Possible is provided as a reference as Appendix A.

3.6 Protective Clothing Selection Criteria

3.6.1 Chemicals Present

The most important factor in selecting PPE is the determination of what chemicals the employee may be exposed to. The number of chemicals on field investigations may range from a few to several hundred. The exact chemicals or group of chemicals present at the site (certain groups tend to require similar protection) can be determined by collecting and analyzing air, soil, water, or other site media samples. When data are lacking, research into the hazardous materials used or stored at the site can be used to infer potential chemical exposures on the site.

The most appropriate clothing shall be selected once the known or suspected chemicals have been identified and considered based on the type of work to be performed.

Protective garments are made of several different substances for protection against specific chemicals. There is no universal protective material. All will decompose, permeate, or otherwise fail to protect under given circumstances. Fortunately, most manufacturers make guides to using their products (i.e., Dupont's Tyvek™ Permeation Guide). These guides are usually for gloves and coveralls and typically provide information regarding chemical degradation rates (failure of the material to maintain structural integrity when in contact with the chemical) and may provide information on the permeation rate (whether or not the material allows the chemical to pass through). When permeation tables are available, they shall be used with degradation tables to determine the most appropriate protective material for the specific chemical hazard(s).

During most site work, chemicals are usually in mixed combinations, and the protective materials are not in continuous contact with pure chemicals for long periods; therefore, the selected material may be adequate for the particular chemical of most concern and type of work being performed, yet not the "best" protecting material for all site chemicals and activities. Selection shall depend upon the most hazardous chemicals based on their hazards and concentrations. Sometimes, layering (i.e., using several layers of protective materials) affords the best protection.

3.6.2 Concentration of the Chemical(s)

One of the major criteria for selecting protective material is the concentration of the chemical(s) in air, liquid, and solid state. Airborne and liquid chemical concentrations should be compared to the OSHA standards and American Conference of Governmental Industrial Hygienists (ACGIH) and National Institute for Occupational Safety and Health (NIOSH) guidelines to determine the level of skin or other absorptive

surface (e.g., eyes) protection needed. While these standards are not designed specifically for skin exposed directly to the liquid, they may provide skin designations indicative of chemicals known to have significant skin or dermal absorption effects. For example, airborne levels of PCBs on-site may be low because they are not very volatile, so the inhalation hazard may be minimal; however, PCB-containing liquid coming in direct contact with the skin may cause overexposure. Thus, PCBs have been assigned a skin designation in the OSHA and ACGIH exposure limit tables.

3.6.3 Physical State

The characteristics of a chemical may range from nontoxic to highly toxic, depending on its physical state. Inorganic lead in soil would not be considered toxic to site personnel unless it became airborne since it is generally not absorbed through the intact skin. However, organic lead in a liquid could be readily absorbed through the skin. Soil is frequently contaminated with hazardous materials. Concentrations will vary from a few parts per million to nearly one hundred percent by volume. The degree of hazard depends on the type of soil and concentration of the chemical. Generally speaking, "dry" soils that have not become airborne do not pose a hazard to site personnel if they take minimal precautions, such as wearing lightweight gloves.

3.6.4 Length of Exposure

The length of time a material is exposed to a chemical increases the probability of a breakthrough. Determinations of actual breakthrough times for short-term exposures indicate that several materials that would be considered inadequate under long-term exposures can be used. Different materials that would be considered inadequate under long-term exposures can be used. It should be kept in mind that during the manufacturer’s permeation testing, a pure (100% composition) liquid is usually placed in direct contact with the material, producing a worst-case situation.

3.6.5 Abrasion

When selecting protective clothing, the job the employee is engaged in must be taken into consideration. Persons moving drums or performing other manual tasks may require added protection for their hands, lower chest, and thighs. Using leather gloves and a heavy apron over other normal protective clothing will help prevent damage to the normal PPE and thus reduce worker exposures.

3.6.6 Dexterity

Although protection from skin and inhalation hazards is the primary concern when selecting PPE, the ability to perform the assigned task must be maintained. For example, personnel cannot be expected to perform work that requires fine dexterity if they must wear thick gloves. Therefore, the PPE selection process must consider the task being performed and provide PPE alternatives or techniques that maintain dexterity while still protecting the worker (e.g., wearing tight latex gloves over more bulky hand protection to increase dexterity).

3.6.7 Ability to Decontaminate

If disposable clothing cannot be used, the ability to decontaminate the materials selected must be taken into consideration. Once a chemical makes contact with the material, the PPE must be cleaned before reusing it. If the chemical has completely permeated the material, the clothing cannot be adequately decontaminated, and the material should be discarded.

3.6.8 Climactic Conditions

The human body works best with few restraints from clothing. Protective clothing adds a body burden by increasing weight, restricting movement, and preventing the body's natural cooling process. In severe situations, a modified work program must be used.

Some materials act differently when they are very hot and very cold. For example, PVC becomes almost brittle in frigid temperatures. If there are any questions about the stability of the protective materials under different conditions, the manufacturer should be contacted before using PPE in the field.

3.6.9 Work Load

Like climactic conditions, the type of work activity may affect work duration and personnel's ability to perform certain tasks. Similarly, the amount of protective materials a person wears will affect their ability to perform certain tasks. For example, a person in a total encapsulating suit, even at 72˚F, cannot work for more than a short period of time without requiring a break.

The work schedule should be adjusted to maintain the health of the employees. Modified work practices may include allowing more time for individual job tasks and implementing work/rest cycles per NIOSH and ACGIH thermal stress recommendations. Special consideration should be given to the selection of clothing that protects the worker and adds the least burden when personnel are required to perform strenuous tasks. Excessive bodily stress frequently represents the most significant hazard encountered during fieldwork.

3.6.10 Types of Protective Materials

1. Cellulose or Paper: suitable for nuisance dust and coarse fibers.
2. Natural and Synthetic Fibers
    a. Tyvek™: suitable small-sized hazardous particles, including lead, asbestos, and mold.
    b. Tychem™: is suitable for a variety of hazards, from light liquid splashes to heavy exposures to industrial chemicals and agents.
    c. Nomex™: is suitable for flame-resistance, radiation resistance, acids, alkalis, fluorocarbon refrigerants (CFCs), and non-polar solvents.
3. Elastomers
    a. Polyethylene: suitable for polar substances and solvents.
    b. Saran™ : suitable for flame-resistance, acids, alkalis, oils, and organic solvents.
    c. Polyvinyl Chloride (PVC): suitable for alcohols, oils, inorganic acids, alkalis, and salts.
    d. Neoprene: suitable for polar/non-polar substances, petroleum mixtures, and ≤ 200 F heat resistance.
    e. Butyl Rubber: suitable for polar substances and solvents.
    f. Viton: suitable for non-polar substances, petroleum mixtures, and ≤ 200 F heat resistance.
    g. Nitrile: suitable for polar/non-polar substances and petroleum mixtures.

3.7 Protection Levels

3.7.1 Level A Protection

Level A protection (a fully encapsulated suit) is used when skin hazards exist or when no known data positively rule out skin and other absorption hazards. Per the Roux Respiratory Protection Management

Program, Roux employees are not authorized to enter an IDLH atmosphere; therefore, the program does not allow supplied air respirators (SARs) or self-contained breathing apparatus (SCBA). At no time will Level A work be performed without the consent of the CHSD and OM.

The following conditions warrant the use of Level A protection:

- Hazardous substances have been identified and require the highest level of protection for skin, eyes, and the respiratory system;
- The atmosphere contains less than 19.5% oxygen or an atmosphere immediately dangerous to life and health (IDLH) that have not been ruled out;
- Site operations involve a high potential for splash, skin immersion, or exposure to suspected skin hazards;
- Direct-reading instruments indicate high levels of unidentified but potentially hazardous vapors or gases in the air (e.g., Total atmospheric readings on the Photoionization Detector (PID), Flame Ionization Detector (FID), and similar instruments indicate 500 to 1,000 ppm of unidentified substances); and
- Direct-reading instruments are not available to test the air and suspected highly toxic substances may be present.

It may be necessary to base the decision to use Level A protection on indirect evidence. Other conditions that may indicate the need for Level A protection include:

- Confined spaces;
- Sites containing known skin hazards;
- Sites with no established history to rule out skin and other absorption hazards;
- Site exhibiting signs of acute mammalian toxicity (e.g., dead animals, illnesses associated with past entry into the site by humans);
- Sites at which sealed drums of unknown materials must be opened;
- Visible indicators such as leaking containers or smoking chemical fires; and
- Extremely hazardous substances (e.g., cyanide compounds, concentrated pesticides, Department of Transportation Poison "A" materials, suspected carcinogens, and infectious substances) are known or suspected to be present, and skin contact is possible.

Table 1: Recommended Level A Ensemble Components			
Component	**Type**	**Manufacturer / Recommended Material**	**Notes**
Respirator	Positive-pressure full- facepiece SCBA or positive-pressure supplied-air respirator with escape SCBA[1]	NIOSH approved respirator	See Roux's Respiratory Protection Program. Roux employees are not approved to utilize Supplied Air (SAR) and/or Self-contained breathing apparatus (SCBA).
Suit	Totally encapsulated chemical- and vapor-protective suit	DuPont® Tychem™ or Responder CSM™	Other material types may be substituted based on known contaminants.
Inner Gloves	Light weight	Nitrile, Neoprene, PVC, or Viton®	Other material types may be substituted based on known contaminants.
Outer Gloves	Integral part of suit	See Appendix A for additional information	Confirm chemical performance rating for suspected contaminants. Glove material may have different performance ratings than suit material. All fully-encapsulating suit materials must be compatible with substances involved.
Inner Boot	Integral Part of Suit	-	-
Outer Boot	HazMat boot[2]	–	Confirm chemical performance rating of outer boot for suspected contaminants. Provides slip/abrasion resistance.
Hard Hat	Standard[3]	-	-

[1] Must be NIOSH approved.
[2] Must meet NFPA 1991/NFPA 1994 requirements depending on the site hazard assessment.
[3] Must comply with the applicable ANSI standard.

3.7.2 Level B Protection

Level B protection is utilized when the highest level of respiratory protection is needed, but hazardous material exposure to the few unprotected areas of the body is unlikely. At no time will Level B work be performed by Roux personnel without the consent of the CHSD and OM.

The following conditions suggest a need for Level B protection:

- The type and atmospheric concentration of toxic substances have been identified, and they require the highest level of respiratory protection;

- IDLH atmospheres where the substance or concentration in the air does not present a severe skin hazard;
- The type and concentrations of toxic substances do not meet the selection criteria permitting the use of air-purifying respirators and
- It is highly unlikely that the work being done will generate high concentrations of vapors, gases, particulates, or splashes of materials that will affect personnel's skin.

Table 2: Recommended Level B Ensemble Components

Component	Type	Manufacturer / Recommended Material	Notes
Respirator	Positive-pressure full- facepiece SCBA or positive-pressure supplied-air respirator with escape SCBA[1]	NIOSH approved respirator	See Roux's Respiratory Protection Program. Roux employees are not approved to utilize Supplied Air (SAR) and/or Self-contained breathing apparatus (SCBA).
Suit	Chemical-resistant clothing (liquid-splash protective suit with integral boot and hood)[2]	DuPont® Tychem® CPF 3	Other material types may be substituted based on known contaminants.
Inner Gloves	Light/medium weight	Nitrile, Neoprene, PVC, Viton®, or PE/EVAL	Other material types may be substituted based on known contaminants.
Outer Gloves	Medium/heavy weight	Butyl MIL-G12223, Nitrile, Neoprene, PVC, Viton®, PE/EVAL, or heavy weight Nitrile or Neoprene	Confirm chemical performance rating. Other material types may be substituted based on known contaminants.
Inner Boot	Safety work boot	–	Other boot types may be substituted based on known contaminants and physical hazards. Puncture resistant shanks may be required.
Outer Boot	Heavy weight Latex booties or outer boots[2]	Latex booties are used to protect suit for light duty applications. NFPA-rated outer boots may be required based on anticipated site conditions and tasks.	Other outer boot coverings may be substituted based on known contaminants/anticipated tasks.
Hard Hat	Standard[3]	-	-

[1] Must be NIOSH approved.
[2] Must meet NFPA 1991/NFPA 1994 requirements depending on the site hazard assessment.
[3] Must comply with the applicable ANSI standard.

3.7.3 Level C Protection

Level C protection is utilized when skin and respiratory hazards are well defined, and the criteria for using negative pressure respirators have been fulfilled (i.e., known contaminants and contaminant concentrations, acceptable oxygen levels, approved filter/cartridge available, known cartridge service

life, etc.). Level C protection may require an emergency escape respirator during specific initial entry and site reconnaissance situations or when applicable after that.

Table 3: Recommended Level C Ensemble Components

Component	Type	Manufacturer / Recommended Material	Notes
Respirator	Full-face air-purifying respirator with appropriate cartridge[1]	NIOSH approved respirator	See Roux's Respiratory Protection Program for information about the brand, model, acceptable configurations, and specific care instructions for the standard issue respirator. Half-faced respirators may be donned if hazard assessment warrants.
Suit	Puncture/tear resistant suit material with boot and hood[2]	DuPont® Tychem® CPF 2/CPF 3 or Saranex	Other material types may be substituted based on known contaminants, if considered more appropriate.
Inner Gloves	Light weight	Nitrile, Neoprene	Other material types like Neoprene, PVC, Viton®, or PE/EVAL may be substituted based on known contaminants, if considered more appropriate.
Outer Gloves	Medium/heavy weight	Butyl, Nitrile, or other work glove	Confirm chemical performance rating. Other material types may be substituted based on known contaminants, if considered more appropriate.
Inner Boot	Safety work boot	–	Other boot types may be substituted based on known contaminants and physical hazards. Puncture resistant shanks may be required.
Outer Boot	Heavy weight Latex booties or outer boots[2]	Latex booties are used to protect suit for light duty applications. NFPA rated outer boots may be required based on anticipated site conditions and tasks.	Other outer boot coverings may be substituted based on known contaminants.
Hard Hat	Standard[3]	-	-
Eye Protection	Safety glasses/goggles[3,4]	-	-

1 Must be NIOSH approved.
2 Must meet NFPA 1991/NFPA 1994 requirements depending on the site hazard assessment.
3 Must comply with the applicable ANSI standard.
4 In the case a ½ face respirator is worn eye protection is required.

3.7.4 Level D Protection

Level D is the basic work uniform. Level D is worn when the atmosphere contains no known hazard. Work functions preclude splashes, immersion, potential for inhalation, or direct contact with hazard chemicals. For most Roux field jobs Level D is the standard minimum level of protection worn.

Table 4: Recommended Level D Ensemble Components

Component	Type	Manufacturer / Recommended Material	Notes
Respirator	None	-	-
Suit	Coveralls, street clothes, or disposable Tyvek suit	–	Other types may be substituted as appropriate.
Inner Gloves	N/A		
Outer Gloves	As appropriate for physical hazards and for comfort	–	-
Boot	Safety work boot	–	Roux's standard safety boot is 6", steel/composite safety toe, and electrical hazard (EH) rated.
Outer Boot Covering	As appropriate	–	–
Hard Hat	Standard[3]	-	-
Eye Protection	Safety glasses/goggles[3]	-	-
High Visibility Clothing	High Visibility Vest /Jacket[3]	-	ANSI Class 2 Safety Vests/Jackets are the standard. Class 3 Safety vests/jackets shall be worn in worksites with 50+ MPH traffic.
Hearing Protection	Ear muffs/plugs	-	Workers exposed to excessive noise shall don hearing protection. Refer to Roux's Hearing Conservation Program for more information.

[1] Must be NIOSH approved.
[2] Must meet NFPA 1991/NFPA 1994 requirements depending on the site hazard assessment.
[3] Must comply with the applicable ANSI standard.

3.7.5 Level E Protection

Level E protection is used when radioactivity above 10 millirems per hour (mrems/hr) is detected at the site. Personal protective equipment for Level E includes:

- Coveralls;
- Air purifying respirator (i.e., P100 or equivalent);
- Time limits on exposure;
- Appropriate dermal protection for the type of radiation present, and

- Radiation dosimetry and ambient monitoring.

3.7.6 Additional Considerations

Fieldwork will contain a variety of situations due to chemicals in various concentrations and combinations. These situations may be partially ameliorated by following the work practices listed below:

1. Foot protection is needed on every site. If the ground to be worked on is contaminated with liquid, and it is necessary to walk in the chemicals, some sort of protective shoe coverings or "booties" can be worn over the boots. Shoe coverings should be designed with soles to help prevent slips. Using disposable shoe coverings when contacting liquid contamination can on and reduce overall decontamination requirements. If non-liquids are to be encountered, a Tyvek™ bootie could be used. The advantage of booties is questionable if the ground contains any sharp objects. Boots should be worn with either cotton or wool socks to help absorb perspiration.
2. If the site requires hard hats, chin straps should be used if a person will be stooping over where his/her hat may fall off. Respirator straps should not be placed over the hard hats, as this will affect the respirator's fit.

   Some types of protective materials conduct heat and cold readily. In cold conditions, natural material clothing should be worn under protective clothing. Protective clothing should be removed before allowing a person "to get warm." Applying heat, such as with a space heater, to the outside of the protective clothing may drive contaminant permeation. In hot weather, under clothing will absorb sweat. It is recommended that workers use all cotton undergarments.
3. Body protection should be worn and taped to prevent anything from running into the top of the boot. Gloves should be worn and taped to prevent substances from entering the top of the glove. Duct tape is preferred, but masking tape can be used. When aprons are used, they should be taped across the back for added protection. However, this should be done so that the person has mobility.
4. Atmospheric conditions such as precipitation, temperature, wind direction, humidity, wind velocity, and pressure determine the behavior of contaminants in air or the potential for volatile materials to become airborne. These parameters should be considered in determining the need for and the level of protection.
5. A program must be established for periodic air monitoring during site operations. Without an air monitoring program, any changes to air quality would go undetected and might jeopardize on-site personnel. Monitoring can be done with various types of air pumps and filtering devices, followed by laboratory analysis of the filtration media, personnel dosimeters, and periodic walk-throughs by personnel carrying real-time direct-reading survey instruments.
6. For operations in the exclusion zone, different levels of protection may be selected, and various types of chemical-resistant clothing may be worn. This selection should be based on the job function, reason for being in the area, and the potential for skin contact with, or inhalation of, the chemicals present.
7. Escape masks must be readily available when levels of respiratory protection do not include an SCBA and the possibility of an IDLH atmosphere exists. The use and placement of escape masks should be made on a case-by-case basis. Escape masks should be strategically located at the site in areas with higher potential for vapors, gases, or particulates.

3.8 Decontamination of PPE

Roux prefers the use of single use PPE to minimize the requirement for significant decontamination. The following procedures shall be considered should a field project require the need for decontamination of PPE. Roux has also developed a Site Control and Decontamination Management Program.

3.8.1 Site-Specific Decontamination Plans

The Project Manager (or another authorized individual) is responsible for formulating the site-specific PPE decontamination plan as an integral part of the Health and Safety Plan (HASP). The SHSO/SS' responsibilities include ensuring the plan's implementation and adapting it as site conditions evolve. Refer to Roux's Site Control and Decontamination Management program for additional requirements.

The decontamination plan, often created in conjunction with PPE selection, must be established prior to workers entering potentially contaminated areas. The plan should address the following key aspects:

- Decontamination Hazard Evaluation and Risk Assessment: Assessing risks associated with decontamination processes.
- PPE for Decontamination Line Assistants: Specifying appropriate PPE for personnel involved in decontamination.
- Roles and Responsibilities During Decontamination: Defining tasks and duties during the decontamination process.
- Layout and Quantity of Decontamination Stations: Determining the number and arrangement of decontamination stations, along with the designated PPE decontamination procedures at each station.
- Decontamination Equipment: Identifying the necessary equipment for effective decontamination.
- Decontamination Methods: Describing the methods and protocols for decontaminating personnel and equipment.
- Preventing Contamination of Clean Areas: Outlining procedures to prevent contamination of uncontaminated zones.
- Minimizing Contact with Contaminants During CPC Removal: Providing guidelines to reduce wearer exposure during the removal of Chemical Protective Clothing (CPC).
- Disposal Procedures for Inadequately Decontaminated Clothing and Equipment: Ensuring proper disposal practices for items that have not been adequately decontaminated.

The initial decontamination plan, which is developed in conjunction with the initial site hazard assessment, should be based on worst-case assumptions about the extent and type of contamination.

3.8.2 Emergency Decontamination of PPE

The designated SHSO/SS (or another authorized individual) assumes responsibility for addressing emergency decontamination within the site-specific Health and Safety Plan (HASP). Emergency decontamination may become necessary due to events such as fires, explosions, sudden violent storms, or medical emergencies. The emergency decontamination plan must clearly delineate emergency egress routes, as well as procedures for both decontamination and egress.

Some key points to consider regarding emergency decontamination.

- Immediate Notification: The SHSO/SS (or their designated counterpart) must be promptly informed of any circumstances requiring emergency decontamination. Additionally, they are accountable for tracking all personnel during the process.
- Urgent Medical Treatment: If urgent medical attention is necessary, decontamination of PPE may be delayed until the victim's condition stabilizes.
- Balancing Priorities: When feasible, decontamination should occur without hindering essential first aid. However, if a worker is exposed to an extremely toxic or corrosive substance, immediate decontamination is crucial to prevent severe injury or fatality.

- Heat-Related Illness: In cases of heat-related illness, protective clothing must be promptly removed (refer to Roux's Heat Illness Prevention Program).

Emergency Facilities:

- For workers potentially exposed to corrosive materials, quick drenching or flushing facilities must be provided in accordance with 29 CFR 1910.151(c) and 1926.50(g).
- Similarly, if workers face other hazards (such as splash or dust) that could harm the eyes or body, readily accessible wash stations are essential. These stations should be properly located and maintained, including regular water changes, as per the manufacturer's instructions.

3.8.3 Protection of Decontamination Line Assistants

Should work require a decontamination corridor the following shall be used as guidance. The SHSO/SS (or other designated person) must for ensuring that decontamination line assistants receive appropriate PPE and addressing their protection within the site-specific HASP. Key zones—namely, the Exclusion Zone (EZ), Contamination Reduction Zone (CRZ), and Clean Support Zone—must be clearly marked both in the field and within the site-specific HASP. The following should be considered when preparing for protection of decontamination line assistants.

1. Task Hazard Analysis: A thorough analysis must be conducted for line assistants to determine the optimal PPE level required. Factors influencing this decision include:
    - Expected or Visible Contamination on Responders
    - Type of Contaminant and associated respiratory and skin hazards
    - Total Vapor/Gas Concentrations in the CRZ
    - Presence of Particulates and specific inorganic or organic vapors in the CRZ
    - Results of Wipe Tests (refer to Section 5.4)
    - Slope and Configuration of the CRZ
2. PPE Levels: Depending on the situation:
    - Line assistants may need to wear the same PPE level as workers in the EZ.
    - Alternatively, line assistants may be adequately protected by using PPE one level lower (e.g., wearing Level C protection while decontaminating workers who are wearing Level B)."

3.8.4 Procedures to Minimize PPE Contamination

Proper work practices and procedures should be implemented at sites to minimize the potential for contact with chemicals of concern while onsite. The following guidance should be considered when developing site specific procedures:

- Opt for single-use Personal Protective Equipment (PPE) when feasible to minimize decontamination needs.
- Ensure complete sealing of PPE closures and interfaces, including pockets, zippers, and other potential openings.
- Position gloves and boots underneath the sleeves and pant legs of outerwear to reduce exposure.
- Place hoods outside the collar if they are not already attached.
- Utilize disposable outerwear and equipment when suitable to facilitate easy disposal and reduce decontamination efforts.
- Secure all junctions with tape to block contaminants from entering gloves, boots, jackets, and suits.

- Adopt work practices that limit contact with hazardous substances, such as avoiding unnecessary exposure.
- Employ remote techniques for sampling, handling, and opening containers, like using drum grapples and pneumatic impact wrenches.
- Store monitoring and sampling devices in bags designed with openings for sample ports and sensors.
- Cover contaminant sources with plastic sheeting or overpacks to shield PPE from contamination.

3.8.5 PPE Disposal

The PM in coordination with the field team shall ensure the safe disposal of all wastes generated from PPE use. PPE must be placed in appropriate containers, labeled, and prepared for disposal separately from other forms of waste. Refer to Roux's General Waste Corporate Management Program for further guidance.

APPENDIX A
EPA's
GUIDELINES TO ENSEMBLES FOR SPECIFIC ACTIVITIES/TASKS
WHERE CHEMICAL EXPOSURE IS POSSIBLE

GUIDELINES TO ENSEMBLES FOR SPECIFIC ACTIVITIES/TASKS
WHERE CHEMICAL EXPOSURE IS POSSIBLE

IMPORTANT: READ FOOTNOTES AND ASSUMPTIONS/JUSTIFICATIONS PRIOR TO USING TABLE

Notes:

1. This table is for use by trained environmental professionals only. To use this table:
   a. Scan the activity description to find activities (bolded) that most closely matches those you plan to engage in.
   b. Review Hazard/Conditions section to make sure the hazards of the planned activity match those listed. Note the Required Work Practices and be ready to follow them.
   c. For those activities most likely to be conducted as part the response, select Targeted Minimum PPE (Personal Protective Equipment).
   d. Necessary equipment needs to be available and used unless other information becomes available which necessitates an upgrade or allows a downgrade in the protection level. The work area must be continuously re-evaluated to ensure workers have the proper safety equipment.
   e. When working in hazardous environments, workers must always be aware of their surroundings. In addition to this Table, workers entering these environments need to use “common sense” prior to proceeding.
2. These ensembles focus on chemical protection and may not be adequate for all hazards. This Table can be used as a starting point but does not circumvent proper evaluation by an industrial hygienist in appropriate situations. See Table 2 for more specific chemical agents.
3. Suits, gloves, boots listed in the Minimum PPE column will not be appropriate for all activities, hazards and conditions. The listings should be used as a guide only. Confirm PPE compatibility with specific chemical contaminants.
4. A comprehensive Task Hazard Analysis must be performed prior to final selection of ensembles/PPE material types.
5. Hardhat (Class A or C), safety glasses/other eye protection are typically required but may not be specified here. In noisy environments (above 85dB) hearing protection is required. In areas where there is traffic, heavy machinery, or other hazards involving worker visibility problems a Class 2 High Visibility Vest must be worn. Activities requiring vests include natural disaster responses, demolitions, and excavations.
6. PPE makes and models referenced in these tables are only suggestions. Other comparable, adequate makes and models may be used.

Activity Description	Hazards/Conditions	Targeted Minimum PPE
Emergency Response and/or Initial Entry/Assessment – Low Hazard Expected (Sites/Facilities): • Air and Radiation Monitoring Sweep • Visual Assessment • Note Taking • Photo-documentation	• Suspected low hazard based on site history/visual evidence. • No CBRN suspected. • No visible/suspected vapors. • No potential for IDLH atmosphere. • Unknown physical hazards. • Some site background information. • No intrusive work expected. • Low potential for chemical splash/contact (based on expected tasks/ known conditions). • **Required Work Practice:** Immediate PPE Change-out (i.e., gloves, etc.) upon contact with chemicals. • **Required Work Practice:** Must follow standard air monitoring protocol.	**Level B** (Downgrade/upgrade based on knowledge of contaminants and monitoring with PID/FID, radiation detector, LEL/O_2 per HASP/ SOSGs) **Respirator: Scott or MSA Full Face** **Suit Type:** [I]Tychem CPF-3 (with boot, hood)/ChemTape **Inner Glove:** [II]Nitrile (6 mil min recommended) **Outer Glove:** [II]Neoprene, Nitrile, (28 mil min recommended) **Outer Steel Toe Boot:** [IV]Tingley HazProof Model 82330 **or** **Steel Toe Boot Cover**: [V]Latex HazMaster Booty and rely on suit boot material for permeation protection. **Steel Toe/Steel Shank Boots:** ASTM F-2413/ANSI Z41 **DECON**: Dry or soap & water

Activity Description	Hazards/Conditions	Targeted Minimum PPE
Emergency Response and/or Initial Entry/Assessment of Unknown – Potential Moderate Hazard (Sites/Facilities): • Air and Radiation Monitoring Sweep • Visual Assessment • Note Taking • Photo-documentation	• Possible high hazard chemicals based on site history/visual evidence (spills, corrosion, industrial practices, etc.). • No CBRN suspected. • No visible/suspected vapors. • **No** reasonable potential for **IDLH** atmosphere. • Unknown physical hazards. • Little/ no site background information. • No intrusive work expected. • Low potential for chemical splash/contact. • **Required Work Practice:** Immediate PPE Change-out (i.e., gloves, etc.) upon contact with chemicals. • **Required Work Practice:** Must follow standard air monitoring protocol.	**Level B** (Downgrade/upgrade based on knowledge of contaminants and monitoring with PID/FID, radiation detector, LEL/O_2 per HASP/ SOSGs) **Respirator: Scott or MSA Full Face** **Suit Type:** [I]Tychem Responder (with boot, hood)/ChemTape **Inner Glove:** [II]Nitrile (6 mil min recommended) **Outer Glove:** [II]Neoprene, Nitrile, (28 mil min recommended) **Outer Steel Toe Boot:** [IV]Tingley HazProof Model 82330 **or** **Steel Toe Boot Cover**: [V]Latex HazMaster Booty and rely on suit boot material for permeation protection. **Steel Toe/Steel Shank Boots:** ASTM F-2413/ANSI Z41 **DECON**: Dry or soap & water

Activity Description	Hazards/Conditions	Targeted Minimum PPE
Emergency Response and/or Initial Entry/Assessment of Unknown - Suspected High Hazard (Sites/Facilities): • Air and Radiation Monitoring Sweep • Visual Assessment • Note Taking • Photo-documentation	• Potential for high hazard chemicals/ IDLH based on site history/visual evidence (visible/expected reactions, spills, vapors, fumes, smoke, known releases, etc.). • No CBRN suspected. • Potential for chemical reactions. • Unknown physical hazards. • Little/ no site background information or information suggesting high hazard. • Intrusive work possible. • Potential for chemical splash/contact. • **Required Work Practice:** Immediate PPE Change-out (i.e., gloves, etc.) upon contact with chemicals. • **Required Work Practice:** Must follow standard air monitoring protocol.	**Level A** (Downgrade/upgrade (Trelleborg, etc.) based on knowledge of contaminants and monitoring with PID/FID, radiation detector, LEL/O_2 per HASP/ SOSGs) **Respirator: Scott or MSA Full Face** **Suit Type:** Encapsulating [I]Tychem Responder/Responder CSM (with boot, hood, gloves)/ChemTape **Inner Glove:** [II]Nitrile (6 mil min recommended) **Outer Glove:** [II]Neoprene, Nitrile, (28 mil min recommended) **Outer Steel Toe/Steel Shank Boot:** [IV]Tingley HazProof Model 82330 and rely on suit boot material for permeation protection. (ASTM F-2413/ANSI Z41) **DECON**: Dry or soap & water: water source for emergency DECON; other DECON agents on hand.

Activity Description	Hazards/Conditions	Targeted Minimum PPE
Drum/Tank Sampling • Container opening • Continuous air monitoring • Product sampling	• Unknown chemicals. • No CBRN. • Potential splash hazard. • Physical hazard controls in place. • Assumes no initial hazardous atmosphere. • Ensure availability of water source for emergency DECON/shower/eyewash. • **Required Work Practice:** Immediate PPE Change-out (i.e., gloves, etc.) upon contact with chemicals. • **Required Work Practice:** Must follow standard air monitoring protocol.	**Level B** (Upgrade/Downgrade based on knowledge of contaminants and monitoring with PID/FID, radiation detector, LEL/O_2 per HASP/ SOSGs) **Respirator: Scott or MSA Full Face** **Suit Type:** [I]Tychem Responder (with boot, hood)/ChemTape **Inner Glove:** [II]Nitrile, Neoprene, Viton, PVC **Outer Glove:** [II]Heavy Duty Butyl, Nitrile, **Other:** ANSI Approved Splash Shield **Outer Steel Toe Boot:** [IV]Tingley HazProof Model 82330 **or** **Steel Toe Boot Cover**: [V]Latex HazMaster Booty and rely on suit boot material for permeation protection. **Steel Toe/Steel Shank Boots:** ASTM F-2413/ANSI Z41 **DECON:** Dry DECON or soap and water; water source for emergency DECON and eyewash suggested.

Activity Description	Hazards/Conditions	Targeted Minimum PPE
Hazardous Categorization Testing (**HAZCAT**) • Opening sample containers in controlled environment • Working with small sample quantities in well ventilated area • Conducting HAZCAT testing with appropriate lab equipment	• Assumes known chemical classes and site situation/background. • No CBRN suspected. • Assumes immediate suit removal if contaminated and frequent glove changes. • **Required Work Practice:** Immediate PPE Change-out (i.e., gloves, etc.) upon contact with chemicals. • **Required Work Practice:** Must follow standard air monitoring protocol.	**Level B** (Upgrade/Downgrade based on knowledge of contaminants and monitoring with PID/FID, radiation detector, LEL/O_2 per HASP/ SOSGs) **Respirator: Scott or MSA Full Face** **Suit Type:** [I]Tychem CPF4 (with hood, boot) **Inner Glove:** [II]Nitrile **Outer Glove:** [II]Viton or 4-H (use surgie over the 4-H for dexterity) **Outer Steel Toe Boot:** [IV]Tingley HazProof Model 82330 **or** **Steel Toe Boot Cover**: [V]Latex HazMaster Booty and rely on suit boot material for permeation protection. **Steel Toe/Steel Shank Boots:** ASTM F-2413/ANSI Z41 **DECON:** Dry or soap and water; water source for emergency DECON and eyewash suggested

Activity Description	Hazards/Conditions	Targeted Minimum PPE
Oil Spill Response/Recovery Operations – Fresh Product: • Recovery operations (vac truck, skimmers, boom deployment where direct contact expected) • Product sampling • Continuous air monitoring at/near source of spill	• Crude oil/diesel/kerosene/gasoline spill. • Assumes fresh/ongoing spill, close proximity to source. • Assumes early phase while evaporation of light organics, benzene/other aromatics is still occurring (24-48 hours or if spill is on-going). • Assumes down-wind location. • Continuous air monitoring required for %LEL, Organics, $\%O_2$ (and H_2S as necessary for sour crude). • **Required Work Practice:** Immediate PPE Change-out (i.e., gloves, etc.) upon contact with chemicals. • **Required Work Practice:** Must follow standard air monitoring protocol.	**Modified Level C:** 1/2 face respirator w/safety glasses/goggles as needed for splash protection. Downgrade as appropriate based on air monitoring. **Respirator: Scott or MSA ½ Face** **Respirator Cartridge:** [III] Multi-Phase Cartridge (Scott 642 Multi-purpose; MSA with/GME P-100 or equivalent). **Suit Type:** [I]Tychem CPF4 w/boot [jet fuel use Tychem BR] **Inner Glove:** [II]Neoprene (for protection at DECON line only, not for prolonged contact) **Outer Glove:** [II]Viton-Butyl Rubber (assumes potential for direct contact with fresh material – based on benzene/aromatic constituents) SEE NEXT ROW FOR WEATHERED PRODUCT. **Outer Steel Toe Boot:** [IV]Tingley HazProof Model 82330 **or** **Steel Toe Boot Cover**: [V]Latex HazMaster Booty and rely on suit boot material for permeation protection. **Steel Toe/Steel Shank Boots:** ASTM F-2413/ANSI Z41 **DECON:** Dry DECON/ Soap and water as feasible

Activity Description	Hazards/Conditions	Targeted Minimum PPE
Oil Spill Response Assessment/Recovery – Weathered Product • Shoreline clean-up assessment (SCAT) • Environmental sampling/weathered product sampling • Recovery Operations for weathered material • Assessment via boat/on or near water – use appropriate flotation device with ensemble.	• Crude oil/diesel/kerosene/gasoline spill. • Assumes weathered oil (over 24-48 hours, depending on spilled material and ambient temperatures). • Assumes operations are remote from source of spill. • Assumes no other potential for airborne aromatics/benzene/flammable vapors.	**Modified Level D** (Upgrade/Downgrade based on potential for contact and air monitoring with FID/PID, LEL/O_2 Meter. **If contact with material suspected, use following:** **Suit Type:** [I]Tychem F w/boot [jet fuel-Tychem BR] (Tychem SL may be an option for weathered crude/diesel – see manufacturer's information) **Inner Glove:** [II]Nitrile **Outer Glove:** [II]Nitrile (Best Nitri-solv 727) **Outer Boot Cover:** [V]Latex HazMaster Booty **Steel Toe/Steel Shank Boots:** ASTM F-2413/ANSI Z41 **DECON:** Dry DECON/Soap and water as feasible

Activity Description	Hazards/Conditions	Targeted Minimum PPE
Demolition/Excavation Operations: • Heavy equipment operation • Excavation/Trenching • Continuous air monitoring when soil is disturbed or demolition activities conducted. • Fuel Oil underground tank removal. • Drum Excavation activities EXCLUDED.	• Demolition activities generating potentially hazardous particulates (asbestos, lead, silica, etc.). • Excavation activities that could expose soil contaminated with low levels of known hazardous chemicals to the surrounding area /in the trench/ excavation. • No potential for IDLH atmosphere. • Site background information available. • Known physical hazards. • Workers will have minimal/ no contact with contaminants (i.e., operators in a cab, inspectors/ observers at a safe distance). • Continuous air monitoring required in trench for %LEL, Toxics, and $\%O_2$ when workers are in trench and for particulate when activities generating particulate are conducted. • **Required Work Practice:** Must follow standard air monitoring protocol.	**Modified Level C:** 1/2 face respirator w/safety glasses. Downgrade or upgrade as appropriate based on air monitoring. **Respirator: Scott or MSA ½ Face** **Respirator Cartridge:** [III] Multi-Phase Cartridge (Scott 642 Multi-purpose P-100; MSA with/GME P-100 or equivalent). **Suit Type:** [I]Proshield Next Gen **Inner Glove:** NA **Outer Glove:** Leather **Outer Steel Toe Boot: NA** **Steel Toe Boot Cover**: [V]Latex HazMaster Booty (if chemical in soil is possible) **Steel Toe/Steel Shank Boots:** ASTM F-2413/ANSI Z41 **DECON:** Dry DECON/ Soap and water as feasible

Activity Description	Hazards/Conditions	Targeted Minimum PPE
Natural Disaster Response (Hurricane, Tornado, Flood, Earthquake) - Orphan Container Recovery: • Routine hand collection/pick-up of small containers from debris piles/lines • Land based operations - conducted on foot **Note:** Physical Hazards may necessitate PPE modifications.	• Unknown materials – confident identification based on visual observations. • **Required Work practice:** re-evaluate prior to moving suspicious containers. Air monitoring and PPE upgrade may be required. • **Required Work Practice:** Immediate PPE Change-out (i.e., gloves, etc.) upon contact with chemicals. • **Required Work Practice:** Must follow standard air monitoring protocol.	**Modified Level D:** Upgrade/downgrade based on suspicious containers (not easily identified visually) and air monitoring with PID/FID, radiation detector, LEL/O_2 per HASP/ SOSGs **Suit Type:** [I]Tychem CPF-3 w/boot **Inner Glove:** [II]Nitrile **Outer Glove:** [II]Nitrile (Best Nitri-solv 727) or Leather **Outer Boot Cover:** [V]Latex HazMaster Booty **Steel Toe/Steel Shank Boots:** ASTM F-2413/ANSI Z41 **DECON:** Dry DECON/Soap and water as feasible
Natural Disaster Response (Hurricane, Tornado, Flood, Earthquake) - Orphan Container Recovery: • Routine Drum recovery from debris lines/piles/ other – conducted on land **Note:** Physical Hazards may necessitate PPE modifications.	• Unknown materials – confident identification based on visual observations. • **Required Work practice:** re-evaluate prior to moving suspicious containers. Air monitoring and PPE upgrade may be required. • **Required Work Practice:** Immediate PPE Change-out (i.e., gloves, etc.) upon contact with chemicals. • **Required Work Practice:** Must follow standard air monitoring protocol.	**Modified Level D:** Upgrade/downgrade based on suspicious containers (not easily identified visually) and air monitoring with PID/FID, radiation detector, LEL/O_2 per HASP/ SOSGs **Suit Type:** [I]Tychem CPF-3 w/boot **Inner Glove:** [II]Nitrile **Outer Glove:** [II]Nitrile (Best Nitri-solv 727) or Leather **Outer Boot Cover** [V]Latex HazMaster Booty **Steel Toe/Steel Shank Boots:** ASTM F-2413/ANSI Z41 **DECON:** Dry DECON/Soap and water as feasible

Activity Description	Hazards/Conditions	Targeted Minimum PPE
Natural Disaster Response (Hurricane, Tornado, Flood, Earthquake) – Flood water sampling: • Water Sampling of flood waters where potential for contact with hands/feet is high **Note:** Physical Hazards may necessitate PPE modifications.	• Unknown contaminants • Potential for pathogens suspected • Low potential for acute exposure to hazardous chemicals • Assumes open air/well ventilated areas **Required Work Practice:** Monitor all poorly ventilated areas in appropriate PPE/Respiratory Protection for organic vapors (PID & FID), %LEL/flammable atmospheres, H_2S prior to entry	**Modified Level D:** Upgrade based on more information as it becomes available. **Suit Type:** [I]Proshield Next Gen **Inner Glove:** [II]Nitrile **Outer Glove:** [II]Nitrile (Best Nitri-solv 727) **Outer Boot**: Waders (butyl, neoprene) as needed. **Steel Toe/Steel Shank Boots:** ASTM F-2413/ANSI Z41 **DECON:** Dry DECON/Soap and water as feasible
Environmental Sampling (Low Concentration Water/Soil/Perimeter Air): • Multi-media Sampling • Documentation (written/photo) • Inspection of clean-up operations	• Known Chemical Contaminants. • Airborne concentrations well below PELs. • Minimal chance of skin exposure to chemicals. • Insects possible.	**Level D:** Upgrade based on more information as it becomes available. **Suit Type:** [I]Proshield 1 (if ticks, etc. maybe a problem) **Inner Glove:** [II]Nitrile **Outer Glove:** NA **Outer Boot:** NA **Steel Toe Boots:** ASTM F-2413/ANSI Z41 **DECON:** NA

i. Tychem and Proshield suits can be purchased from Safeware: 800-331-6707, http://www.safewareinc.com , (see also LSS, http://www.labsafety.com, Dupont: 1-800-931-3456, http://www2.dupont.com/Personal_Protection/en_US/index.html)

ii. Nitrile Inner/Outer Gloves; Viton; Butyl Rubber; 4-H (polymeric) can be purchased from Safeware: 800-331-6707, http://ww.safewareinc.com ; Airgas: 1-866-718-0685, http://www.airgas.com (see also North Safety, http://www.northsafety.com); Best Gloves, http://www.bestglove.com ; Lab Safety Supply (LSS), http://www.labsafety.com; Airbill, http://www.airbill.com)

iii. Multi-Phase Cartridge (Scott 642 Multi-purpose; MSA with/GME P-100 or equivalent) can be purchased from LSS: 1-800-356-0673, http://www.labsafety.com (see also Safeware, http://www.safewareinc.com; Scott Safety, http://www.scotthealthsafety.com/; MSA, http://www.msanet.com/)

iv. Tingley HazProof Overboots or similar can be purchased from LSS: 1-800-356-0673, http://www.labsafety.com; National Safety, Inc.: 1-800-213-7092, http://www.nationalsafetyinc.com

v. Latex Hazmaster Booties, Nuke Boot or similar can be purchased from Safeware: 800-331-6707, http://www.safewareinc.com; Airbill: 1-215-632-2000, http://www.airbill.com; (see also Airgas, http://www.airgas.com; LSS, http://www.labsafety.com

APPENDIX E

Subsurface Utility Clearance Management Program

SUBSURFACE UTILITY CLEARANCE MANAGEMENT PROGRAM

CORPORATE HEALTH AND SAFETY DIRECTOR	:	**Brian Hobbs, CIH, CSP**
EFFECTIVE DATE	:	**01/2019**
REVIEW DATE	:	**03/2024**
REVISION NUMBER	:	**4**

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APPENDICES

Appendix A – Roux Subsurface Utility Clearance Checklist/ Utility Verification/Site Walkthrough Record

Appendix B – Private Utility Technology Applications and Considerations

1. PURPOSE

Roux Associates, Inc. and its affiliated companies, Roux Environmental Engineering and Geology, D.P.C., and Remedial Engineering (collectively, "Roux") has instituted the following program for completing proper utility mark-outs and for conducting subsurface clearance activities. This establishes a method to ensure, to the greatest extent possible, that utilities have been identified and contact and/or damage to underground utilities and other subsurface structures will be avoided. For the purpose of this program, a structure is defined as any underground feature that may present a potential source(s) of energy, such as, but not limited to, utility vaults, bunkers, piping, electrical boxes, wires, conduits, culverts, utility lines, underground tanks, and ducts.

2. SCOPE AND APPLICABILITY

The Subsurface Utility Clearance Management Program applies to all Roux employees, its contractors, and subcontractors. Employees are expected to follow this program for all intrusive work involving Roux or other personnel (e.g., contractors/subcontractors) working for Roux unless the client's requirements are more stringent. Intrusive work activities can include, but are not limited to, digging or scraping the ground surface, including, but not limited to, excavation; test pitting or trenching; soil vapor sampling or the installation of soil borings, soil vapor monitoring points and wells, or monitoring wells; and drilling within concrete slabs on grade.

Deviation from the program, regardless of the specific work activity or location, must be pre-approved based on the client's site knowledge, experience, site conditions, and additional documentation on the site. Any exceptions shall be documented through the Roux Subsurface Utility Clearance Variance Form located within the Roux Health & Safety Online Application or through OKTA. Approval is required by the Project Principal (PP) and the Operations Manager (OM) in consultation with the Office Health and Safety Manager (OHSM) or Corporate Health and Safety Director (CHSD) prior to mobilization. Depending on the work location, more stringent federal, state, local, or client requirements may apply. It is the responsibility of the Project Team to identify such requirements prior to mobilization.

3. PROCEDURES

3.1 Before Intrusive Activities/Job Planning Process

Prior to intrusive work at a site, the Project Manager (PM) shall ensure that the notification of the State One Call or equivalent service (Nationwide-811) is completed a minimum of 48-72 hours (One-Call State Law Directory) before intrusive work activities (this timeline excludes Saturdays, Sundays, Legal Holidays and 811 observed holidays). This notification is required by law for all states. State-specific/local laws related to utility location may vary. The project team is responsible for understanding requirements that may affect their work site.

Obtain, review, and field verify relevant historical site data that may include: as-builts/site plans; easement/right-of-way information; historical aerial photos/development plans; local/state permitting records; previous site investigation/boring logs; and/or interviews with site representative/client. Interviews with site or client personnel should ask the following:

- Employee(s) Name and Relationship with the site;
- Types of utilities, including structure and location of utilities on-site;
- Depth of known utilities; and

- Any other relevant information as it pertains to the site.

Prior to intrusive work activities, information pertaining to the site should be included in Roux's Subsurface Utility Clearance Checklist and Utility Verification/Site Walkthrough forms. This form is located within the Roux Health & Safety Online Application or through OKTA.

If there is the potential for unexploded ordinances or munitions, consultation with your OM and CHSD is required prior to site operations.

3.1.1 Project Kick-Off Meeting

During the project kick-off meeting for intrusive activities, the PM will review the Roux Subsurface Utility Clearance Checklist, Utility Verification / Site Walkthrough Record (Appendix A) and the below bullet points with the project field team:

- Confirm that the State One Call or equivalent is received and that the ticket number is confirmed, reviewed, and valid for the time of work. If intrusive work activities are not conducted during this valid time period, the One Call ticket must be renewed, and the site must be remarked;
- Review the work scope to be performed with the site owner/tenant to determine if it may impact any utilities;
- Determine the need for utility owner companies to be contacted or to have their representatives on site;
- Where mark-outs terminate at the property boundary, consider the use of private utility locating / (e.g., Radio Frequency Detection, Electromagnetic Induction), Ground Penetrating Radar (GPR) , and other applicable geophysical inspection services. The use of private utility locating firms, however, does not eliminate the legal requirement for the subcontractor (e.g., driller, excavation firm) to submit a request for Public Utility Mark-outs. Also, the information provided by the service may be inaccurate and unable to locate subsurface utilities and structures in urban areas, landfills, urban fill areas, below-reinforced slabs, etc. They should not be relied upon as the only means of performing utility clearance;
    - A mark-out is defined as the process of contracting with a competent and qualified company to confirm the presence or absence of underground utilities and structures. This process will clearly mark out and delineate identified utilities so that intrusive work activities can be performed without causing disturbance or damage to the subsurface utilities and structures. After utility mark-outs are completed, soft Digging must completed prior to intrusive work. Section 3.4 Preferred Methods of Clearing the Subsurface (Pre-Clearing) outlines requirements for pre-clearing techniques in order of preference.
- Documented description of the dig site, which is included in the project's Health and Safety Plan (HASP), and one call report will be maintained in the field and distributed amongst Roux personnel, its contractors, and subcontractors; and
- Documentation of the actual placement of mark outs in the field shall be collected using dated pictures, videos, and/or sketches with distance from markings to fixed objects. All documentation shall be maintained within the project file.

3.2 Utility Mark Out

- Ensure the Mark-out / Stake-out Request Information Sheet (or one-call report) is complete and accurate for the site, including address and cross streets, and review for missing utilities. Ensure ticket life is still valid for work.

  - Note: utility mark-out organizations do not have contracts with all utilities, and it is often necessary to contact certain utilities separately, such as the local water and sewer authorities, local transportation departments, and railroad operators. In the event the Project Teams anticipate subsurface work will impact public utilities, railroad operations, or public roadways, coordination with the utility owners/operators is required.

- Have written confirmation prior to mobilizing to the site that the Project Team or Roux personnel performing the intrusive activity has correctly completed the mark-out notification process, including requesting mark-outs, waiting for mark-outs to be applied to ground surfaces at the site, and receiving written confirmation of findings (via fax or email) from utility operators for all known or suspected utilities in the proposed area of intrusive activity, and provided utility owner written confirmation to Roux personnel for review and project files documentation.
- Do not begin any intrusive activity until all utility mark-outs have been completed (i.e., Did all utilities mark-out the site?) and any unresolved mark-out issues are finalized. Perform a site walk to review the existing utilities and determine if the utility locators have located said utilities.

  (Note: The Tolerance Zone is defined as three feet from the outside edge of any subsurface structure.)
- For non-subscribing utility owners or if public one-call service is not available, perform due diligence and request further information regarding utility type, construction details, location, and burial depth directly from public service providers/utility owners. Request utility mark-out by each public service provider/utility owner as applicable. Confirm contact and response by each public utility owner on the Subsurface Utility Clearance Checklist.
- If utilizing a Private Mark out, ensure the contractor has a plan regarding what types of technology will be used based on Table 1 in Appendix B: Private Utility Technology Applications and Considerations. If possible, it is recommended that multiple technologies be used to sweep each location/work area. Use a tracer wire to locate the utility (when tracer wires are present). Record the results of the private utility mark-out on the Utility Verification/Site Walkthrough Record form.

3.3 Site Visit/Utility Walkthrough

Before mobilization with the subcontractor or during the pre-work safety tailgate with the subcontractor, perform a site walkthrough after utility mark-outs have been completed to determine whether additional potential hazards are present and look for visible signs of utilities that may be present. Outlined below are considerations regarding a site walk before intrusive activities. Before initiating any intrusive work, verify that the utilities marked on-site align with the information provided in the One Call response notification/ticket and with site plans and documents. If any discrepancies arise, address them promptly to ensure accuracy and do not start intrusive work until they are rectified.

- Identify overhead utilities that may impede equipment mobilization or work zones to ensure adequate Occupational Safety and Health Administration (OSHA) clearance distance(s), as specified within the site-specific Health and Safety Plan (HASP) and 29 CFR 1926.1408 Table A.

The presence of any of the following may indicate potential subsurface structures:

- Locations of buildings, equipment, and features like area lights, signs, sprinkler systems, phones, drains, natural gas meters, manholes, etc.;
- Warning tape, which is often a sign of underground services;
- Material like pea gravel, sand, or other non-native materials can indicate the presence of tanks or lines or any deviations from the established native soil or backfill conditions;

- Red concrete, which is often used for electrical duct banks;
- Evidence of damaged utilities, such as piping materials, insulation, or odors present in the work area; and
- Other utilities, including fire hydrants, electrical transformers, pipeline markers, valve covers, steam lines, valve box covers, clean-outs, etc.

By observing the path between the main service line and the connection point (e.g., a utility meter at the exterior of the site building), it may be possible to determine the likely routing of on-site utilities. However, this method should not be relied upon solely, and proper risk mitigation strategies should be in place before proceeding with any ground disturbance activities. Look outside your work zone for other potential utilities that may cross through your work zone.

For sites with potential underground storage tanks present (UST), the following guidance applies:

- Identify if the product piping is either rigid or flexible.
- Conduct a visual examination of the tank field, observation wells, dispensers, vent stacks, and UST fill points to determine their location.
- Locate and become familiar with the emergency shutoff button/switch, if present.
- Determine the orientation, arrangement, and location of the tanks, as well as their size and capacity, through the examination of visible features at grade, such as fill ports and extractor covers, and by consulting any available as-built drawings.

Before commencing any subsurface intrusive work, field staff should thoroughly address any discrepancies in utility company mark-outs or the absence of mark-outs.

3.3.1 Project Management-Field Personnel

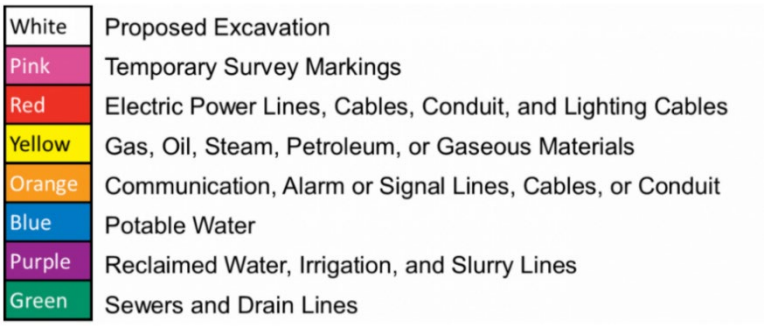
Whenever possible, it is advisable to assign the same project personnel to both utility location and clearance tasks as well as intrusive activities. This continuity ensures that site knowledge and utility information gathered during the clearance phase remain up-to-date. Having this historical perspective helps minimize the risk potential of utility strikes.

In cases where maintaining the same personnel throughout the project isn't feasible, a thorough knowledge transfer regarding site utilities, locations, clearance results, and proposed intrusive activities becomes essential. The PM must ensure that there is a successful handoff of information when there is a change in field personnel.

3.3.2 Utility Markings

The utility marking color code includes various uniform colors. The following APWA uniform color code (ANSI Z535.1) is provided below. While certain government agencies or large industrial facilities may use additional colors, Roux's policy is to consider any unlisted paint marking or pin flag color as a subsurface utility marking unless proven otherwise.

If utilities or subsurface anomalies are identified but their type or classification remains uncertain, it is advised to employ pink paint or pin flag (Temporary Survey Marking) for marking. Once the utility type is definitively established, the pink marks should be updated to accurately represent the correct type of utility.

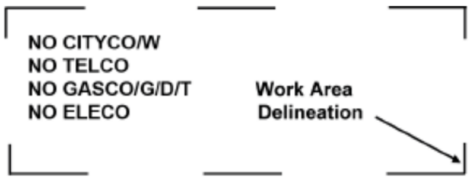


Understanding the markings left by locators during the 811 process is crucial for avoiding utility-related issues. Typically, these markings are done when Roux staff members are not physically present on-site. To enhance understanding/accuracy, it is advisable for staff to be present during the 811 process or engage in conversations with locators, both public and private, while on-site. Additionally, utility marks must adhere to the proper standards outlined in the Uniform Color Code.

Common Abbreviations

Source: Common Ground Alliance

Facility Identifier		**Underground Construction Descriptions**		**Infrastructure Materials**	
CH	Chemical	C	Conduit	ABS	Acrylonitrile - Butadiene - Styrene
E	Electric	CDR	Corridor	ACP	Asbestos Cement Pipe
FO	Fiber Optic	D	Distribution Facility	CL	Cast Iron
G	Gas	DB	Direct Buried	CMC	Cement Mortar Coated
LPG	Liquefied Petroleum	DE	Dead End	CML	Cement Mortar Lined
PP	Petroleum Products	JT	Joint Trench	CPP	Corrugated Plastic Pipe
RR	Railroad Signal	HP	High Pressure	CMP	Corrugated Metal Pipe
S	Sewer	HH	Hand Hole	CU	Copper
SD	Storm Drain	MH	Manhole	CWD	Creosote Wood Duct
SS	Storm Sewer	PB	Pull Box	HDPE	High Density Polyethylene
SL	Street Lighting	R	Radius	MTD	Multiple Tile Duct
STM	Steam	STR	Structure (vaults, junction inlets, lift station)	PLA	Plastic (conduit or pipe)
SP	Slurry System	T	Transmission Facility	RCB	Reinforced Concrete Box
TEL	Telephone			RCP	Reinforced Concrete Pipe
TS	Traffic Signal			RF	Reinforced Fiberglass
TV	Television			SCCP	Steel Cylinder Concrete Pipe
W	Water			STL	Steel
W	Reclaimed Water "Purple"			VCP	Vertrified Clay Pipe



3.4 Preferred Methods of Clearing the Subsurface (Pre-Clearing)

At least one of the methods listed below shall be carried out during pre-clearing activities. The Project Team is responsible for evaluating risks associated with the Scope of Work to determine which method is selected. If none of the following pre-clearing activities are performed, a Subsurface Utility Clearance Variance must be submitted to the OM. This Subsurface Utility Clearance Variance must provide clear lines of evidence that there are no utilities present within the intrusive work zone. Examples include demolition permits of the site, utility closure documents indicating no live utilities on-site, as-builts, site history, etc.

The following approaches shall be considered and implemented based on the Scope of Work.

- ***Soft Digging***
  - This is the preferred method of utility clearance when clearing higher-risk utilities. Soil should be cleared through the use of a vacuum truck/equivalent, an accompanying air knife (preferred), or a water lance to break up and loosen the soil for removal with the vacuum.
- ***Hand Digging***
  - Soil should be broken up and removed using a shovel or other appropriate hand tools without excessive force. Limit the use of dig bars or other tools that, if used incorrectly, can significantly damage utilities.
- ***Hand Augering***
  - The hand auger must be turned slowly using even hand pressure without excessive force. Rounded edge augers are preferred. Hand augers should not be used in pea stone/pea gravel where utilities may be present and could potentially be damaged by the hand auger. The abrupt absence of soil recovery in a hand auger could indicate utilities as pea gravel or sand may have spilled out of the auger (exception: native soil conditions that typically result in poor hand auger recoveries). If any resistance is encountered while operating the hand auger for pre-clearance, the equipment will be removed, and the exploratory test hole will be visually inspected by onsite personnel for any obstructions or indications of subsurface structures.

3.4.1 Guidance for Tools and Equipment

Personnel performing pre-clearance activities shall keep tools and equipment in safe working order and be properly inspected before use. If tools or equipment are broken, they will be tagged and removed from service. The following specify additional guidelines regarding tools and equipment:

- Hand-digging tools must have a non-conductive handle, such as fiberglass, wood, or composite, or fully insulated handles and potential contact surfaces.
- Blades on shovels and post-hole diggers should have rounded or blunt edges.
- Pick axes or pointed spades should not be used for physical clearance.
- Crowbars, pinch-bars, or pry bars should not be used to break hardened soil or backfill except when authorized by the Site Supervisor (SS). This should only be used to loosen materials like bricks or larger stones.

- Electric-powered equipment must have ground fault protection.
- Should there be refusal or difficulty with advancing hand tools, the contractor shall stop work and notify the Roux SS or Site Health and Safety Officer (SHSO) immediately.

3.5 During Intrusive Activities

3.5.1 Concrete/Paving Surface Removal

Remove any surface coverings (i.e., pavement, brush, debris, etc.) to ensure workers have clear visibility of the work area and subsurface conditions. Avoid mechanical jackhammering over known lines unless they are de-energized, locked-out/tagged-out, and potential repairs are planned or if the utility has been completely disconnected prior. When cutting or coring, go only as far as needed to penetrate the surface cover. When removing a large surface area, begin at the perimeter of the removal zone. This initial step helps identify any utilities passing through the work zone. For extensive areas, using a concrete saw might not be practical. Instead, heavy equipment is often employed. During this process, a designated spotter should guide the heavy equipment. Their role is to watch for warning signs of utilities. It's crucial that the heavy equipment does not have "teeth" that could potentially pass through the surface and damage utilities.

3.5.2 Pre-Clearance Procedures

Install pre-clearance exploratory test holes using one of the techniques, as outlined in Section 3.4, for the first 5-ft below land surface (BLS) at each location before conducting intrusive mechanized activities. Should utilities be located at a greater depth than 5-ft BLS consult with the OM, OHSM and CHSD regarding adjustments to the pre-clearance requirements to go greater than 5-ft BLS. Some Clients may require greater than 5-ft BLS for pre-clearance test holes; Project teams should be aware of such Client requirements prior to work.

Pre-clearance exploratory test holes should be defined in the SOW/proposal provided to the client to prevent project delays and to allow adequate time for the PM and PP to evaluate alternative approaches for the project. Alternative approaches will need to be pre-approved by the OM through a Subsurface Utility Clearance Variance.

Both single-point and three-point clearance are acceptable as long as the following criteria are met below. For single-point clearance, the exploratory test hole is advanced at the exact location of the proposed borehole. If three-point clearance is performed, it must be done in a triangular pattern around the proposed borehole and in a configuration that would not allow utilities to enter the borehole.

- The size of the pre-clearance exploratory test hole should be, at a minimum, twice the diameter of any downhole tool or boring device.
- For direct push applications (CPT, Geoprobe®, etc.), the borehole clearance diameter shall be at least 125% of the diameter of the largest tool being pushed through the subsurface (e.g., tip, rod, sampler, etc.), to the minimum required depth.
- For excavations, all utilities need to be marked and then exposed by soft-digging or by hand following the protocols in this program. Pre-clearing for excavations may be performed by the "moat" technique (i.e., soft Digging around the perimeter). In these cases, dig in small lifts (<12" for first 5 feet) using a dedicated spotter.)
- For Tolerance Zone work, unless otherwise agreed upon with the Utility Operator, work within the tolerance zone requires verification by means of pre-clearance test holes specified in Section 3.4 to expose the utility. Once structures have been verified, a minimum clearance of three feet must be maintained between the utility and any powered equipment. If considered a high-risk utility, additional requirements may be necessary and required by the Operator of the utility. Consultation with the OM and CHSD may be appropriate.

The PM, field team lead, or personnel performing oversight is to:

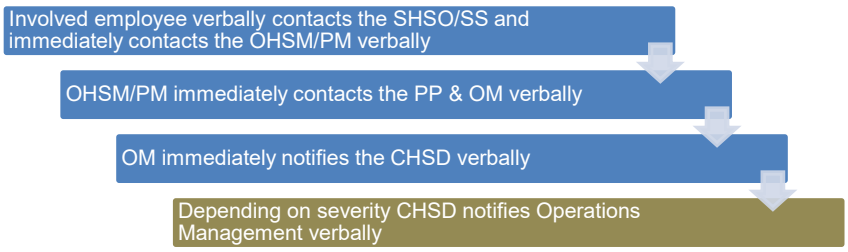
- Ensure the mark-out remains valid. (In certain states, there are limits regarding the duration of time after the mark-out was applied to the ground surface work can be started or interrupted.) Additionally, the mark-outs must be maintained, documented, and in many cases, refreshed periodically to be considered valid. This will be accomplished through calls to the one call center.
- Ensure intrusive activities are only performed within the safe boundaries of the mark-out as detailed in the One-Call Report.
- Halt all work if intrusive activities have resulted in the discovery of an unmarked utility. Roux personnel shall notify the facility owner/operator and the one call center. All incidents such as this will be reported as per Roux Incident Investigation and Reporting Management Program.
- Halt all work if intrusive activities must take place outside of the safe boundaries of a mark-out and only proceed after new mark-outs and subsurface utility clearance are performed.
- Halt the intrusive activities and immediately consult with the PP if an unmarked utility is encountered.
- Complete any loss reports associated with subsurface utility strikes as necessary.
- If a utility cannot be found as marked, Roux personnel shall notify the facility owner/operator directly or through the one-call center. If the facility operator is not responsive, then the one-call center must be notified. Following notification, the excavation/mechanical intrusive work may continue unless otherwise specified in state law.
- Contractors/subcontractors must contact the one-call center to refresh the ticket when the excavation continues past the life of the ticket. State law dictates ticket life. Project teams must be aware of their state-specific requirements.

3.6 Stop Work Authority

Each Roux employee has Stop Work Authority that he or she will execute upon determination of any imminent safety hazard, emergency situation, or other potentially dangerous situation, such as hazardous weather conditions. This Stop Work Authority includes subsurface clearance issues such as the adequacy of a mark-out or identification during intrusive operations of an unexpected underground utility. Authorization to proceed with work will be issued by the PM/PP in consultation with the OHSM after such action is reviewed and resolved. The PM will initiate and execute all management notifications and contact emergency facilities and personnel when this action is appropriate.

3.7 Reporting Utility Incidents

Roux field personnel engaged in any utility strike (e.g., subsurface/aboveground) must promptly stop work, shutdown any equipment and get to a safe location at the Site. Then notify the PM to discuss the incident. In case of injuries, field personnel must call 911 or the local emergency services number and then inform the PM. Additional notifications shall follow Roux's Incident Notification Process. Depending on the utility strike additional notifications shall be made to utility operators and/or clients/site contacts.



Appendix A
Roux Subsurface Utility Clearance Checklist

Appendix A

Roux Subsurface Utility Clearance Checklist/Utility Verification/Site Walkthrough Record

Roux Subsurface Utility Clearance Checklist ***Date of Revision: 3/2024***

Work site set-up and work execution

ACTIVITY	Yes	No	N/A	COMMENTS INCLUDING JUSTIFICATION IF RESPONSE IS NO OR NOT APPLICABLE
Daily site safety meeting conducted, SPSAs performed, JSAs reviewed, appropriate work permits obtained (if applicable).				
HASP is available and reviewed by site workers / visitors.				
Subsurface Utility Clearance Procedure has been reviewed with all site workers.				
Mechanical intrusive work activities may not be performed at any location without authorization from the Roux Site Supervisor (SS). Clearance activities may not be performed at any location unless the SS is physically present.				
Work area secured; traffic control established as needed. Emergency shut-off switch located. Fire extinguishers / other safety equipment available as needed.				
Utility mark-outs (public / private) clear and visible. Provide Excavator's Stake-Out Reference Number / Request Date / Time.				
Tolerance zone work identified. Intrusive work activities cannot be performed in areas that are in direct conflict with any markings made by public or private locators.				
Unless the PP & OM authorizes it, all boreholes and test pit locations must be physically cleared before using mechanized equipment. Required minimum physical clearance depths and diameters are as follows: • Physically clear to a depth of 5 feet bls. • The size of the pre-clearance exploratory test hole must be, at a minimum, twice the diameter of any downhole tool or boring device. • For direct push applications (CPT, Geoprobe®, etc.) the borehole clearance diameter shall be at least 125% to the diameter of the largest tool being pushed through the subsurface (e.g., tip, rod, sampler, etc.).				
Work execution plan reviewed and adhered to (ground disturbance methods, clearance depths, any special utility protection requirements, or any other execution requirements; especially for Tolerance Zone work).				

Mechanical intrusive work is prohibited within 3-feet distance in all directions from subsurface structures that will be intentionally exposed during pre-clearance. Any removal of material within 3-feet of the subsurface structure may only proceed by hand using non-conductive tools/compressed air if authorized by state law and the owner/operator of the utility.				
All equipment onsite must maintain the appropriate horizontal distance from any point on the equipment to the nearest overhead electrical power line. Refer to site-specific HASP and local/utility company requirements.				
Verbal endorsement received from Roux PM and OM for any required field deviations to work execution plan.				

Key Reminders for Execution

The Subsurface Utility Clearance Protocol should be referenced to determine all requirements while executing subsurface work. The bullet points below are intended as general reminders only and should not be relied upon solely.

- The size of the pre-clearance exploratory test hole must be at a minimum twice the diameter of any downhole tool or boring device to minimum required depth of 5 feet bls.
- For direct push applications (CPT, Geoprobe®, etc.) the borehole clearance diameter shall be at least 125% of the diameter of the largest tool being pushed through the subsurface (e.g., tip, rod, sampler, etc.), to the minimum required depth of 5 feet bls.
- The tolerance zone is defined as three feet plus half of the diameter or half of the greatest dimension (for elliptical sewers, duct banks, and other non-cylindrical utilities) of a utility and three feet from the outside of any subsurface structure.
- For excavations, all utilities need to be marked and then exposed by hand, following the protocols in this program. Pre-clearing for excavations may be performed by the “moat” technique (i.e., soft digging around the perimeter). In these cases, dig in small lifts (<12” for first five feet) using a dedicated spotter.) For Tolerance Zone work, unless otherwise agreed upon with the Utility Operator, work within the tolerance zone requires verification by means of hand-dug test holes to expose the utility. Once structures have been verified, a minimum clearance of three feet must be maintained between the utility and any powered equipment.

Utility Verification/Site Walkthrough Record

Employee Name:_____

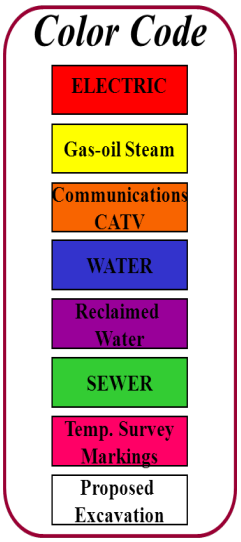
Date: _____

Instructions: For each utility suspected at the job site, indicate the location on the job site, approximate burial depth, and means of detecting the utility. Leave blank if that utility is not believed to be present.

Utility	Description of Utility Location Identified Onsite	Approx. Depth (bls)	Method / Instrumentation used to determine Utility Location	Utility Owner Response (Date/Time)	Mark Out Indicates (Clear / Conflict)
Electrical Lines					
Gas Lines					
Pipelines					
Steam Lines					
Water Lines					
Sanitary and Stormwater Sewer lines					
Pressured Air-Lines					
Tank Vent Lines					
Fiber Optic Lines					
Underground Storage Tanks					
Phone Lines/ Other					

* bls - below land surface

Site Sketch Showing Utilities:



Other Comments / Findings:

Completed by: _____

Signature: _____ Date: _____

Appendix B
Private Utility Technology Applications and Considerations

Appendix B – Private Utility Technology Applications and Considerations

Technology ⇒ Utility/Object ⇓	Radio Frequency Electro-Magnetic Detector (connection to utility, or induction without connection)	Radio Frequency Electro-Magnetic Detector (passive sweep)	Ground Penetrating Radar (GPR)⊙	Acoustic Plastic Pipe Locator	Beacon, Sonde or Conductive Rodder Insertion	EM-61 (time domain electromagnetics) Ξ	
Power/Instrument Line (Energized/Signaled) □	❋ G	G	G	R	R	G	
Power Line (Non-energized) □	❋ G	R	G	R	R	G	
Sewer/Water Line (Metallic) □	❋ G	Y	G	Y	G	G	
Sewer/Water Line (Non-metallic)	R	R	G	G	❋ G	R	
Instrument / Telecomm Lines (Non-energized)	❋ G	R	G	R	R	Y Only if metallic	
Hydrocarbon Transmission Line (Pipeline)◆ □	❋ G	R	G	R	R	G	
Metallic/Non-Metallic Line (with Tracer Wire)	❋ G	Y	G	Y	Y	G metallic	Y non-metallic
Metallic/Non-Metallic Line (without Tracer Wire)	G metallic	R non-metallic	R	❋ G	Y	Y	G metallic	R non-metallic
Metal or Fiberglass UST	R	R	❋ G	R	R	G metallic	R non-metallic

Additional Considerations

Technology ⇒ Variable ⇓	Radio Frequency Electro-Magnetic Detector	Ground Penetrating Radar (GPR)⊙	Acoustic Pipe Locator	Beacon, Sonde, or Conductive Rodder Insertion	EM-61 Ξ
Moist Soil	G	Y	G	G	G
Dry Soil	Y	G	Y	G	G
Clay	Y	R	G	G	G
Concrete w/Rebar	R	Y	G	G	R
Long Horizontal Profile	G	G	G	G	G
Short Horizontal but Deep Vertical Profile	Y	G	R	R	G
Access to Line✚	G	N/A	G	G	G
No Access to Line✚	G (induction or passive)	G	R	R	G
	R (direct connect)				G
Ferrous Metal	G	G	G	G	G
Non-ferrous Metal	Y	G	G	G	G
Adjacent or crossing conductive utility(ies)	Y	N/A	N/A	N/A	Y

Each site will be unique. Do not use this table as the sole criteria for technology selection. Use it as a starting point to assess available, applicable technology(s).

❋ Indicates best technology for given object. Site structures, rebar in concrete, shallow groundwater tables, perched storm water, etc. can significantly affect performance and reliability of any electro/magnetic method. Other utilities which cross or are adjacent to the target line can cause the EM signal to bleed or jump to the other utility line.

□ Metallic lines that have power running through them or can be connected to a tracer signal generator.

◆ Natural gas pipeline locating technicians must be trained/certified (in the U.S. requires DOT and Office of Pipeline Safety standards, other regions may have similar certification or requirements).

⊙ Most sensitive to interpretation. The skill, training and experience of operator are critical.

Ξ Emerging technology with limited availability.

✚ Access: induce unique electronic signature, apply acoustical impulse or insert conductive rodder/beacon/sonde.

Green Generally, an applicable technology **Yellow** May or may not be applicable **Red** Not generally applicable

APPENDIX G

Quality Assurance Project Plan/Field Sampling Plan

Quality Assurance Project Plan/Field Sampling Plan (QAPP/FSP)

35-18 Steinway Street
Astoria, New York

January 29, 2026

Prepared for:

LMXD INNOQ B1 LLC

Prepared by:

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1. Professional Profiles
2. NYSDEC PFAS Guidance
3. Laboratory's Standard Operating Procedures
4. Roux's Standard Operating Procedures

1. Introduction

Roux Environmental Engineering and Geology, D.P.C. (Roux), on behalf of LMXD INNOQ B1 LLC (Requestor), has prepared this Quality Assurance Project Plan/Field Sampling Plan (QAPP/FSP) to describe the measures that will be taken to ensure that the data generated during performance of the Remedial Action (RA) in accordance with the Remedial Action Work Plan (RAWP) for the property located at 35-18 Steinway Street, Astoria, New York (Site) are of quality sufficient to meet project-specific data quality objectives (DQOs). This QAPP/FSP also includes field sampling procedures. The Requestor has submitted an application for entry into the the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP). The RA would be completed in accordance with the requirements of the BCP.

This QAPP/FSP was prepared in accordance with the guidance provided in NYSDEC's DER-10, Technical Guidance for Site Investigation and Remediation (DER-10) dated May 2010, and the United States Environmental Protection Agency's (USEPA's) Guidance on Systematic Planning using the Data Quality Objectives Process (EPA QA/G-4) dated February 2006.

1.1 Purpose

This QAPP/FSP describes in detail the quality assurance/quality control (QA/QC) and field sampling methods to be used during soil, soil vapor, and groundwater sampling tasks performed during the RA.

This QAPP/FSP provides guidelines and procedures to be followed by field personnel during performance of sampling during the RA. Information contained in this QAPP/FSP relates to:

- sampling objectives (Section 2);
- project organization (Section 3);
- sample media, locations, analytical suites, and frequency (Section 4);
- field sampling procedures (Section 5);
- sample handling, sample analysis, and QA/QC (Section 6); and
- Site control procedures and decontamination (Section 7).

2. Sampling Objectives

Previous investigations at the Site have documented the presence of soil impacts and the presence of contaminated historic fill materials.

The RA will evaluate soil quality during the course of the RA to determine whether cleanup requirements have been achieved or whether further remediation is required.

Sampling procedures are discussed in Section 5 of this QAPP/FSP. A discussion of the DQOs and QA/QC is provided in Section 6.

3. Project Organization

A general and generic summary of the overall management structure and responsibilities of project team members are presented below. Professional profiles for the team are provided in Attachment 1.

Project Principal/Remedial Engineer

Noelle Clark, P.E. will serve as the Project Principal and Remedial Engineer. The Project Principal is responsible for defining project objectives and bears ultimate responsibility for the successful completion of the investigation. The Remedial Engineer is a registered professional engineer licensed by the State of New York. The Remedial Engineer will have primary direct responsibility for implementation of the RA. The Remedial Engineer will certify in the Final Engineering Report (FER) that the remedial activities were observed by qualified environmental professionals under their supervision as well as any other relevant provisions of Environmental Conservation Law (ECL) 27-1419 have been achieved in full conformance with the RAWP.

Project Manager

Jack Rusk will serve as the Project Manager. The Project Manager is responsible for defining project objectives and bears ultimate responsibility for the successful completion of the work. This individual will provide overall management for the implementation of the scope of work and will coordinate all field activities. The Project Manager is also responsible for data review/interpretation and report preparation.

Field Team Leader

Marilyn Villacres will serve as the Field Team Leader. The Field Team Leader bears the responsibility for the successful execution of the field program. The Field Team Leader will direct the activities of the technical staff in the field, as well as all subcontractors. The Field Team Leader will also assist in the interpretation of data and in report preparation. The Field Team Leader reports to the Project Manager.

Laboratory Project Manager

Laboratory analysis will be completed by Eurofins Environment Testing of Edison, New Jersey, Sacramento, California, and Burlington, Vermont, New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP)-certified laboratories (11452, 11666, and 10391, respectively). The Laboratory Project Manager is Elizabeth Flannery. The Laboratory Project Manager is responsible for sample container preparation, sample custody in the laboratory, and completion of the required analysis through oversight of the laboratory staff. The Laboratory Project Manager will ensure that QA procedures are followed and that an acceptable laboratory report is prepared and submitted. The Laboratory Project Manager reports to the Project Principal and Project Manager.

Quality Assurance Officer

David Kaiser will serve as the Quality Assurance Officer (QAO) for this project. The QAO is responsible for conducting reviews, inspections, and audits to ensure that the data collection is conducted in accordance with the QAPP/FSP. The QAO's responsibilities range from ensuring effective field equipment decontamination procedures and proper sample collection to the review of all laboratory analytical data for completeness and usefulness. The QAO makes recommendations to the Field Team Leader.

4. Sample Media, Locations, Analytical Suites, and Frequency

The media to be sampled during the RA includes soil. A discussion of the sampling schedule is provided below, while the assumed number of field samples to be collected, including QC samples, is included in Tables 2 and 3. Specifics regarding the collection of samples at each location are provided in Section 5 of this QAPP/FSP.

4.1 Soil Sampling Rational

The proposed soil, groundwater, soil vapor, indoor air, and ambient air sampling locations are described in the table below.

Table 1. Summary of Sample Rationale

Sample Location ID	Region of Site	Rationale	Sample Depths	Analyses
BCS-01 through BCS-47 (Soil)	Entire Site	Bottom confirmation sampling will be conducted at a frequency of at least one sample per approximately 900 square feet of excavation area (47 samples total).	Immediately Below Remedial Excavation Depth	Target Compound List (TCL)/NYSDEC Part 375 VOCs, SVOCs (including 1,4-Dioxane), pesticides/herbicides, polychlorinated biphenyls (PCBs), Target Analyte List (TAL)/NYSDEC Part 375 metals, Per- and Polyfluoroalkyl Substances
SCS-01 through SCS-08 (Soil)	Sidewalls of Excavation to 22 feet below land surface	Sidewall confirmation sampling will be conducted at a frequency of at least one sample per approximately 30 linear feet of sidewall (8 samples total).	From Approximately 20 to 22 feet below land surface	Target Compound List (TCL)/NYSDEC Part 375 VOCs, SVOCs (including 1,4-Dioxane), pesticides/herbicides, polychlorinated biphenyls (PCBs), Target Analyte List (TAL)/NYSDEC Part 375 metals, Per- and Polyfluoroalkyl Substances

*1,4-Dioxane and PFAS are considered Emerging Contaminants (ECs).

ECs list includes 1,4-Dioxane and the 40 PFAS which include the 40 compounds listed in the most recent April 2023 NYSDEC guidance Sampling, Analysis, and Assessment of Per-and Polufluoroalkyl Substances (PFAS) Under NYSDEC's Part 375 Remedial Programs (NYSDEC April 2023 Guidance) and is included as Attachment 2 to this QAPP/FSP. PFAS in soil and groundwater will be analyzed via USEPA EPA Method 1633. 1,4-Dioxane in soil will be analyzed by USEPA EPA Method 8270E.

The Eurofins Standard Operating Procedures (SOPs) for completing analyses listed in the table above and reporting limits/minimum detection limits for compounds are included in Attachment 3.

Samples will be collected in laboratory-provided containers and analyzed at a NYSDOH Environmental Laboratory Approval Program-certified laboratory.

4.2 Soil Sample Analytical Suites

Soil samples will be used to determine whether cleanup requirements have been achieved or whether further remediation is required. A total of 47 bottom confirmation samples and 8 sidewall confirmation samples are proposed to be installed at the locations shown in Figure 7 of the RAWP.

Soil samples collected as part of the RI will be analyzed for the following list of parameters:

- Target Compound List (TCL)/NYSDEC Part 375 volatile organic compounds (VOCs) via USEPA method 8260D;
- TCL/NYSDEC Part 375 semivolatile organic compounds (SVOCs) via USEPA method 8270E (including the EC 1,4-dioxane);
- TCL/NYSDEC Part 375 pesticides USEPA method 8081B;
- TCL/NYSDEC Part 375 herbicides USEPA method 8151A;
- TCL/NYSDEC Part 375 polychlorinated Biphenyls (PCBs) via USEPA method 8082A;
- Total Analyte List (TAL)/NYSDEC Part 375 metals (including mercury, hexavalent chromium, trivalent chromium, and total cyanide) via USEPA method 6020B, 7471B, 7196A and 9012B; and
- PFAS via USEPA 1633

Appropriate QA/QC samples will be collected based on applicable guidance. Additional samples may be required if evidence of impacts is observed.

5. Field Sampling Procedures

This section provides a detailed discussion of the field procedures to be used during soil sampling as part of the RA. As discussed, the sample locations are shown on Figure 7 of the RAWP. Additional details regarding sampling procedures and protocols are described in Roux's relevant SOPs, which are provided in Attachment 4.

5.1 Soil Sampling

Details for the collection of soil samples are provided below.

5.1.1 Soil Sampling

Bottom confirmation sampling will be conducted at a frequency of at least one sample per approximately 900 square feet of excavation area (47 samples total). Sidewall confirmation sampling will be conducted at a frequency of at least one sample per approximately 30 linear feet of sidewall (8 samples total). The frequency of bottom sampling and sidewall sampling proposed for this alternative is consistent with the guidance provided in NYSDEC DER-10 5.4. It should be noted that the entire site, will be excavated to elevation 21 ft NAVD88 for redevelopment purposes with two areas excavated to 15 NAVD88 for elevator pits. In addition, in portions of the Site where the remedial excavation depth is shallower than the final redevelopment excavation depth, the confirmation samples will be collected immediately below the remedial excavation depth.

A total of 47 bottom confirmation samples (BCS) identified as BCS-01 through BCS-47, and 8 sidewall confirmation samples (SCS) identified as SCS-01 through SCS-08, will be collected at the Site as described in **Table 3**. Samples will be distributed throughout the Site and will be biased toward impacts, if any are observed.

Soil samples will be analyzed for the parameters described above in Section 4.2. These samples will be placed in the laboratory-supplied containers and shipped to the laboratory under chain of custody procedures in accordance with Roux's SOPs, included in Attachment 4.

All soil sampling activities will be completed in accordance with the NYSDEC April 2023 Guidance. Additional necessary precautions will be taken when sampling for ECs in the field, including, but not limited to:

- Using the proper field clothing or personal protective equipment (PPE) (i.e., no materials will contain Gore-Tex or Tyvek);
- Avoid using sampling equipment components/containers making contact with aluminum foil, low-density polyethylene (LDPE), glass, or polytetrafluoroethylene materials;
- Following PFAS field sampling guidelines (i.e., using sampling materials made from high-density polyethylene [HDPE], silicon, or stainless steel and avoid using equipment containing Teflon and using Sharpies, permanent markers, adhesives, and waterproof/plastic clipboards and notebooks); and,
- Utilizing regular ice for sample presevation and only Alconox for decontamination.

6. Sample Handling, Sample Analysis, and QA/QC

To ensure quality data acquisition and collection of representative samples, there are selective procedures to minimize sample degradation or contamination. These include procedures for preservation of the samples, as well as sample packaging, shipping procedures, and QA/QC.

6.1 Field Sample Handling

A discussion of the proposed number and types of samples to be collected during each task, as well as the analyses to be performed, can be found in Section 4 of this QAPP/FSP. The types of containers, volumes, and preservation techniques for the aforementioned testing parameters are presented in Table 4.

6.2 Sample Custody Documentation

The purpose of documenting sample custody is to ensure that the integrity and handling of the samples is not subject to question. Sample custody will be maintained from the point of sampling through the analysis (and return of unused sample portion, if applicable).

Each individual collecting samples is personally responsible for the care and custody of the samples. All sample labels should be pre-printed or filled out using waterproof ink. The technical staff will review all field activities with the Field Team Leader to determine whether proper custody procedures were followed during the field work and to decide if additional samples are required.

All samples being shipped offsite for analysis must be accompanied by a properly completed chain of custody form. The sample numbers will be listed on the chain of custody form. When transferring the possession of samples, individuals relinquishing and receiving will sign, date, and note the time on the record. This record documents transfer of custody of samples from the sampler to another person, to/from a secure storage area, and to the laboratory.

Samples will be packaged for shipment and dispatched to the appropriate laboratory for analysis with a separate signed custody record enclosed in each sample box or cooler. Shipping containers will be locked and/or secured with strapping tape in at least two locations for shipment to the laboratory.

6.3 Sample Shipment

Samples are anticipated to be transported to the laboratory via courier, however, if sample shipment is necessary, sample packaging and shipping procedures are based upon USEPA specifications, as well as DOT regulations. The procedures vary according to potential sample analytes, concentration, and matrix and are designed to provide optimum protection for the samples and the public. Sample packaging and shipment must be performed using the general outline described below.

All samples will be shipped within 24 hours of collection and will be preserved appropriately from the time of sample collection. A description of the sample packing and shipping procedures is presented below:

1. Prepare cooler(s) for shipment:
   - tape drain(s) of cooler shut;
   - affix “This Side Up” arrow labels and “Fragile” labels on each cooler; and
   - place mailing label with laboratory address on top of cooler(s).

2. Arrange sample containers in groups by sample number.
3. Ensure that all bottle labels are completed correctly. Place clear tape over bottle labels to prevent moisture accumulation from causing the label to peel off.
4. Arrange containers in front of assigned coolers.
5. Place packaging material at the bottom of the cooler to act as a cushion for the sample containers.
6. Arrange containers in the cooler so that they are not in contact with the cooler or other samples.
7. Fill remaining spaces with packaging material.
8. Ensure all containers are firmly packed in packaging material.
9. If ice is required to preserve the samples, ice cubes should be repackaged in Zip-lock™ bags and placed on top of the packaging material. Blue Ice cannot be used for cooling inside containers being used for shipping PFAS samples.
10. Sign chain of custody form (or obtain signature) and indicate the time and date it was relinquished to courier as appropriate.
11. Separate chain of custody forms. Seal proper copies within a large Zip-loc™ bag and tape to inside cover of cooler. Retain copies of all forms.
12. Close lid and latch.
13. Secure each cooler using custody seals.
14. Tape cooler shut on both ends.
15. Relinquish to overnight delivery service as appropriate. Retain air bill receipt for project records. (Note: All samples will be shipped for “NEXT A.M.” delivery).

6.4 QA/QC

Judy Harry, a third-party data validator, will review the analytical data for QA/QC and prepare the Data Usability Summary Report (DUSR) in accordance with NYSDEC standards. Validator resume is included in Attachment 1. A laboratory SOP for analysis of PFAS is included in Attachment 3.

The primary intended use for the data proposed to be collected is to determine whether cleanup requirements have been achieved or whether further remediation is required. The primary DQO of the soil program, therefore, is that data be accurate and precise, and hence representative of the actual Site conditions. Accuracy refers to the ability of the laboratory to obtain a true value (i.e., compared to a standard) and is assessed through the use of laboratory QC samples, including laboratory control samples and matrix spike samples, as well as through the use of surrogates, which are compounds not typically found in the environment that are injected into the samples prior to analysis. Precision refers to the ability to replicate a value and is assessed through both field and laboratory duplicate samples.

Sensitivity is also a critical issue in generating representative data. Laboratory equipment must be of sufficient sensitivity to detect target compounds and analytes at levels below NYSDEC standards and guidelines whenever possible. Equipment sensitivity can be decreased by field or laboratory contamination of samples and by sample matrix effects. Assessment of instrument sensitivity is performed through the analysis of reagent blanks, near-detection-limit standards, and response factors. Potential field and/or laboratory contamination is assessed through use of trip blanks, method blanks, and equipment rinse blanks (also called “field blanks”).

Table 2 lists the requirements for field and laboratory QC samples that will be analyzed to assess data accuracy and precision, as well as to determine if equipment sensitivity has been compromised. Table 3 lists the number/type of field and QA/QC samples that will be collected during the RI. Table 4 lists the preservation, holding times, and sample container information.

All RI "assessment" analyses will be performed in accordance with the NYSDEC Analytical Services Protocol (ASP), using USEPA SW 846 methods, where applicable.

All laboratory data are to be reported in NYSDEC ASP Category B deliverables and will be delivered to NYSDEC in electronic data deliverable (EDD) format as described on NYSDEC's website (http://www.dec.ny.gov/chemical/62440.html). A DUSR will be prepared meeting the requirements in Section 2.2(a)1.ii and Appendix 2B of DER-10 for all data packages generated during the RA.

7. Site Control Procedures and Decontamination

Site control procedures, including decontamination, waste handling, and disposal, are discussed below. Site control procedures have been developed to minimize both the risk of exposure to contamination and the spread of contamination during field activities at the Site. All personnel who come into designated work areas, including contractors and observers, will be required to adhere strictly to the conditions imposed herein and to the provisions of a Site-Specific Health and Safety Plan (HASP). The HASP is included as Appendix F to the RAWP.

7.1 Decontamination

In an attempt to avoid the spread of contamination, all sampling equipment must be decontaminated at a reasonable frequency in a properly designed and located decontamination area. Detailed procedures for the decontamination of field and sampling equipment are included in Roux's SOPs included in Attachment 4. The location of the decontamination area will be determined prior to the start of field operations. The decontamination area will be constructed to ensure that all wash water generated during decontamination can be collected and containerized for proper disposal. All decontmination will be completed using the standard two step process using detergent (only Alconox will be used as detergent, Liquinox shall not be used) and clean, PFAS-free water for sample equipment. All water sources used for equipment decontamination during soil sampling will be verified in advance to be PFAS-free through laboratory analysis or certification, in accordance with the NYSDEC April 2023 Guidance.

TABLES

1. Summary of Sample Rationale *(embedded in text)*
2. Field and Laboratory QC Summary
3. Remedial Investigation Sampling Summary
4. Preservation, Holding Times, and Sample Containers

Table 2. Field and Laboratory QC Summary

QC Check Type	Minimum Frequency	Use
Field QC		
Duplicate	1 per matrix per 20 samples or SDG*	Precision
Trip Blank	1 per VOC cooler	Sensitivity
Field Blank (non-PFAS)	1 per matrix per 20 samples	Sensitivity
Field Blank (PFAS)	1 per matrix per 20 samples	Sensitivity
Laboratory QC		
Laboratory Control Sample	1 per matrix per SDG	Accuracy
Matrix Spike/Matrix Spike Duplicate/Matrix Duplica	1 per matrix per SDG	Accuracy/Precision
Surrogate Spike	All organics samples	Accuracy
Laboratory Duplicate	1 per matrix per SDG	Precision
Method Blank	1 per matrix per SDG	Sensitivity

Notes:

* SDG - Sample Delivery Group - Assumes a single extraction or preparation

** Provided to lab by field sampling personnel

PFAS - Per- and Polyfluoroalkyl Substances

Table 3. Remedial Action Sampling Summary

Sample Medium	Target Analytes	Field Samples	Replicates[1]	Trip Blanks[2]	Field Blanks[1]	Matrix Spikes[1]	Spike Duplicates[1]	Total No. of Samples
Soil	TCL/Part 375 VOCs +10	55	3	10	3	3	3	77
	TCL/Part 375 SVOCs +20	55	3	-	3	3	3	67
	TCL/Part 375 Pesticides	55	3	-	3	3	3	67
	TCL/Part 375 Herbicides	55	3	-	3	3	3	67
	TCL/Part 375 PCBs	55	3	-	3	3	3	67
	TAL Metals	55	3	-	3	3	3	67
	PFAS	55	3	-	3	3	3	67

Totals are estimated based on scope of work as written, actual sample quantities may vary based on field conditions. QA/QC sample quantities will be adjusted accordingly.

[1] Based on 1 per 20 samples or 1 per Sample Delivery Group (3 days max)

[2] Based on 1 cooler per day

TCL/Part 375 - USEPA Contract Laboratory Program Target Compound List

USEPA - United States Environmental Protection Agency

VOCs - Volatile Organic Compounds

SVOCs - Semivolatile Organic Compounds

PCBs - Polychlorinated Biphenyls

PFAS - Per- and Polyfluoroalkyl Substances

TAL - USEPA Contract Laboratory Program Target Analyte List

Table 4. Preservation, Holding Times and Sample Containers

Analysis	Matrix	Bottle Type	Preservation	Holding Time(a)
TAL/Part 375 Metals (total) via USEPA SW-846 6020B/7471	Soil Water	8 oz wide mouth glass, teflon lined cap 250 mL plastic, teflon lined cap	Cool to 4°C Nitric acid	180 days, Hg 28 days
Hexavalent Chromium via USEPA SW-846 7196A	Soil Water	2 oz wide mouth glass, teflon lined cap 500 mL plastic bottle	None	30 days from sample collection to extraction; 7 days following extraction 24 hours from sample collection
Total Cyanide via USEPA SW-846 9012B	Soil Water	4 oz wide mouth glass, teflon lined cap 250 mL plastic bottle	Cool to 4°C NaOH	14 days from sample collection 14 days from sample collection
PFAS via EPA 1633	Soil Water	Three 250 mL HDPE bottles Three 250 mL HDPE bottles	None Trizma	14 days to extract, 40 days to analysis 14 days from sample collection
1,4-Dioxane via SW-846 8270E 1,4-Dioxane via 8270E-SIM	Soil Water	8 oz wide mouth glass, teflon lined cap 500 mL amber glass	Cool to 4°C Cool to 4°C	14 days to extract, 40 days to analysis 7 days from sample collection
TCL/Part 375 Volatile Organic Compounds (VOCs) via SW-846 8260D	Soil Soil Water	Encore Terra Core 40mL voa vial, teflon lined cap	Cool to 4°C Methanol Cool to 4°C Hydrochloric Acid	48 hours to be extruded into sealed DI and methanol vials; DI vial frozen to -7 to -20 degrees C. 14 days to analysis. 48 hours to freeze DI vials to -7 to -20 degrees C; 14 days to analyze DI and methanol vials 14 days from sample collection
TCL/Part 375 Semivolatile Organic Compounds (SVOCs) via SW-846 8270E	Soil Water	8 oz wide mouth glass, teflon lined cap 1 liter amber glass, teflon lined cap	Cool to 4°C	14 days to extract, 40 days to analysis 7 days to extract, 40 days to analysis
TCL/Part 375 Pesticides via SW-846 8081B	Soil Water	8 oz wide mouth glass, teflon lined cap 1 liter amber glass, teflon lined cap	Cool to 4°C	14 days to extract, 40 days to analysis 7 days to extract, 40 days to analysis
TCL/Part 375 Herbicides via SW-846 8051A	Soil Water	8 oz wide mouth glass, teflon lined cap 1 liter amber glass, teflon lined cap	Cool to 4°C	14 days to extract, 40 days to analysis 7 days to extract, 40 days to analysis
TCL/Part 375 Polychlorinated biphenyls (PCBs) - SW-846 8082A	Soil Water	8 oz wide mouth glass, teflon lined cap 1 liter amber glass, teflon lined cap	Cool to 4°C	14 days to extract, 40 days to analysis 7 days to extract, 40 days to analysis

[a] All soil and groundwater samples to be preserved in ice during collection and transport
[b] Days from date of sample collection.
TAL - Target Analyte List
PFAS - Per- and Polyfluoroalkyl Substances
TCL - USEPA Contract Laboratory Program Target Compound List
USEPA - United States Environmental Protection Agency

ATTACHMENTS

1. Professional Profiles
2. NYSDEC PFAS Guidance
3. Laboratory's Standard Operating Procedures
4. Roux's Standard Operating Procedures

Professional Profiles

PROFESSIONAL PROFILE

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EDUCATION
BS, Civil Engineering, Hofstra University, 2006

PROFESSIONAL LICENSES
Professional Engineer (NY), 2017
Fundamentals of Engineering EIT, 2006

David E. Kaiser, PE

Senior Engineer I

EXPERIENCE SUMMARY
Seventeen years of experience: Senior Engineer, Project Engineer, Staff Engineer with Roux; previously Design Engineer with Bohler Engineering.

TECHNICAL SPECIALTIES
Engineering services including development and review of design drawings, implementation of design, development of technical specifications, review of construction submittals, development of SWPPPs, field management and site safety of various heavy construction projects, and civil/remediation engineering construction management. Designs have included sub slab depressurization systems, soil vapor extraction systems, stormwater drainage systems, NYCDEP sewer system, NYCDOB/DOT sidewalk project, and remedial system design. Additional services including budget management, permitting, project coordination, project scheduling, development of bid packages and cost estimating. Field management and construction oversight of heavy equipment construction including sewer construction, drainage construction, crane lift activities and remedial construction activities. Environmental site assessments focusing on soil, soil vapor, groundwater, and excavation dewatering investigations.

REPRESENTATIVE PROJECTS

- **Soil Vapor Mitigation Systems Design.** Senior Engineer for the design and development of sub slab depressurization systems (SSDS) and soil vapor extraction systems (SVES) for various sites including residential, commercial, and industrial in Suffolk County, Nassau County and New York City Boroughs. Project sites have included system design for new construction buildings, retrofit system for existing buildings and existing system takeovers with troubleshooting and optimization. Designs included strategic layouts and coordination with architects and MEPs to reduce piping conflicts; head loss calculations to ensure adequate vacuum influence on the sub slab via SSDSs comprised of solid headers, perforated laterals and suction points; blower and in-line fan design and sizing appropriate for anticipated head loss and building configuration; and accompanying vapor barrier system to prevent vapor intrusion.

- **Suffolk County Drywell Closure.** Senior Engineer for the planning and coordination of closing existing drywell structures serving as sanitary and industrial retention basins for an industrial facility. The project consisted of developing a sampling plan for the site, coordinating sampling and inspection of existing sanitary and industrial drywells in accordance with Suffolk County Department of Health Services Article 12, SOP No. 9-95 Pumpout and Soil Cleanup Criteria. Following the sampling event, a summary of results was prepared and sent to the SCDHS for review. Due to exceedances that were present within the septic tanks, a remedial action work plan was developed to identify the required steps for successful closure which included coordinating the SCDHS field inspection, extraction of contaminated liquids and solids, and proper disposal of the waste.

- **SPDES Outfall Control Structure Design and Construction.** Senior Engineer for the design and construction of a new SPDES outfall control structure utilizing a precast concrete vault formerly used as a subgrade tank enclosure in Brooklyn, NY. Design included retrofitting an existing precast concrete tank vault to serve as an effluent control structure; and a poured in place concrete compound weir wall to allow control of effluent, flow monitoring to SPDES outfall as well as prevent tidal influx from backflowing into the system. Construction required the management of several trades both landside and waterside to perform an SOE, custom concrete pour for compound weir, dewatering, new steel bulkhead penetration, and sealing of the entire system.

- **NYSDEC Spills Project Remediation.** Senior Engineer for the development, implementation and reporting of Remedial Action Work Plan for a former gasoline retail facility in Greenwich, NY. Remediation included: UST removal, excavation and disposal of approximately 7,000 tons of petroleum hydrocarbon impacted soil via a complex slide rail SOE system, and application of approximately 8,000 pounds of oxygen release compound (ORC) to the groundwater zone across the excavation to enhance the *in situ* aerobic bioremediation.
- **Shooting Range Lead Sampling and Abatement.** Senior Engineer for the development, implementation and reporting of Lead Sampling and Abatement of an indoor state government operated shooting range. Sampling and abatement included: review of surface wipe sampling, live fire air monitoring, assessment of results in accordance with OSHA Action Levels and Permissible Exposure Limits, coordination and management of cleaning and abatement of the range with post-cleaning clearance sampling.
- **Property Drainage System Design and Construction.** Project Engineer for the design and development of a new on-site stormwater treatment system located at a former petroleum terminal in Brooklyn, NY. Design included drainage improvements and modifications for the former petroleum terminal to support ongoing remediation activities that were being conducted to facilitate the future closure of an existing in-ground oil/water separator and removal of associated piping, and to support the anticipated long-term remedy for, and potential future redevelopment of, the subject property. The proposed drainage modifications included the installation of new drainage structures, Contech treatment structures and conveyance piping to collect and treat stormwater runoff within the property, and bypass the existing in-ground oil/water separator, prior to discharging the stormwater via an existing SPDES outfall.
- **Oil/Water Separator Closure.** Project Engineer for engineering support and review for the closure of an existing in-ground oil/water separator at a former petroleum terminal in Brooklyn, NY. The closure and abandonment of the oil/water separator was deemed the long-term remedy as approved by the NYSDEC. The oil/water separator was originally constructed in the early 1900s and has served the property by providing stormwater runoff treatment. The closure project includes the following tasks: dewatering and treatment of separator water; excavation of existing sludge in separator; dewatering and drying/stabilization of the sludge removed; power washing of interior; backfill and compaction of clean fill inside separator; removal of all existing above grade structures including catwalks, guardrails and piping; proper shipping and disposal of sludge contents; installation of a final cover system consisting of a geosynthetic clay liner (GCL) and filter fabric barrier; and final site grading.
- **Utility Tunnel Extension.** Project Engineer for construction management of a utility tunnel extension and modification project. The project consisted of installation of a precast concrete stairway access to an existing utility tunnel, installation of a structural slab to span the tunnel extension, installation of a new base slab, installation of cast-in-place concrete walls and top slab, installation of sidewalks and relocation of all existing system piping and conduits. The work was performed in accordance with the requirements of the New York City Department of Buildings (NYCDOB) and the New York City Department of Transportation (NYCDOT).
- **Treatment System Building Upgrades.** Project Engineer for the review and implementation of engineering drawings for a metals removal system upgrade to an existing 450-gpm groundwater treatment system. The upgrades consisted of: relocating and reinstalling the existing oil/water separator tank on a steel spacer via crane; lifting and installing the existing 10,000 gallon equalization tank to be repurposed as a filter backwash solids removal tank; lifting and installing prefabricated concrete pads with a subbase of Geogrid BX1200 and 6” of aggregate size number 57 (as per NYCDDC Highway Specifications and ASTM C33) compacted to 95% Standard Proctor, under proposed tank locations; locating a new 20,000 gallon equalization/aeration tank on the new pad; installing of new blower motor and enclosure; and installing of new piping and appurtenances.
- **Recovery Well Construction.** Staff Engineer for the construction of aspects of a dual-phase free-phase petroleum product (free-product) and groundwater recovery well at a former petroleum terminal in Brooklyn, NY. Groundwater extracted from the recovery well would be conveyed through 4-inch diameter high density polyethylene standard dimension ratio 11 (HDPE SDR 11) piping and connected to an existing 6-inch HPDE SDR 11 force main piping network that transports the groundwater to an existing on-site groundwater treatment system. Any free-product recovered would be sent to an existing 2,000 gallon above ground storage tank (AST) via 1-inch double wall product piping. Electrical and signal conduits were routed to an existing well house where the system control components were housed.
- **Treatment System Building Roof Rehabilitation and Platform Installation.** Project/Staff Engineer for providing engineering design, review, and construction management of the rehabilitation of a roof and installation of an internal platform in an existing remediation groundwater treatment system building located at a former petroleum terminal in Brooklyn, NY. The roof rehabilitation project included the

replacement of approximately 1,200 square feet of stainless steel decking, insulation and waterproofing. The project also included the construction of three new skylights and access ladders. The platform installation project included the installation of new steel members and fiberglass reinforced polymer (FRP) molded grating within the existing remediation groundwater treatment to provide a working platform for on-site technicians. The new steel members were bolted to existing infrastructure to limit on-site welding and the platform was installed with tubular steel handrails. Responsibilities included: ensuring that the development of the plans and technical specifications were in accordance with the New York City Construction Codes, New York State Building Standards and Codes, various ASTM standards, American Institute of Steel Construction (AISC) "Code of Standard Practice for Steel Buildings and Bridges," and Steel Structures Painting Council (SSPC) Publications.

- **NYCDEP Private Storm and Sanitary Sewer System.** Project/Staff Engineer for the design and development of a New York City Department of Environmental Protection (NYCDEP) Private Storm and Sanitary Sewer System located at a former petroleum terminal in Brooklyn, NY. The sewer system comprised of over 2,600 LF of sewer in Greenpoint Brooklyn over two phases of construction. During the duration of this project responsibilities included: develop/revise NYCDEP sewer design plans and construction notes, address NYCDEP comments and markups, develop Bill of Materials, develop cost estimates, develop technical specifications, develop bid package, ensure compliance with NYCDEP and NYCDOT specifications and requirements, develop/revise NYCDOT Builder's Pavement Plan (BPP), develop NYCDOT Maintenance and Protection of Traffic plans, conduct/participate in design construction meetings, review subcontractor submittals and cut sheets, address NYCDEP punch list items, management/oversight/coordination of subcontractor construction activities.
- **NYCDOB/NYCDOT Sidewalk Installation.** Project/Staff Engineer for the design, development, and installation of over 4,000 linear feet of new sidewalks over various phases located at a former petroleum terminal in Brooklyn, NY. The design, development, and installation of these sidewalks were in accordance with the New York City Department of Buildings and New York City Department of Transportation specifications and details of construction. During the duration of these projects my major responsibilities included: develop/revise NYCDOT Builder's Pavement Plans, develop cost estimates, develop technical specifications, develop bid package, ensure compliance with NYCDOB and NYCDOT specifications and requirements, develop NYCDOT Maintenance and Protection of Traffic plans, conduct/participate in design construction meetings, ensure proper installation and testing of sidewalks in accordance with NYCDOB and NYCDOT, management/oversight/coordination of subcontractor construction activities.
- **Sub Slab Depressurization System.** Staff Engineer for the design and construction of two sub slab depressurization systems (SSDS) located within the footprint of a petroleum remediation site where a new building was proposed to be built. These projects were part of an Interim Remedial Measure (IRM) Action Plan as approved by the NYSDEC to provide a preventative proactive measure to address potential soil vapor issues. The SSDSs were designed to operate passively; however, header piping was installed to allow for the installation of the necessary equipment if an active system was required. The SSDSs consisted of ¾-inch gravel with 4-inch diameter polyvinyl chloride (PVC) schedule 40 well screen used as soil gas collection piping and 6-inch diameter solid PVC used as the header piping. A vapor barrier/waterproofing membrane and nonwoven geotextile fabric were installed between the venting layer and the floor slab. All penetrations through the floor slab were sealed using a silicone based waterproof sealant. The scope of work included excavation and trench work for the SSDS; placement of pipe bedding; jointing and installation of the pipe fittings, valves, and appurtenances; installation of pipe sleeves and mechanical seals; and installation of nonwoven geotextile fabric and silicone based waterproof sealant.
- **Remediation System Signal Network Utility Expansion Oversight and Management.** Staff Engineer and Field Manager for the completion of a signal communication network expansion as part of a petroleum remediation system. My responsibilities included oversight of a subcontractor while installing level sensors within the product pull boxes to improve the safety of the system operations by continuously monitoring the underground product piping network for potential leaks, and programming, testing and verification of operation of sensors. The scope of work also included the installation of signal and control wiring from recovery well houses to subsurface vaults through existing conduit located beneath New York City streets located in Greenpoint Brooklyn. The signal expansion was part of an effort to integrate the sensor/components within the vaults with the existing remediation system's programmable logic controllers (PLCs). The scope of work also included: development of programming to integrate input infrastructure to existing PLCs, development of human machine interface (HMI) screens to allow for remote viewing at the system control buildings, and installation of power supplies and other apparatuses as required for the operation of the new infrastructure. My responsibilities for this work included: subcontractor management, submittal and cut

sheet review, scheduling management, 3rd party coordination, and construction meetings.

- **New York City Transit Plan Submission.** Staff Engineer for researching, preparing, and submitting New York City Transit (NYCT) Plans for various sites to seek approval for drilling and other subsurface activities in proximity to NYC Subways. The scope of work included visiting the Microfilm Room at the NYCT Office to obtain copies of the as-built plans, roof plans, profiles, sections, and alignments adjacent to the properties that our clients were proposing to perform subsurface work. Using these plans, develop proposed boring location plans and cross section plans, overlaying the NYCT plans to determine the proposed distance to adjacent NYCT structures. Ensured that these plans had the most up to date NYCT construction notes since these drawing became part of the projects' contract drawings. Submitted the plans and fees to the NYCT and coordinated with the NYCT inspectors assigned to each project ensuring that all requirements and questions were satisfied. Procured the associated NYCT approvals and distributed to the client so that they may proceed.
- **Stormwater Pollution Prevention Plan (SWPPP) Reports.** Staff Engineer for preparing and submitting Stormwater Pollution Prevention Plans (SWPPP) for various residential and commercial development sites in New York City and Long Island. The scope of work included preparation of SWPPP Reports in accordance with the most current New York State Department of Environmental Conservation (NYSDEC) regulations at the time including the 'General Permit for Stormwater Discharges from Construction Activity' and the 'New York State Stormwater Management Design Manual.' Preparation of the SWPPP Reports included: summarizing the site history and project description, soil geology, potential pollutants, erosion and sediment control practices, inspection and maintenance procedures, water quantity and water quality control plans, construction sequence scheduling, and the Notice of Intent (NOI) for each project as required by the NYSDEC.
- **Former Petroleum Storage Wetland and Canal Remediation Site.** Staff Engineer for daily construction oversight of subcontractors as a field manager and implementation of the site-specific health and safety plan as a Community Air Monitoring Program manager. The scope of work included conducting an on-site Community Air Monitoring Program monitoring for airborne dust and VOCs that were potentially generated by remedial and construction work activities. Stopping work and implementing best engineering/control practices if action levels were exceeded. Recording and providing QA/QC analysis of on-site weather and air monitoring data, as well as ensuring the proper operation of all instruments/monitors on a daily basis. Inspections were conducted of three on-site aboveground API concrete oil/water separators. Stormwater Pollution Prevention Plan (SWPPP) inspections were performed, ensuring compliance with NYSDEC State Pollutant Discharge Elimination System (SPDES) General Permit for Stormwater Discharges from Construction Activity and daily reports were generated which would comprehensively document daily work activities and CAMP data and exceedances.
- **Land Development Site Plan Preparation.** Design Engineer for the design and development of residential, commercial, and industrial site plan packages for Suffolk County, Nassau County and New York City Boroughs. Site plan packages for the various municipalities within Suffolk County, Nassau County and New York City included components such as: zoning analysis, site removals plan, site design and construction documents, water, and sewer system design (detention and retention systems), site grading and drainage plans, and lighting analysis and design.

PROFESSIONAL TRAININGS

OSHA 40-Hour HAZWOPER Training: 2008

OSHA 30-Hour Construction Safety Training: 2011

OSHA 10-Hour Construction Safety Training: 2018

NYSDOT Hazardous Materials Awareness Training: 2017

NYSDEC Erosion and Sediment Control Training: 2016

Loss Prevention Systems Training Certification: 2008

PROFESSIONAL PROFILE

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EDUCATION
BS, Earth and Atmospheric Science, Cornell University, 2020

Jack Rusk

Project Geologist

EXPERIENCE SUMMARY
Over four years of experience: Project Geologist (2024-Present) and Staff Geologist II (2021-2024) at Roux, Islandia, New York; Geologist at Tectonic Engineering Consultants, Geologists & Land Surveyors, D.P.C., Newburgh, New York (2020-2021).

TECHNICAL SPECIALTIES
Drilling and soil boring oversight; assessments of lithology; soil characterization; multiple soil, soil vapor, and groundwater sampling techniques; management of soil trucking and manifestation processes; and management of Community Air Monitoring Projects (CAMP).

REPRESENTATIVE PROJECTS

- Project manager for projects to support remediation activities at the Amtrak Sunnyside Yard State Superfund Site in Long Island City, New York. Oversaw the implementation of remediation activities, including soil excavation, off-site disposal, and a Community Air Monitoring Plan (CAMP).
- Project manager for remediation activities for a redevelopment in Greenpoint, Brooklyn, New York enrolled in the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP). Oversaw the implementation of remediation activities, including soil excavation, offsite disposal, and endpoint confirmation sampling, and the construction of a geothermal heat exchange system.
- Project manager of multiple Phase II Environmental Site Assessments (ESAs) for a solar battery company throughout the NY metropolitan area. The Phase II ESAs included groundwater, soil, and soil vapor sampling to investigate the potential presence of contamination at the sites associated with historical operations.
- Project manager responsible for the implementation of a remedial investigation in Long Island City, New York for a site enrolled in the NYSDEC BCP with petroleum-related contamination in soils and groundwater. Technical responsibilities included management of the field operations, daily reporting to NYSDEC, and budget management.
- Field manager responsible for the field implementation of a remedial investigation in Long Island City, New York. Responsibilities included oversight of soil boring advancement using a Geoprobe direct push rig and sonic drill rig, subcontractor oversight, lithologic classification of 22 soil borings, collection and screening of soil samples, installation of six monitoring wells, installation of ten soil vapor points, soil vapor sampling, groundwater sampling, and laboratory coordination. Responsible for performance of CAMP and daily reporting to NYSDEC.
- Field manager responsible for the remediation of a BCP site in the Inwood neighborhood of Manhattan, New York. Responsibilities included oversight of excavation, import and export of material, performance of CAMP and daily reporting to NYSDEC, UST removal, and endpoint sampling. More than 2,100 truckloads of material were disposed at five different facilities, and 96 confirmation endpoint samples were taken. The Site reached its unrestricted use goals.
- Field manager responsible for the field implementation of a remedial investigation in Sunset Park, Brooklyn, New York. Responsibilities included oversight of soil boring advancement using a Geoprobe direct push rig, subcontractor oversight, lithologic classification of 16 soil borings, collection and screening of soil samples, installation of four monitoring wells,

installation of three soil vapor points, soil vapor sampling, groundwater sampling, and laboratory coordination. Responsible for performance of CAMP and daily reporting to the NYSDEC.

- Field manager responsible for waste characterization and soil trucking at a site in Williamsburg, Brooklyn, New York. Responsibilities included waste characterization sampling, oversight of excavation, organization and proper handling of waste manifests, and updating of daily truck logs. Responsible for performance of CAMP and daily reporting to OER.
- Field manager responsible for sediment sampling with a barge-mounted rig at a site in the Arthur Kill River off of Staten Island, New York. Responsibilities included classification of soil, lithology, collection and screening of soil samples, gINT logging, and tide coordination.
- Storm Water Pollution Protection Plan (SWPPP) inspector for two sites in South Bronx, New York. Weekly reports were completed detailing changes in stormwater management at the sites.
- Assisted in annual groundwater monitoring program at a former petroleum refinery and terminal in Brooklyn, New York. This work was done to monitor the largest subsurface free product plume in North America. Fieldwork responsibilities included the gauging of over 50 wells for petroleum-contaminated groundwater.
- Site Safety Officer for various remedial investigation sites. Responsibilities include preparation of health and safety plans (HASPs), job safety analysis (JSA) documents development and review, on-site safety meeting management, safety document preparation (Lessons Learned, Near Loss, Field Audits, etc.), and planning/execution of corrective actions.
- Assisted with groundwater sampling at a New York State Brownfields Cleanup Program site in Long Island City, New York. The three-acre Site was formally used for the manufacturing and storage of disinfectants, soaps, and pesticides, which created a large Creosote plume. Fieldwork included sampling 13 off-site wells.
- Field Manager at a one-acre former industrial paint manufacturing site enrolled in the NYSDEC BCP. Responsibilities included oversight of excavation, removal of USTs, performance of CAMP, and daily reporting.
- Field Manager responsible for oversight of soil boring advancement using hand tools and a Geoprobe for a pre-design investigation in Howard Beach, Queens, New York. Responsibilities included subcontractor oversight classification of soil, lithology, collection and screening of soil samples, installation of temporary monitoring wells, groundwater sampling, and laboratory coordination.
- Field Manager responsible for the implementation of a subsurface investigation in Astoria, Queens, New York. Responsibilities included oversight of soil boring advancement using a CME drill rig, lithologic classification of soil and rock cores, oversight of cone penetration testing, and oversight of geophysical seismic testing.

PROFESSIONAL TRAININGS

OSHA 40-Hour HAZWOPER Training, 2021

OSHA 30-hour Construction Safety Training, 2021

NYC Site Safety Training, 2021

Storm Water Pollution Prevention Plan Certified

JUDY V. HARRY
P. O. Box 208
120 Cobble Creek Rd.
North Creek, NY 12853

Occupation: Data Validator/Environmental Technical Consultant

Years Experience: 45

Education: B.S., Chemistry, Magna cum laude, 1976, Phi Beta Kappa

Certifications: New York State Woman-Owned Business Enterprise (WBE)

Relevant Work History:

Data Validation Services: September 1989 - present

Sole proprietor of Data Validation Services, a woman-owned small business registered with SAM, providing consultation/validation services to regulatory and commercial clients.

These services include the review of analytical laboratory data for compliance with respect to specific protocols, accuracy and defensibility of data, verification of reported values, and evaluation of quality parameters for analytical usability of results. Approved by USEPA, NYSDEC, NJDEP, NYSERDA, and NYCDEP as a data validator for projects, including USEPA Superfund, Brownfield, and lead sites, and those contracted through the NYSDEC Division of Hazardous Waste Remediation, Division of Solid Waste, and Division of Water Quality.

Performed validation for compliance with laboratory analytical protocols including USEPA OLM, USEPA OLC, USEPA ILM, USEPA DFLM, USEPA SOW3/90, USEPA SOW 7/87 CLP, USEPA SOW 2/88 CLP, USEPA SW846, RCRA, AFCEE, NYS 6 NYCRR Part 360, 40 CFR, Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, including TO-15, 1989/1991/1995/2000/2005 NYSDEC ASPs, and 1987 NYSDEC CLP.

Performed validation according to the USEPA National and Regional SOPs and Functional Guidelines, AFCEE requirements, NYSDEC Validation Scope of Work, NYS DUSR, and NJDEP Division of Hazardous Site Mitigation/Publicly Funded Site Remediation SOPs.

Performed validation for USEPA Superfund Sites including Salem Acres, York Oil, Port Washington L-4 Landfill, Bridgeport Rental and Oil Services, GE-MRFA, MMR/ OTIS AFB, LCP, and Peter Cooper site; and for USEPA lead sites including SJ&J Piconne, Maska, Bowe System, Jones Sanitation, and Syossett Landfill, involving CLP, RAS, and SAS protocols.

Contracted for NYSDEC Superfund Standby Contracts with LMS Engineers/HDR, CDM Smith, Malcolm-Pirnie/ARCADIS, Ecology & Environment, Shaw Environmental/APTIM, CG&I, O'Brien & Gere Engineers, and EC Jordan, involving samples collected at NYS Superfund Sites and analyzed under the NYSDEC ASP.

Performed validation services for NYSDEC Phase II remedial investigations, RI/FS projects, Brownfield sites, and PRP over-site projects for hazardous waste sites.

Performed validation services for clients conducting RI/FS activities involving samples of many matrices, including waste, air, sludges, leachates, solids/sediments, aqueous, and biota.

Clients have included AECOM, ARCADIS, Barton & Loguidice, Benchmark Engineering, Bergmann Associates, Blasland, Bouck & Lee, Brown and Caldwell, CDM Smith, CB&I Shaw Environmental, C&S Consulting Engineers, Chazen Companies, Clough Harbour & Associates, Columbia Analytical Services, C.T. Male, Dames & Moore, Day Engineering, EA Engineering, EcolSciences, Ecology & Environment, Ecosystems, EC Jordan, Environmental Chemical Corporation, EHRT, ENSR Consulting, ELM, ERM-Northeast, Fagan Engineers, Fanning Phillips & Molnar, FluorDaniel GTI, Frontier, Foster Wheeler Environmental Corp, Frontier Technical, Galson Consultants, GEI, GE&R, Geomatrix Consultants, GZA Environmental, Handex of N, Hazard Evaluations, H2M Group, HDR, HRP, IT Corp, Jacques Whitford, JTM Associates, JMT, Labella Associates, Langan Engineers, Leader Environmental, Lockwood, Kessler & Bartlett, LMS Engineers, Malcolm-Pirnie, Metcalf & Eddy, NWEC&C, O'Brien & Gere Engineers, Pace, Parsons Engineering-Science, Plumley Engineering, Prescott Environmental, P. W. Grosser, Rizzo Associates, Roux Associates, Sear Brown Group, SECOR, Shaw Environmental, Stantec, ThermoRemediation Inc., TRC Environmental, Turnkey Environmental Restoration, TVGA Engineering, URS Consultants, Wehran Emcon, Weston, Wittman Geosciences, YEC, and private firms.

Provided consultation services to laboratories regarding analytical procedures and protocol interpretation, and to law firms for litigation support.

Provided services to firms involving audits of environmental analytical laboratories to determine analytical capability, particularly for compliance with NYSDEC ASP and AFCEE requirements.

Guest speaker on a panel discussing Data Review/Compliance and Usability, for an analysis workshop for the New York Association of Approved Environmental Laboratories, 1993.

Adirondack Environmental Services: June 1987 - August 1989

Senior mass spectroscopist for AES. Responsible for GC/MS analyses of environmental samples by USEPA and NYSDEC protocols, development of the GC/MS laboratory, initiating the instrumental and computer operations from the point of installation, and for implementing the procedures and methodologies for Contract Laboratory Protocol.

CompuChem Laboratories: May 1982 - January 1987

Managed a GC/MS production laboratory; developed, implemented, and supervised QA/QC criteria at three different levels of review; and was responsible for the development and production of the analysis of environmental and clinical samples. Directed a staff of 23 technical and clerical personnel, and managed the extraction and GC/MS labs and data review operations.

Research Triangle Institute (RTI): December 1979 - May 1982

Worked as an analytical research chemist responsible for development of analytical methods for the EPA Federal Register at RTI. This involved analysis of biological and environmental samples for priority pollutants, primarily relating to wastewaters and to human sampling studies. Method development included modification and interfacing of the initially developed Tekmar volatile purge apparatus to GC/MS, development and refinement of methods for entrapment and concentration of the air medium for subsequent volatile analysis, and the analysis and resolution/ identification of individual PCB congeners within Aroclor mixtures by capillary column and mass spectra.

Guardsman Chemical Company: February 1977 - November 1979

Performed all quality control functions for the manufacturing plant. Performed research and development on coatings and dyes.

Almay Cosmetics: May 1976 - December 1976

Product evaluation chemist. Responsible for analytical QC of manufactured products.

Publication

Pellizzzari, E.D., Moseley, M.A., Cooper, S.D., Harry, J.V., Demian, B., & Mullin, M. D. (1985). Recent Advances in the Analysis of Polychlorinated Biphenyls in Environmental and Biological Media. *Journal of Chromatography*, 334(3) 277-314.

PROFESSIONAL PROFILE

CONTACT INFORMATION

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Islandia, NY 11749

EDUCATION

BS, Civil Engineering,
Manhattan College, 1991
ME, Environmental Engineering,
Manhattan College, 1994

PROFESSIONAL LICENSES

Professional Engineer in New York

Noelle M. Clarke, PE

Principal Engineer

EXPERIENCE SUMMARY

Thirty-two years' experience: Principal Engineer/Senior Engineer at Remedial Engineering, P.C./Roux; Project Engineer at Camp Dresser & McKee.

TECHNICAL SPECIALTIES

Feasibility studies, pilot testing, remedial design, implementation, construction management, and startup evaluations for remediation of soil, groundwater, soil vapor and sediment. Phase I/Phase II Environmental Site Assessments (ESA). Extensive experience at brownfields redevelopment sites, former industrial facilities, and public works facilities. Evaluation and design of storm water drainage systems. Evaluation, design, and construction management for new and existing wastewater treatment processes.

REPRESENTATIVE PROJECTS

- Principal Engineer providing due diligence support for real estate transactions on multiple projects in the New York metropolitan area. Projects have included multi-family housing (both affordable and market rate), retail/ commercial, community services and industrial properties. Services have included Phase I and Phase II ESAs.
- Principal Engineer for a Brownfield redevelopment of a property adjacent to a dry cleaning solvent distribution facility in Brooklyn, New York under the NYSDEC BCP. The site was previously a warehouse built on a former freight railyard that serviced the dry cleaning solvent facility. Offloading spillage on site and migration from the offsite facility resulted in significant soil, groundwater, and vapor contamination with chlorinated VOCs. The site was developed into multifamily housing with first floor retail use. Pre-remediation and posts-remediation Phase I ESAs were prepared by Roux. The remedy, as summarized in the Remedial Action Work Plan, consisted of soil hot spot removal, a physical barrier to limit on site groundwater migration, a permeable reactive wall to treat groundwater and mitigate offsite migration, and a sub slab depressurization system. Roux, under the direction of Ms. Clarke, provided full-time oversight of the remediation and prepared the Final Engineering Report and Site management Plan. The Certificate of Completion for the Site was obtained in October 2015 and Roux is currently providing post-remediation monitoring services.
- Principal Engineer for a Brownfield redevelopment in Brooklyn, New York at a mixed-use multifamily housing/neighborhood retail complex with a former onsite dry cleaner under the NYSDEC BCP. There is soil, groundwater, and vapor contamination from chlorinated VOCs from the former onsite dry cleaner, as well as groundwater contamination from offsite dry cleaners. The remedy, described in the Remedial Action Work Plan prepared by Roux, consisted of hot spot soil removal, *in situ* groundwater treatment and a sub slab depressurization system for vapor mitigation in the existing buildings. The NYSDEC accepted the Final Engineering Report prepared by Roux and the Site received a Certificate of Completion from NYSDEC in 2016 and Roux is currently providing post-remediation monitoring services.
- Principal Engineer for a complex dredging project for a major petroleum company on the Allegheny River in New York. The goal of the project was to remove 1,000 tons of petroleum impacted sediments from the river. Work included Site investigation, remedial investigation, alternatives evaluation, remedial design, planning and extensive regulatory permitting with multiple federal, state, and local agencies. The remediation work was completed in 2021.

- Principal engineer for the investigation and remediation of a former petroleum refinery located in Olean, New York under the NYSDEC BCP. The work included site investigation and preparation of an Alternatives Analysis Report (to document analysis of engineering options and remedy recommendation), Remedial Action Work Plan and remedial design documents to address the environmental impacts associated with the historical operations. The selected remedy includes excavation of shallow soil, in-situ stabilization of 25,000 cubic yards of deep petroleum impacted soil and capping. The work is being completed in phases beginning in 2022, with an anticipated completion date of 2024.
- Principal Engineer for the alternatives evaluation, remedy selection, regulatory negotiation, preparation of design documents (drawings, specifications, and permit applications) and permitting for all remedial components in support of redevelopment at a former metals manufacturing site in Staten Island, New York under the NYSDEC Voluntary Cleanup Program (VCP). The remedy included dredging and onsite disposal of stream sediments; consolidation and capping of fill material across the site; in-place abandonment of the Site's former sewer system; installation of drainage swales for storm water management; and wetland bank stabilization and mitigation/restoration. Required permits and regulatory approvals for the project included a Joint Permit from the USACE and NYSDEC; a NYSDEC SPDES equivalency permit for discharge of treated water to the Arthur Kill, a New York State Department of State Coastal Management Program (CMP) Federal Consistency Assessment; a New York City Waterfront Revitalization Program Consistency Assessment, a modification of topography authorization from New York City Department of City Planning; and a New York City Department of Environmental Protection permit for temporary discharge to a combined sewer. Also required by the USACE and National Marine Fisheries, was preparation of an Essential Fish Habitat Study, in support of the Joint Permit application. Permitting activities included preparation of the various permit applications, forms and supporting documentation, as well as follow up meetings and correspondence to finalize the authorizations.
- Principal Engineer for the design, bidding, contractor selection, and remedial construction phase at a former metals manufacturing facility in Staten Island under the NYSDEC VCP. Responsibilities included finalizing biddable construction documents, issuing to bidders, preparing addenda, and evaluating bids for presentation to the client. Following contractor selection Roux was heavily involved in coordinating with the client, regulators, and contractor for mobilization to the site in late 2006. During the construction Ms. Clarke provided support to the onsite construction manager regarding field changes, design revisions to account for unexpected conditions and contractor questions. The Final Engineering Report summarizing the construction activities was accepted by NYSDEC.
- Principal-in-Charge of an investigation and remediation project at a former petroleum refinery and current distribution facility located in Buffalo, New York. The site entered the NYSDEC BCP in 2006. Roux completed the BCP application and supported the application process. The work included assessing and remediating the potential environmental impacts associated with historical Site operations. These activities have included preparing multiple work plans and directing the activities of another consultant performing the fieldwork and preparing reports of results for field investigations including soil boring and sampling, well installation and groundwater sampling, aquifer pump testing, and groundwater/separate phase modeling. An in situ chemical oxidation system was designed, installed, and was operated as an IRM to remediate an area of free product and impacted groundwater discharging to the Buffalo River in OU-4.
- For the same petroleum Site in Buffalo, New York, multiple Alternatives Analysis Reports (to document analysis of engineering options and remedy recommendation), Remedial Action Work Plans and remedial design documents have been prepared to address the environmental impacts associated with the five Operable Units (OU) on the Site. Remedial construction for OU-1 was completed in 2007 and included excavation and disposal of impacted soil. The Final Construction Certification Report for OU-1 was accepted by the NYSDEC. The Alternatives Analysis Report and Remedial Design for OU-4 were submitted and approved by NYSDEC. The remedy for OU-4 included excavation and onsite consolidation of river sediments and site soil, stabilization of 1,400 linear feet of river embankment using tiered slopes, rip rap, and reinforced bioengineering, slurry wall groundwater containment, low permeability capping, a stormwater collection system and constructed wetland treatment for stormwater. Various vegetative measures were incorporated into the design in order to promote vegetative growth and enhance wildlife habitats. The remedial construction was completed in 2013 and 2014 and preparation of the Final Construction Completion Report was completed in 2015. The Alternatives Analysis Reports for OU-2 and OU-3 were submitted to NYSDEC. For OU-2, bench scale studies of stabilization/solidification agents were completed and evaluated for treatment of lead and petroleum impacted soil. In addition, field pilot studies of multiple options to treat petroleum impacted soils were completed and evaluated. Design of a stormwater collection system for portions of OU-2 and OU-3 was completed in 2010 and construction was completed in 2014 under the direction of Ms. Clarke.

- For the same petroleum terminal in Buffalo, New York, the work also included performing activities related to the operation of the remediation systems at the Site. These activities have included preparing a feasibility study work plan for improving water management systems at the site; preparing a work plan, directing the field work, and preparing an evaluation summary report for startup and testing of a portion of the groundwater extraction system at the Site; and assisting in preparation of plans to upgrade the existing treatment facilities at the Site.
- For the same petroleum terminal in Buffalo, New York, the work also included preparation of design documents and a completion report for in-place closure of the site's former in-ground oil water separator. In addition, a vapor enhanced extraction pilot study work plan was prepared and implemented at the site for recovery of separate-phase product in one portion of the site located adjacent to the Buffalo River. The results of the VER pilot testing, along with the results of chemical oxidation pilot testing conducted at the site, have been summarized in a Remedial Action Selection report, which recommended implementation of chemical oxidation in this portion of the site. A conceptual plan for implementation of chemical oxidation was submitted with the selection document. The work also included maintaining contact with regulatory agencies regarding the status of activities at the Terminal; preparing compliance monitoring reports for submittal to the regulatory agencies; overall project coordination; and budget management and tracking.
- Principal Engineer for the investigation, design, and implementation of a soil remediation project at a 4-acre former oil terminal in Cold Spring Harbor, New York under the NYSDEC spills program. The remedy completed included excavation and offsite disposal of approximately 20,000 tons of petroleum contaminated and/or hazardous lead contaminated soil in accordance with the future use of the site under an Environmental Easement. Additional activities completed by Roux at the site included asbestos remediation followed by building demolition, UST removal, and cesspool remediation. Roux prepared a Final Engineering Report, which was accepted by NYSDEC and resulted in the closure of the spill number for the Site.
- Principal Engineer for the investigation, design, and implementation of a soil remediation project at a portion of a former oil terminal in Sag Harbor, New York. The remedy completed included excavation and offsite disposal of approximately 2,000 tons of petroleum contaminated soil from beneath an active public roadway under the NYSDEC spills program. The remedy included extensive traffic control and coordination with Village of Sag Harbor officials, dewatering, water treatment, temporary water discharge of treated water to Sag Harbor and restoration of the public roadway in accordance with the Village of Sag Harbor Department of Public Works requirements. Roux prepared a Final Engineering Report, which was accepted by NYSDEC and resulted in the closure of the spill number for the Site.
- Project Manager for preparation of a work plan, direction the field activities and preparation of a summary report for investigation of the storm-water collection system at a petroleum terminal in Buffalo, New York. The objectives of the storm sewer investigation were to: prepare a detailed map of the Site's sewer system; re-establish connections that may have become blocked by debris; investigate the structural integrity of the storm sewers; locate areas of groundwater infiltration and assess infiltration rate and quality; assess wet and dry-weather flow and quality; and identify areas contributing surface water to the collection system, including hydrologic modeling using TR-55. Based on the results of the investigation, several improvements to the sewer system were recommended, including eliminating inlets to the system in areas of the site where no active operations currently take place and rehabilitation and/or installation of new sewers to restore flow by gravity to the treatment system.
- Principal Engineer for the investigation, remedial design, construction oversight and operation and maintenance of a bioventing and soil vapor extraction system at the Site of a diesel UST failure in Brooklyn. A free product recovery system was also designed, installed, and operated by Roux. Investigation activities included the use of the sonic drilling technique to advance twelve wells to 85 feet below grade through cobbles and boulders for delineation of separate phase product, soil, and groundwater impacts. Eight wells were converted to combination biovent/SVE wells. Design included specification of SVE and biovent blowers, piping, valves, and an automatic control system. Product only pumps were also designed and installed in three wells. Approximately 2,000 gallons of product were recovered by the two systems and the spill was closed by NYSDEC in 2011.
- Principal Engineer for a Brownfield redevelopment in Staten Island, New York of a former retail service station site under the NYSDEC BCP. There is soil, groundwater, and vapor contamination from petroleum-related constituents in the vicinity of the former gasoline piping and pump island (the petroleum source area), as well as historic fill across the entire site. The remedy, described in the Remedial Action Work Plan prepared by Roux, consisted of a sealed sheet pile containment wall around the petroleum source area, a Site Cover System across the entire site, comprised of concrete building slab/walkways, asphalt parking areas and limited landscaped areas and a sub-slab depressurization system to prevent vapor intrusion into the proposed retail building. A certificate of completion from NYSDEC was obtained in 2020.

- Project Manager for the remedial design at a Superfund Site in Nanuet, New York for the New York State Department of Environmental Conservation. The work included preparation of a preliminary design report, which evaluated two alternatives for handling hazardous soils and sediments at the site contaminated with volatile organic compounds. Each alternative was evaluated on the basis of technical feasibility, cost, and schedule for implementation. Based upon this evaluation, off-site disposal was recommended over on-site treatment. The report presented a site-wide conceptual plan for remediation, including soil/sediment excavation, staging and sampling; stream diversion; excavation dewatering; temporary on-site groundwater treatment; and long term monitoring. Duties also included managing and tracking all project budgets and serving as the main client contact.
- Principal Engineer for the design and specification of a large-scale (750 scfm) soil vapor extraction (SVE) pilot system with thermal oxidation off-gas treatment for a client in Brazil. Responsibilities included equipment sizing and specification, selection of materials of construction, SVE well and equipment layout, description of general startup procedures and preparation of a pilot test work plan. The pilot test work plan included a description of the pilot test operating procedures to be followed, operating parameters to be monitored and data to be collected and analyzed. The work also included conducting the pilot test activities and generating a report that included plans for expanding the SVE system across the Site. The work also included technical support for evaluating and optimizing system performance.
- Project Manager for a storm sewer study at the former metals manufacturing facility in Staten Island, New York as part of the Voluntary Cleanup Program for the Site to identify contaminated infiltration sources, provide an accurate site drainage map, and verify contributing areas to each outfall. The investigation included field inspections, surveying, dye testing, and sampling during varying tidal conditions. The storm sewer map prepared was used for future sewer closure and site redevelopment planning.
- Principal engineer for the design of a new storm water collection system for a metals manufacturing site in Staten Island, New York under the NYSDEC VCP. The design included evaluation and hydrologic modeling of the system using the USG Soil Conservation Service TR-55 hydrologic analysis model, inlet structure and pipe sizing and layout, outfall design and specification of materials and methods of construction for all system components.
- Principal-in-Charge of the operation, maintenance, monitoring and reporting activities at multiple active and former petroleum storage and distribution terminals located in New York for a large petroleum company. The work includes operation, maintenance, and performance/compliance monitoring services at the sites that currently have active remediation systems installed and monitoring, sampling, and reporting services at sites without systems. The remediation systems include groundwater extraction and treatment, free product recovery, bio-sparging, and soil vapor extraction/air sparging. At these sites, Roux is responsible for: maintaining and troubleshooting the various system components to reduce downtime to the extent possible; repairing and/or replacing equipment as needed; coordinating the upgrading of the electrical systems, as needed, to meet current building code requirements; expanding systems to meet regulatory requirements, as needed; optimizing system performance; collecting performance monitoring samples and data to track the efficiency of the treatment systems; and collecting compliance monitoring data.
- Principal Engineer for at multiple petroleum terminals in New York State for groundwater quality and surface water quality sampling and monitoring well gauging as required by the New York State Department of Environmental Conservation, as well as quarterly reporting for all sites. The work has also included collection of soil quality data at several sites and performance of an electromagnetic survey to support the divestiture and redevelopment of one of these sites. Based on these results, soil removal activities were performed at one of the former terminals in order to obtain regulatory closure of the site. Roux successfully completed the remedial activities to the satisfaction of the regulator and received closure for the client of the open spill number. Regulatory closure of another of these former terminals was obtained based upon the results of ongoing groundwater monitoring and reporting.
- Project Engineer for design of a 2.6-mgd groundwater treatment system at the Fireman's Training Center for Nassau County Department of Public Works on Long Island. The work included design of air strippers, exhaust stacks, liquid-phase GAC treatment units, and all chemical feed and storage facilities, including unit sizing, selection of materials of construction, equipment layout, and coordination with other disciplines. The work also included development of the "mass balance" for the facility.
- Task leader in charge of overseeing a bioventing pilot study conducted by a subconsultant, to treat contaminated vadose zone soils at the Fireman’s Training Center site in Nassau County, New York. The work included development of a preliminary design report for the full-scale implementation of bioventing at the site based upon the results of the pilot study.
- Project Engineer for the design, specification, construction, and operation of an air sparging and soil vapor extraction pilot at

the Long Island terminal of a large petrochemical distributor. The pilot was designed to treat contaminated ground water and vadose zone soils resulting from a one-million-gallon gasoline spill at the site. The work included development of the field sampling program and sampling and evaluation of various parameters to determine the pilot's radius of influence and effectiveness. The work also included performing data analysis and preparation of the pilot study report, which recommended full scale implementation of air sparging at the site. The site-wide implementation of air sparging and expansion of the site's existing vapor extraction system at the same Long Island petrochemical terminal was also part of the work. Responsibilities included design, specification, and layout of all mechanical equipment, vapor extraction, and air sparging wells and new vapor extraction/air sparging piping.

- Task leader responsible for investigating alternatives for the treatment of gasoline contaminated off-gas from air stripping operations a Long Island petrochemical terminal. Based on this evaluation, biofiltration was selected for piloting. Responsibilities included design of a pilot unit; development of sampling and data collection procedures; construction oversight and "troubleshooting" for the unit; coordination of data collection activities; and compilation and analysis of the pilot data.
- Project Engineer for the design of a 0.50-mgd groundwater treatment facility at a Long Island petrochemical terminal. Responsibilities included the design, specification, and layout of mechanical equipment, including the air stripping tower, vapor phase granular activated carbon off-gas treatment, centrifugal blowers, ductwork, influent pump, and concrete wet well. Responsible for shop drawing review during the construction phase.
- Project Manager for an investigation at a gasoline service station with soil and groundwater contamination. Responsible for reviewing and evaluating the work of another consultant that performed the soil and groundwater sampling and conducted remedial activities at the site including investigation summary reports; remedial designs; remediation progress reports; correspondence with regulators; and plans for future work at the Site. The work also included mapping the groundwater flow patterns in the area of the service station and mapping the areal and vertical extent of the groundwater contamination. Responsible for project coordination and budget management and tracking.
- Project Manager for the field investigation, feasibility evaluation, and remedial design at Superfund Site in Spring Valley, New York for the New York State Department of Environmental Conservation. The work included development of a work plan and site operations plan. The field investigations included Geoprobe soil borings; groundwater monitoring well installation; groundwater sampling; aquifer pump testing; and vapor extraction pilot testing. Work also included conducting the field operations for the vapor extraction pilot and producing a summary report of the field investigation results. The report presented an evaluation of the cost and feasibility of several alternatives for remediation of the site. It recommended reducing the level of effort of the remediation presented in the Record of Decision, based on lower levels of contamination encountered during the investigation. Duties also included project coordination, budget management and tracking, and development of subcontract agreements.
- Project Engineer for upgrades to the Spring Creek Auxiliary Water Pollution Control Plant for the City of New York. The work included the evaluation, design, and specification of a two-stage odor control system, chemical storage and feed facilities and new effluent disinfection system.
- Project Engineer responsible for preparation of design documents for the replacement of the sodium hypochlorite pumps and piping at the Mamaroneck Wastewater Treatment Plant for Westchester County Department of Environmental Facilities in New York.
- Project Engineer for design of upgrades to the New Rochelle Wastewater Treatment Facility for Westchester County Department of Environmental Facilities in New York. Designed upgrades to the main influent pump station, including rehabilitation of the existing influent pumps and replacement of the magnetic drives with new variable frequency drives. Responsibilities also included design of a submersible automatic duplex sump pump system, new primary sludge pumps and piping and new primary and secondary settling tank equipment. The work also included assisting the County during the bidding and contractor selection phase and preparing addenda to the contract documents.
- Project Manager for the construction of upgrades to the New Rochelle Wastewater Treatment Facility. Responsibilities included overseeing the shop drawing logging and distribution process; reviewing mechanical equipment shop drawings; addressing contractor questions regarding the contract documents; and coordinating with the resident engineer in the field and the electrical and general contractors.
- Project Engineer for the performance evaluation of the Harriman Wastewater Treatment Plant for the Orange County Department of Environmental Facilities and Services. Responsibilities included documentation of the existing conditions at the plant and evaluation of the historical and current performance of the plant with respect to its potential for expansion. A summary report was prepared, which included evaluations of the existing plant processes with respect to

standard design criteria, typical design practices and receiving water considerations. This summary report served as the basis for the facilities plan prepared as the next phase of the project.

- Project Engineer for the facilities plan for the upgrade of the Harriman Wastewater Treatment Plant. Responsibilities included evaluation of alternatives for expanding the plant's treatment capacity. A report was prepared, which recommended the conversion of the existing oxidation ditches to sequencing batch reactors (SBR) in order to increase the plant's treatment capacity to 6.0 mgd within the limited space available on the site.
- Project Engineer for the Gates-Chili-Ogden Pump Station and Force main design for Monroe County, New York. The design consisted of a new 36 mgd wet pit/dry pit pump station, influent sewer, and force main. Responsibilities included evaluating influent pumping conditions, and design of the influent sewer, manual influent bar racks and a duplex automatic submersible sump pump system for the station.
- Project Manager for the Flow Augmentation Needs Study (FANS) for Suffolk County Department of Public Works, New York. Responsibilities included coordinating and implementing the annual wetland monitoring effort for collection of data to characterize the vegetation communities and surface water and groundwater conditions at four freshwater wetland sites in Suffolk County. Duties also included maintaining a database of all vegetation data collected; developing and refining equations to characterize the groundwater table and wetlands vegetation in all monitoring areas; evaluating potential impacts of sewering on sensitive wetlands; and evaluating the need for any mitigation of these sites as triggered by vegetation changes correlated to groundwater drawdown. Responsibilities also included coordinating the production of a draft and final annual monitoring report summarizing the findings of the program.

PRESENTATIONS

Sparging Targets Submerged Residual Saturation Contamination, written with D. Bennett and L. Buchanan. Presented at the 66th New York Water Environment Federation Association Annual Meeting, New York, New York, February 1994.

Suffolk County Wetlands – Flow Augmentation Needs Study, written with M. A. Taylor and R. Southard. In Proceedings of the Annual Meeting, Hydrology and Hydrogeology of Urban and Urbanizing Areas. American Institute of Hydrology, April 1996.

ATTACHMENT 2

NYSDEC PFAS Guidance

NEW YORK STATE OF OPPORTUNITY.

Department of Environmental Conservation

SAMPLING, ANALYSIS, AND ASSESSMENT OF PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS)

Under NYSDEC's Part 375 Remedial Programs

April 2023

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ERRATA SHEET for

SAMPLING, ANALYSIS, AND ASSESSMENT OF PER- AND POLYFLUOROALKYL SUBSTANCES (PFAS) Under NYSDEC's Part 375 Remedial Programs Issued January 17, 2020

Citation and Page Number	Current Text	Corrected Text	Date
Title of Appendix I, page 32	Appendix H	Appendix I	2/25/2020
Document Cover, page 1	Guidelines for Sampling and Analysis of PFAS	Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (PFAS) Under NYSDEC's Part 375 Remedial Programs	9/15/2020
Data Assessment and Application to Site Cleanup Page 3	Until such time as Ambient Water Quality Standards (AWQS) and Soil Cleanup Objectives (SCOs) for PFOA and PFOS are published	Until such time as Soil Cleanup Objectives (SCOs) for PFOA and PFOS are published	3/28/2023
Water Sample Results Page 3	PFOA and PFOS should be further assessed and considered as potential contaminants of concern in groundwater or surface water if PFOA or PFOS is detected in any water sample at or above 10 ng/L (ppt) and is determined to be attributable to the site, either by a comparison of upgradient and downgradient levels, or the presence of soil source areas, as defined below.	NYSDEC has adopted ambient water quality guidance values for PFOA and PFOS. Groundwater samples should be compared to the human health criteria of 6.7 ng/l (ppt) for PFOA and 2.7 ng/l (ppt) for PFOS. These guidance values also include criteria for surface water for PFOS applicable for aquatic life, which may be applicable at some sites. Drinking water sample results should be compared to the NYS maximum contaminant level (MCL) of 10 ng/l (ppt).Analysis to determine if PFOA and PFOS concentrations are attributable to the site should include a comparison between upgradient and downgradient levels, and the presence of soil source areas, as defined below.	3/28/2023
Soil Sample Results Page 3	Soil cleanup objectives for PFOA and PFOS have been proposed in an upcoming revision to 6 NYCRR Part 375-6. Until SCOs are in effect, the following are to be used as guidance values:	NYSDEC will delay adding soil cleanup objectives for PFOA and PFOS to 6 NYCRR Part 375-6 until the PFAS rural soil background study has been completed. Until SCOs are in effect, the following are to be used as guidance values:	3/28/2023
Protection of Groundwater Page 3	PFOA (ppb) 1.1 PFOS (ppb) 3.7	PFOA (ppb) 0.8 PFOS (ppb) 1.0	3/28/2023

Citation and Page Number	Current Text	Corrected Text	Date
Footnote 2 Page 3	The movement of PFAS in the environment is being aggressively researched at this time; that research will eventually result in more accurate models for the behaviors of these chemicals. In the meantime, DEC has calculated the guidance value for the protection of groundwater using the same procedure used for all other chemicals, as described in Section 7.7 of the Technical Support Document (http://www.dec.ny.gov/docs/remediation_hudson_pdf/techsuppdoc.pdf).	The Protection of Groundwater values are based on the above referenced ambient groundwater guidance values. Details on that calculation are available in the following document, prepared for the February 2022 proposed changes to Part 375 (https://www.dec.ny.gov/docs/remediation_hudson_pdf/part375techsupport.pdf). The movement of PFAS in the environment is being aggressively researched at this time; that research will eventually result in more accurate models for the behaviors of these chemicals. In the meantime, DEC has calculated the guidance value for the protection of groundwater using the same procedure used for all other chemicals, as described in Section 7.7 of the Technical Support Document (http://www.dec.ny.gov/docs/remediation_hudson_pdf/techsuppdoc.pdf).	3/28/2023
Testing for Imported Soil Page 4	If the concentrations of PFOA and PFOS in leachate are at or above 10 ppt (the Maximum Contaminant Levels established for drinking water by the New York State Department of Health), then the soil is not acceptable.	If the concentrations of PFOA and PFOS in leachate are at or above the ambient water quality guidance values for groundwater, then the soil is not acceptable.	3/28/2023
Routine Analysis, page 9	"However, laboratories analyzing environmental samples…PFOA and PFOS in drinking water by EPA Method 537, 537.1 or ISO 25101."	"However, laboratories analyzing environmental samples…PFOA and PFOS in drinking water by EPA Method 537, 537.1, ISO 25101, or Method 533."	9/15/2020
Additional Analysis, page 9, new paragraph regarding soil parameters	None	"In cases where site-specific cleanup objectives for PFOA and PFOS are to be assessed, soil parameters, such as Total Organic Carbon (EPA Method 9060), soil pH (EPA Method 9045), clay content (percent), and cation exchange capacity (EPA Method 9081), should be included in the analysis to help evaluate factors affecting the leachability of PFAS in site soils."	9/15/2020

Citation and Page Number	Current Text	Corrected Text	Date
Data Assessment and Application to Site Cleanup Page 10	Until such time as Ambient Water Quality Standards (AWQS) and Soil Cleanup Objectives (SCOs) for PFAS are published, the extent of contaminated media potentially subject to remediation should be determined on a case-by-case basis using the procedures discussed below and the criteria in DER-10. Target levels for cleanup of PFAS in other media, including biota and sediment, have not yet been established by the DEC.	Until such time as Ambient Water Quality Standards (AWQS) and Soil Cleanup Objectives (SCOs) for PFOA and PFOS are published, the extent of contaminated media potentially subject to remediation should be determined on a case-by-case basis using the procedures discussed below and the criteria in DER-10. Preliminary target levels for cleanup of PFOA and PFOS in other media, including biota and sediment, have not yet been established by the DEC.	9/15/2020
Water Sample Results Page 10	PFAS should be further assessed and considered as a potential contaminant of concern in groundwater or surface water (…) If PFAS are identified as a contaminant of concern for a site, they should be assessed as part of the remedy selection process in accordance with Part 375 and DER-10.	PFOA and PFOS should be further assessed and considered as potential contaminants of concern in groundwater or surface water (…) If PFOA and/or PFOS are identified as contaminants of concern for a site, they should be assessed as part of the remedy selection process in accordance with Part 375 and DER-10.	9/15/2020

Citation and Page Number	Current Text	Corrected Text	Date
Soil Sample Results, page 10	"The extent of soil contamination for purposes of delineation and remedy selection should be determined by having certain soil samples tested by Synthetic Precipitation Leaching Procedure (SPLP) and the leachate analyzed for PFAS. Soil exhibiting SPLP results above 70 ppt for either PFOA or PFOS (individually or combined) are to be evaluated during the cleanup phase."	"Soil cleanup objectives for PFOA and PFOS will be proposed in an upcoming revision to 6 NYCRR Part 375-6. Until SCOs are in effect, the following are to be used as guidance values. " [Interim SCO Table] "PFOA and PFOS results for soil are to be compared against the guidance values listed above. These guidance values are to be used in determining whether PFOA and PFOS are contaminants of concern for the site and for determining remedial action objectives and cleanup requirements. Site-specific remedial objectives for protection of groundwater can also be presented for evaluation by DEC. Development of site-specific remedial objectives for protection of groundwater will require analysis of additional soil parameters relating to leachability. These additional analyses can include any or all the parameters listed above (soil pH, cation exchange capacity, etc.) and/or use of SPLP. As the understanding of PFAS transport improves, DEC welcomes proposals for site-specific remedial objectives for protection of groundwater. DEC will expect that those may be dependent on additional factors including soil pH, aqueous pH, % organic carbon, % Sand/Silt/Clay, soil cations: K, Ca, Mg, Na, Fe, Al, cation exchange capacity, and anion exchange capacity. Site-specific remedial objectives should also consider the dilution attenuation factor (DAF). The NJDEP publication on DAF can be used as a reference: https://www.nj.gov/dep/srp/guidance/rs/daf.pdf. "	9/15/2020

Citation and Page Number	Current Text	Corrected Text	Date
Testing for Imported Soil Page 11	Soil imported to a site for use in a soil cap, soil cover, or as backfill is to be tested for PFAS in general conformance with DER-10, Section 5.4(e) for the PFAS Analyte List (Appendix F) using the analytical procedures discussed below and the criteria in DER-10 associated with SVOCs. If PFOA or PFOS is detected in any sample at or above 1 µg/kg, then soil should be tested by SPLP and the leachate analyzed for PFAS. If the SPLP results exceed 10 ppt for either PFOA or PFOS (individually) then the source of backfill should be rejected, unless a site-specific exemption is provided by DER. SPLP leachate criteria is based on the Maximum Contaminant Levels proposed for drinking water by New York State's Department of Health, this value may be updated based on future Federal or State promulgated regulatory standards. Remedial parties have the option of analyzing samples concurrently for both PFAS in soil and in the SPLP leachate to minimize project delays. Category B deliverables should be submitted for backfill samples, though a DUSR is not required.	Testing for PFAS should be included any time a full TAL/TCL analyte list is required. Results for PFOA and PFOS should be compared to the applicable guidance values. If PFOA or PFOS is detected in any sample at or above the guidance values then the source of backfill should be rejected, unless a site-specific exemption is provided by DER based on SPLP testing, for example. If the concentrations of PFOA and PFOS in leachate are at or above 10 ppt (the Maximum Contaminant Levels established for drinking water by the New York State Department of Health), then the soil is not acceptable. PFOA, PFOS and 1,4-dioxane are all considered semi-volatile compounds, so composite samples are appropriate for these compounds when sampling in accordance with DER-10, Table 5.4(e)10. Category B deliverables should be submitted for backfill samples, though a DUSR is not required.	9/15/2020

Citation and Page Number	Current Text	Corrected Text	Date
Footnotes	None	[1] TOP Assay analysis of highly contaminated samples, such as those from an AFFF (aqueous film-forming foam) site, can result in incomplete oxidation of the samples and an underestimation of the total perfluoroalkyl substances. [2] The movement of PFAS in the environment is being aggressively researched at this time; that research will eventually result in more accurate models for the behaviors of these chemicals. In the meantime, DEC has calculated the soil cleanup objective for the protection of groundwater using the same procedure used for all other chemicals, as described in Section 7.7 of the Technical Support Document (http://www.dec.ny.gov/docs/remediation_hudson_pdf/techsuppdoc.pdf).	9/15/2020
Additional Analysis, page 9	In cases… soil parameters, such as Total Organic Carbon (EPA Method 9060), soil…	In cases… soil parameters, such as Total Organic Carbon (Lloyd Kahn), soil…	1/8/2021
Appendix A, General Guidelines, fourth bullet	List the ELAP-approved lab(s) to be used for analysis of samples	List the ELAP- certified lab(s) to be used for analysis of samples	1/8/2021
Appendix E, Laboratory Analysis and Containers	Drinking water samples collected using this protocol are intended to be analyzed for PFAS by ISO Method 25101.	Drinking water samples collected using this protocol are intended to be analyzed for PFAS by EPA Method 537, 537.1, 533, or ISO Method 25101	1/8/2021
Water Sample Results Page 9	"In addition, further assessment of water may be warranted if either of the following screening levels are met: a. any other individual PFAS (not PFOA or PFOS) is detected in water at or above 100 ng/L; or b. total concentration of PFAS (including PFOA and PFOS) is detected in water at or above 500 ng/L"	Deleted	6/15/2021

Citation and Page Number	Current Text	Corrected Text	Date
Routine Analysis, Page XX	Currently, New York State Department of Health's Environmental Laboratory Approval Program (ELAP)… criteria set forth in the DER's laboratory guidelines for PFAS in non-potable water and solids (Appendix H - Laboratory Guidelines for Analysis of PFAS in Non-Potable Water and Solids).	Deleted	5/31/2022
Analysis and Reporting, Page XX	As of October 2020, the United States Environmental Protection Agency (EPA) does not have a validated method for analysis of PFAS for media commonly analyzed under DER remedial programs (non-potable waters, solids). DER has developed the following guidelines to ensure consistency in analysis and reporting of PFAS.	Deleted	5/31/2022
Routine Analysis, Page XX	LC-MS/MS analysis for PFAS using methodologies based on EPA Method 537.1 is the procedure to use for environmental samples. Isotope dilution techniques should be utilized for the analysis of PFAS in all media.	EPA Method 1633 is the procedure to use for environmental samples.	
Soil Sample Results, Page XX	Soil cleanup objectives for PFOA and PFOS will be proposed in an upcoming revision to 6 NYCRR Part 375-6	Soil cleanup objectives for PFOA and PFOS have been proposed in an upcoming revision to 6 NYCRR Part 375-6	
Appendix A	"Include in the text… LC-MS/MS for PFAS using methodologies based on EPA Method 537.1"	"Include in the text ….EPA Method 1633"	
Appendix A	"Laboratory should have ELAP certification for PFOA and PFOS in drinking water by EPA Method 537, 537.1, EPA Method 533, or ISO 25101"	Deleted	
Appendix B	"Samples collected using this protocol are intended to be analyzed for PFAS using methodologies based on EPA Method 537.1"	"Samples collected using this protocol are intended to be analyzed for PFAS using EPA Method 1633"	

Citation and Page Number	Current Text	Corrected Text	Date
Appendix C	"Samples collected using this protocol are intended to be analyzed for PFAS using methodologies based on EPA Method 537.1"	"Samples collected using this protocol are intended to be analyzed for PFAS using EPA Method 1633"	
Appendix D	"Samples collected using this protocol are intended to be analyzed for PFAS using methodologies based on EPA Method 537.1"	"Samples collected using this protocol are intended to be analyzed for PFAS using EPA Method 1633"	
Appendix G		Updated to include all forty PFAS analytes in EPA Method 533	
Appendix H		Deleted	
Appendix I	Appendix I	Appendix H	
Appendix H	"These guidelines are intended to be used for the validation of PFAS analytical results for projects within the Division of Environmental Remediation (DER) as well as aid in the preparation of a data usability summary report."	"These guidelines are intended to be used for the validation of PFAS using EPA Method 1633 for projects within the Division of Environmental Remediation (DER)."	
Appendix H	"The holding time is 14 days…"	"The holding time is 28 days…"	
Appendix H, Initial Calibration	"The initial calibration should contain a minimum of five standards for linear fit…"	"The initial calibration should contain a minimum of six standards for linear fit…"	
Appendix H, Initial Calibration	Linear fit calibration curves should have an R^2 value greater than 0.990.	Deleted	
Appendix H, Initial Calibration Verification	Initial Calibration Verification Section	Deleted	
Appendix H	secondary Ion Monitoring Section	Deleted	
Appendix H	Branched and Linear Isomers Section	Deleted	

Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances (PFAS) Under NYSDEC's Part 375 Remedial Programs

Objective

New York State Department of Environmental Conservation's Division of Environmental Remediation (DER) performs or oversees sampling of environmental media and subsequent analysis of PFAS as part of remedial programs implemented under 6 NYCRR Part 375. To ensure consistency in sampling, analysis, reporting, and assessment of PFAS, DER has developed this document which summarizes currently accepted procedures and updates previous DER technical guidance pertaining to PFAS.

Applicability

All work plans submitted to DEC pursuant to one of the remedial programs under Part 375 shall include PFAS sampling and analysis procedures that conform to the guidelines provided herein.

As part of a site investigation or remedial action compliance program, whenever samples of potentially affected media are collected and analyzed for the standard Target Analyte List/Target Compound List (TAL/TCL), PFAS analysis should also be performed. Potentially affected media can include soil, groundwater, surface water, and sediment. Based upon the potential for biota to be affected, biota sampling and analysis for PFAS may also be warranted as determined pursuant to a Fish and Wildlife Impact Analysis. Soil vapor sampling for PFAS is not required.

Field Sampling Procedures

DER-10 specifies technical guidance applicable to DER's remedial programs. Given the prevalence and use of PFAS, DER has developed "best management practices" specific to sampling for PFAS. As specified in DER-10 Chapter 2, quality assurance procedures are to be submitted with investigation work plans. Typically, these procedures are incorporated into a work plan, or submitted as a stand-alone document (e.g., a Quality Assurance Project Plan). Quality assurance guidelines for PFAS are listed in Appendix A - Quality Assurance Project Plan (QAPP) Guidelines for PFAS.

Field sampling for PFAS performed under DER remedial programs should follow the appropriate procedures outlined for soils, sediments, or other solids (Appendix B), non-potable groundwater (Appendix C), surface water (Appendix D), public or private water supply wells (Appendix E), and fish tissue (Appendix F).

QA/QC samples (e.g. duplicates, MS/MSD) should be collected as specified in DER-10, Section 2.3(c). For sampling equipment coming in contact with aqueous samples only, rinsate or equipment blanks should be collected. Equipment blanks should be collected at a minimum frequency of one per day per site or one per twenty samples, whichever is more frequent.

Analysis and Reporting

The investigation work plan should describe analysis and reporting procedures, including laboratory analytical procedures for the methods discussed below. As specified in DER-10 Section 2.2, laboratories should provide a full Category B deliverable. In addition, a Data Usability Summary Report (DUSR) should be prepared by an independent, third-party data validator. Electronic data submissions should meet the requirements provided at: https://www.dec.ny.gov/chemical/62440.html.

DER has developed a *PFAS Analyte List* (Appendix G) for remedial programs to understand the nature of contamination at sites. It is expected that reported results for PFAS will include, at a minimum, all the compounds listed. If lab and/or matrix specific issues are encountered for any analytes, the DER project manager, in consultation with the DER chemist, will make case-by-case decisions as to whether certain analytes may be temporarily or permanently discontinued from analysis at each site. As with other contaminants that are analyzed for at a site, the *PFAS Analyte List* may be refined for future sampling events based on investigative findings.

Routine Analysis

EPA Method 1633 is the procedure to use for environmental samples. Reporting limits for PFOA and PFOS in aqueous samples should not exceed 2 ng/L. Reporting limits for PFOA and PFOS in solid samples should not exceed 0.5 µg/kg. Reporting limits for all other PFAS in aqueous and solid media should be as close to these limits as possible. If laboratories indicate that they are not able to achieve these reporting limits for the entire *PFAS Analyte List*, site-specific decisions regarding acceptance of elevated reporting limits for specific PFAS can be made by the DER project manager in consultation with the DER chemist. Data review guidelines were developed by DER to ensure data comparability and usability (Appendix H - Data Review Guidelines for Analysis of PFAS in Non-Potable Water and Solids).

Additional Analysis

Additional laboratory methods for analysis of PFAS may be warranted at a site, such as the Synthetic Precipitation Leaching Procedure (SPLP) and Total Oxidizable Precursor Assay (TOP Assay).

In cases where site-specific cleanup objectives for PFOA and PFOS are to be assessed, soil parameters, such as Total Organic Carbon (Lloyd Kahn), soil pH (EPA Method 9045), clay content (percent), and cation exchange capacity (EPA Method 9081), should be included in the analysis to help evaluate factors affecting the leachability of PFAS in site soils.

SPLP is a technique used to determine the mobility of chemicals in liquids, soils and wastes, and may be useful in determining the need for addressing PFAS-containing material as part of the remedy. SPLP by EPA Method 1312 should be used unless otherwise specified by the DER project manager in consultation with the DER chemist.

Impacted materials can be made up of PFAS that are not analyzable by routine analytical methodology. A TOP Assay can be utilized to conceptualize the amount and type of oxidizable PFAS which could be liberated in the environment, which approximates the maximum concentration of perfluoroalkyl substances that could be generated if all polyfluoroalkyl substances were oxidized. For example, some polyfluoroalkyl substances may degrade or transform to form perfluoroalkyl substances (such as PFOA or PFOS), resulting in an increase in perfluoroalkyl substance concentrations as contaminated groundwater moves away from a source. The TOP Assay converts, through oxidation, polyfluoroalkyl substances (precursors) into perfluoroalkyl substances that can be detected by routine analytical methodology.[1]

[1] TOP Assay analysis of highly contaminated samples, such as those from an AFFF (aqueous film-forming foam) site, can result in incomplete oxidation of the samples and an underestimation of the total perfluoroalkyl substances.

Commercial laboratories have adopted methods which allow for the quantification of targeted PFAS in air and biota. The EPA's Office of Research and Development (ORD) is currently developing methods which allow for air emissions characterization of PFAS, including both targeted and non-targeted analysis of PFAS. Consult with the DER project manager and the DER chemist for assistance on analyzing biota/tissue and air samples.

Data Assessment and Application to Site Cleanup

Until such time as Soil Cleanup Objectives (SCOs) for PFOA and PFOS are published, the extent of contaminated media potentially subject to remediation should be determined on a case-by-case basis using the procedures discussed below and the criteria in DER-10. Preliminary target levels for cleanup of PFOA and PFOS in other media, including biota and sediment, have not yet been established by the DEC.

Water Sample Results

NYSDEC has adopted ambient water quality guidance values for PFOA and PFOS. Groundwater samples should be compared to the human health criteria of 6.7 ng/l (ppt) for PFOA and 2.7 ng/l (ppt) for PFOS. These human health criteria should also be applied to surface water that is used as a water supply. This guidance also includes criteria for surface water for PFOS applicable for aquatic life, which may be applicable at some sites. Drinking water sample results should be compared to the NYS maximum contaminant level (MCL) of 10 ng/l (ppt). Analysis to determine if PFOA and PFOS concentrations are attributable to the site should include a comparison between upgradient and downgradient levels, and the presence of soil source areas, as defined below.

If PFOA and/or PFOS are identified as contaminants of concern for a site, they should be assessed as part of the remedy selection process in accordance with Part 375 and DER-10.

Soil Sample Results

NYSDEC will delay adding soil cleanup objectives for PFOA and PFOS to 6 NYCRR Part 375-6 until the PFAS rural soil background study has been completed. Until SCOs are in effect, the following are to be used as guidance values:

Guidance Values for Anticipated Site Use	PFOA (ppb)	PFOS (ppb)
Unrestricted	0.66	0.88
Residential	6.6	8.8
Restricted Residential	33	44
Commercial	500	440
Industrial	600	440
Protection of Groundwater[2]	0.8	1.0

PFOA and PFOS results for soil are to be compared against the guidance values listed above. These guidance values are to be used in determining whether PFOA and PFOS are contaminants of concern for the site and for determining remedial action objectives and cleanup requirements. Site-specific remedial objectives for protection of groundwater can also be presented for evaluation by DEC. Development of site-specific remedial objectives for protection of groundwater will require analysis of additional soil parameters relating to leachability. These

[2] The Protection of Groundwater values are based on the above referenced ambient groundwater guidance values. Details on that calculation are available in the following document, prepared for the February 2022 proposed changes to Part 375 (https://www.dec.ny.gov/docs/remediation_hudson_pdf/part375techsupport.pdf). The movement of PFAS in the environment is being aggressively researched at this time; that research will eventually result in more accurate models for the behaviors of these chemicals. In the meantime, DEC has calculated the guidance value for the protection of groundwater using the same procedure used for all other chemicals, as described in Section 7.7 of the Technical Support Document (http://www.dec.ny.gov/docs/remediation_hudson_pdf/techsuppdoc.pdf).

additional analyses can include any or all the parameters listed above (soil pH, cation exchange capacity, etc.) and/or use of SPLP.

As the understanding of PFAS transport improves, DEC welcomes proposals for site-specific remedial objectives for protection of groundwater. DEC will expect that those may be dependent on additional factors including soil pH, aqueous pH, % organic carbon, % Sand/Silt/Clay, soil cations: K, Ca, Mg, Na, Fe, Al, cation exchange capacity, and anion exchange capacity. Site-specific remedial objectives should also consider the dilution attenuation factor (DAF). The NJDEP publication on DAF can be used as a reference: https://www.nj.gov/dep/srp/guidance/rs/daf.pdf.

Testing for Imported Soil

Testing for PFAS should be included any time a full TAL/TCL analyte list is required. Results for PFOA and PFOS should be compared to the applicable guidance values. If PFOA or PFOS is detected in any sample at or above the guidance values then the source of backfill should be rejected, unless a site-specific exemption is provided by DER based on SPLP testing, for example. If the concentrations of PFOA and PFOS in leachate are at or above the ambient water quality guidance values for groundwater, then the soil is not acceptable.

PFOA, PFOS and 1,4-dioxane are all considered semi-volatile compounds, so composite samples are appropriate for these compounds when sampling in accordance with DER-10, Table 5.4(e)10. Category B deliverables should be submitted for backfill samples, though a DUSR is not required.

Appendix A - Quality Assurance Project Plan (QAPP) Guidelines for PFAS

The following guidelines (general and PFAS-specific) can be used to assist with the development of a QAPP for projects within DER involving sampling and analysis of PFAS.

General Guidelines in Accordance with DER-10

- Document/work plan section title – Quality Assurance Project Plan
- Summarize project scope, goals, and objectives
- Provide project organization including names and resumes of the project manager, Quality Assurance Officer (QAO), field staff, and Data Validator
    - The QAO should not have another position on the project, such as project or task manager, that involves project productivity or profitability as a job performance criterion
- List the ELAP certified lab(s) to be used for analysis of samples
- Include a site map showing sample locations
- Provide detailed sampling procedures for each matrix
- Include Data Quality Usability Objectives
- List equipment decontamination procedures
- Include an "Analytical Methods/Quality Assurance Summary Table" specifying:
    - Matrix type
    - Number or frequency of samples to be collected per matrix
    - Number of field and trip blanks per matrix
    - Analytical parameters to be measured per matrix
    - Analytical methods to be used per matrix with minimum reporting limits
    - Number and type of matrix spike and matrix spike duplicate samples to be collected
    - Number and type of duplicate samples to be collected
    - Sample preservation to be used per analytical method and sample matrix
    - Sample container volume and type to be used per analytical method and sample matrix
    - Sample holding time to be used per analytical method and sample matrix
- Specify Category B laboratory data deliverables and preparation of a DUSR

Specific Guidelines for PFAS

- Include in the text that sampling for PFAS will take place
- Include in the text that PFAS will be analyzed by EPA Method 1633
- Include the list of PFAS compounds to be analyzed (*PFAS Analyte List*)
- Include the laboratory SOP for PFAS analysis
- List the minimum method-achievable Reporting Limits for PFAS
    - Reporting Limits should be less than or equal to:
        - Aqueous – 2 ng/L (ppt)
        - Solids – 0.5 µg/kg (ppb)
- Include the laboratory Method Detection Limits for the PFAS compounds to be analyzed
-
- Include detailed sampling procedures
    - Precautions to be taken
    - Pump and equipment types
    - Decontamination procedures
    - Approved materials only to be used
- Specify that regular ice only will be used for sample shipment
- Specify that equipment blanks should be collected at a minimum frequency of 1 per day per site for each matrix

Appendix B - Sampling Protocols for PFAS in Soils, Sediments and Solids

General

The objective of this protocol is to give general guidelines for the collection of soil, sediment and other solid samples for PFAS analysis. The sampling procedure used should be consistent with Sampling Guidelines and Protocols – Technological Background and Quality Control/Quality Assurance for NYS DEC Spill Response Program – March 1991 (http://www.dec.ny.gov/docs/remediation_hudson_pdf/sgpsect5.pdf), with the following limitations.

Laboratory Analysis and Containers

Samples collected using this protocol are intended to be analyzed for PFAS using EPA Method 1633.

The preferred material for containers is high density polyethylene (HDPE). Pre-cleaned sample containers, coolers, sample labels, and a chain of custody form will be provided by the laboratory.

Equipment

Acceptable materials for sampling include stainless steel, HDPE, PVC, silicone, acetate, and polypropylene. Additional materials may be acceptable if pre-approved by New York State Department of Environmental Conservation's Division of Environmental Remediation.

No sampling equipment components or sample containers should come in to contact with aluminum foil, low density polyethylene, glass, or polytetrafluoroethylene (PTFE, Teflon™) materials including sample bottle cap liners with a PTFE layer.

A list of acceptable equipment is provided below, but other equipment may be considered appropriate based on sampling conditions.

- stainless steel spoon
- stainless steel bowl
- steel hand auger or shovel without any coatings

Equipment Decontamination

Standard two step decontamination using detergent (Alconox is acceptable) and clean, PFAS-free water will be performed for sampling equipment. All sources of water used for equipment decontamination should be verified in advance to be PFAS-free through laboratory analysis or certification.

Sampling Techniques

Sampling is often conducted in areas where a vegetative turf has been established. In these cases, a pre-cleaned trowel or shovel should be used to carefully remove the turf so that it may be replaced at the conclusion of sampling. Surface soil samples (e.g. 0 to 6 inches below surface) should then be collected using a pre-cleaned, stainless steel spoon. Shallow subsurface soil samples (e.g. 6 to ~36 inches below surface) may be collected by digging a hole using a pre-cleaned hand auger or shovel. When the desired subsurface depth is reached, a pre-cleaned hand auger or spoon shall be used to obtain the sample.

When the sample is obtained, it should be deposited into a stainless steel bowl for mixing prior to filling the sample containers. The soil should be placed directly into the bowl and mixed thoroughly by rolling the material into the middle until the material is homogenized. At this point the material within the bowl can be placed into the laboratory provided container.

Sample Identification and Logging

A label shall be attached to each sample container with a unique identification. Each sample shall be included on the chain of custody (COC).

Quality Assurance/Quality Control

- Immediately place samples in a cooler maintained at 4 ± 2º Celsius using ice
- Collect one field duplicate for every sample batch, minimum 1 duplicate per 20 samples. The duplicate shall consist of an additional sample at a given location
- Collect one matrix spike / matrix spike duplicate (MS/MSD) for every sample batch, minimum 1 MS/MSD per 20 samples. The MS/MSD shall consist of an additional two samples at a given location and identified on the COC
- Request appropriate data deliverable (Category B) and an electronic data deliverable

Documentation

A soil log or sample log shall document the location of the sample/borehole, depth of the sample, sampling equipment, duplicate sample, visual description of the material, and any other observations or notes determined to be appropriate. Additionally, care should be performed to limit contact with PFAS containing materials (e.g. waterproof field books, food packaging) during the sampling process.

Personal Protection Equipment (PPE)

For most sampling Level D PPE is anticipated to be appropriate. The sampler should wear nitrile gloves while conducting field work and handling sample containers.

Field staff shall consider the clothing to be worn during sampling activities. Clothing that contains PTFE material (including GORE-TEX®) or that have been waterproofed with PFAS materials should be avoided. All clothing worn by sampling personnel should have been laundered multiple times.

Appropriate rain gear (PVC, polyurethane, or rubber rain gear are acceptable), bug spray, and sunscreen should be used that does not contain PFAS. Well washed cotton coveralls may be used as an alternative to bug spray and/or sunscreen.

PPE that contains PFAS is acceptable when site conditions warrant additional protection for the samplers and no other materials can be used to be protective. Documentation of such use should be provided in the field notes.

Appendix C - Sampling Protocols for PFAS in Monitoring Wells

General

The objective of this protocol is to give general guidelines for the collection of groundwater samples for PFAS analysis. The sampling procedure used should be consistent with Sampling Guidelines and Protocols – Technological Background and Quality Control/Quality Assurance for NYS DEC Spill Response Program – March 1991 (http://www.dec.ny.gov/docs/remediation_hudson_pdf/sgpsect5.pdf), with the following limitations.

Laboratory Analysis and Container

Samples collected using this protocol are intended to be analyzed for PFAS using EPA Method 1633.

The preferred material for containers is high density polyethylene (HDPE). Pre-cleaned sample containers, coolers, sample labels, and a chain of custody form will be provided by the laboratory.

Equipment

Acceptable materials for sampling include: stainless steel, HDPE, PVC, silicone, acetate, and polypropylene. Additional materials may be acceptable if pre-approved by New York State Department of Environmental Conservation's Division of Environmental Remediation.

No sampling equipment components or sample containers should come in contact with aluminum foil, low density polyethylene, glass, or polytetrafluoroethylene (PTFE, Teflon™) materials including plumbers tape and sample bottle cap liners with a PTFE layer.

A list of acceptable equipment is provided below, but other equipment may be considered appropriate based on sampling conditions.

- stainless steel inertia pump with HDPE tubing
- peristaltic pump equipped with HDPE tubing and silicone tubing
- stainless steel bailer with stainless steel ball
- bladder pump (identified as PFAS-free) with HDPE tubing

Equipment Decontamination

Standard two step decontamination using detergent (Alconox is acceptable) and clean, PFAS-free water will be performed for sampling equipment. All sources of water used for equipment decontamination should be verified in advance to be PFAS-free through laboratory analysis or certification.

Sampling Techniques

Monitoring wells should be purged in accordance with the sampling procedure (standard/volume purge or low flow purge) identified in the site work plan, which will determine the appropriate time to collect the sample. If sampling using standard purge techniques, additional purging may be needed to reduce turbidity levels, so samples contain a limited amount of sediment within the sample containers. Sample containers that contain sediment may cause issues at the laboratory, which may result in elevated reporting limits and other issues during the sample preparation that can compromise data usability. Sampling personnel should don new nitrile gloves prior to sample collection due to the potential to contact PFAS containing items (not related to the sampling equipment) during the purging activities.

Sample Identification and Logging

A label shall be attached to each sample container with a unique identification. Each sample shall be included on the chain of custody (COC).

Quality Assurance/Quality Control

- Immediately place samples in a cooler maintained at 4 ± 2º Celsius using ice
- Collect one field duplicate for every sample batch, minimum 1 duplicate per 20 samples. The duplicate shall consist of an additional sample at a given location
- Collect one matrix spike / matrix spike duplicate (MS/MSD) for every sample batch, minimum 1 MS/MSD per 20 samples. The MS/MSD shall consist of an additional two samples at a given location and identified on the COC
- Collect one equipment blank per day per site and minimum 1 equipment blank per 20 samples. The equipment blank shall test the new and decontaminated sampling equipment utilized to obtain a sample for residual PFAS contamination. This sample is obtained by using laboratory provided PFAS-free water and passing the water over or through the sampling device and into laboratory provided sample containers
- Additional equipment blank samples may be collected to assess other equipment that is utilized at the monitoring well
- Request appropriate data deliverable (Category B) and an electronic data deliverable

Documentation

A purge log shall document the location of the sample, sampling equipment, groundwater parameters, duplicate sample, visual description of the material, and any other observations or notes determined to be appropriate. Additionally, care should be performed to limit contact with PFAS containing materials (e.g. waterproof field books, food packaging) during the sampling process.

Personal Protection Equipment (PPE)

For most sampling Level D PPE is anticipated to be appropriate. The sampler should wear nitrile gloves while conducting field work and handling sample containers.

Field staff shall consider the clothing to be worn during sampling activities. Clothing that contains PTFE material (including GORE-TEX®) or that have been waterproofed with PFAS materials should be avoided. All clothing worn by sampling personnel should have been laundered multiple times.

Appropriate rain gear (PVC, polyurethane, or rubber rain gear are acceptable), bug spray, and sunscreen should be used that does not contain PFAS. Well washed cotton coveralls may be used as an alternative to bug spray and/or sunscreen.

PPE that contains PFAS is acceptable when site conditions warrant additional protection for the samplers and no other materials can be used to be protective. Documentation of such use should be provided in the field notes.

Appendix D - Sampling Protocols for PFAS in Surface Water

General

The objective of this protocol is to give general guidelines for the collection of surface water samples for PFAS analysis. The sampling procedure used should be consistent with Sampling Guidelines and Protocols – Technological Background and Quality Control/Quality Assurance for NYS DEC Spill Response Program – March 1991 (http://www.dec.ny.gov/docs/remediation_hudson_pdf/sgpsect5.pdf), with the following limitations.

Laboratory Analysis and Container

Samples collected using this protocol are intended to be analyzed for PFAS using EPA Method 1633.

The preferred material for containers is high density polyethylene (HDPE). Pre-cleaned sample containers, coolers, sample labels, and a chain of custody form will be provided by the laboratory.

Equipment

Acceptable materials for sampling include: stainless steel, HDPE, PVC, silicone, acetate, and polypropylene. Additional materials may be acceptable if pre-approved by New York State Department of Environmental Conservation's Division of Environmental Remediation.

No sampling equipment components or sample containers should come in contact with aluminum foil, low density polyethylene, glass, or polytetrafluoroethylene (PTFE, Teflon™) materials including sample bottle cap liners with a PTFE layer.

A list of acceptable equipment is provided below, but other equipment may be considered appropriate based on sampling conditions.

- stainless steel cup

Equipment Decontamination

Standard two step decontamination using detergent (Alconox is acceptable) and clean, PFAS-free water will be performed for sampling equipment. All sources of water used for equipment decontamination should be verified in advance to be PFAS-free through laboratory analysis or certification.

Sampling Techniques

Where conditions permit, (e.g. creek or pond) sampling devices (e.g. stainless steel cup) should be rinsed with site medium to be sampled prior to collection of the sample. At this point the sample can be collected and poured into the sample container.

If site conditions permit, samples can be collected directly into the laboratory container.

Sample Identification and Logging

A label shall be attached to each sample container with a unique identification. Each sample shall be included on the chain of custody (COC).

Quality Assurance/Quality Control

- Immediately place samples in a cooler maintained at 4 ± 2º Celsius using ice
- Collect one field duplicate for every sample batch, minimum 1 duplicate per 20 samples. The duplicate shall consist of an additional sample at a given location
- Collect one matrix spike / matrix spike duplicate (MS/MSD) for every sample batch, minimum 1 MS/MSD per 20 samples. The MS/MSD shall consist of an additional two samples at a given location and identified on the COC
- Collect one equipment blank per day per site and minimum 1 equipment blank per 20 samples. The equipment blank shall test the new and decontaminated sampling equipment utilized to obtain a sample for residual PFAS contamination. This sample is obtained by using laboratory provided PFAS-free water and passing the water over or through the sampling device and into laboratory provided sample containers
- Request appropriate data deliverable (Category B) and an electronic data deliverable

Documentation

A sample log shall document the location of the sample, sampling equipment, duplicate sample, visual description of the material, and any other observations or notes determined to be appropriate. Additionally, care should be performed to limit contact with PFAS containing materials (e.g. waterproof field books, food packaging) during the sampling process.

Personal Protection Equipment (PPE)

For most sampling Level D PPE is anticipated to be appropriate. The sampler should wear nitrile gloves while conducting field work and handling sample containers.

Field staff shall consider the clothing to be worn during sampling activities. Clothing that contains PTFE material (including GORE-TEX®) or that have been waterproofed with PFAS materials should be avoided. All clothing worn by sampling personnel should have been laundered multiple times.

Appropriate rain gear (PVC, polyurethane, or rubber rain gear are acceptable), bug spray, and sunscreen should be used that does not contain PFAS. Well washed cotton coveralls may be used as an alternative to bug spray and/or sunscreen.

PPE that contains PFAS is acceptable when site conditions warrant additional protection for the samplers and no other materials can be used to be protective. Documentation of such use should be provided in the field notes.

Appendix E - Sampling Protocols for PFAS in Private Water Supply Wells

General

The objective of this protocol is to give general guidelines for the collection of water samples from private water supply wells (with a functioning pump) for PFAS analysis. The sampling procedure used should be consistent with Sampling Guidelines and Protocols – Technological Background and Quality Control/Quality Assurance for NYS DEC Spill Response Program – March 1991 (http://www.dec.ny.gov/docs/remediation_hudson_pdf/sgpsect5.pdf), with the following limitations.

Laboratory Analysis and Container

Drinking water samples collected using this protocol are intended to be analyzed for PFAS by EPA Method 537, 537.1, 533, or ISO Method 25101. The preferred material for containers is high density polyethylene (HDPE). Pre-cleaned sample containers, coolers, sample labels, and a chain of custody form will be provided by the laboratory.

Equipment

Acceptable materials for sampling include stainless steel, HDPE, PVC, silicone, acetate, and polypropylene. Additional materials may be acceptable if pre-approved by New York State Department of Environmental Conservation's Division of Environmental Remediation.

No sampling equipment components or sample containers should come in contact with aluminum foil, low density polyethylene, glass, or polytetrafluoroethylene (PTFE, Teflon™) materials (e.g. plumbers tape), including sample bottle cap liners with a PTFE layer.

Equipment Decontamination

Standard two step decontamination using detergent (Alconox is acceptable) and clean, PFAS-free water will be performed for sampling equipment. All sources of water used for equipment decontamination should be verified in advance to be PFAS-free through laboratory analysis or certification.

Sampling Techniques

Locate and assess the pressure tank and determine if any filter units are present within the building. Establish the sample location as close to the well pump as possible, which is typically the spigot at the pressure tank. Ensure sampling equipment is kept clean during sampling as access to the pressure tank spigot, which is likely located close to the ground, may be obstructed and may hinder sample collection.

Prior to sampling, a faucet downstream of the pressure tank (e.g., washroom sink) should be run until the well pump comes on and a decrease in water temperature is noted which indicates that the water is coming from the well. If the homeowner is amenable, staff should run the water longer to purge the well (15+ minutes) to provide a sample representative of the water in the formation rather than standing water in the well and piping system including the pressure tank. At this point a new pair of nitrile gloves should be donned and the sample can be collected from the sample point at the pressure tank.

Sample Identification and Logging

A label shall be attached to each sample container with a unique identification. Each sample shall be included on the chain of custody (COC).

Quality Assurance/Quality Control

- Immediately place samples in a cooler maintained at 4 ± 2º Celsius using ice
- Collect one field duplicate for every sample batch, minimum 1 duplicate per 20 samples. The duplicate shall consist of an additional sample at a given location
- Collect one matrix spike / matrix spike duplicate (MS/MSD) for every sample batch, minimum 1 MS/MSD per 20 samples. The MS/MSD shall consist of an additional two samples at a given location and identified on the COC
- If equipment was used, collect one equipment blank per day per site and a minimum 1 equipment blank per 20 samples. The equipment blank shall test the new and decontaminated sampling equipment utilized to obtain a sample for residual PFAS contamination. This sample is obtained by using laboratory provided PFAS-free water and passing the water over or through the sampling device and into laboratory provided sample containers.
- A field reagent blank (FRB) should be collected at a rate of one per 20 samples. The lab will provide a FRB bottle containing PFAS free water and one empty FRB bottle. In the field, pour the water from the one bottle into the empty FRB bottle and label appropriately.
- Request appropriate data deliverable (Category B) and an electronic data deliverable
- For sampling events where multiple private wells (homes or sites) are to be sampled per day, it is acceptable to collect QC samples at a rate of one per 20 across multiple sites or days.

Documentation

A sample log shall document the location of the private well, sample point location, owner contact information, sampling equipment, purge duration, duplicate sample, visual description of the material, and any other observations or notes determined to be appropriate and available (e.g. well construction, pump type and location, yield, installation date). Additionally, care should be performed to limit contact with PFAS containing materials (e.g. waterproof field books, food packaging) during the sampling process.

Personal Protection Equipment (PPE)

For most sampling Level D PPE is anticipated to be appropriate. The sampler should wear nitrile gloves while conducting field work and handling sample containers.

Field staff shall consider the clothing to be worn during sampling activities. Clothing that contains PTFE material (including GORE-TEX®) or that have been waterproofed with PFAS materials should be avoided. All clothing worn by sampling personnel should have been laundered multiple times.

Appendix F - Sampling Protocols for PFAS in Fish

This appendix contains a copy of the current SOP developed by the Division of Fish and Wildlife (DFW) entitled "General Fish Handling Procedures for Contaminant Analysis" (Ver. 8). This SOP should be followed when collecting fish for contaminant analysis. Note, however, that the Bureau of Ecosystem Health will not be supplying bags or tags. All supplies are the responsibility of the collector

Procedure Name: General Fish Handling Procedures for Contaminant Analysis

Number: FW-005

Purpose: This procedure describes data collection, fish processing and delivery of fish collected for contaminant monitoring. It contains the chain of custody and collection record forms that should be used for the collections.

Organization: Environmental Monitoring Section
Bureau of Ecosystem Health
Division of Fish and Wildlife (DFW)
New York State Department of Environmental Conservation (NYSDEC)
625 Broadway
Albany, New York 12233-4756

Version: 8

Previous Version Date: 21 March 2018

Summary of Changes to this Version: Updated bureau name to Bureau of Ecosystem Health. Added direction to list the names of all field crew on the collection record. Minor formatting changes on chain of custody and collection records.

Originator or Revised by: Wayne Richter, Jesse Becker

Date: 26 April 2019

Quality Assurance Officer and Approval Date: Jesse Becker, 26 April 2019

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

GENERAL FISH HANDLING PROCEDURES FOR CONTAMINANT ANALYSES

A. Original copies of all continuity of evidence (i.e., Chain of Custody) and collection record forms must accompany delivery of fish to the lab. A copy shall be directed to the Project Leader or as appropriate, Wayne Richter. All necessary forms will be supplied by the Bureau of Ecosystem Health. Because some samples may be used in legal cases, it is critical that each section is filled out completely. Each Chain of Custody form has three main sections:

   1. The top box is to be filled out **and signed** by the person responsible for the fish collection (e.g., crew leader, field biologist, researcher). This person is responsible for delivery of the samples to DEC facilities or personnel (e.g., regional office or biologist).

   2. The second section is to be filled out **and signed** by the person responsible for the collections while being stored at DEC, before delivery to the analytical lab. This may be the same person as in (1), but it is still required that they complete the section. Also important is the **range of identification numbers** (i.e., tag numbers) included in the sample batch.

   3. Finally, the bottom box is to record any transfers between DEC personnel and facilities. Each subsequent transfer should be **identified, signed, and dated**, until laboratory personnel take possession of the fish.

B. The following data are required on each **Fish Collection Record** form:

   1. Project and Site Name.

   2. DEC Region.

   3. All personnel (and affiliation) involved in the collection.

   4. Method of collection (gill net, hook and line, etc.)

   5. Preservation Method.

C. The following data are to be taken on each fish collected and recorded on the **Fish Collection Record** form:

   1. Tag number - Each specimen is to be individually jaw tagged at time of collection with a unique number. Make sure the tag is turned out so that the number can be read without opening the bag. Use tags in sequential order. For small fish or composite samples place the tag inside the bag with the samples. The Bureau of Ecosystem Health can supply the tags.

   2. Species identification (please be explicit enough to enable assigning genus and species). Group fish by species when processing.

   3. Date collected.

   4. Sample location (waterway and nearest prominent identifiable landmark).

   5. Total length (nearest mm or smallest sub-unit on measuring instrument) and weight (nearest g or

smallest sub-unit of weight on weighing instrument). Take all measures as soon as possible with calibrated, protected instruments (e.g. from wind and upsets) and prior to freezing.

6. Sex - fish may be cut enough to allow sexing or other internal investigation, but do not eviscerate. Make any incision on the right side of the belly flap or exactly down the midline so that a left-side fillet can be removed.

D. General data collection recommendations:

1. It is helpful to use an ID or tag number that will be unique. It is best to use metal striped bass or other uniquely numbered metal tags. If uniquely numbered tags are unavailable, values based on the region, water body and year are likely to be unique: for example, R7CAY11001 for Region 7, Cayuga Lake, 2011, fish 1. If the fish are just numbered 1 through 20, we have to give them new numbers for our database, making it more difficult to trace your fish to their analytical results and creating an additional possibility for errors.

2. Process and record fish of the same species sequentially. Recording mistakes are less likely when all fish from a species are processed together. Starting with the bigger fish species helps avoid missing an individual.

3. If using Bureau of Ecosystem Health supplied tags or other numbered tags, use tags in sequence so that fish are recorded with sequential Tag Numbers. This makes data entry and login at the lab and use of the data in the future easier and reduces keypunch errors.

4. Record length and weight as soon as possible after collection and before freezing. Other data are recorded in the field upon collection. An age determination of each fish is optional, but if done, it is recorded in the appropriate “Age” column.

5. For composite samples of small fish, record the number of fish in the composite in the Remarks column. Record the length and weight of each individual in a composite. All fish in a composite sample should be of the same species and members of a composite should be visually matched for size.

6. Please submit photocopies of topographic maps or good quality navigation charts indicating sampling locations. GPS coordinates can be entered in the Location column of the collection record form in addition to or instead for providing a map. These records are of immense help to us (and hopefully you) in providing documented location records which are not dependent on memory and/or the same collection crew. In addition, they may be helpful for contaminant source trackdown and remediation/control efforts of the Department.

7. When recording data on fish measurements, it will help to ensure correct data recording for the data recorder to call back the numbers to the person making the measurements.

E. Each fish is to be placed in its own individual plastic bag. For small fish to be analyzed as a composite, put all of the fish for one composite in the same bag but use a separate bag for each composite. It is important to individually bag the fish to avoid difficulties or cross contamination when processing the fish for chemical analysis. Be sure to include the fish’s tag number inside the bag, preferably attached to the fish with the tag number turned out so it can be read. Tie or otherwise secure the bag closed. **The Bureau of Ecosystem Health will supply the bags.** If necessary, food grade bags may be procured from a suitable vendor (e.g., grocery store). It is preferable to redundantly label each bag with a manila tag tied between the knot and the body of the bag. This tag should be labeled with the project name, collection location, tag number, collection date, and fish species. If scales are collected, the scale envelope should be labeled with

the same information.

F. Groups of fish, by species, are to be placed in one large plastic bag per sampling location. **The Bureau of Ecosystem Health will supply the larger bags.** Tie or otherwise secure the bag closed. Label the site bag with a manila tag tied between the knot and the body of the bag. The tag should contain: project, collection location, collection date, species and **tag number ranges**. Having this information on the manila tag enables lab staff to know what is in the bag without opening it.

G. Do not eviscerate, fillet or otherwise dissect the fish unless specifically asked to. If evisceration or dissection is specified, the fish must be cut along the exact midline or on the right side so that the left side fillet can be removed intact at the laboratory. If filleting is specified, the procedure for taking a standard fillet (SOP PREPLAB 4) must be followed, including removing scales.

H. Special procedures for PFAS: Unlike legacy contaminants such as PCBs, which are rarely found in day to day life, PFAS are widely used and frequently encountered. Practices that avoid sample contamination are therefore necessary. While no standard practices have been established for fish, procedures for water quality sampling can provide guidance. The following practices should be used for collections when fish are to be analyzed for PFAS:

No materials containing Teflon.
No Post-it notes.
No ice packs; only water ice or dry ice.
Any gloves worn must be powder free nitrile.
No Gore-Tex or similar materials (Gore-Tex is a PFC with PFOA used in its manufacture).
No stain repellent or waterproof treated clothing; these are likely to contain PFCs.
Avoid plastic materials, other than HDPE, including clipboards and waterproof notebooks.
Wash hands after handling any food containers or packages as these may contain PFCs.
Keep pre-wrapped food containers and wrappers isolated from fish handling.
Wear clothing washed at least six times since purchase.
Wear clothing washed without fabric softener.
Staff should avoid cosmetics, moisturizers, hand creams and similar products on the day of sampling as many of these products contain PFCs (Fujii et al. 2013). Sunscreen or insect repellent should not contain ingredients with “fluor” in their name. Apply any sunscreen or insect repellent well downwind from all materials. Hands must be washed after touching any of these products.

I. All fish must be kept at a temperature <45° F (<8° C) immediately following data processing. As soon as possible, freeze at -20° C ± 5° C. Due to occasional freezer failures, daily freezer temperature logs are required. The freezer should be locked or otherwise secured to maintain chain of custody.

J. In most cases, samples should be delivered to the Analytical Services Unit at the Hale Creek field station. Coordinate delivery with field station staff and send copies of the collection records, continuity of evidence forms and freezer temperature logs to the field station. For samples to be analyzed elsewhere, non-routine collections or other questions, contact Wayne Richter, Bureau of Ecosystem Health, NYSDEC, 625 Broadway, Albany, New York 12233-4756, 518-402-8974, or the project leader about sample transfer. Samples will then be directed to the analytical facility and personnel noted on specific project descriptions.

K. A recommended equipment list is at the end of this document.

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
DIVISION OF FISH AND WILDLIFE
FISH COLLECTION RECORD

Project and Site Name _____ DEC Region _____

Collections made by (include all crew) _____

Sampling Method: □Electrofishing □Gill netting □Trap netting □Trawling □Seining □Angling □Other _____

Preservation Method: □Freezing □Other _____ Notes (SWFDB survey number): _____

FOR LAB USE ONLY- LAB ENTRY NO.	COLLECTION OR TAG NO.	SPECIES	DATE TAKEN	LOCATION	AGE	SEX &/OR REPROD. CONDIT	LENGTH ( )	WEIGHT ( )	REMARKS

richter: revised 2011, 5/7/15, 10/4/16, 3/20/17; becker: 3/23/17, 4/26/19

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
CHAIN OF CUSTODY

I, _____, of _____ collected the
(Print Name) (Print Business Address)

following on _____, 20____ from _____
(Date) (Water Body)

in the vicinity of _____
(Landmark, Village, Road, etc.)

Town of _____, in _____ County.

Item(s) _____

_____

Said sample(s) were in my possession and handled according to standard procedures provided to me prior to collection. The sample(s) were placed in the custody of a representative of the New York State Department of Environmental Conservation on _____, 20_____.

_____ _____
Signature Date

I, _____, received the above mentioned sample(s) on the date specified and assigned identification number(s) _____ to the sample(s). I have recorded pertinent data for the sample(s) on the attached collection records. The sample(s) remained in my custody until subsequently transferred, prepared or shipped at times and on dates as attested to below.

_____ _____
Signature Date

SECOND RECIPIENT (Print Name)	TIME & DATE	PURPOSE OF TRANSFER
SIGNATURE	UNIT	
THIRD RECIPIENT (Print Name)	TIME & DATE	PURPOSE OF TRANSFER
SIGNATURE	UNIT	
FOURTH RECIPIENT (Print Name)	TIME & DATE	PURPOSE OF TRANSFER
SIGNATURE	UNIT	
RECEIVED IN LABORATORY BY (Print Name)	TIME & DATE	REMARKS
SIGNATURE	UNIT	
LOGGED IN BY (Print Name)	TIME & DATE	ACCESSION NUMBERS
SIGNATURE	UNIT	

richter: revised 21 April 2014; becker: 23 March 2017, 26 April, 2019

NOTICE OF WARRANTY

By signature to the chain of custody (reverse), the signatory warrants that the information provided is truthful and accurate to the best of his/her ability. The signatory affirms that he/she is willing to testify to those facts provided and the circumstances surrounding the same. Nothing in this warranty or chain of custody negates responsibility nor liability of the signatories for the truthfulness and accuracy of the statements provided.

HANDLING INSTRUCTIONS

On day of collection, collector(s) name(s), address(es), date, geographic location of capture (attach a copy of topographic map or navigation chart), species, number kept of each species, and description of capture vicinity (proper noun, if possible) along with name of Town and County must be indicated on reverse.

Retain organisms in manila tagged plastic bags to avoid mixing capture locations. Note appropriate information on each bag tag.

Keep samples as cool as possible. Put on ice if fish cannot be frozen within 12 hours. If fish are held more than 24 hours without freezing, they will not be retained or analyzed.

Initial recipient (either DEC or designated agent) of samples from collector(s) is responsible for obtaining and recording information on the collection record forms which will accompany the chain of custody. This person will seal the container using packing tape and writing his signature, the time and the date across the tape onto the container with indelible marker. Any time a seal is broken, for whatever purpose, the incident must be recorded on the Chain of Custody (reason, time, and date) in the purpose of transfer block. Container then is resealed using new tape and rewriting signature, with time and date.

EQUIPMENT LIST

Scale or balance of appropriate capacity for the fish to be collected.

Fish measuring board.

Plastic bags of an appropriate size for the fish to be collected and for site bags.

Individually numbered metal tags for fish.

Manila tags to label bags.

Small envelops, approximately 2” x 3.5”, if fish scales are to be collected.

Knife for removing scales.

Chain of custody and fish collection forms.

Clipboard.

Pens or markers.

Paper towels.

Dish soap and brush.

Bucket.

Cooler.

Ice.

Duct tape.

Appendix G – PFAS Analyte List

Group	Chemical Name	Abbreviation	CAS Number
Perfluoroalkyl sulfonic acids	Perfluorobutanesulfonic acid	PFBS	375-73-5
	Perfluoropentanesulfonic acid	PFPeS	2706-91-4
	Perfluorohexanesulfonic acid	PFHxS	355-46-4
	Perfluoroheptanesulfonic acid	PFHpS	375-92-8
	Perfluorooctanesulfonic acid	PFOS	1763-23-1
	Perfluorononanesulfonic acid	PFNS	68259-12-1
	Perfluorodecanesulfonic acid	PFDS	335-77-3
	Perfluorododecanesulfonic acid	PFDoS	79780-39-5
Perfluoroalkyl carboxylic acids	Perfluorobutanoic acid	PFBA	375-22-4
	Perfluoropentanoic acid	PFPeA	2706-90-3
	Perfluorohexanoic acid	PFHxA	307-24-4
	Perfluoroheptanoic acid	PFHpA	375-85-9
	Perfluorooctanoic acid	PFOA	335-67-1
	Perfluorononanoic acid	PFNA	375-95-1
	Perfluorodecanoic acid	PFDA	335-76-2
	Perfluoroundecanoic acid	PFUnA	2058-94-8
	Perfluorododecanoic acid	PFDoA	307-55-1
	Perfluorotridecanoic acid	PFTrDA	72629-94-8
	Perfluorotetradecanoic acid	PFTeDA	376-06-7
Per- and Polyfluoroether carboxylic acids	Hexafluoropropylene oxide dimer acid	HFPO-DA	13252-13-6
	4,8-Dioxa-3H-perfluorononanoic acid	ADONA	919005-14-4
	Perfluoro-3-methoxypropanoic acid	PFMPA	377-73-1
	Perfluoro-4-methoxybutanoic acid	PFMBA	863090-89-5
	Nonafluoro-3,6-dioxaheptanoic acid	NFDHA	151772-58-6
Fluorotelomer sulfonic acids	4:2 Fluorotelomer sulfonic acid	4:2-FTS	757124-72-4
	6:2 Fluorotelomer sulfonic acid	6:2-FTS	27619-97-2
	8:2 Fluorotelomer sulfonic acid	8:2-FTS	39108-34-4
Fluorotelomer carboxylic acids	3:3 Fluorotelomer carboxylic acid	3:3 FTCA	356-02-5
	5:3 Fluorotelomer carboxylic acid	5:3 FTCA	914637-49-3
	7:3 Fluorotelomer carboxylic acid	7:3 FTCA	812-70-4
Perfluorooctane sulfonamides	Perfluorooctane sulfonamide	PFOSA	754-91-6
	N-methylperfluorooctane sulfonamide	NMeFOSA	31506-32-8
	N-ethylperfluorooctane sulfonamide	NEtFOSA	4151-50-2
Perfluorooctane sulfonamidoacetic acids	N-methylperfluorooctane sulfonamidoacetic acid	N-MeFOSAA	2355-31-9
	N-ethylperfluorooctane sulfonamidoacetic acid	N-EtFOSAA	2991-50-6
Perfluorooctane sulfonamide ethanols	N-methylperfluorooctane sulfonamidoethanol	MeFOSE	24448-09-7
	N-ethylperfluorooctane sulfonamidoethanol	EtFOSE	1691-99-2

Group	Chemical Name	Abbreviation	CAS Number
Ether sulfonic acids	9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (F-53B Major)	9Cl-PF3ONS	756426-58-1
	11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (F-53B Minor)	11Cl-PF3OUdS	763051-92-9
	Perfluoro(2-ethoxyethane) sulfonic acid	PFEESA	113507-82-7

Appendix H - Data Review Guidelines for Analysis of PFAS in Non-Potable Water and Solids

General

These guidelines are intended to be used for the validation of PFAS using EPA Method 1633 for projects within the Division of Environmental Remediation (DER). Data reviewers should understand the methodology and techniques utilized in the analysis. Consultation with the end user of the data may be necessary to assist in determining data usability based on the data quality objectives in the Quality Assurance Project Plan. A familiarity with the laboratory's Standard Operating Procedure may also be needed to fully evaluate the data. If you have any questions, please contact DER's Quality Assurance Officer, Dana Barbarossa, at dana.barbarossa@dec.ny.gov.

Preservation and Holding Time

Samples should be preserved with ice to a temperature of less than 6°C upon arrival at the lab. The holding time is 28 days to extraction for aqueous and solid samples. The time from extraction to analysis for aqueous samples is 28 days and 40 days for solids.

Temperature greatly exceeds 6ºC upon arrival at the lab*	Use professional judgement to qualify detects and non-detects as estimated or rejected
Holding time exceeding 28 days to extraction	Use professional judgement to qualify detects and non-detects as estimated or rejected if holding time is grossly exceeded

*Samples that are delivered to the lab immediately after sampling may not meet the thermal preservation guidelines. Samples are considered acceptable if they arrive on ice or an attempt to chill the samples is observed.

Initial Calibration

The initial calibration should contain a minimum of six standards for linear fit and six standards for a quadratic fit. The relative standard deviation (RSD) for a quadratic fit calibration should be less than 20%.

The low-level calibration standard should be within 50% - 150% of the true value, and the mid-level calibration standard within 70% - 130% of the true value.

%RSD >20%	J flag detects and UJ non detects

Continuing Calibration Verification

Continuing calibration verification (CCV) checks should be analyzed at a frequency of one per ten field samples. If CCV recovery is very low, where detection of the analyte could be in question, ensure a low level CCV was analyzed and use to determine data quality.

CCV recovery <70 or >130%	J flag results

Blanks

There should be no detections in the method blanks above the reporting limits. Equipment blanks, field blanks, rinse blanks etc. should be evaluated in the same manner as method blanks. Use the most contaminated blank to evaluate the sample results.

Blank Result	Sample Result	Qualification
Any detection	<Reporting limit	Qualify as ND at reporting limit
Any detection	>Reporting Limit and >10x the blank result	No qualification
>Reporting limit	>Reporting limit and <10x blank result	J+ biased high

Field Duplicates

A blind field duplicate should be collected at rate of one per twenty samples. The relative percent difference (RPD) should be less than 30% for analyte concentrations greater than two times the reporting limit. Use the higher result for final reporting.

RPD >30%	Apply J qualifier to parent sample

Lab Control Spike

Lab control spikes should be analyzed with each extraction batch or one for every twenty samples. In the absence of lab derived criteria, use 70% - 130% recovery criteria to evaluate the data.

Recovery <70% or >130% (lab derived criteria can also be used)	Apply J qualifier to detects and UJ qualifier to non detects

Matrix Spike/Matrix Spike Duplicate

One matrix spike and matrix spike duplicate should be collected at a rate of one per twenty samples. Use professional judgement to reject results based on out of control MS/MSD recoveries.

Recovery <70% or >130% (lab derived criteria can also be used)	Apply J qualifier to detects and UJ qualifier to non detects of parent sample only
RPD >30%	Apply J qualifier to detects and UJ qualifier to non detects of parent sample only

Extracted Internal Standards (Isotope Dilution Analytes)

Problematic analytes (e.g. PFBA, PFPeA, fluorotelomer sulfonates) can have wider recoveries without qualification. Qualify corresponding native compounds with a J flag if outside of the range.

Recovery <50% or >150%	Apply J qualifier
Recovery <25% or >150% for poor responding analytes	Apply J qualifier
Isotope Dilution Analyte (IDA) Recovery <10%	Reject results

Signal to Noise Ratio

The signal to noise ratio for the quantifier ion should be at least 3:1. If the ratio is less than 3:1, the peak is discernable from the baseline noise and symmetrical, the result can be reported. If the peak appears to be baseline noise and/or the shape is irregular, qualify the result as tentatively identified.

Reporting Limits

If project-specific reporting limits were not met, please indicate that in the report along with the reason (e.g. over dilution, dilution for non-target analytes, high sediment in aqueous samples).

Peak Integrations

Target analyte peaks should be integrated properly and consistently when compared to standards. Ensure branched isomer peaks are included for PFAS where standards are available. Inconsistencies should be brought to the attention of the laboratory or identified in the data review summary report.

ATTACHMENT 3

Laboratory's Standard Operating Procedures

Title: Analysis of Organochlorine Herbicides by SW846 Method 8151A

Once printed, this is considered an uncontrolled document

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Carl Armbruster	10/17/2022 Date	Mark Acierno	10/17/2022 Date
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1.0 Scope and Application

1.1 Analytes, Matrix(s), and Reporting Limits

This SOP describes Eurofins Edison's procedure for the analysis of select organochlorine herbicides in solid and aqueous matrices by USEPA SW846 Method 8151A using dual capillary column gas chromatography (GC) with electron capture detector (ECD). Water samples are prepared using the extraction techniques detailed in Eurofins Edison SOP No. ED-ORP-015, *Extraction of Organochlorine Herbicides in Water by SW846 Method 8151A,* current revision. Solid sample extraction procedures are detailed in Eurofins Edison SOP No. ED- ORP-023, *Extraction of Organochlorine Herbicides in Soil by SW846 Method 8151A,* current revision. Table 1 (below) lists the method target compounds as well as the analytical reporting limit for each compound by matrix.

Table 1: Analytes and Reporting Limits

Parameter	CAS No.	Soil Reporting Limits (ug/kg)	Water Reporting Limits (ug/L)	Leachate Reporting Limits (ug/L)	Waste Reporting Limits (ug/kg)
2,4-D	94-75-7	17	0.50	0.080	33
2,4,5-TP (Silvex)	93-72-1	17	0.50	0.080	33
2,4,5-T	93-76-5	17	0.50	0.080	33
Dalapon	75-99-0	17	0.50	n/a	33
Dinoseb	88-85-7	17	0.50	n/a	33
2,4-DB	94-82-6	17	0.50	n/a	33
DIcamba	1918-00-9	17	0.05	n/a	33
Dichlroprop	120-36-5	17	0.05	n/a	33
MCPA	94-74-6	1700	50.0	n/a	3300
MCPP	93-65-2	1700	50.0	n/a	3300
Pentachlorophenol	87-86-5	17	0.05	n/a	33
Picloram	1918-02-01	17	0.05	n/a	33

On occasion clients may request modifications to this SOP. These modifications are handled following the procedures outlined in Sections 9 (Review of Work) and 19 (Test Methods and Method Validation) in the Eurofins Edison Quality Assurance Manual.

2.0 Summary of Method

2.1. A measured volume or weight of sample (30 g for soil, 1000 ml for water, 15 ml for leachates) is extracted using the appropriate preparation SOP (see Section 1.1). The final volume is 10 ml in hexane (soil and water) and 5 ml in hexane (leachates).

2.2. Water samples are extracted with diethyl ether and then esterified with diazomethane. The derivatives are determined by gas chromatography with an electron capture detector (GC/ECD). The results are reported as acid equivalents.

2.3. Soil and waste samples are extracted and esterified with diazomethane. The derivatives are determined by gas chromatography with an electron capture detector (GC/ECD). The results are reported as acid equivalents.

2.4. Samples are analyzed after all the necessary calibration and QC checks have been performed as described herein. Since quantitative values for organochlorine herbicide analyses are based on the methyl ester derivatives of the free acid herbicides, the results must be adjusted for the difference in molecular weight between the free acid and the methyl ester. (See Attachment 1 for Conversion Factors)

2.5. All data undergoes two documented levels of review prior to release to clients.

3.0 Definitions

For a complete list of definitions refer to Appendix 5 in the most current revision of Eurofins Edison's Quality Assurance Manual (ED-QA-LQM).

4.0 Interferences

4.1. Method interferences may be caused by contaminants in solvents, reagents, glassware, and other sample processing hardware that lead to discrete artifacts or elevated baselines in gas chromatograms. All these materials must be routinely demonstrated to be free from interferences under the conditions of the analysis, by analyzing reagent blanks.

4.1.1. Glassware must be scrupulously cleaned. Clean each piece of glassware as soon as possible after use by rinsing it with the last solvent used in it. This should be followed by detergent washing with hot water and rinses with tap water, then with organic-free reagent water. Glassware should be solvent-rinsed with acetone and pesticide-quality hexane. After rinsing and drying, glassware should be sealed and stored in a clean environment to prevent any accumulation of dust or other contaminants. Store glassware inverted or capped with any accumulation of dust or other contaminants. Store glassware inverted or capped with aluminum foil. Immediately prior to use, glassware should be rinsed with the next solvent to be used. For complete details reference Eurofins Edison SOP No. ED-GEN-013, *Glassware Cleaning*, most current revision.

4.1.2. The use of high purity reagents and solvents helps to minimize interference problems. Purification of solvents by distillation in all-glass systems may be required.

4.2. Matrix interferences may be caused by contaminants that are coextracted from the sample. The extent of matrix interferences will vary considerably depending upon the nature and diversity of the material being analyzed.

4.3. Organic acids, especially chlorinated acids, cause the most direct interference with the determination by methylation. Phenols, including chlorophenols, may also interfere with this procedure. The determination using pentafluorobenzylation is more sensitive, and more prone to interferences from the presence of organic acids or phenols than by methylation.

4.4. Alkaline hydrolysis and subsequent extraction of the basic solution removes many chlorinated hydrocarbons and phthalate esters that might otherwise interfere with the electron capture analysis. However, hydrolysis may result in the loss of Dinoseb and the formation of aldol condensation products if any residual acetone remains from the extraction of solids. Strong organic acids react readily with alkaline substances and may be lost during analysis. Therefore, glassware must be acid-rinsed and then rinsed to constant pH with organic-free reagent water. Sodium sulfate must be acidified.

4.5. Organochlorine herbicides, being strong organic acids, react readily with alkaline substances and may be lost during analysis. Therefore, glassware must be acid-rinsed and then rinsed to constant pH with organic-free reagent water. Sodium sulfate must be acidified.

4.6. Sample extracts should be dry prior to methylation or poor recoveries may result.

5.0 Safety

Employees must abide by the policies and procedures in the Corporate Environmental Health and Safety Manual (CW-E-M-001) and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum

5.1. Specific Safety Concerns or Requirements

The gas chromatograph contains zones that have elevated temperatures. The analyst needs to be aware of the locations of those zones, and must cool them to room temperature prior to working on them.

There are areas of high voltage in the gas chromatograph. Depending on the type of work involved, either turn the power to the instrument off, or disconnect it from its source of power.

5.2. Primary Materials Used

The following is a list of the materials used in this method, which have a serious or significant hazard rating. **Note: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the MSDS for each of the materials listed in the table.** A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the MSDS for each material before using it for the first time or when there are major changes to the MSDS.

Material	Hazards	Exposure Limit (1)	Signs and symptoms of exposure
Acetone	Flammable	1000 ppm-TWA	Inhalation of vapors irritates the respiratory tract. May cause coughing, dizziness, dullness, and headache.
Hexane	Flammable Irritant	500 ppm-TWA	Inhalation of vapors irritates the respiratory tract. Overexposure may cause lightheadedness, nausea, headache, and blurred vision. Vapors may cause irritation to the skin and eyes.
1 – Exposure limit refers to the OSHA regulatory exposure limit.			

6.0 Equipment and Supplies

6.1. Instrumentation:

6.1.1. The system used is an Agilent Technologies (Avondale, PA) model 5890A or 6890 Gas Chromatograph (GC). It is equipped for simultaneous quantitation and confirmation columns using two separate detector channels on dual megabore capillary columns that are suitable for the analysis of organochlorine herbicides. All operations are as automated as possible with the equipment utilized.

6.1.2. Injection system: Dual tower Agilent Technologies 7673 Autosampler, or equivalent. Sample injection is accomplished by dual autoinjectors. A robot arm that shuttles samples between the sample tray and the injector turret services the auto injectors.

6.1.3. The samples are injected into a split/splitless injection port. The injection port is normally operated in splitless mode during injection with electronic pressure control (EPC) providing for constant flow during oven temperature programming.

6.1.4. Liners: The injection ports are each fitted with replaceable, heavy-walled glass liners. Each liner contains a plug of Hexane extracted, Teflon wool approximately 1 cm in length. The Teflon wool is positioned in the liner 1 cm from the bottom for the 5890 system. The Teflon wool is positioned in the middle of the goose neck of the siltek liner used in the 6890 system.

6.1.5. GC Oven: capable of integrated temperature control between 35^{O}C and 400^{O}C. Temperature programming of the gas chromatograph is employed.

6.1.6. Two dissimilar columns are used for analysis. An Agilent Technologies DB-5, 30m x 0.53mm ID column is used for sample quantitation. The secondary column is an Agilent Technologies DB-608, 30m x 0.53mm ID megabore column.

6.1.7. Detectors: The GC is equipped with dual Electron Capture Detectors (ECD), one for each column. Each detector is supplemented with make-up gas to provide sufficient detector flow for maintaining the electron

plasma. This is in addition to the gas exiting the column. The make-up gas consists of Ultra high purity (99.999%) Argon (95%)/Methane (5%) (a.k.a. P-5 Mixture) (P-5) and is fed from a supply separate from the carrier or injection port gas streams.

6.1.8. Data System:

6.1.8.1 **Chemstation:** The Chemstation is utilized for automation of runs and acquisition. The system is dedicated to a single GC and does not multitask. Therefore, data manipulation cannot be done while sample analysis is in progress. The data system acquires and stores all chromatographic data.

6.1.8.2 **Eurofins Chrom** chromatography data processing software package. Chrom is used for post acquisition GC data processing, reporting and storage and is fully integrated with Eurofins's LIMs (TALS).

6.1.9. Final processed data is uploaded to the Eurofins LIMS (TALS).

6.2. Supplies

6.2.1 4mm splitless sleeve (Restek Catalog # 11868-773 or equivalent) - This liner/glass wool combination provides many functions. The glass wool serves as a heat sink rapidly vaporizing solvent and samples resulting in higher response factors. The liner also protects the column head from accumulation of high boiling residuals and particulates.

6.2.2 0.8mm ID, Gold Inlet Seal (Restek Catalog # 21241 or 21318 or equivalent)

6.2.3 Snoop Leak Detector solution or equivalent.

6.2.4 Gas-tight syringes (various sizes)

6.2.5 Injection port septa

6.2.6 Pre-silanized glass wool (Supelco 2-0411 or equivalent)

6.2.7 Syringes, Assorted sizes 10ul - 1000ul; gas-tight

6.2.8 Bottles, 10 and 5ml amber screw cap with Teflon liner

6.2.9 Vials, 2ml amber screw cap with Teflon liner

6.2.10 Wheaton microvials 100ul or equivalent

7.0 Reagents and Standards

7. 1. Reagents

7.1.1. **Gases:** Ultra high purity (99.999%) Helium is used as the carrier and injection port purge gas. It is introduced to the GC at the injection port. Ultra high purity (99.999%) Argon (95%) / Methane (5%) (a.k.a. P-5 Mixture) is used as make-up gas. It is introduced to the GC via the make-up gas adapter at the end of the capillary column. They are supplied by M-G Industries (Valley Forge, PA). Both gases are supplied at tank pressures of 2000-2400 psig., for a 300 cft. tank. The tank pressure is regulated to an outlet pressure of 70 psig. Each tank is used until the tank pressure drops to less than 500 psig.

7.1.1.1. The gas streams are polished using three traps or filters before introduction to the GC The traps are as follows:

7.1.1.1.1. Hydrocarbon trap
7.1.1.1.2. H_2O trap
7.1.1.1.3. O_2 scrubber

7.1.2. All sample extracts are in hexane (reference the sample prep SOPs detailed in Section 2.0 above).

7.1.2.1. Hexane, Pesticide Grade, Baxter 217-4 or equivalent.

7.1.3. All solvents must be pesticide quality or equivalent. Each lot of solvent is screened for contaminants before being used for analysis as detailed in Eurofins Corporate Quality SOP No. CA-Q-S-001 (*Solvent & Acid Lot Testing & Approval*) and Eurofins Edison SOP No. ED-GEN-023 (*Bulk Solvent Testing and Approval*).

7. 2. Standards

7.2.1. Standards are purchased as concentrated solutions (see Section 7.2.2). Most stock solutions are diluted (in volumetric glassware) to working concentration using hexane as the diluent as described in Section 7.3.

7.2.2. **Standard mixes and sources:**

Table 2:
Herbicide Standard Mixes and Sources*

Standard Name ("Lab Name")	Concentration (ug/ml)	Source
Acid Herbicide Spiking Mix 2 ("Spiking Mix")	varies (in acetone)	Supelco Catalog # 861259
Underivatized Chlorinated Herbicides ("10 Compound Spiking Mix")	Varies (in methanol)	Accustandard Catalog #M-8150A)
EPA 8270 Herbicide Ester Mix ("Calibration Mix")	2000 (in hexane)	Supelco Catalog # 48474
Pentachloroanisole ("Pentachloroanisole")	100 (in methanol)	Accustandard Catalog # P-199S
Picloram methyl ester ("Picloram methyl ester")	Neat	Chem Service Catalog # F2155
Methyl Derivatives of Chlorinated Herbicides ("Calibration Mix - 10 compound")	Varies (in methanol)	AccuStandard Catalog # M-8150
Pentachlorophenol ("Pentachlorophenol spike")	1000	Spex Certiprep Catalog #

Table 2: Herbicide Standard Mixes and Sources*		
Standard Name ("Lab Name")	**Concentration (ug/ml)**	**Source**
		S-2950
Picloram (4-amino-3,5,6-trichloropicolinic acid) ("Picloram Acid Spiking Standard")	Neat	Chem Service. Catalog No. F2041
2,4-DCAA Acid Spike Mix ("Surrogate Spiking Solution")	100 (in acetone)	Supelco Catalog # 861271
2,4-DCAA methyl ester ("Surrogate Solution")	1000 (in hexane)	Supelco Catalog # 861272

* May be substituted with equivalent standards from alternate sources.

Table 3: Components of Herbicide Standard Mixes			
Parameter	**Catalog Nos.**	**Lab Standard Name**	**Concentration (ug/ml)**
2,4-dichlorophenoxyacetic acid (2,4-D)	Supelco 861259	Spiking Mix	50
2-(2,4,5-Trichlorophenoxy)propionic acid (2,4,5-TP aka Silvex)	Supelco 861259	Spiking Mix	20
2,4,5-Trichlorophenoxyacetic acid (2,4,5-T)	Supelco 861259	Spiking Mix	20
2,4-D methyl ester	Supelco 48474	Calibration Mix	2000
2,4,5-T methyl ester	Supelco 48474	Calibration Mix	2000
Silvex methyl ester	Supelco 48474	Calibration Mix	2000
2,4-D methyl ester	Accustandard M-8150	Calibration Mix – 10 compound	100
Dalapon methyl ester	Accustandard M-8150	Calibration Mix – 10 compound	100
2,4-DB methyl ester	Accustandard M-8150	Calibration Mix – 10 compound	100
Dicamba methyl ester	Accustandard M-8150	Calibration Mix – 10 compound	100
Dichloroprop methyl ester	Accustandard M-8150	Calibration Mix – 10 compound	100
Dinoseb methyl ester	Accustandard M-8150	Calibration Mix – 10 compound	100
MCPA methyl ester	Accustandard M-8150	Calibration Mix – 10 compound	10000
MCPP methyl ester	Accustandard M-8150	Calibration Mix – 10 compound	10000
2,4,5-T methyl ester	Accustandard M-8150	Calibration Mix – 10 compound	100
2,4,5-TP methyl ester	Accustandard M-8150	Calibration Mix – 10 compound	100
2,4-D	Accustandard M-8150A	Spiking Mix – 10 compound	100
2,4-DB	Accustandard M-8150A	Spiking Mix – 10 compound	100
2,4,5-T	Accustandard M-8150A	Spiking Mix – 10 compound	100
Silvex	Accustandard M-8150A	Spiking Mix – 10 compound	100

Table 3:
Components of Herbicide Standard Mixes

Parameter	Catalog Nos.	Lab Standard Name	Concentration (ug/ml)
Dalapon	Accustandard M-8150A	Spiking Mix – 10 compound	100
Dicamba	Accustandard M-8150A	Spiking Mix – 10 compound	100
Dichloroprop	Accustandard M-8150A	Spiking Mix – 10 compound	100
Dinoseb	Accustandard M-8150A	Spiking Mix – 10 compound	100
MCPA acid	Accustandard M-8150A	Spiking Mix – 10 compound	10000
MCPP acid	Accustandard M-8150A	Spiking Mix – 10 compound	100000
Pentachloroanisole	Accustandard P-199S	Pentachloroanisole	100
Pentachlorophenol	Spex Certiprep S-2960	Pentachlorophenol spike	1000
Picloram methyl ester	Chem Service Catalog # F2155	Picloram methyl ester	neat
Picloram (4-amino-3,5,6-trichloropicolinic acid)	Chem Service. Catalog No. F2041	Picloram Acid Spiking Standard	neat
2,4-Dichlorophenylacetic Acid	Supelco 861271	Surrogate Spiking Solution	100
2,4-Dichlorophenylacetic Acid methyl ester	Supelco 861272	Surrogate Solution	1000

7. 3. Standards Preparation

7.3.1. All standard stock solutions are diluted to the working concentrations with hexane or acetone (as indicated) using Class A volumetric glassware.

7.3.2. Total Herbicide Calibration Standards:

7.3.2.1 Total Herbicide Calibration Standards (10 compound analysis): The ten (10) compound/surrogate total herbicide calibration standard range is prepared when analyzing for the expanded list of herbicides. Table 4 details the preparation of the five calibration concentration levels using the 10 compound calibration mix. The standards are prepared using a methyl ester source with the final concentration adjusted to the free acid equivalent concentration using the conversion factors detailed in Attachment 1.

Table 4:
Preparation of Total Herbicide Calibration Standards (10 compound analysis)

Parameter	Level 1 Conc. (ug/ml) [1] 25.0 ul '8151-Herbicide Mix (10 compounds)' & 5ul 'Surrogate Solution" into 50ml Hexane	Level 2 Conc. (ug/ml) [1] 125 ul '8151-Herbicide Mix (10 compounds)' & 25ul 'Surrogate Solution" into 50ml Hexane	Level 3 Conc. (ug/ml) [1] 375 ul '8151-Herbicide Mix (10 compounds)' & 75ul 'Surrogate Solution" into 50ml Hexane	Level 4 Conc. (ug/ml) [1] 750 ul '8151-Herbicide Mix (10 compounds)' & 150ul 'Surrogate Solution" into 50ml Hexane	Level 5 Conc. (ug/ml) [1] 750 ul '8151-Herbicide Mix (10 compounds)' & 150ul 'Surrogate Solution" into 25ml Hexane
2,4-D methyl ester	0.047	0.235	0.705	1.41	2.82
2,4,5-T methyl ester	0.047	0.235	0.705	1.41	2.82
2,4,5-TP (Silvex) methyl ester	0.048	0.238	0.712	1.42	2.85
Dalapon methyl ester	0.046	0.228	0 .682	1.36	2.73
2,4-DB methyl ester	0.047	0.235	0.705	1.41	2.82
Dicamba methyl ester	0.047	0.235	0.705	1.41	2.82
Dichloroprop methyl ester	0.047	0.235	0.705	1.41	2.82
Dinoseb methyl ester	0.047	0.235	0.705	1.41	2.82
MCPA methyl ester	4.67	23.4	70.1	140	280
MCPP methyl ester	4.67	23.4	70.1	140	280
2,4-DCAA methyl ester (surr)	0.096	0.478	1.43	2.86	5.73

[1] The calculated final standard concentrations have been converted from the methyl ester concentration to the free acid equivalent concentration using the factors found in Attachment 1

7.3.2.2 Pentachlorophenol Calibration Standards: A pentachlorophenol /surrogate total herbicide calibration standard range is prepared when analysis is required for this compound. Table 5 details the preparation of the five calibration concentration levels. The standards are prepared using a source containing the derivatized form of the compound (pentachloroanisole) the final concentration adjusted to the free acid equivalent concentration using the conversion factors detailed in Attachment 1.

Table 5:
Preparation of Pentachlorophenol Calibration Standards

Parameter	Level 1 Conc. (ug/ml) [1] 50 ul 'Pentachloroanisole' & 10ul 'Surrogate Solution" into 100ml Hexane	Level 2 Conc. (ug/ml) [1] 25 ul 'Pentachloroanisole' & 5ul 'Surrogate Solution" into 10ml Hexane	Level 3 Conc. (ug/ml) [1] 75 ul 'Pentachloroanisole' & 15ul 'Surrogate Solution" into 10ml Hexane	Level 4 Conc. (ug/ml) [1] 150 ul 'Pentachloroanisole' & 30ul 'Surrogate Solution" into 10ml Hexane	Level 5 Conc. (ug/ml) [1] 300 ul 'Pentachloroanisole' & 60ul 'Surrogate Solution" into 10ml Hexane
Pentachlorophenol	0.048	0.237	0.712	1.42	2.85
2,4-DCAA methyl ester (surr)	0.096	0.478	1.43	2.87	5.73

[1] The calculated final standard concentrations have been converted from the deriviatized concentration to the free acid equivalent concentration using the factors found in Attachment 1

7.3.2.3 Picloram Methyl Ester Calibration Standards: A Picloram methyl ester/surrogate calibration standard range is prepared when analysis is required for this compound. Table 6 details the preparation of the five calibration concentration levels. The standards are prepared using a source containing the picloram methyl ester and the final concentration is adjusted to the free acid equivalent concentration using the conversion factors detailed in Attachment 1.

7.3.2.3.1 Prior to the preparation of the picloram calibration standards a working stock solution must be prepared using the neat material described in Table 2. This working stock solution is prepared at 9000 ug/ml by dissolving 9.00 grams of neat picloram methyl ester into 1000 ml of hexane using class A volumetric glassware. This solution is used as described in Table 6.

Table 6:
Preparation of Picloram Calibration Standards

Parameter	Level 1 Conc. (ug/ml) [1] 20 ml of Level 3 Picloram methyl ester into 100ml Hexane	Level 2 Conc. (ug/ml) [1] 33 ml of Level 3 Picloram Methyl ester into 100ml Hexane	Level 3 Conc. (ug/ml) [1] 8.5 ul Picloram Methyl ester stock (9000ug/ml) & 150 ul 'Surrogate Solution" into 100ml Hexane	Level 4 Conc. (ug/ml) [1] 17 ul Picloram Methyl ester stock (9000ug/ml) & 300 ul 'Surrogate Solution" into 100ml Hexane	Level 5 Conc. (ug/ml) [1] 34 ul Picloram Methyl ester stock (9000ug/ml) & 600 ul 'Surrogate Solution" into 100ml Hexane
Picloram	0.047	0.236	0.709	1.42	2.84
2,4-DCAA methyl ester (surr)	0.095	0.477	1.43	2.86	5.73

[1] The calculated final standard concentrations have been converted from the deriviatized concentration to the free acid equivalent concentration using the factors found in Attachment 1

7.3.3. Herbicide Spiking Standard (LCS/MS/MSD):

7.3.3.1 Herbicide QC Spiking Standard Mix (10 compound analysis): The ten (10) compound spiking standard is prepared and used when analyzing for an expanded list of herbicides. The 10 compound spiking mix is prepared using volumetric glassware as detailed in Table 7 (below) using a concentrated solution of free acid herbicides (Accustandard Catalog # M-1850A; see Tables 1 and 2):

Table 7: Preparation of Total Herbicide 10 Compound Spiking Mix	
Parameter	**Final Conc. (ug/ml)** 5.0 ml 'Spiking Mix -10 compounds)' into 10ml Acetone
2,4-D	50
2,4,5-T	50
2,4,5-TP (Silvex)	50
Dalapon	50
2,4-DB	50
Dicamba	50
Dichloroprop	50
Dinoseb	50
MCPA	5000
MCPP	5000

The concentrate is used for spiking of the following quality control sample types: MS, MSD, and LCS. For spiking instructions see the appropriate herbicide prep SOP referenced in Section 1.1.

7.3.3.2 **Pentachlorophenol QC Spiking Standard:** The pentachlorophenol spiking standard is prepared and used when analyzing for this herbicide. The pentachlorophenol spiking mix is prepared using volumetric glassware by diluting 1ml of the concentrated pentachlorophenol solution Spex # S-2950; see Tables 1 and 2) into a final volume of 10ml acetone. The concentrate is used for spiking of the following quality control sample types: MS, MSD, and LCS. For spiking instructions see the appropriate herbicide prep SOP referenced in Section 1.1.

7.3.3.3 **Picloram Acid QC Spiking Standard:** The picloram acid spiking standard is prepared and used when analyzing for this herbicide. The standard is prepared using a source containing the picloram free acid. Prior to the preparation of the picloram acid spiking standard a working stock solution must be prepared using the neat material described in Table 2. This working stock solution is prepared at 10000 ug/ml by dissolving 10.00 grams of neat picloram free acid into 1000 ml of hexane using class A volumetric glassware

7.3.3.3.1 Prepare the 5000 ug/ml picloram spiking solution by diluting 500ml of the working stock solution (see Sec. 7.3.3.4) into 1000 ml of hexane using class A volumetric glassware. For spiking instructions see the appropriate herbicide prep SOP referenced in Section 1.1

7.3.4. **Herbicide Surrogate Spiking Standard (**2,4-DCAA Acid Spike Mix**):** The herbicide surrogate spiking solution is a concentrated 10 ml solution of 2,4-DCAA at a concentration of 100 ug/ml. (Supelco Catalog # 861271, see Tables 1 and 2). The concentrate is used without further dilution prior to the spiking of samples.

7.3.5. **Initial Calibration Verification Standard:** The ICV is prepared as detailed in Section 7.3.2 (dependent upon the compound being analyzed) and must be from a separate lot or separate source from the standards used in the Initial Calibration Range (the analyst must confirm and document that a separate source or lot is used).

8.0 Sample Collection, Preservation, Shipment and Storage

Sample container, preservation techniques and holding times may vary and are dependent on sample matrix, method of choice, regulatory compliance, and/or specific contract or client requests. Listed below are the holding times and the references that include preservation requirements.

Matrix	Sample Container	Min. Sample Size	Preservation	Holding Time	Reference
Waters	Glass	1L amber	Cool 4 ± 2ºC	7 days to extraction; 40 days to analysis	USEPA SW846
Soil/Sediment	Glass	4 oz wide mouth	Cool 4 ± 2ºC	14 Days to extraction; 40 days to analysis	USEPA SW846

8.1. Extracts must be stored under refrigeration (Cool 4 ± 2ºC) in the dark and analyzed within 40 days of extraction.

9.0 Quality Control

9.1 **Sample QC** - The following quality control samples are prepared with each batch of samples.

Quality Controls	Frequency	Control Limit
Method Blank (MB)	1 in 20 or fewer samples	< Rpt. Limit
Laboratory Control Sample (LCS)[1]	1 in 20 or fewer samples	Statistical Limits [4]
Matrix Spike (MS)[2]	1 in 20 or fewer samples	Statistical Limits [4]
MS Duplicate (MSD)[2]	1 in 20 or fewer samples	Statistical Limits [4]
Surrogates	every sample[3]	Statistical Limits [4]

[1] LCS Duplicate (LCD) is performed only when insufficient sample is available for the MS/MSD or when requested by the client/project/contract.
[2] The sample selection for MS/MSD is randomly selected by the organic prep lab, unless specifically requested by a client.
[3] Analytical and QC samples (MB, LCS, MS/MSD)
[4] Statistical control limits are updated annually and are updated into TALS (LIMS).

9.1.1. Method Blanks are extracted with each sample batch on each day that samples are extracted. The analytical results for the method blank must fall below the reporting limit for each compound of interest. If a target compound is detected in the blank at a concentration higher than the reporting limit, first the extract is reanalyzed for confirmation. If results are still outside of limits the entire batch of samples extracted with the affected blank must be re-extracted and reanalyzed.

9.1.2. Laboratory Control Sample (LCS): A Laboratory Control Sample (LCS) or blank spike must be extracted and analyzed for with each batch of 20 environmental samples. The LCS data is used to ensure that the analytical system is in control. It is also used to assess performance if the MS/MSD recoveries fall outside of established limits. The recoveries of the LCS must fall within lab generated acceptance criteria. If the spiked sample recovery results fall outside the laboratory generated limits (refer to the current active TALS method limit group database), the LCS recovery is evaluated. If LCS recovery is within limits the poor sample recovery results are attributed to matrix interference. If the LCS recovery results are outside QC limits, first the extract is reanalyzed and if it is still outside the limits the entire QC batch must be re-extracted and reanalyzed.

9.1.3. Matrix Spike/Matrix Spike Duplicate (MS/MSD): A Matrix Spike/Matrix Spike Duplicate (MS/MSD) pair is extracted and analyzed with every batch of 20 environmental samples. MS/MSD recoveries are evaluated against lab generated limits (refer to refer to the current active TALS method limit group database). If the MS/MSD recovery limits fall outside of lab limits the LCS recovery is evaluated and corrective action is taken as described in 9.1.2.

9.1.4. Surrogate Standards: All samples, blanks and QC samples are spiked with surrogate standard solution containing 2,4-DCAA (see Section 7.3.4). The percent recovery of the surrogate standards is calculated and compared to lab generated limits (refer to refer to the current active TALS method limit group database). If the surrogate recovery limits are outside of acceptance limits the sample extract is reanalyzed to confirm. If the recoveries are still outside of limits the sample must be re-extracted and reanalyzed or the data flagged as “estimated concentration”.

9.2 Instrument QC

9.2.1. Initial Calibration Range and Initial Calibration Verification (ICV)

9.2.1.1. ***Initial Calibration Range*:** A five-point calibration range is analyzed for each target compound using herbicide methyl ester standard mixes. Standards are prepared following the instructions in Section 7.3.

9.2.1.2. ***Initial Calibration Verification (ICV):*** An Initial Calibration Verification (ICV) standard is analyzed immediately after the Initial Calibration Range and before any samples are analyzed.

The ICV is prepared as detailed in Section 7.3.2 (dependent upon the compound being analyzed) and must be from a separate lot or separate source from the standards used in the Initial Calibration Range (the analyst must confirm and document that a separate source or lot is used).

9.2.2. Continuing Calibration Verification (CCV): A mid-point Continuing Calibration Verification (CCV) must be analyzed every 12-hours or 20 samples (whichever is more frequent) and at the end of each analytical sequence. The CCV consists of the Level 3 calibration standard (~700 ppb) detailed in Section 7.3

9.2.3. Calibration Acceptance Summary

9.2.3.1. Retention Time Windows: Retention time windows must be established to compensate for minor shifts in absolute retention times as a result of sample loading and normal chromatographic variability. All gas chromatographs used for pesticides analysis at Eurofins Edison are equipped with electronic pressure control (EPC). The use of EPC results in little retention time variability between analyses. Accordingly, retention time variability for the purpose of retention time window determination for standards analysis is extremely small. The default retention time window option must therefore be employed as follows to accommodate the excellent precision of EPC equipped systems.

9.2.3.1.1 Obtain the retention time for all single component compounds from the analysis of the midpoint standard for the calibration curve. Establish the center of the retention time window for each analyte and surrogate by using the absolute retention time for each analyte and surrogate from the calibration verification standard at the beginning of the analytical shift. For samples run during the same shift as an initial calibration, use the retention time of the mid-point standard of the initial calibration. Apply the retention time window data in the table in Attachment 2 to its corresponding compound (ex., mid-point RT ±0.10 minute). Calculate absolute retention time windows for each analyte and surrogate on each chromatographic column and instrument.

9.2.3.1.2 New retention time windows must be established when whenever a chromatographic column is replaced or a new detector is installed .Whenever the observed retention time of each analyte and surrogate is outside of the established retention time window, the analyst is advised to determine the cause and correct the problem before continuing analyses.

9.2.3.2. Initial Calibration Range: External standard calibration is employed for this method. The response factor (defined as the

ratio of the area to the standard concentration) is calculated for each analyte at each calibration concentration. The average response factor may be used for quantitation if the % RSD across the 5 point range is <20%. Alternatively, linear regression may be used if the correlation coefficient (r1) is ≥ 0.990 (note: if the linear regression model is used the curve must NOT be forced through the origin). Calibration is checked every 12 hours or after every twenty (20) samples, whichever comes first, by injecting a calibration verification standard for all single response pesticide standards.

9.2.3.2.1 Calculate the percent Relative Standard Deviation of the response factors for each compound at each level:

% RSD = (RF Standard Deviation/RF Mean) X 100

RF = Response Factor

9.2.3.2.2 If the % RSD across the 5 point range is <20% the calibration can be assumed to be linear and the average response factor can be used to calculate concentrations of target compounds in samples.

9.2.3.2.3 If the % RSD is >20% for any given compound, a first order linear regression can be applied to the data to calculate the calibration curve and determine sample concentration. If this method is employed, the r^1 (Correlation Coefficient) value must be ≥ 0.990 for the calibration to be acceptable. Calibration is checked every 12 hours or after every twenty (20) samples, whichever comes first, by injecting a calibration verification standard for all single component pesticide standards.

9.2.3.3. Relative Standard Error: The percent relative standard error (% RSE) from the calibration curve is used to evaluate the initial calibration. This provides a measure of how much error is associated with using the calibration curve for quantitation. The average Relative Standard Error (RSD for average response factors) of the calibration points from the curve used must be ≤ 20%.

Some data systems will not measure the %RSE from a linear or quadratic fit. For the linear case, the correlation coefficient may be used as an alternative to the %RSE, and must be greater than or equal to 0.990. For the quadratic case the Coefficient of Determination may be used, and must be greater or equal to 0.990.

Note: The Relative Standard Error (RSE) is superior to the Correlation Coefficient (r) and Coefficient of Determination (r_2) for testing the fit of a set of calibration points to a line. The lower points on a curve have little effect on r. As a result, a curve may have a very good correlation coefficient (>0.990) while also having > 100% error at the low point

9.2.3.4. Initial Calibration Verification (ICV): An ICV will consist of a second source standard at or near the midpoint of the Initial Calibration Range analyzed immediately after an initial calibration range. The calculated concentration of the ICV must be within ±15%D of the expected concentration. Should the %D exceed 15% the analyst should take corrective action (check standard solution, perform instrument maintenance, etc.) and re-inject the ICV. If the %D still exceeds 15% after a single ICV reinjection, a new Initial Calibration Range must be analyzed.

9.2.3.5. Continuing Calibration Verification (CCV): A CCV will consist of an ICAL standard at or near the midpoint of the Initial Calibration Range analyzed after each 10 samples (every 12 hours at minimum). The calculated concentration of the CCV must be within ±15%D of the expected concentration. Should the %D exceed 15% the analyst should take corrective action (check standard solution, perform instrument maintenance, etc.) and re-inject the CCV. If the %D still exceeds 15% after a single CCV reinjection, a new Initial Calibration Range must be analyzed.

Step	*Standards*	*Type*	*Control Limit*	*Frequency*
Method # 8151A Instrument QC Summary				
Initial Calibration	*5 point*	*Average response factor or 1st order linear regression*	*For average RF: <20%RSD all analytes. For linear regression: r ≥0.990 or <20%RSE*	*As required when ICV or CCV do not meet requirements*
ICV	*Separate source (midpoint)*	*Average*	*± 15%D*	*After every initial calibration*
CCV	*ICAL source (midpoint)*	*Average*	*± 15%D*	*1 in 10 or fewer samples (every 12 hours minimum)*

10.0 Procedure

10.1. Gas Chromatograph Operation

10.1.1. The sequence of events for GC analysis involves many steps. First the injection system and column performance and calibration must be verified.

Maintenance operations are performed as needed. Then samples must be run on the instrument. Chromatograms and reports must be evaluated for content, integration and concentration. Re-runs and dilutions must be made based on the calibrations that were in effect at the time the sample was run. Lastly, a detailed analysis and calculations must be performed to determine the concentration of all the parameters for which the sample was analyzed.

10.1.2. Injection System: A split/splitless injection port with electronic pressure control (EPC) is used. Thirty seconds after sample injection, the purge valve is turned on to facilitate the sweeping of any remaining residual solvent/sample from the injection port. The EPC is used in constant flow mode.

10.1.2.1. For herbicide analysis the normal operating conditions of the injection port are as follows:

Injection port Temperature:	275^{o}C
Temperature Rate:	10 deg C/minute
Inlet pressure	4.0 psi
Initial Temperature:	55 deg C
EPC:	Constant flow
Detector temperature	300C

10.1.2.1.1 For pentachlorophenol analysis the following injection port settings are used:

Injection port Temperature:	250^{o}C
Temperature Rate:	4 deg C/minute
Inlet pressure	7.9 psi
Initial Temperature:	190 deg C
EPC:	Constant flow
Detector temperature	300C

10.1.2.2. In addition to the EPC, the injection port is also equipped with a siltek-coated glass double goose neck liner that contains a 1 cm glass wool plug. The plug of glass wool is located in the liner between the double goose neck.

10.1.2.3. This liner/glass wool combination provides many functions. The glass wool serves as a heat sink rapidly vaporizing solvent and samples resulting in higher response factors. The liner also protects the column head from accumulation of high boiling residuals and particulates.

10.1.2.4. Regular maintenance is performed on the injection port. When the glass wool/liner is changed, the septa also must be

changed. Injection port, oven and detector temperatures are lowered to ambient prior to "cracking" the system. This is so as to introduce a minimum of damaging oxygen molecules into the system.

10.1.2.5. After the system has cooled, the old liner is removed. The injection port should be checked for particulate residues and cleaned as needed. A flashlight is usually required for this. After a new liner has been prepared it is placed into the injection port. A graphite seal is placed around the liner. The edges of the seal must be flat, not knife-edged, and free of nicks or burrs. If any of these conditions are not met, the graphite seal must be replaced as well. The graphite seal is critical to proper operation of the injection port. If in doubt, replace it.

10.1.2.6. The locking ring on the top of the injection port should be turned, with the wrench, about 1/8 turn past finger tight. The septum nut should never be tightened more than finger tight. After the injection port is reassembled, all column nuts inside the oven should be checked for leaks using Snoop (Supelco) or another suitable leak tester.

10.1.2.7. Once the signal from both detectors has stabilized, it is time to re-heat the zones. The zones should be heated in the order of detectors, oven and then injectors. This is to ensure that volatilized contaminants do not condense on the column or detector.

10.1.3. Oven: With the megabore columns installed, temperature programming is employed to achieve higher resolution of compounds and shorter run times than could be accomplished using isothermal methods.

10.1.3.1. The standard oven program for total herbicide analysis is :

Initial Temp	Time	Rate	Final Temp	Time
55°C	3.0 min	10°/min	244°C	11.5 min

10.1.3.2. The standard oven program for TCLP herbicide analysis is :

Initial Temp	Time	Rate	Final Temp	Time
190°C	3.0 min	4.0°/min	238°C	0.00 min

10.1.4. Detectors: Detectors operate at 300°C and need to be supplied with 40-60 ml/min total flow. They are essentially maintenance free on a day-to-day basis. They are routinely baked out at 325°C to remove persistent contaminants. On occasion the detectors may be baked out at a higher temperature to remove contaminants with an extremely high boiling point (CAUTION: Do not exceed the maximum detector temperature of 380°C).

10.1.4.1. If the detectors are particularly contaminated, they must be sent to Agilent Technologies in Avondale, Pennsylvania for reconditioning. This should occur if the detector baseline is greater than 100 Hz. Detector reconditioning should be required at a maximum of biannually.

10.1.5. Chemstation: The HP Chemstation application is used for automation of runs and acquisition. The system is dedicated to a single GC and does not multitask. Therefore, data manipulation cannot be done while sample analysis is in progress. The data system acquires and stores all chromatographic data.

10.1.6. Eurofins's Chrom chromatography data processing application is utilized for the processing of ChemStation chromatography data files. Calibrations, verification standards and samples are processed using this database. All of the processed files are imported into the TALS database. Data is processed and first level reviewed by the analysts. Senior analysts or managers do the second level review and update the status of the job to 'Lab Complete' in TALS. All client reports are generated in TALS.

10.1.7. Eurofins LIMS (TALS): All data files processed in Chrom are then imported to into TALS. The data files are reprocessed in TALS after linking the appropriate reagents and standards to the batch. All samples and quality control runs are reviewed. A TALS non-conformance memo (NCM) is written for any QC outlier or situation requiring additional documentation. Samples and QC results are assigned to primary/secondary column as per reporting requirements. Files that are not reported are marked rejected. All data files that are being reported are first level reviewed in TALS by the analyst. Second level TALS review is done by a trained peer or supervisor. Once second level review is completed in TALS reports are generated and reviewed after which the job is marked complete.

10.2. Analytical Sequences

10.2.1. Calibration Ranges:

10.2.1.1 Herbicides are calibrated using a five-point calibration range. Standards are prepared as detailed in Section 7.3 and analyzed under the instrumental conditions detailed in Section 10.1 as appropriate for total or TCLP herbicide analysis.

10.2.1.2 A calibration factor, defined as the ratio of the response to the amount injected, is calculated for each analyte at each standard concentration. The average calibration factor (if the %RSD across the five-point range is <20%) or a linear calibration not through the origin (if the correlation coefficient (r1) is $\geq$ 0.99) is used for quantitation. Calibration is

checked every 12 hours or after every ten (10) samples, whichever comes first, by injection a calibration check standard.

10.2.1.3 Generating a calibration table: After the five calibration standards have been run, the data files are copied over to the Chrom data system. A new Chrom batch is created and the method file from the previous Chrom batch is copied to the new Chrom batch.

10.2.1.4 The data files representing the five levels of calibration are also copied to the new Chrom batch and processed with the method file. The integration of the five levels is checked for consistency in Chrom Review.

10.2.1.5 Linear Calibration. Check the percent relative standard deviation (% RSD) of the calibration factors for each individual analyte. If the % RSD is less than 20% over its working range, the linearity of the range is assumed. The average value of the calibration factors is used for quantitation of all the samples and continuing standards.

10.2.1.6 Linear Calibration Using Least Squares Regression. If the % RSD is >20% for any given compound, a first order linear regression can be applied to the data to calculate the calibration curve and determine sample concentration. If this method is employed, the r^1 (Correlation Coefficient) value must be $\geq$ 0.99 for the calibration to be acceptable.

10.2.1.7 Since the calibration is performed using standards made from methyl ester compounds (compounds not esterified by application of this method), then the calculation of free acid herbicide concentrations must include a correction for the molecular weight of the methyl ester versus the acid herbicide (see Attachment 1).

10.2.2. Calibration Check Standards:

10.2.2.1. **Initial Calibration Verification** (ICV) is analyzed and evaluated immediately after the initial calibration range as detailed in Sections 7.3 (standard prep) and 9.2 (instrument QC).

10.2.2.2. **Continuing Calibration Verification** (CCV): is analyzed and analyzed after each 10 sample injections as further detailed in Sections 7.3 (standard prep) and 9.2 (instrument QC). The CCV is also analyzed at the end of each analytical sequence as a closing calibration check standard.

10.2.2.3. Note that samples are always quantified against the average calibration factor from the initial calibration range (or from the initial calibration curve). Calibration check standards serve only

to confirm the validity of the initial calibration range and are never used to quantify sample concentrations.

Calibration Controls	Sequence	Control Limit
Calibration Standards	5-point (minimum) linearity	≤20% RSD
Cont. Cal. Verif. (CCV)	Prior to / after every 10 injections	Prior to/after every 10 injections
RT Windows (RTW)	Init. CCV determines midpt. of RTW	±3X SD

10.2.3. Idealized Analytical Sequence

10.2.3.1. Analysis Sequence: The automation of the GC runs is accomplished via the "SEQUENCE" macro of the Chemstation.

10.2.3.2. The Sequence File: The sequence file contains the name of Method file corresponding to the type of analysis to be performed, the range of samples to be run, and the number of injections per bottle

10.2.3.3. It is common practice to evaluate the instrument status, and then complete the Sample Table and Sequence File. If everything else is complete, the run is initiated using the START SEQUENCE soft-key of the SEQUENCE macro.

10.2.3.4. An idealized analytical sequence is presented below:

Ideal Analysis Sequence*
Instrument Blank (solvent injection)
Initial Calibration Range Standards (5)
ICV
CCV
Method Blanks and LCS
Client Samples (10)
CCV
Client Samples (10)
CCV*

*After the analysis of ten sample injections or 12 hours of analysis, a CCV must be successfully analyzed.

10.3. Documentation

10.3.1. After samples have been run, each standard and sample must be entered into the Instrument Run Log. The Instrument Run Log should contain the following information: run date, data file name, vial position, sample number, initial volume/weight, final volume, dilution factor, method, job

number, QC Batch number, extraction date, lab prep batch, Chrom batch, signature of analyst at the bottom of each page, lot numbers for standards used, and result of run (e.g., 'O.K'., 're-run at dilution', 'non-inject', etc.).

10.4. Dual Column Approach

10.4.1. The laboratory designates the rear column as the primary column and the front column as the secondary column. If the difference between the dual columns results in ≤40% RPD report the higher concentration.

10.4.2. The values are calculated from the chromatographic peaks that fall within the daily retention time windows established from the most recent preceding calibration verification.

10.4.3. If the calculated values are greater than 40% RPD of each other, report the lower concentration regardless of whether that result is from the primary or secondary column. Report the result with a flag of P.

10.4.4. If the surrogates on one column are very different (>40% RPD) compared to the other column, this may be indicative of a bad injection or column blockage. The sample should be reanalyzed. If similar results are obtained following reanalysis, report the lower of the two numbers and describe the circumstances in the job summary and report case narrative.

10.4.5. If one of the columns fails CCV criteria (but the CCV is between 15%-40% greater than expected value), the sample results shall be reported from the compliant column. If the falls outside of acceptance criteria on the low side, reanalysis shall be performed.

10.4.6. If the CCV on one of the columns is more than 40% different from the correct value, it can be assumed that there has been significant drift on that column. The sample shall be reanalyzed against an acceptable calibration.

10.4.6.1 An exception to this requirement would be if the CCV recovery on one column fails on the high side and >40% RPD but the associated samples were non-detect for all target analytes on both columns. In this case the non-detect results may be reported from the compliant column.

10.4.7 In summary, the flow chart in Attachment 3 presents a recommended rational approach to selecting the better number to report for dual column data. It shall be noted that these recommendations may be overridden by project specific requirements and that they cannot cover all eventualities. The complexity of some data set will require the final decision to be made utilizing the judgment of experienced analysts. In some cases further cleanup steps to remove interferences may be appropriate.

10.5. Data Processing

10.5.1. Process all samples, QC samples, and blanks using Chrom. Evaluate the QC samples (Method Blank, MS/MSD, and LCS) against the criteria detailed in Section 9.1. Take corrective action as detailed in that section.

10.5.2. Evaluate chromatograms for carryover and cross-contamination. Any samples suspected of having carryover must be re-prepped and re-analyzed. To make sure there is no carryover, reagent water is injected before the re-prepped sample.

10.5.3. Any compound concentration that exceeds the concentration of the calibration range must be diluted and re-analyzed.

10.5.4. The reporting limit is based on the concentration of the lowest standard in the initial calibration, adjusted for the sample wt/vol, final volume, dilution factor and %moisture (No unqualified analytical results or non detects may be reported which correspond to an extract concentration less than the lowest standard in the calibration range).

11.0. Calculations / Data Reduction

11.1. Accuracy:

$$\text{ICV / CCV, LCS \% Recovery} = \frac{\text{observed concentration}}{\text{known concentration}} \times 100$$

$$\text{MS \% Recovery} = \frac{\text{(spiked sample) - (unspiked sample)}}{\text{spiked concentration}} \times 100$$

11.2. Precision (RPD):

$$\text{Matrix Duplicate (MD)} = \frac{|\text{orig. sample value - dup. sample value}|}{[(\text{orig. sample value + dup. sample value})/2]} \times 100$$

11.3. $$\text{Concentration = mg/kg or L} = \frac{C \times V \times D}{W}$$

Where:
C = sample concentration in extract (ppm)
V = Volume of extract (mL)
D = Dilution Factor

W = Weight/Volume of sample aliquot extracted (grams or mLs)

NOTE: All dry weight corrections are made in LIMS at the time the final report is prepared

11.4. Relative Standard Error (RSE)

$$\%\,RSE = 100\% \times \sqrt{\frac{\sum_{i=1}^{N}\left[\frac{C_i - PC_i}{C_i}\right]^2}{(N-P)}}$$

Where:

N = Number of points in the curve
P = Number of parameters in the curve (= 1 for average response factor, 2 for linear, 3 for quadratic)
CI = True concentration for level i
PCi = Predicted concentration for level i

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12.0. Method Performance

12.1. Method Detection Limit Study (MDL)

The method detection limit (MDL) is the lowest concentration that can be detected for a given analytical method and sample matrix with 99% confidence that the analyte is present. The MDL is determined according to the laboratory's MDL procedure in Section 20 (Test Methods and Method Validation) of Eurofins Edison's Quality Assurance Manual (ED-QA-LQM). MDLs reflect a calculated (statistical) value determined under ideal laboratory conditions in a clean matrix, and may not be achievable in all environmental matrices. The laboratory maintains MDL studies for analyses performed; these are verified at least annually unless method requirements require a greater frequency.

12.2. Lower Limit of Quantitation (LLOQ) (aka Reporting Limit) Verification:

The LLOQ is the lowest concentration at which the laboratory has demonstrated target analytes can be reliably measured and reported with a certain degree of confidence, which must be ≥ the lowest point in the calibration curve. The lab verifies the LLOQ annually to demonstrate the capability of quantiation at lower analyte concentrations. The verification is performed by the extraction and analysis of an MDL spike at a concentration of 0.5-2 times the established LLOQ. Recovery of target analytes in the LLOQ verification should be within established in-house limits or within other such project-specific acceptance limits to demonstrate acceptable method performance at the LLOQ. Until the laboratory has sufficient data to determine acceptance limits, the LCS criteria ± 20% (i.e., lower limit minus 20% and upper limit plus 20%) will be used for the LLOQ acceptance criteria. The annual LLOQ verification is completed and documented with the required annual MDL evaluation.

12.3. Demonstration of Capabilities

For DOC procedure refer to Section 19 in the most current revision of Eurofins Edison's Quality Assurance Manual (ED-QA-LQM).

12.4. Training Requirements

Refer to Eurofins Edison SOP No. ED-GEN-022, Training, for the laboratory's training program.

13.0. Pollution Control

13.1. Pollution prevention encompasses any technique that reduces or eliminates the quantity or toxicity of waste at the point of generation. Numerous opportunities for pollution prevention exist in laboratory operation. The USEPA has established a prevention hierarchy of environmental management techniques that places pollution prevention as the management option of first choice. Whenever feasible, laboratory personnel should use pollution prevention techniques to address their waste generation. When wastes cannot be feasibly reduced at the source, the agency recommends recycling as the next best option.

13.2. The quantity of chemical purchased should be based on expected usage during its shelf life and disposal cost of unused material. Actual reagent preparation volumes should reflect anticipated usage

14.0. Waste Management

14.1. The U.S. Environmental Protection Agency requires that laboratory waste management practices conducted be consistent with all applicable rules and regulations. All waste will be disposed of in accordance with Federal, State and Local regulations. Where reasonably feasible, technological changes have been implemented to minimize the potential for pollution of the environment. Employees will abide by this method and the policies in section 13 of the Corporate Safety Manual for "Waste Management and Pollution Prevention."

14.2. The following waste streams are generated as a result of this analysis:

The following waste streams are generated when using this method:

- Auto sampler vials and expired standards: These vials are collected in satellite accumulation within the instrument laboratory. The vials are then placed into a 55 steel open top drum in the waste room. When the drums are full, the drum will be collected by the waste vendor for disposal. This waste is treated for incineration.

  Teris Profile Number: 50016652
  Onyx Profile WIP Number: 282493

- Mixed Solvent Waste: Mixed solvent waste is collected in a small beaker inside the bench top hood. This waste is then transferred into the satellite accumulation container in the Organic Prep. Lab. on a daily basis. This material is transferred into 5 gallon solvent cans as satellite accumulation. These cans are emptied every 24 hours into a steel drum in the

waste room. This drum is kept in the walk in hood until it is full. The full drum is then removed from the hood and placed on secondary containment in the waste room.

Teris Profile Number: 50016624
Onyx Profile WIP Number: 545240

15.0. References / Cross-References

15.1. United States Environmental Protection Agency, "Method 8151A: Organochlorine Herbicides by Gas Chromatography", Test Methods for Evaluating Solid Wastes, SW846 Third Edition, Volume 1B: Laboratory Manual, Physical/Chemical Methods, Revision 3, December 1996.

15.2. Eurofins Edison SOP No. ED-ORP-015, Extraction of Organochlorine Herbicides in Water by SW846 Method 8151A, current revision.

15.3. Eurofins Edison SOP No. ED- ORP-023,Extraction of Organochlorine Herbicides in Soil by SW846 Method 8151A, current revision.

15.4. Eurofins Edison Document No. ED-QA-LQM, Laboratory Quality Manual, current revision.

15.5. Eurofins Corporate Document No. CW-E-M-001, Environmental Health and Safety Manual, current revision.

15.6. Eurofins Corporate Quality SOP No. CA-Q-S-001, Solvent & Acid Lot Testing & Approval, current revision.

15.7. Eurofins Edison SOP No. ED-GEN-023, Bulk Solvent Testing and Approval, current revision.

15.8. Eurofins Edison SOP No. ED-GEN-013, Glassware Cleaning, most current revision

15.9. Eurofins Edison SOP No. ED-GEN-022, Training, current revision.

16.0. Method Modifications:

N/A

17.0. Attachments

Attachment 1: Herbicide Free Acid Conversion Chart

Attachment 2: Retention Time (RT) Windows for Primary Herbicides/Surrogate

Attachment 3: Dual Column Reporting Flowchart

18.0. Revision History

- Revision 12, dated 17 Oct 2022
    - Updated throughout to reflect Eurofins branding.
    - Section 9.2.3.3: Included details of evaluation of initial calibration for Relative Standard Error (RSE).
    - Section 11.4: added formula for calculation of RSE.
    - Section 12.2 added: details the annual LLOQ verification requirement.

- Revision 11, dated 22 March 2021
    - Added Section 10.5.4 which details the establishment of the reporting limit (RL).

- Revision 10, dated 10 December 2020
    - Updated throughout to reflect Eurofins branding.
    - Revised references to Quality Manual section numbers as required

- Revision 9, dated 22 February 2016
    - Revised throughout to correct the spelling of Picloram (4-amino-3,5,6-trichloropicolinic acid).

- Revision 8, dated 12 August 2013
    - Revised throughout to reflect the lab's implementation of the TestAmerica Chrom data system.
    - Deleted Section 7.3.2.1 (Total Herbicide Calibration Standards, 3 Compound Analysis). Renumbered remaining sections accordingly.
    - Deleted Section 7.3.1.1 (Herbicide QC Spiking Standard, 3 Compound Analysis). Renumbered remaining sections accordingly.
    - Deleted Table 4 (Preparation of Total Herbicide Calibration Standards, 3 Compound Analysis). Renumbered remaining tables accordingly.
    - Revised 2,4,5-TP (Silvex) methyl ester concentrations (all levels) and Dalapon (level 3) in Table 4 (formerly Table 5)
    - Revised Pentachlorophenol concentrations (levels 2 and 3) in Table 5 (formerly Table 6)
    - Revised Picloram concentrations (all levels) and 2,4-DCAA methyl ester (level 4) in Table 6 (formerly Table 7)

- Revision 7, dated 15 August 2011
    - Section 7.3.3.4: Corrected weight of neat Picloram from 9 grams to 10 grams
    - Attachment 3: revised to reflect current practice.
    - Revised 'Distribution' footer on Cover Page to reflect current practice.

- Revision 6, dated 28 October 2009

    - Revised SOP format in accordance with TestAmerica Corporate Quality SOP No. CW-QS-002 (Rev 0) Writing a Standard Operating Procedure (SOP).
    - Section 1.1. Added Table 1, *Analytes and Reporting Limits*
    - Section 1.1 Added reference to Quality Assurance Manual for method modifications.
    - Section 1.1: Expanded to include references to applicable prep and cleanup SOPs.
    - Section 3: revised to reference new location for definitions.
    - Section 5: Revised to include most up to date corporate health and safety references and information.
    - Section 7.2.2: Added table detailing components found in the various standards mixes.
    - Section 7.3: Updated the instructions for preparation of standards.
    - Section 7.3: Added tables with calibration standards prep details.
    - Section 8: Updated with additional details including a table outlining containers, preservation and holding times for waters and soils.
    - Section 9.1: Expanded QC sample preparation, analysis, evaluation and corrective action details.
    - Section 9.2: Expanded details of preparation, analysis, evaluation and corrective action for initial and continuing calibration and calibration verifications.
    - Section 10.2.3: added procedures for dual column evaluation.
    - Section 10.4.1: Updated Idealized Analytical Sequence table.
    - References: Expanded to include more specific SOP references
    - Section 18: Added this Revision History section
    - Throughout document: added references to TestAmerica LIMS (TALS).
    - Attachments: Added Attachment 3: Dual Column Reporting Flowchart

Attachment 1

Herbicide Free Acid Conversion Chart

Analyte	Free Acid Molecular Weight	Methyl Ester Molecular Weight
Dalapon	142.97	156.97
2, 4 - D	221.00	235.00
2, 4, 5 - TP (Silvex)	269.50	283.50
2, 4, 5 - T	255.50	269.50
Dinoseb	240.22	254.22
2, 4 - DB	249.09	263.09
Dicamba	221.04	235.04
Dichloroprop	235.05	249.05
Picloram	241.48	255.48
Pentachlorophenol	266.50	280.50
MCPA	200.63	214.63
MCPP	200.63	214.63
DCAA	297.13	311.13

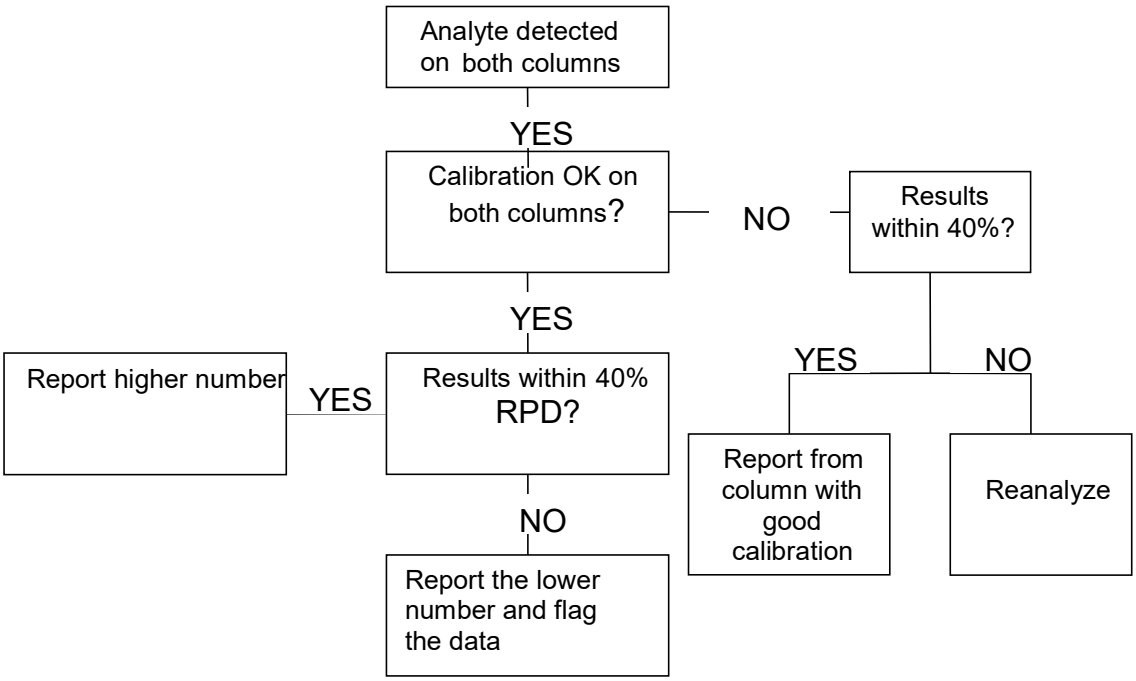
$$[\text{Free Acid}] = \frac{[\text{Methyl Ester}] \times \text{Free Acid Molecular Weight}}{\text{Methyl Ester Molecular Weight}}$$

Attachment 2

Retention Time (RT) Windows For Herbicides/Surrogate

Compound	RT Window (minutes)	
	Total Herbs	TCLP Herbs
2,4-D	*± 0.10*	*± 0.05*
2,4,5-TP (Silvex)	*± 0.10*	*± 0.05*
2,4,5-T	*± 0.10*	*± 0.05*
Dalapon	*± 0.10*	
2,4-DB	*± 0.10*	
Dicamba	*± 0.10*	
2,4-DP (Dichloroprop)	*± 0.10*	
Picloram	*± 0.10*	
Pentachlorophenol	*± 0.10*	
MCPA	*± 0.10*	
MCPP	*± 0.10*	
Picloram	*± 0.10*	
DCAA (surrogate)	*± 0.10*	*± 0.10*

Attachment 3
Dual Column Reporting Flowchart



Title: SW846 Method 8082A, Analysis of Polychlorinated Biphenyls by Gas Chromatography

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Approvals (Signature/Date):

Catalina Dalangin SVOA GC Manager	06/07/2024 Date	Dan Helfrich Health & Safety Manager	06/07/2024 Date
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1.0 Scope and Application

This method is used to quantify specific polychlorinated biphenyls (PCBs) as Aroclors (see Table 1 below) in extracts from aqueous, soil, sludge, leachate, wipe or oil matrices by direct injection dual capillary column gas chromatography using SW846 Method 8082A. An electron capture detector (ECD) is employed for detection.

1.1 Analytes, Matrix(s), and Reporting Limits

The specific analytes determined by this method are identified in Table 1.

Table 1
Polychlorinated Biphenyls

Compound Name	CAS Registry No.
Aroclor 1016	12674-11-2
Aroclor 1221	11104-28-2
Aroclor 1232	11141-16-5
Aroclor 1242	53469-21-9
Aroclor 1248	12672-29-6
Aroclor 1254	11097-69-1
Aroclor 1260	11096-82-5
Aroclor 1262	37324-23-5
Aroclor 1268	11100-14-4

The routine Eurofins Edison reporting limits (RLs) by analyte and matrix are summarized in Table 2 (below).

Table 2
Reporting Limits by Matrix

Parameter	Soil	Soil	Water	Leachate	Oil	Wipe
	Reporting Limits (ug/kg) LOW Level	Reporting Limits (ug/kg) MED Level	Reporting Limits (ug/L)	Reporting Limits (mg/L)	Reporting Limits (ug/kg)	Reporting Limits (ug/wipe)
Aroclor-1016	67	500	0.50	0.0050	1000	0.40
Aroclor-1221	67	500	0.50	0.0050	1000	0.40
Aroclor-1232	67	500	0.50	0.0050	1000	0.40
Aroclor-1242	67	500	0.50	0.0050	1000	0.40
Aroclor-1248	67	500	0.50	0.0050	1000	0.40
Aroclor-1254	67	500	0.50	0.0050	1000	0.40
Aroclor-1260	67	500	0.50	0.0050	1000	0.40
Aroclor-1262	67	500	0.50	0.0050	1000	------
Aroclor-1268	67	500	0.50	0.0050	1000	------

The most current MDLs and RLs for this method can be found in the active Eurofins LIMS (TALS) SW846 8082A Method Limit Group (MLG) database.

1.2 On occasion clients may request modifications to this SOP. These modifications are handled following the procedures outlined in Section 7 (*Review of Work Request*) and Section 19 (*Test Methods and Method Validation)* of Eurofins Edison's Quality Assurance Manual (ED-QA-LQM).

2.0 Summary of Method

2.1. Samples undergo a preparation step prior to analysis by SW846 Method 8082A. A measured volume or weight of sample is extracted using the appropriate matrix-specific sample extraction technique (reference the applicable Organic Sample Prep SOPs listed below). The extract is exchanged into hexane and concentrated to a final volume between 1 and 20 ml depending upon the prep technique used.

2.1.1. Aqueous and leachate samples are extracted at a neutral pH using either SW846 Method 3510C (SOP No. ED-ORP-014: *Extraction of Pesticides and PCBs in Water by Separatory Funnel*) or SW846 Method 3511 (SOP No. ED-ORP-051: *Extraction of Semivolatile Organic Compounds in Water by Microextraction using SW846 Method 3511*)

2.1.2. Wipe samples are extracted using SW846 Method 3550B: Sonication (*SOP No. ED-ORP-018: Extraction of Pesticides/PCBs in Soil Using Low-Level Extraction, SW846 Method 3550B*)

2.1.3. Solid samples are extracted using SW846 Method 3546 (*SOP No. ED-ORP-0044: Procedure for the Microwave Extraction of Solids,SW846 Method 3546*).

2.1.4. Organic liquids are prepared using SW846 Method 3580A (*SOP No. ED-ORP-019: Waste Dilution for Pesticides and PCBs, SW846 Method 3580A*).

2.1.5. Extract cleanup steps are employed as need depending on the nature of the matrix interferences encountered. Suggested cleanups include SW846 Method 3620B (*SOP No. ED-ORP-020: Florisil Cleanup for Pesticide/PCB Sample Extracts*), SW846 Method 3660B (*SOP No. ED-ORP-021: The Removal of Elemental Sulfur from Pesticide/PCB Sample Extracts*) and SW846 Method 3665A (*SOP No. ED-ORP-022, Sulfuric Acid Cleanup for PCB Extracts, SW846 Method 3665A*) for heavy organic interferences.

2.2. After cleanup, the extract is analyzed by injecting a known volume of sample into a gas chromatograph equipped with a dual wide-bore fused silica capillary columns and dual electron capture detectors (GC/ECD). The GC is temperature programmed to separate and detect the analytes recovered during the extraction step. Quantitation is accomplished by comparing the area response of each target analyte relative to an internal standard established through a five-point initial calibration (six points for second order regression). Specific calibration and quality control steps are detailed in this SOP and meet the specification of SW846 Method 8082A.

2.3. Samples are analyzed only after all the necessary calibration and QC checks have been performed.

2.4. Acquired data from sample analysis is manually reviewed. Secondary column confirmation of target compounds and quantitation are conducted by the analyst as required.

3.0 Definitions

For a complete list of definitions refer to Appendix 2 in the most current revision of Eurofins Edison's Quality Assurance Manual (ED-QA-LQM).

4.0 Interferences

4.1. Interferences from phthalate esters introduced during sample preparation can pose major difficulties for PCB determinations.

4.1.1. Interferences from phthalate esters can be minimized by avoiding contact with any plastic materials and checking all solvents and reagents for phthalate contamination. Exhaustive cleanup of solvents, reagents and glassware may be required to eliminate background phthalate ester contamination.

4.2. The presence of elemental sulfur will result in broad peaks that interfere with the detection of early-eluting PCBs. Sulfur contamination should be expected with sediment samples. Employ SW846 Method 3660B (*SOP No. ED-ORP-021: The Removal of Elemental Sulfur from Pesticide/PCB Sample Extracts*) for removal of sulfur.

4.3. Co-eluting chlorophenols are eliminated by using SW846 Method 3620B (*SOP No. ED-ORP-020: Florisil Cleanup for Pesticide/PCB Sample Extracts*),

4.4. Interferences from other organic compounds can effectively be removed using a sulfuric acid treatment, SW846 Method 3665A (*SOP No. ED-ORP-022, Sulfuric Acid Cleanup for PCB Extracts, SW846 Method 3665A*). This destructive technique can be employed only when the sample extract is being analyzed solely for PCBs (i.e., it is not to be used prior to analysis for pesticides).

4.5. Compounds extracted from the sample matrix to which the detector will respond, such as single-component chlorinated pesticides, including the DDT analogs (DDT, DDE, and DDD) will cause interference. A standard of the DDT analogs should be injected to determine which of the PCB or Aroclor peaks may be subject to interferences on the analytical columns used. There may be substantial DDT interference with the last major Aroclor 1254 peak in some soil and sediment samples. A System Performance Check (DDT/Endrin) is analyzed daily to assist in evaluation of potential DDT interference with this Aroclor 1254 peak.

5.0 Safety

Employees must abide by the policies and procedures in the Corporate Environmental Health and Safety Manual (CW-E-M-001) and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum

5.1. Specific Safety Concerns or Requirements

The gas chromatograph contains zones that have elevated temperatures. The analyst needs to be aware of the locations of those zones, and must cool them to room temperature prior to working on them.

There are areas of high voltage in the gas chromatograph. Depending on the type of work involved, either turn the power to the instrument off, or disconnect it from its source of power.

5.2. Primary Materials Used

The following is a list of the materials used in this method, which have a serious or significant hazard rating. **Note: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the MSDS for each of the materials listed in the table.** A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the MSDS for each material before using it for the first time or when there are major changes to the MSDS.

Material (1)	Hazards	Exposure Limit (2)	Signs and symptoms of exposure
Acetone	Flammable	1000 ppm-TWA	Inhalation of vapors irritates the respiratory tract. May cause coughing, dizziness, dullness, and headache.
Hexane	Flammable Irritant	500 ppm-TWA	Inhalation of vapors irritates the respiratory tract. Overexposure may cause lightheadedness, nausea, headache, and blurred vision. Vapors may cause irritation to the skin and eyes.
Methylene Chloride	Carcinogen Irritant	25 ppm-TWA 125 ppm-STEL	Causes irritation to respiratory tract. Has a strong narcotic effect with symptoms of mental confusion, light-headedness, fatigue, nausea, vomiting and headache. Causes irritation, redness and pain to the skin and eyes. Prolonged contact can cause burns. Liquid degreases the skin. May be absorbed through skin.

Material (1)	Hazards	Exposure Limit (2)	Signs and symptoms of exposure
Sulfuric Acid	Corrosive Oxidizer Dehydrator Poison Carcinogen	1 Mg/M3-TWA	Inhalation produces damaging effects on the mucous membranes and upper respiratory tract. Symptoms may include irritation of the nose and throat, and labored breathing. Symptoms of redness, pain, and severe burn can occur. Contact can cause blurred vision, redness, pain and severe tissue burns. Can cause blindness.
1 – Always add acid to water to prevent violent reactions.			
2 – Exposure limit refers to the OSHA regulatory exposure limit.			

6.0 Equipment and Supplies

6.1 Gas Chromatograph:

6.1.1 Agilent Technologies (Avondale, PA) model 5890/6890 Gas Chromatograph (GC), equipped for simultaneous quantitation and confirmation columns using two separate detector channels on dual megabore capillary columns that are suitable for the analysis of organochlorine pesticides and PCB's. All operations are as automated as possible with the equipment utilized.

6.1.2 Injection system: Sample injection is accomplished by a single auto injector. The auto injector is serviced by a robot arm that shuttles a single sample between the sample tray and the injector turret.

6.1.2.1 The sample is injected into a split/splitless injection port equipped with electronic pressure control (EPC). The injection port is normally operated in splitless mode during injection. The EPC is operated in the ramp pressure mode.

6.1.3 Liners: The injection port is each fitted with a replaceable, heavy-walled glass double gooseneck liner. The liner contains a plug of silanized glass wool approximately 1 cm in length. The glass wool is positioned in the liner between the double gooseneck. The liner is replaced on a regular maintenance schedule.

6.1.4 Oven and Columns: Temperature programmable gas chromatograph ovens are required, capable of integrated temperature control between 35^{O}C and 350^{O}C.

6.1.4.1 Two dissimilar columns are used for analysis. A Restek StxCLPesticides, 30m x 0.53mm ID x 0.5um film thickness column (or equivalent) is used for sample quantitation. The secondary column is a Restek StxCLPesticides II, 30m x 0.53mm ID x 0.42um film thickness column (or equivalent).

6.1.5 Detectors: Sample detection is by electron capture. The GC is equipped with dual Electron Capture Detectors (ECD), one for each column.

6.1.5.1 Each detector is supplemented with make-up gas to provide sufficient detector flow for maintaining the electron plasma. This is in addition to the gas exiting the column. The make-up gas is fed from a supply other than the injection port.

6.2 Data System:

6.2.1 The data systems consist of Agilent Technologies GC Chemstation Revision A.08.02 and Agilent Technologies Enviroquant Chemstation G1701AA Version A.03.00 upgraded to A.03.02 which is used for acquisition and Eurofins Chrom (chromatography data processing software).

7. Reagents and Standards

7.1. Reagents

7.1.1. Gases: Ultra high purity (99.999%) Hydrogen is used as the carrier and injection port purge gas. It is introduced to the GC at the injection port. Ultra high purity (99.999%) Nitrogen is used as make-up gas. (Alternatively, ultra-high purity Helium with P-5 make-up gas may be used). Make-up gas is introduced to the GC via the make-up gas adapter at the end of the capillary column. Gases are supplied at tank pressures of 2000-2400 psig for a 300 cft tank. The tank pressure is regulated to an outlet pressure of 70 psig. Each tank is used until the tank pressure drops to less than 500 psig.

7.1.1.1. The gas streams are polished using three traps or filters before introduction to the G.C. The traps are as follows:

- Hydrocarbon trap
- H_2O (moisture) trap
- O_2 scrubber

7.1.1.2. Both the moisture trap and the Oxygen scrubber are of the indicating type. They require either replacement or reconditioning upon color change of the active agents. Refer to the instructions for the individual traps to determine if it is still active. The hydrocarbon trap is a simple activated carbon trap. With high quality gas, it should last for an extended period of time (1-yr. minimum).

7.1.2. Solvents used in the extraction, clean up procedures and dilutions include Hexane, Methylene Chloride, and Acetone that are exchanged to Hexane prior to analysis. All solvents must be pesticide quality or equivalent. Each lot of solvent is screened for contaminants before being used for analysis.

7.2. Standards

7.2.1. Standards are purchased as concentrated solutions. Standard compounds or mixtures for this analysis include an Aroclor 1016/1260 mix, Aroclor

1221, 1232, 1242, 1248, 1254, 1262, 1268 and the surrogate compound Decachlorobiphenyl (DCB) (packaged with the Tetrachloro-m-xylene (TCMX), a surrogate used in pesticide analysis).

NOTE: Two independent sources are used for quantitation standards and spiking standards

7.2.1.1. Most stock solutions are diluted (in volumetric glassware) to working concentration using hexane as the diluent.

7.2.2. Standards mixes and sources: *

Standard Name	Source	Concentration
TCMX/DCB Surrogate Calibration Mix	Restek 32000	200 ug/ml
TCMX/DCB Surrogate Spike Mix	Supelco 861275	10 ug/ml
Aroclor 1016 Calibration Standard	Supelco 48097	1000 ug/ml
Aroclor 1221 Calibration Standard	Restek 32007	1000 ug/ml
Aroclor 1232 Calibration Standard	Restek 32008	1000 ug/ml
Aroclor 1242 Calibration Standard	Restek 32009	1000 ug/ml
Aroclor 1248 Calibration Standard	Restek 32010	1000 ug/ml
Aroclor 1254 Calibration Standard	Restek 32011	1000 ug/ml
Aroclor 1260 Calibration Standard		1000 ug/ml
Aroclor 1262 Calibration Standard	Restek 32409	1000 ug/ml
Aroclor 1268 Calibration Standard	Restek 32410	1000 ug/ml
Aroclor 1660 Mix (Arolcors 1016 & 1260)	Restek 32039	1000 ug/ml
Aroclor 1016/1260 Calibration Standard (Second Source)	Restek 32039.sec	1000 ug/ml
1-Bromo-2-nitrobenzene (internal standard)	Restek 32279	1000 ug/ml

*Suppliers with equivalent standards may be used.

7.2.3. Aroclor 1016/1260 & Surrogate Calibration Standard Solution Preparation

Five levels of calibration standards are prepared using the above referenced Aroclor 1660 Mix (Restek – 23039) and TCMX/DCB Surrogate Calibration standard mix (Restek 32000). They are prepared as follows:

Final Concentration of Aroclor 1016/1260 (Concentration of DCB)	Volume (ul) of Aroclor 1660 Mix (1000 ug/ml)	Volume (ul) of TCMX/DCB Surrogate Calibration Mix (200 ug/ml)	Final Volume in hexane (ml)
50 ppb (25 ppb DCB) (1)	5	6.25	100
500 ppb (50 ppb DCB)	50	25	100
1000 ppb (100 ppb DCB)	1000	500	1000
1500 ppb (150 ppb DCB)	150	75	100
2500 ppb (200 ppb DCB)	250	100	100

(1): The low level Aroclor 1016/1260 standard is 50 ppb and 12.5 ppb for the surrogate DCB (prepare by making a 2x dilution of the 100 ppb standard in hexane).

7.2.4. Surrogate Spiking Solution (soil and water)

A TCMX/DCB Surrogate Spike Mix is prepared by diluting 10 ml of Restek 32000 (see Table 1 above) to 200 ml of Acetone. Final solution concentration is 10 ug/ml. For reduced volume LVI preps a secondary dilution of this mix is utilized. This is prepared by diluting 20 ml of the 10 ug/ml solution to 100 ml acetone with a final solution concentration of 2 ug/ml.

7.2.5. Aroclor 1016/1260 Spiking Solution (soil, water and wipe)

An Aroclor 1660 Mix is prepared by diluting 10 ml of Restek 32039 (See Tables 1 and 2 above) to 100 ml acetone. Final solution concentration is 100 ug/ml. For reduced volume LVI preps a secondary dilution of this mix is utilized. This is prepared by diluting 20 ml of the 100 ug/ml solution to 200 ml with a final solution concentration of 20 ug/ml. used spiking soils and waters as received from Supelco without further dilution.

7.2.6. Individual Aroclor Calibration Solutions (1221, 1232, 1242, 1248, 1254, 1262 & 1268)

A 1000 ppb calibration standard is prepared for each remaining Aroclor from the stock standards detailed in Section 7.2.1. 200ul of 1000 ug/ml individual Aroclor solution and 100ul of 200 ug/ml TCMX/DCB is diluted to 200ml with Acetone. The final concentration of surrogates is 100 ppb.

7.2.7. Aroclor 1016/1260 Initial Calibration Verification (ICV) Standard Solution Preparation

A mid-point Aroclor 1016/1260 ICV standard is prepared using the second source Aroclor 1016/1260 Calibration Standard (Restek 32039.sec) detailed in Section 7.2.2. 1000 ul of 1000 ug/ml standard along with 500 ul of 200 ug/ml TCMX/DCB surrogate standard (Restek 32000) is diluted to 1000 ml with acetone for a final ICV concentration of 1 ug/ml (1000 ppb).

7.2.8. PCB Internal Standard Spike Mix (1 ug/ml)

The PCB 1 ug/ml internal standard spike mix is prepared by dilution 500ul of 1000 ug/ml of the 1-Bromo-2-Nitrobenzene standard (Restek 32279) in to 500 ml of Hexane. 20 ul of this solution is added to all standards, QC samples and field sample extracts prior to analysis.

7.2.9. System Performance Solution (3,3-DDT and Endrin at 0.25 ug/ml):
The DDT/Endrin performance solution is prepared by taking 250 ul of 500 ug/ml DDT/Endrin Mix (Supelco Catalog No 48282) and bringing it up to a volume of 500 ml with hexane.

8. Sample Collection, Preservation, Shipment and Storage

Sample container, preservation techniques and holding times may vary and are dependent on sample matrix, method of choice, regulatory compliance, and/or specific contract or client requests. Listed below are the holding times and the references that include preservation requirements.

Matrix	Sample Container	Min. Sample Size	Preservation	Holding Time	Reference
Waters	Amber glass, 250 ml (SW3510), 40 or 60 ml (SW3511)	250 ml (SW3510), 40 or 60 ml (SW3511)	Cool 4 ± 2°C	7 days to extraction; Analyze within 40 days of extraction	SW846
Soils	Glass, 2 or 4 oz	100 g	Cool 4 ± 2°C	14 days to extraction; Analyze within 40 days of extraction	SW846

.

8.1. Extracts must be stored under refrigeration in the dark and analyzed within 40 days of extraction.

8.2. Samples from chlorinated water sources must be treated with sodium thiosulfate (0.008% solution) at the time of collection to remove chlorine. NOTE: containers pre-preserved with sodium thiosulfate must be requested in bottle orders for samples from chlorinated water sources.

9. Quality Control

9.1. **Sample QC** - The following quality control samples are prepared with each batch of samples.

Quality Controls	Frequency	Control Limit
Method Blank (MB)	1 in 20 or fewer samples	< Rpt. Limit
Laboratory Control Sample (LCS)[1]	1 in 20 or fewer samples	Statistical Limits [4]
Matrix Spike (MS)[2]	1 in 20 or fewer samples	Statistical Limits [4]
MS Duplicate (MSD)[2]	1 in 20 or fewer samples	Statistical Limits [4]
Surrogates	every sample[3]	Statistical Limits [4]
Internal Standard	every sample[3]	Response within -50% to +100% of most recent cal standard.

[1] LCS Duplicate (LCD) is performed only when insufficient sample is available for the MS/MSD or when requested by the client/project/contract.
[2] The sample selection for MS/MSD are randomly selected, unless specifically requested by a client….predetermined by the extraction lab.
[3] Analytical and QC samples (MB, LCS, MS/MSD)
[4] Statistical control limits are updated annually and are updated into LIMS.

9.1.1. **Method Blanks** are extracted with each sample batch on each day that samples are extracted. The analytical results for the method blank must fall below the reporting limit for each compound of interest. If a target compound is detected in the blank at a concentration higher than the reporting limit, first the extract is reanalyzed for confirmation. If results are still outside of limits the entire batch of samples extracted with the affected blank must be re-extracted and reanalyzed.

9.1.2. **Laboratory Control Sample (LCS):** A Laboratory Control Sample (LCS) or blank spike must be extracted and analyzed for with each batch of 20 environmental samples. The LCS data is used to assess method performance and serves to determine whether the methodology is in control at the time of preparation and analysis. The recoveries of the LCS must fall within lab generated acceptance criteria. If the LCS recovery results are outside QC limits, the extract is reanalyzed. If upon reanalysis the recoveries remain outside of recovery limits the following evaluations are made:

- If LCS results fall outside the laboratory generated limits with low recoveries (refer to the current TALS Method Limit Group database), the LCS and all associated samples should be re-extracted and re-analyzed.

- If LCS results fall outside the laboratory generated limits with high recoveries (refer to the current TALS Method Limit Group database), the LCS and associated sample results may be reported with an Non-Conformance Memo (NCM) detailing the issue.

9.1.3. **Matrix Spike/Matrix Spike Duplicate (MS/MSD):** A Matrix Spike/Matrix Spike Duplicate (MS/MSD) pair is extracted and analyzed with every batch of 20 environmental samples. MS/MSD recoveries are evaluated against lab generated limits (refer to the current TALS Method Limit Group database). If the MS/MSD recovery limits fall outside of lab limits the LCS recovery is evaluated. If the LCS recoveries meet criteria the data is reported and a Non-Conformance Memo (NCM) is written.

9.1.4. **Surrogate Standards:** All samples, blanks and QC samples are spiked with a 2 component surrogate standard mix containing TCMX & DCB (see Section 7.2). The percent recovery of the DCB surrogate standard is calculated and compared to lab generated limits (refer to the current TALS Method Limit Group database). (Note: the surrogate must pass CCV criteria to be reportable and must be reported from the same column as sample target analyte results). If the DCB recovery is outside of acceptance limits the sample extract is reanalyzed to confirm. If the recoveries are still outside of limits the sample must be re-extracted and reanalyzed or the data flagged as “estimated concentration”.

9.1.5. Internal Standard: The internal standard (1-bromo-2-nitrobenzne) must elute within 30 seconds of and have an area response of 50 to 100% as compared to the most recent preceding calibration standard.

9.2. Instrument QC

9.2.1. Initial Calibration Range and Initial Calibration Verification (ICV)

9.2.1.1. *Initial Calibration Range*: Aroclors 1016/1260 and the surrogate (DCB) are calibrated using a five-point calibration range using a minimum of five (5) peaks per Aroclor. The reporting limit (RL) is equal to the low point of the calibration range. The initial calibration block must include at least one level with Aroclor 1016 analyzed separately for pattern recognition purposes (note: this run does not need to be part of the actual calibration). If the 1016/1260 calibration meets the required average RF criteria all other Aroclors are then calibrated at the anticipated midpoint of the calibration range with a single point calibration using a minimum of five (5) peaks for each Arolcor (minimum of 3 peaks for Aroclor 1221). All peaks selected must be at least 25% the peak height of the largest peak in the Aroclor (except for Aroclor 1268 where the requirement is 10%). The following Aroclors can be analyzed together: 1016/1260, 1221/1254, 1232/1262 and 1242/1268. Standards are prepared following the instructions in Section 7.2.

9.2.1.2. *Initial Calibration Verification (ICV):* An Initial Calibration Verification (ICV) standard is analyzed immediately after the Initial Calibration Range and before any samples are analyzed. The ICV is prepared as detailed in Section 7.2.7 and must be from a source separate from the standards used in the Initial Calibration Range.

9.2.2. Continuing Calibration Verification (CCV): A mid-point Continuing Calibration Verification (CCV) standard (typically Aroclors 1016/1260) must be analyzed after every 20 samples at minimum. If the samples being analyzed are being specifically targeted for a different Aroclor, that Aroclor may be analyzed as the CCV instead of 1016/1260. If an Aroclor other than Aroclors 1016/1260 is detected a CCV of the identified Arolcor must be analyzed within 12 hours of the sample. If that CCV does not meet criteria the sample must be reanalyzed under an acceptable CCV using the detected Arolcor. The response factors for the CCV must be within +/- 20 % of the initial calibration RF.

9.2.3. Calibration Acceptance Summary

9.2.3.1. Retention Time Windows: Retention time (RT) windows must be determined for all analytes.

9.2.3.1.1 Initial determination of RT windows.

9.2.4.1.1.1. The center of the retention time (RT) window shall be updated based on the middle level in the initial calibration of the first CCV in the daily sequence, whichever is most recent.

9.2.3.1. **Initial Calibration Range**. The internal standard calibration technique is employed for this method. The response factor (defined as the ratio of the area to the standard concentration) is calculated for each characteristic peak in the Aroclor 1016/1260 standard at each calibration concentration. The percent relative standard deviation (% RSD) of the response factors for each individual peak in the Aroclor 1016/1260 mix on each column is then determined (both columns must pass calibration criteria).

9.2.3.1.1. Calculate the percent Relative Standard Deviation of the response factors for each compound at each level:

% RSD = (RF Standard Deviation/RF Mean) X 100

RF = Response Factor

9.2.3.1.2. Linear Calibration: If the % RSD is less than 20% over its working range for at least five peaks in the Aroclor 1016/1260 mix, the linearity of the range is assumed for all Aroclors over the same analytical range. Each individual peak's response factor is used for quantitation of all the samples and verification standards. The average of the value calculated for each individual peak is used to report the concentration in the samples.

9.2.3.1.3. Linear Calibration Using Least Squares Regression: If the % RSD is >20% for any given compound, a first order linear regression can be applied to the data to calculate the calibration curve and determine sample concentration. If this method is employed, the r squared value must be > 0.99 for the calibration to be acceptable

9.2.3.1.4. **Relative Standard Error:** The percent relative standard error (% RSE) from the calibration curve is used to evaluate the initial calibration. This provides a measure of how much error is associated with using the calibration curve for quantitation. The average Relative Standard Error (RSD for average response factors) of the calibration points from the curve used must be ≤ 20%.

Some data systems will not measure the %RSE from a linear or quadratic fit. For the linear case, the correlation coefficient may be used as an alternative to the %RSE, and must be greater than or equal to 0.990. For the

quadratic case the Coefficient of Determination may be used, and must be greater or equal to 0.990.

Note: The Relative Standard Error (RSE) is superior to the Correlation Coefficient (*r*) and Coefficient of Determination (r_2) for testing the fit of a set of calibration points to a line. The lower points on a curve have little effect on *r.* As a result, a curve may have a very good correlation coefficient (>0.990) while also having > 100% error at the low point

9.2.3.2. Initial Calibration Verification (ICV):

9.2.3.2.1. After the initial calibration range has been analyzed, an Initial Calibration Verification standard is analyzed on each column to verify the validity of the initial calibration range. The ICV standard must be from a standard lot independent of the standards used in the initial calibration range. The verification standard for PCBs is the mid-range Aroclor 1016/1260 standard at 1000ppb. (See Section 7.2.7 for details on the preparation of the ICV).

9.2.3.2.2. At least five characteristic peaks of each Aroclor 1016/1260 plus surrogates in the ICV must be checked to verify the Initial Calibration Verification. The calculated concentration of the ICV must be within ±20%D of the expected concentration. Should the %D exceed 20%, the analyst should take corrective action (check standard solution, perform instrument maintenance, etc.) and re-inject the ICV. If the %D still exceeds 20% after a single ICV reinjection, a new Initial Calibration Range must be analyzed.

9.2.3.3. Continuing Calibration Verification (CCV) and System Performance Check:

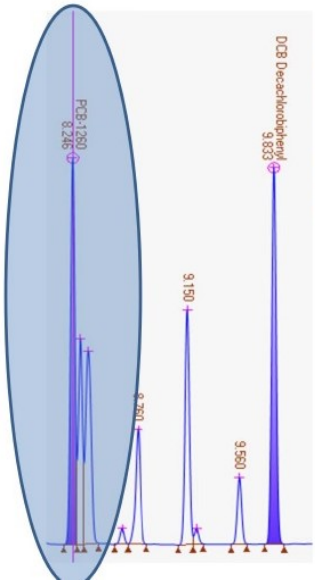
9.2.3.3.1. On each day of analysis the System Performance Check (see Section 7.2.9) is analyzed to assist in the evaluation of possible DDT interferences with the last major peak in Aroclor 1254.

9.2.3.3.2. A mid-point Continuing Calibration Verification (CCV) standard (typically Aroclors 1016/1260) must be analyzed after every 20 samples at minimum. If the samples being analyzed are being specifically targeted for a different Aroclor, that Aroclor may be analyzed as the CCV instead of 1016/1260.

9.2.3.3.3. If there are Aroclor hits in the associated samples then the calculated concentration of the CCV must be within

±20%D of the expected concentration on both columns. If there are no Aroclor hits in the associated samples one column may exceed the ±20%D criteria on the hight side (alternatively a low level Aroclor 1016/1260 standard may be analyzed to demonstrate adequate sensitivity. Should the foregoing criteria not be met the analyst must take corrective action (check standard solution, perform instrument maintenance, etc.) and re-inject the CCV. If the %D still exceeds 20% after a single CCV reinjection, a new Initial Calibration Range must be analyzed. The surrogate (DCB) must also meet CCV criteria on both columns.

9.2.3.3.4. Resolution (Aroclor 1260): The CCV level Aroclor 1016/1260 standard must meet the following resolution critieria: Resolution (degree of overlap) for the triplet towards the end of the 1260 chromatogram must be <75% on <u>one</u> of the two columns used. The resolution requirement must be met for peak 1/2 and peak 2/3:



The circled triplet of peaks is observed towards the end of the 1260 pattern on columns such as CLP 1. Minimum resolution (degree of overlap) requirement between peak 1 / 2 and peak 2 / 3 is <75%. This chromatogram shows overlap of about 50% between peak 2 and 3, and 30% between peak 1 and 2.

Resolution (degree of overlap) is calculated as

[Height of the valley / (Sum of the two peak heights / 2)] x 100%

The acceptance criteria for the Initial Calibration Range, the ICV and the CCV are detailed in the table below.

Step	Standards	Type	Control Limit	Frequency
Method # 8082A				
Initial Calibration Range	50, 500, 1000, 1500 and 2500 ppb for Aroclor 1016/1260, 1000 ppb for all remaining Aroclors	*Average response factor or 1st order linear regression*	*For average RF: <20%RSD all analytes. For linear regression: r^2 ≥0.990*	*Initially and as required when ICV or CCV do not meet requirements*
ICV	*1000 ppb*	*Average*	*± 20%D*	*Once after each initial calibration*
CCV	*1000 ppb*	*Average*	*± 20%D (see Section 9.2.3.4.2 for exceptions); Acceptable Resolution*	*Every 20 samples*
System Performance Standard			*For evaluation of DDT intereference with Ar1254*	*Once daily*

10. Procedure

10.1. Gas Chromatograph (GC) Operation

10.1.1. The sequence of events for GC analysis involves many steps. First the injection system and column performance and calibration must be verified. Maintenance operations are performed as needed. Then samples must be run on the instrument. Chromatograms and reports must be evaluated for content, integration and concentration. Re-runs and dilutions must be made based on the calibrations that were in effect at the time the sample was run. Lastly, a detailed analysis and calculations must be performed to determine the concentration of all the parameters for which the sample was analyzed.

10.1.2. General Instrument Operating Conditions:

10.1.2.1. **Injection System**: A splitless injection port with electronic pressure control (EPC) is used. Seventy-five seconds after sample injection, the purge valve is turned on to facilitate the sweeping of any remaining residual solvent/sample from the injection port.

10.1.2.2. The EPC is used in the pressure Ramp mode. The ramp pressure program is as follows:

Initial Pressure	InitialTime	Rate	Final Pressure	Hold
25 psi	0.50 min	20psi/min	15 psi	2.00 min
		8 psi/min	12 psi	6.60 min
		10.0 min	16 psi	2.00 min

10.1.2.3. For PCB analysis the normal operating conditions of the injection port are as follows:

Injection Temperature:	250ºC
Injection Port Pressure: Column flow:	25ml/min 33.2 ml/minute
Split vent flow:	60.0 ml/minute
Purge vent flow:	1.2 ml/minute
EPC:	Ramp pressure mode

10.1.2.4. In addition to the EPC, the injection port is also equipped with a siltek-coated glass double goose neck liner that contains a 1 cm glass wool plug. This liner/glass wool combination provides many functions.

10.1.2.5. The glass wool serves as a heat sink rapidly vaporizing solvent and samples resulting in higher response factors. The liner also protects the column head from accumulation of high boiling residuals and particulates.

10.1.2.6. Regular maintenance is performed on the injection port. When the glass wool/liner is changed, the septa also must be changed. Injection port, oven and detector temperatures are lowered to ambient prior to "cracking" the system. This is so as to introduce a minimum of damaging oxygen molecules into the system.

10.1.2.6.1. After the system has cooled, the old liner is removed. The injection port should be checked for particulate residues and cleaned as needed. A flashlight is usually required for this. After a new liner has been prepared it is placed into the injection port. A graphite seal is placed around the liner. The edges of the seal must be flat, not knife-edged, and free of nicks or burrs. If any of these conditions are not met, the graphite seal must be replaced as well. The graphite seal is critical to proper operation of the injection port. If in doubt, replace it.

10.1.2.6.2. The locking ring on the top of the injection port should be turned, with the wrench, about 1/8 turn past finger tight. The septum nut should never be tightened more than finger tight. After the injection port is reassembled, all column nuts inside the oven should be checked for leaks using Snoop (Supelco) or another suitable leak tester.

10.1.2.6.3. The septa should be changed each time the injection port is opened. Another routine maintenance operation

to improve column performance is the removal of the first 3 cm of the column.

10.1.2.6.4. Once the signal from both detectors has stabilized, it is time to re-heat the zones. The zones should be heated in the order of detectors, oven and then injectors. This is to ensure that volatilized contaminants do not condense on the column or detector.

10.1.2.7. Oven: With the megabore columns installed, temperature programming is employed to achieve higher resolution of compounds and shorter run times than could be accomplished using isothermal methods.

10.1.2.7.1. The oven program and pressure ramping for PCB analysis is employed for all columns as follows:

Initial Temp	Hold Time 1	Rate1	Temp1
164°C	0.0min	12°/min	234°C
Hold Time2	**Rate2**	**FinalTemp**	**FinalTime**
2.4 min	40°/min	325°C	1.5min

10.1.2.8. If the detectors are particularly contaminated, they must be sent to Agilent Technologies in Avondale, Pennsylvania for reconditioning. This should occur if the detector baseline is greater than 100 Hz. Detector reconditioning should be required at a maximum of biannually.

10.1.2.9. Chemstation: The Chemstation is utilized for automation of runs and acquisition. The system is dedicated to a single GC and does not multitask. Therefore, data manipulation cannot be done while sample analysis is in progress. The data system acquires and stores all chromatographic data.

10.1.2.10. Eurofins Chrom data processing software is used for the processing of the chromatography data files. Calibrations, verification standards and samples are processed and reviewed using this database. Chrom is integral to Eurofins LIMS (TALS) which is used to generate all reports.

10.2. Analytical Sequence

10.2.1. The instrument operating conditions should be set as detailed in Section 10.1.

10.2.2. Once instruments conditions have been established, the Initial Calibration Range, calibration verifications and retention time windows must be established Section 9.2.

10.2.3. The analytical sequence is established via the "SEQUENCE" macro of the Chemstation data system. The sequence file contains the name of Method file corresponding to the type of analysis to be performed, the range of samples to be run, and the number of injections per bottle. It is common practice to run the calibration and/or calibration verification standards, evaluate the instrument status, and, finally, (if all meet criteria) complete the Sample Table and Sequence File. If everything else is complete, the run is initiated using the START SEQUENCE soft-key of the SEQUENCE macro

10.2.4. An idealized analytical sequence including an Initial Calibration Range is presented in the table below.

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Idealized Analytical Sequence with Initial Calibration Range	
Injection Number	**Identification**
1	Hexane
2	Instrument Blank
3	Aroclor-1660 Level 1 Cal Std (50 ppb)
4	Aroclor-1660 Level 2 Cal Std (500 ppb)
5	Aroclor-1660 Level 3 Cal Std (1000ppb)
6	Aroclor-1660 Level 4 Cal Std (1500 ppb)
7	Aroclor-1660 Level 5 Cal Std (2500 ppb)
8	Aroclor-1221 Level 3 Cal Std (1000 ppb)
9	Aroclor-1232 Level 3 Cal Std (1000 ppb)
10	Aroclor-1242 Level 3 Cal Std (1000 ppb)
11	Aroclor-1248 Level 3 Cal Std (1000 ppb)
12	Aroclor-1254 Level 3 Cal Std (1000 ppb)
13	Aroclor-1262 Level 3 Cal Std (1000 ppb)
14	Aroclor-1268 Level 3 Cal Std (1000 ppb)
15	Initial Calibration Verification (Aroclor 1660)
16	Hexane
17	Continuing Calibration Verification (Aroclor1660)
18 thru 37	Client samples and QC Samples (MS/MSD, LCS, Method Blank)
19	Continuing Calibration Verification (Aroclor1660) (*every 20 samples*)

10.2.5. After each 20 samples a CCV standard mix must be analyzed. If this standard fails the criteria listed in Section 9.2.3.4, all samples analyzed during the previous period must be re-analyzed with a passing CCV.

10.2.6. PCB Data Reporting: The Chrom data system calculates the concentrations of the selected Aroclor Peaks. The reporting limit is based

on the concentration of the lowest standard in the initial calibration, adjusted for the sample wt/vol, final volume, dilution factor and % moisture (No unqualified analytical results or non detects may be reported which correspond to an extract concentration less than the lowest standard in the calibration range).

10.2.7.1. The quantitative values for all confirmed analytes must agree within 40% between the primary column and the confirmation column.

10.2.7.2. If the quantitative values do not agree within 40%, the discrepancy must be noted in the report with a qualification

10.3 Dual Column Approach

NOTE: Data generated under the NJDEP DKQP requires the reporting of the higher concentration in all cases unless it can be demonstrated that interfering compounds are the cause of the higher results in which case the lower value can be reported with a narrative explanation. Other programs may also require a dual column reporting approach different than the one described below in which case the lab will report as required by that program.

10.3.1. The laboratory designates the rear column as the primary column and the front column as the secondary column. Results are reported from the primary column unless the difference in concentration between the two columns results in ≥40% RPD in which case the lower concentration is reported (unless the client or program requirements dictate otherwise).

10.3.2. The values are calculated from the chromatographic peaks that fall within the daily retention time windows established from the most recent preceding calibration verification.

10.3.3. If the calculated values are greater than 40% RPD of each other, report the lower concentration regardless of whether that result is from the primary or secondary column. Report the result with a flag of P*.

10.3.4. If the surrogates on one column are very different (>40% RPD) compared to the other column, this may be indicative of a bad injection or columnar blockage. The sample should be reanalyzed. If similar results are obtained following reanalysis, report the lower of the two numbers and describe the circumstances in the job summary and report case narrative.

10.3.5. If one of the columns fails CCV criteria (but the CCV is between 15%-40% greater than expected value), the sample results shall be reported from the compliant column. If the recovery falls outside of acceptance criteria on the low side, reanalysis shall be performed.

10.3.6. If the CCV on one of the columns is more than 40% different from the correct value, it can be assumed that there has been significant drift on that column. The sample shall be reanalyzed against an acceptable calibration.

10.3.6.1. An exception to this requirement would be if the CCV recovery on one column fails on the high side and >40% RPD but the associated samples were non-detect for all target analytes on both columns. In this case the non-detect results may be reported from the compliant column.

10.3.7. In some cases where the sample chromatography is complex and has largely varying peaks concentrations, the chromatographic separation may not be sufficient on the 0.53mm ID columns. In this case a confirmatory analysis on an instrument with 0.32 ID columns may be required. The supplemental data produced using analysis on the 0.32mm ID 'microbore' column may minimize overlapping and baseline interference difficulties, and better resolves potential positive identifications. Use of this alternative chromatographic technique shall be noted in the job summary and report case narrative.

10.3.8. In summary, the flow chart in Attachment 1 presents a recommended approach to selecting the better number to report for dual column data. It shall be noted that these recommendations may be overridden by project specific requirements and that they cannot cover all eventualities. The complexity of some data set will require the final decision to be made utilizing the judgment of experienced analysts. In some cases further cleanup steps to remove interferences may be appropriate.

10.4 Extract Cleanup

10.4.1. Cleanup methods are dictated by the original sample matrix and the parameters being determined.

10.4.2. Cleanup of all water samples, if needed, is performed using Sulfuric Acid Permanganate and/or TBA sulfite. Refer to Eurofins Edison SOP No. ED-ORP-021: *The Removal of Elemental Sulfur from Pesticide/PCB Sample Extracts, SW846 Method 3660B,* most current revision and Eurofins Edison SOP No. ED-ORP-022: *Sulfuric Acid Cleanup for PCB Extracts, SW846 Method 3665A*, *SW846 Method 3665A,* most current revision. Blanks must also undergo cleanup following the same procedures as samples..

10.4.3. Cleanup of all soil samples is conducted using TBA sulfite and Sulfuric Acid Permanganate. Blanks must also undergo cleanup following the same procedures as samples.

10.4.4. Cleanup using Sulfuric Acid Permanganate effectively destroys the majority of organic material in the sample extract and should be used only when PCB is the only analysis to be performed on the sample extract.

10.5 Documentation

10.5.1 Before the analysis sequence is initiated the GC Performance and Repairs logbook must be filled out. It should contain the following information: date, injector temp, oven temp, detector temp, column A flow, column B flow, signal A, signal B, analysts initials, and notes for any necessary repairs.

10.5.2 After samples have been run, each standard and sample must be entered into the Instrument Run Log. The Instrument Run Log should contain the following information: run date, data file name, vial position, sample number, initial volume/weight, final volume, dilution factor method, job number, QA number, extraction date, lab prep batch, target batch signature of analyst at the bottom of each page, lot numbers for standards used, and result of run (O.K., dilution, non-inject, etc.).

11.0. Calculations / Data Reduction

11.1. Accuracy:

$$\text{ICV / CCV, LCS \% Recovery} = \frac{\text{observed concentration}}{\text{known concentration}} \times 100$$

$$\text{MS \% Recovery} = \frac{\text{(spiked sample) - (unspiked sample)}}{\text{spiked concentration}} \times 100$$

11.2. Precision (RPD):

$$\text{Matrix Duplicate (MD)} = \frac{|\text{orig. sample value - dup. sample value}|}{[(\text{orig. sample value + dup. sample value})/2]} \times 100$$

11.3. Calculation of Sample Amounts (Internal Standard Procedure)

11.3.1 Aqueous Samples

$$\text{Concentration (µg/L)} = \frac{(As)(Cis)(D)}{(Ais)(RF)(Vs)\,(Vi)\,(1000)}$$

Where:

As	=	Area of the target analyte peak in the sample
Cis	=	Concentration of the internal standard (ug/L)
D	=	Dilution factor, if the sample or extract was diluted prior to analysis. If no dilution is performed, D = 1.
Vi	=	Volume of the extract injected (ul)
Ais	=	Area of the internal standard peak
RF	=	Average response factor from the initial calibration.
Vs	=	Volume of sample extracted (ml)

The 1000 in the denominator represents the number of ul in 1 ml.

11.3.2 Solid Samples

$$\text{Concentration (µg/kg)} = \frac{(As)(Cis)(D)(Vt)}{(Ais)(RF)(Ws)\,(Vi)\,(1000)}$$

Where:

As	=	Area of the target analyte peak in the sample
Cis	=	Concentration of the internal standard (ug/L)
D	=	Dilution factor, if the sample or extract was diluted prior to analysis. If no dilution is performed, D = 1.
Vi	=	Volume of the extract injected (ul)
Ais	=	Area of the internal standard peak
RF	=	Average response factor from the initial calibration.
Vt	=	Volume of concentrated extract (ul)
Ws	=	Weight of sample (g)

The 1000 in the denominator represents the number of ul in 1 ml

11.3.3 Wipe Samples

$$\text{Concentration (µg/kg)} = \frac{(As)(Cis)(D)(Vt)}{(Ais)(RF)(W)\,(Vi)\,(1000)}$$

Where:

As	=	Area of the target analyte peak in the sample
Cis	=	Concentration of the internal standard (ug/L)
D	=	Dilution factor, if the sample or extract was diluted prior to analysis. If no dilution is performed, D = 1.
Vi	=	Volume of the extract injected (ul)
Ais	=	Area of the internal standard peak
RF	=	Average response factor from the initial calibration.
Vt	=	Volume of concentrated extract (ul)
W	=	Wipe

The 1000 in the denominator represents the number of ul in 1 ml

11.4 Relative Response Factors

$$RRF = \frac{A_x}{A_{is}} \times \frac{C_{is}}{C_x}$$

Where:

A_x = Area of target analyte peak
Ais = Area of internal standard peak
Cis = Concentration of internal standard
Cx = Concentration of compound in standard

11.5 Percent Relative Standard Deviation (% RSD):

$$\% \text{ RSD} = \frac{\text{Standard Deviation of RRFs}}{\text{Mean RRF}}$$

11.6 Percent Difference (% D):

$$\overline{\% \text{ D}} = \frac{RRF_c - \overline{RRF_i}}{\overline{RRF_i}} \times 100$$

Where: RRFc = RRF from continuing calibration

$\overline{RRF_i}$ = Mean RRF from current initial calibration

11.7 Relative Standard Error (RSE)

$$\%\,RSE = 100\% \times \sqrt{\frac{\sum_{i=1}^{N}\left[\frac{C_i - PC_i}{C_i}\right]^2}{(N-P)}}$$

Where:

N = Number of points in the curve
P = Number of parameters in the curve (= 1 for average response factor, 2 for linear, 3 for quadratic)
CI = True concentration for level i
PCi = Predicted concentration for level i

11.8 Percent Recovery (% R): Surrogates and Spikes

$$\text{Recovery (\%)} = \frac{\text{Concentration (or amount) found}}{\text{Concentration (or amount) added}} \times 100$$

11.9 Dry Weight Correction: All solid samples must be corrected for dry weight using the following formula for dry weight determination

$$DW = \frac{Gd}{Gw} \times 100$$

Where:

DW	=	Percent % Dry Weight
Gd	=	Dry weight of selected sample aliquot
Gw	=	Wet weight of selected sample aliquot

Multiply the DW value times the wet weight of the sample extracted.

NOTE: All dry weight corrections are made in TALS at the time the final report is prepared.

12.0. Method Performance

12.1. Method Detection Limit Study (MDL) The method detection limit (MDL) is the lowest concentration that can be detected for a given analytical method and sample matrix with 99% confidence that the analyte is present. The MDL is determined according to the laboratory's MDL procedure in Section 19 (Test Methods and Method Validation) of Eurofins Edison's Quality Assurance Manual (ED-QA-LQM). MDLs reflect a calculated (statistical) value determined under ideal laboratory conditions in a clean matrix, and may not be achievable in all environmental matrices. The laboratory maintains MDL studies for analyses performed; these are verified at least annually unless method requirements require a greater frequency.

12.2. Lower Limit of Quantitation (LLOQ) (aka Reporting Limit) Verification: The LLOQ is the lowest concentration at which the laboratory has demonstrated target analytes can be reliably measured and reported with a certain degree of confidence, which must be ≥ the lowest point in the calibration curve. The lab verifies the LLOQ annually to demonstrate the capability of quantiation at lower analyte concentrations. The verification is performed by the extraction and analysis of an MDL spike at a concentration of 0.5-2 times the established LLOQ. Recovery of target analytes in the LLOQ verification should be within established in-house limits or within other such project-specific acceptance limits to demonstrate acceptable method performance at the LLOQ. Until the laboratory has sufficient data to determine acceptance limits, the LCS criteria ± 20% (i.e., lower limit minus 20% and upper limit plus 20%) will be used for the LLOQ acceptance criteria. The annual LLOQ verification is completed and documented with the required annual MDL evaluation.

12.3. Demonstration of Capabilities

For DOC procedure refer to Section 19 in the most current revision of Eurofins Edison's Quality Assurance Manual (ED-QA-LQM).

12.4. Training Requirements

Refer to Eurofins SOP No. ED-GEN-022, *Training*, for the laboratory's training program.

13.0. Pollution Control

13.1. Pollution prevention encompasses any technique that reduces or eliminates the quantity or toxicity of waste at the point of generation. Numerous opportunities for pollution prevention exist in laboratory operation. The USEPA has established a prevention hierarchy of environmental management techniques that places pollution prevention as the management option of first choice. Whenever feasible, laboratory personnel should use pollution prevention techniques to address their waste generation. When wastes cannot be feasibly reduced at the source, the agency recommends recycling as the next best option.

13.2. The quantity of chemical purchased should be based on expected usage during its shelf life and disposal cost of unused material. Actual reagent preparation volumes should reflect anticipated usage

14.0. Waste Management

14.1. The U.S. Environmental Protection Agency requires that laboratory waste management practices conducted be consistent with all applicable rules and regulations. All waste will be disposed of in accordance with Federal, State and Local regulations. Where reasonably feasible, technological changes have been implemented to minimize the potential for pollution of the environment. Employees will abide by this method and the policies in section 13 of the Corporate Safety Manual for "Waste Management and Pollution Prevention."

14.2. The following waste streams are generated as a result of this analysis:

- Auto sampler vials and expired standards: These vials are collected in satellite accumulation within the instrument laboratory. The vials are then placed into a 55 steel open top drum in the waste room. When the drums are full, the drum will be collected by the waste vendor for disposal. This waste is treated for incineration.
  Teris Profile Number: 50016652
  Onyx Profile WIP Number: 282493

- Mixed Solvent Waste: Mixed solvent waste is collected in a small beaker inside the bench top hood. This waste is then transferred into the satellite accumulation container in the Organic Prep. Lab. on a daily basis. This material is transferred into 5 gallon solvent cans as satellite accumulation. These cans are emptied every 24 hours into a steel drum in the waste room. This drum is kept in the walk in hood until it is full. The full drum is then

removed from the hood and placed on secondary containment in the waste room.

Teris Profile Number: 50016624
Onyx Profile WIP Number: 545240

- Soil Retain Samples - These samples if not flagged in the system for any hazardous constituents are transferred to poly-lined cubic yard boxes. These boxes when full are sent to stabilization or incineration. These materials are sent out as hazardous for lead and chromium

  Teris Profile Number (incineration): 50016710
  Onyx Profile Number: (stabilization) 402535

15.0. References / Cross-References

15.1. United States Environmental Protection Agency, "Method SW8000C: Determinative Chromatographic Separations,", Test Methods for Evaluating Solid Wastes, SW846, Revision 3, March 2003.

15.2. United States Environmental Protection Agency, "Method 8082A, Organochlorine Pesticide by Gas Chromatography", Test Methods for Evaluating Solid Wastes, SW846 Third Edition, Volume 1B: Laboratory Manual, Physical/Chemical Methods, Revision 1, February 2007.

15.3. Eurofins Edison Document No. ED-QA-LQM, *Laboratory Quality Manual*, most current revision.

15.4. Eurofins Edison SOP No. ED-ORP-014: *Extraction of Pesticides and PCBs in Water by Separatory Funnel, SW846 Method 3510C,* most current revision.

15.5. Eurofins Edison SOP No. ED-ORP-018*: Extraction of Pesticides/PCBs in Soil Using Low-Level Extraction, SW846 Method 3550B,* most current revision.

15.6. Eurofins Edison SOP ED-ORP-044, *Procedure for the Microwave Extraction of Solids, SW846 3546*

15.7. Eurofins Edison SOP No. ED-ORP-019*: Waste Dilution for Pesticides and PCBs, SW846 Method 3580A,* most current revision.

15.8. Eurofins Edison SOP No. ED-ORP-051: *Extraction of Semivolatile Organic Compounds in Water by Microextraction using SW846 Method 3511*

15.9. Eurofins Edison SOP No. ED-ORP-020*: Florisil Cleanup for Pesticide/PCB Sample Extracts*, SW846 Method 3620B, most current revision.

15.10. Eurofins Edison SOP No. ED-ORP-021: *The Removal of Elemental Sulfur from Pesticide/PCB Sample Extracts, SW846 Method 3660B,* most current revision.

15.11. Eurofins Edison SOP No. ED-ORP-022: *Sulfuric Acid Cleanup for PCB Extracts, SW846 Method 3665A*, *SW846 Method 3665A,* most current revision.

15.12. Eurofins Edison SOP No. ED-GEN-022, *Training,* most current revision.

15.13. Eurofins Corporate Work Instruction No. CA-T-WI-003, PCB Minimum Requirements, most current revision.

16.0. Method Modifications:

None

17.0. Attachments

Attachment 1: Dual Column Approach

18.0. Revision History

Revision 8, dated 06/07/2024

- Updated to include SW846 3511 as aqueous prep method.

Revision 7, dated 21 Oct 2022

- Section 4.5 added which details possible DDT and analogs interference with the last major DDT peak.
- Section 7.2.9: Added System Performance Standard (DDT/Endrin) for use in evaluating potential interference of DDT with last major Aroclor 1254 peak.
- Section 9.2.3.3.1: Added requirement to analyze System Performance standard daily for evaluation of DDT interference with Aroclor 1254 quantitation.

Revision 6 dated 17 Oct 2022

- Updated to Eurofins branding, removed TestAmerica references
- Added Section 8.2 to include requirement to treat samples from chlorinated sources with sodium thiosulfate
- Section 9.2.3.1.4: Section 9.2.4.3: Included details of evaluation of initial calibration for Relative Standard Error (RSE).
- Section 11.7: added formula for calculation of RSE.
- Section 12.2 added: details the annual LLOQ verification requirement.

Revision 5 dated 01 Apr 2020

- Updated to Eurofins branding
- Section 7.2.5: added wipe matrix
- Added Section 11.3.3 – calculation for wipe samples

Revision 4 dated 15 Dec 2016

- Section 7.2.8: clarified text to more accurately describe the PCB Internal Standard Mix.

Revision 3 dated 16 May 2016

- Section 2.1: removed SW846 3550 as a prep method for solids and added it as a prep method for wipe samples.
- Section 2.1.1 and 15.0: removed reference to SW846 Method 3520C (SOP No. ED-ORP-003: *Extraction of Semi-Volatile Organic Compounds in Water by Continuous Liquid-Liquid Extraction, SW846 Method 3520C).*
- Section 2.2: expanded to include reference to internal standard calibration.
- Section 7.1.1: revised to clarify that the primary carrier:make-up gas combo is hydrogen and nitrogen.
- Section 7.2.2: added 1-Bromo-2-nitrobenzene (internal standard) to the list of standards (Restek 32279). Components and concentration added to the table
- Added Section 7.2.8 which describes the preparation of the internal standard solution.
- Section 9.1: added internal standard to 'Sample QC' table
- Section 9.1.2: completely re-written to clarify LCS evaluation and corrective action.
- Section 9.1.4: clarified that surrogates must pass CCV criteria in order to be reportable and must be reported from the same column as target analyte results.
- Added Section 9.1.5 which describes acceptance criteria for internal standards (retention time and response)
- Section 9.2.1.1: added following sentence for clarity and compliance with TestAmerica PCB Minimum Requirements document (WI No. CA-T-WI-003): "All other Aroclors are calibrated using a single point calibration up to 8 peaks at the anticipated midpoint of the calibration range if the 1016/1260 calibration meets the required average RF criteria." Added language detailing which Aroclor standards can be analyzed together.
- Section 9.2.1.1: added this sentence: "The initial calibration block must include at least one level with 1016 analyzed separately for pattern recognition purposes (note: this run does not need to be part of the actual calibration)."
- Section 9.2.1.1: clarified that a minimum of five peaks are required for quantitation of each Aroclor (except for Aroclor 1221 which requires a minimum of three peaks). Added requirement that selected peaks must be at least 25% of height of largest peak in Aroclor (except Aroclor 1268 where the requirement is 10%).
- Section 9.2.2: Revised first sentence to read: "A mid-point Continuing Calibration Verification (CCV) standard must be analyzed after every 20 samples at minimum," (i.e., removed the closing CCV requirement and 12 hour requirement).
- Section 9.2.2: clarified that the CCV typically consists of a 1016/1260 standard. Also added the following sentence: "If the samples being analyzed are being

specifically targeted for a different Aroclor, that Aroclor may be analyzed as the CCV instead of 1016/1260."

- Section 9.2.2: added requirement to analyze a CCV for each detected Aroclor within 12 hours of detection.
- Table 2: updated with the expected RT acceptance criteria from Minimum Requirements document (0.03 minutes).
- Section 9.2.3.2: Revised 'External standard' to 'Internal Standard'. Emphasized that both columns must pass calibration criteria.
- Section 9.2.3.2.2: revised to require that 5 peaks must be selected (was 3) and evaluated for initial calibration (per corporate Minimum Requirements).
- Section 9.3.3.3.1: corrected section reference for preparation of ICV (was Section 7.2.9; now Section 7.2.7);
- Section 9.2.3.3.2: revised first sentence to read: "At least five characteristic peaks of each Aroclor 1016/1260 plus surrogates in the ICV must be checked to verify the Initial Calibration Verification." (it had previously required three peaks).
- Section 9.2.4.3.1: updated text reflect corporate Minimum Requirements document.
- Added Section 9.2.3.4.2: more fully describes CCV acceptance criteria and corrective actions. Updated table with calibration criteria.
- Added Section 9.2.3.4.3: details resolution requirements per the corporate Minimum Requirements document.
- Section 10.2.5: revised to remove 12 hour requirement (replaced solely with 20 sample requirement) and bracketing requirement. Corrected section reference for CCV acceptance criteria.
- Section 11: completely re-written to include internal standard result calculations and other required QC calculations.
- Section 15 (References): added following document reference: TestAmerica Corporate Work Instruction No. CA-T-WI-003, PCB Minimum Requirements, most current revision.
- Attachment 1: revised completely.

- Revision 2, dated 08 Jun 2015

  - Section 1.1: Corrected Method Limit Group (MLG) reference to 8082 (was incorrectly listed as 8081B,
  - Table 2: updated RLs for leachates from 0.0050 mg/L to 0.00050 mg/L.
  - Throughout document: updated the default initial volumes for aqueous preps (250 ml) and leachate (TCLP/SPLP/ASTM) preps (250 ml).
  - Throughout document: removed any notes referencing option for 'reduced volume' extractions since this is now standard as defined in SOP.
  - Section 2.2.2: replaced SW846 3541 (Soxtherm) prep with SW846 3546 (Microwave) prep.
  - Section 6.2.1 (and throughout document): replaced Target software references with references to TestAmerica's Chrom chromatography data processing software.
  - Section 7.2.2 and throughout document: updated source of standards from Supelco to Restek.
  - Section 7.2.3 and throughout document revised concentration of low calibration standard to 50 ppb.
  - Section 7.29: updated ICV prep instructions using Restek standards.

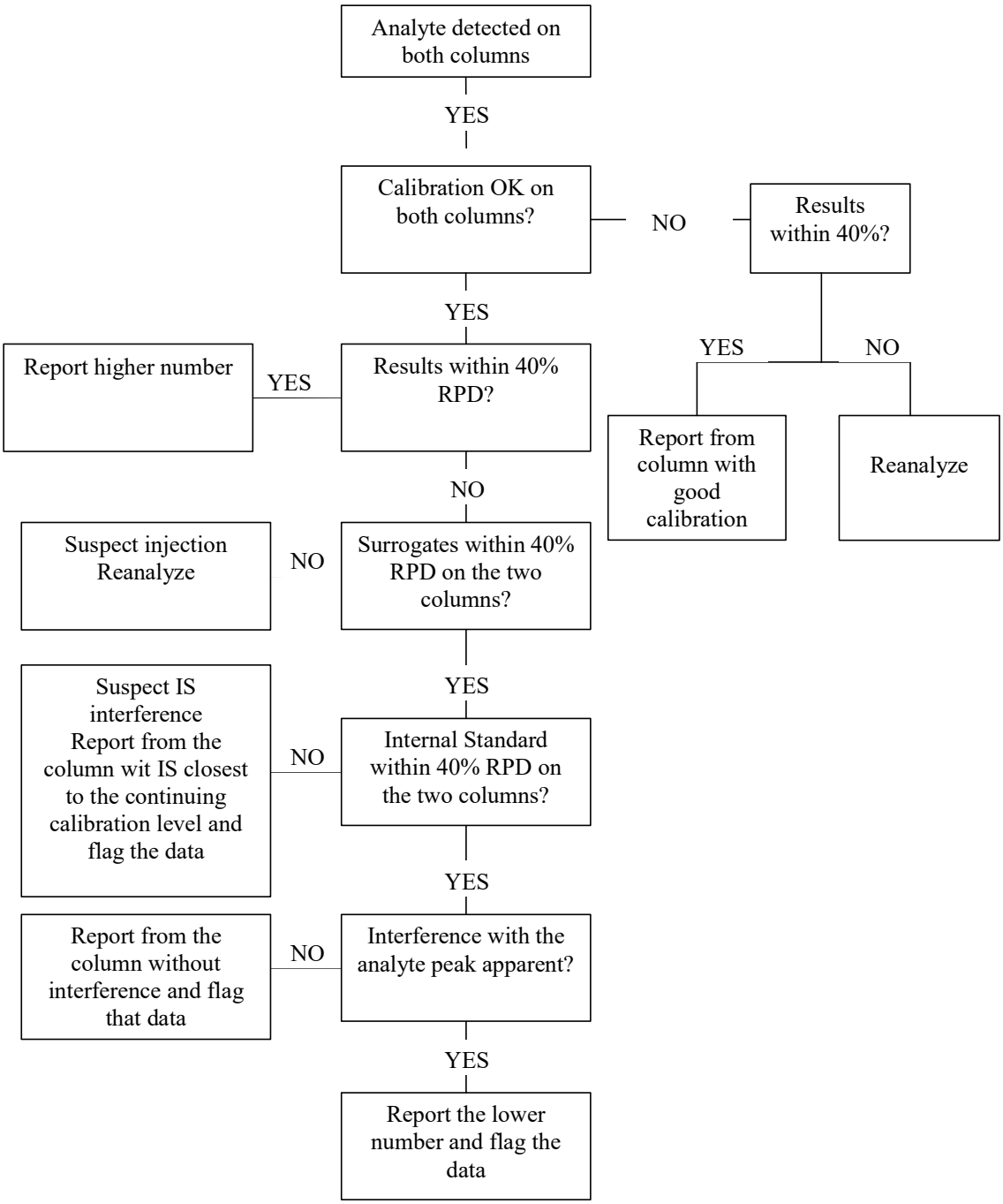
  - Section 8: updated sample container from 1000ml to 250ml; updated minimum sample size to 250ml.
  - Section 10.3: added note explaining NJDEP DKQP requirement to report the higher concentration in all cases.
  - Section 10.3 and Attachment 1: revised to reflect current TestAmerica dual column reporting rules.
  - Section 15: removed outdated references.

- Revision1, dated 11 October 2012

  - Throughout document: Revised LQM section references to reflect the most current LQM revision
  - Revised Table 2 to reflect RLs for reduced initial/final volume prep option.
  - Section 2.1.1: added description of reduced initial volume (125ml)/final volume (1ml) extraction option.
  - Section 2.1.2 and Section 15.0: Added reference to TestAmerica Edison SOP ED-ORP-044, *Procedure for the Microwave Extraction of Solids, SW846 3546.*
  - Section 7.2.3: added procedure for prep and analysis of a lower level Aroclor 1016/1260 standard (50 ppb) and for the surrogate DCB (12.5 ppb) when analyzing samples prepped using the reduced initial/final volume procedure.
  - Section 9.2.3.4.1: Added reference to 50 ppb 1016/1260 ICAL standard for the reduced initial/final volume method.
  - Section 10.2.4: Added 50 ppb 1016/1260 ICAL standard to the sequence for the reduced initial/final volume method

- Revision 0, dated 02/16/2011: NEW

Attachment 1
Dual Column Approach


Analyte detected on both columns
YES
Calibration OK on both columns?
NO
Results within 40%?
YES
NO
YES
Report higher number
YES
Results within 40% RPD?
Report from column with good calibration
Reanalyze
NO
Suspect injection Reanalyze
NO
Surrogates within 40% RPD on the two columns?
YES
Suspect IS interference Report from the column wit IS closest to the continuing calibration level and flag the data
NO
Internal Standard within 40% RPD on the two columns?
YES
Report from the column without interference and flag that data
NO
Interference with the analyte peak apparent?
YES
Report the lower number and flag the data

Title: Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS), SW846 Methods 8270E

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Approvals (Signature/Date):

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Carl Armbruster Quality Assurance Manager	10/18/2022 Date	Mark Acierno Laboratory Director	10/18/2022 Date

Diaa Nimer — 10/18/2022 Date
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1.0 Scope and Application

1.1 Analytes, Matrix(s), and Reporting Limits

USEPA Method 8270E is an analytical method which employs the use of GC/MS to determine the concentration of semivolatile organic compounds in extracts prepared from many types of solid waste matrices, soils, and water samples

Eurofins Edison has the capability to analyze and report the compounds listed in Table 1 via Method 8270E.

Table 1

Compound	CAS No.	Compound	CAS No.
1,1'-Biphenyl	92-52-4	Anthracene **(1)**	120-12-7
1,2,4,5-Tetrachlorobenzene	95-94-3	Atrazine	1912-24-9
1,2,4-Trichlorobenzene	120-82-1	Benzaldehyde	100-52-7
1,2-Dichlorobenzene	95-50-1	Benzidine	92-87-5
1,2-Diphenylhydrazine	122-66-7	Benzo[a]anthracene **(1)**	56-55-3
1,3-Dichlorobenzene	541-73-1	Benzo[a]pyrene **(1)**	50-32-8
1,3-Dimethylnaphthalene	575-41-7	Benzo[b]fluoranthene **(1)**	205-99-2
1,4-Dichlorobenzene	106-46-7	Benzo[g,h,i]perylene **(1)**	191-24-2
1,4-Dichlorobenzene-d4 **(ISTD)**	3855-82-1	Benzo[k]fluoranthene **(1)**	207-08-9
1,4-Dioxane **(1) (2)**	123-91-1	Benzoic acid	65-85-0
1-Methylnaphthalene	90-12-0	Benzyl alcohol	100-51-6
1-Naphthylamine	134-32-7	Bis(2-chloroethoxy)methane	111-91-1
2,2'-oxybis[1-chloropropane]	108-60-1	Bis(2-chloroethyl)ether **(1)**	111-44-4
2,3,4,6-Tetrachlorophenol	58-90-2	Bis(2-ethylhexyl) phthalate	117-81-7
2,3,7,8-TCDD	1746-01-6	Bisphenol-A	80-05-7
2,3-Dihydroindene	496-11-7	Butyl benzyl phthalate	85-68-7
2,3-Dimethylaniline	87-59-2	Caprolactam	105-60-2
2,4,5-Trichlorophenol	95-95-4	Carbamazepine	298-46-4
2,4,5-Trimethylaniline	137-17-7	Carbazole	86-74-8
2,4,6-Tribromophenol **(Surrogate)**	118-79-6	Chrysene **(1)**	218-01-9
2,4,6-Trichlorophenol	88-06-2	Chrysene-d12 **(ISTD)**	1719-03-5
2,4-Dichlorophenol	120-83-2	Coumarin	91-64-5
2,4-Dimethylphenol	105-67-9	Dibenz(a,h)anthracene **(1)**	53-70-3
2,4-Dinitrophenol	51-28-5	Dibenzofuran	132-64-9
2,4-Dinitrotoluene	121-14-2	Diethyl phthalate	84-66-2
2,4-Xylidine	95-68-1	Dimethyl phthalate	131-11-3
2,6-Dinitrotoluene	606-20-2	Di-n-butyl phthalate	84-74-2
2-Chloronaphthalene	91-58-7	Di-n-octyl phthalate	117-84-0
2-Chlorophenol	95-57-8	Fluoranthene **(1)**	206-44-0
2-Ethylaniline	578-54-1	Fluorene **(1)**	86-73-7
2-Fluorobiphenyl **(Surrogate)**	321-60-8	Hexachlorobenzene **(1)**	118-74-1
2-Fluorophenol **(Surrogate)**	367-12-4	Hexachlorobutadiene	87-68-3
2-Methylnaphthalene	91-57-6	Hexachlorocyclopentadiene	77-47-4
2-Methylphenol	95-48-7	Hexachloroethane	67-72-1
2-Naphthylamine	91-59-8	Indeno[1,2,3-cd]pyrene **(1)**	193-39-5
2-Nitroaniline	88-74-4	Isophorone	78-59-1
2-Nitrophenol	88-75-5	n,n'-Dimethylaniline	121-69-7
2-tertbutyl-4-methylphenol	2409-55-4	Naphthalene **(1)**	91-20-3
2-Toluidine	95-53-4	Naphthalene-d8 **(ISTD)**	1146-65-2

Table 1

Compound	CAS No.	Compound	CAS No.
3 & 4 Methylphenol	15831-10-4	n-Decane	124-18-5
3,3'-Dichlorobenzidine	91-94-1	Nitrobenzene	98-95-3
3,4-Dimethylaniline	95-64-7	Nitrobenzene-d5 **(Surrogate)**	4165-60-0
3,5-di-tert-butyl-4-hydroxytol	128-37-0	N-Nitrosodimethylamine **(1)**	62-75-9
3-Nitroaniline	99-09-2	N-Nitrosodi-n-propylamine	621-64-7
4,6-Dinitro-2-methylphenol **(1)**	534-52-1	N-Nitrosodiphenylamine	86-30-6
4-Bromophenyl phenyl ether	101-55-3	n-Octadecane	593-45-3
4-chloro-2-methylaniline	95-69-2	o-Toluidine-d9 **(Surrogate)**	194423-47-7
4-Chloro-3-methylphenol	59-50-7	Pentachloronitrobenzene	82-68-8
4-Chloroaniline	106-47-8	Pentachlorophenol **(1)**	87-86-5
4-Chloroaniline–d4 **(Surrogate)**	191656-33-4	Perylene-d12 **(ISTD)**	1520-96-3
4-Chlorophenyl phenyl ether	7005-72-3	Phenanthrene **(1)**	85-01-8
4-Methylphenol	106-44-5	Phenanthrene-d10 **(ISTD**)	1517-22-2
4-Nitroaniline	100-01-6	Phenol	108-95-2
4-Nitrophenol	100-02-7	Phenol-d5 **(Surrogate)**	4165-62-2
Acenaphthene **(1)**	83-32-9	Phenyl ether	101-84-8
Acenaphthene-d10 **(ISTD)**	15067-26-2	Pyrene **(1)**	129-00-0
Acenaphthylene **(1)**	208-96-8	Pyridine	110-86-1
Acetophenone	98-86-2	Terphenyl-d14 **(Surrogate)**	1718-51-0
Aniline	62-53-3	Total Cresols	STL00160
Aniline-d5 **(Surrogate)**	4165-61-1		

(1) Compound can be analyzed by full scan or Selected Ion Monitoring (SIM).
(2) Compound can also be analyzed by Isotope Dilution/SIM.

1.2 For a listing of method detection limits (MDLs) and Reporting Limits (RLs) please refer to the currently active Method 8270 Method Limit Groups in TALS (Eurofins LIMS).

1.3 On occasion clients may request modifications to this SOP. These modifications are handled following the procedures outlined in Section 7 (*Review of Work)*, and Section 19 (*Test Methods and Method Validation)* in Eurofins Edison's Quality Assurance Manual (Eurofins Edison Document No. ED-QA-LQM).

1.4 Any variation in procedure shall be completely documented using an NCM. The NCM is approved by the supervisor and then automatically sent to the laboratory Project Manager by e-mail so that the client can be notified as appropriate. The QA department also receives NCMs by e-mail for tracking and trending purposes. The NCM process is described in more detail in SOP ED-GEN-003. The NCM shall be filed in the project file and addressed in the case narrative. Any unauthorized deviations from this procedure must also be documented as a nonconformance, with a cause and corrective action described.

2.0 Summary of Method

2.1 This method is used for the analysis of aqueous and solid matrices for semi-volatile base, neutral and acid organic compounds that are extracted from the sample matrix with an organic solvent.

2.2 An aliquot of sample containing surrogate spiking compounds is extracted with an organic solvent. The extract is concentrated on a steam bath to a suitable volume. Internal standards are added to the extract.

2.3 Sample extraction techniques are specified for each matrix in the following Eurofins Edison SOPs:

- ED-ORP-002 (*Extraction of Semivolatile Organic Compounds in Water by Separatory Funnel, SW846 Method 3510C*);
- ED-ORP-043 (*SW846 Method 3580A - Waste Dilution Prep for Analysis of BNAs by SW846 Method 8270);*
- ED-ORP-0044 (*Microwave Extraction for Solids, SW846 Method 3546*);

2.4 A small aliquot of the extract is injected into a gas chromatograph (GC) equipped with a capillary column. The GC is temperature programmed to separate the compounds which were recovered during the extraction step by boiling point. The effluent of the gas chromatograph is interfaced to a mass spectrometer (MS) which is used to detect the compounds eluting from the GC. The detected compounds are fragmented with an electron beam to produce a mass spectrum which is characteristic of the compound introduced into the MS. Identification of target analytes is accomplished by comparing their mass spectra with the electron ionization spectra of authentic standards. Quantitation is accomplished by comparing the response of a major ion (quantitation ion) relative to an internal standard established through a five-point calibration (six points for second order regression). Specific calibration and quality control steps are included in the method that must be performed and must meet the specifications of SW846 Method 8270E as applicable.

2.5 The standard preparation procedure for aqueous samples involves use of a Reduced Volume Extraction (250 ml) (RVE) followed by analysis using a Large Volume Injection (LVI). Optionally, a full volume (1000 ml nominal) may be employed. The details of the extractions are outlined in the applicable prep SOPs while the analytical details for 8270E is presented in this SOP.

2.6 These methods are also applicable to the analysis of samples by Selected Ion Monitoring (SIM) for the purpose of obtaining lower reporting limits for the following compounds:

Table 2 – SIM Analytes

SIM Analytes	CAS #
1,4-Dioxane	123-91-1
4,6-Dinitro-2-methylphenol	534-52-1
Acenaphthene	83-32-9

Table 2 – SIM Analytes	
SIM Analytes	**CAS #**
Acenaphthylene	208-96-8
Anthracene	120-12-7
Benzo[a]anthracene	56-55-3
Benzo[a]pyrene	50-32-8
Benzo[b]fluoranthene	205-99-2
Benzo[g,h,i]perylene	191-24-2
Benzo[k]fluoranthene	207-08-9
Bis(2-chloroethyl)ether	111-44-4
Chrysene	218-01-9
Dibenz(a,h)anthracene	53-70-3
Fluoranthene	206-44-0
Fluorene	86-73-7
Hexachlorobenzene	118-74-1
Indeno[1,2,3-cd]pyrene	193-39-5
Naphthalene	91-20-3
N-Nitrosodimethylamine	62-75-9
Pentachlorophenol	87-86-5
Phenanthrene	85-01-8
Pyrene	129-00-0

2.7 An isotope dilution selected ion monitoring (SIM) technique for the analysis of 1,4-dioxane in water at a reporting level of 0.2 ug/l is also described in this SOP. Using this technique 1,4-dioxane-d8 is added prior to sample extraction and is used as an internal standard to calculate the concentration of 1,4-dioxane present. Additionally, 1,4-dichorobenzene-d4 is added to the extract prior to analysis to monitor the recovery of 1,4-dioxane-d8.

3.0 Definitions

For a complete list of definitions refer to Appendix 2 in the most current revision of the Quality Assurance Manual (ED-QA-LQM).

4.0 Interferences

4.1 GC/MS data from all blanks, samples, and spikes must be evaluated for interferences. Analysts must take steps to determine the source of the interference and take corrective action to eliminate the problem.

4.1.1 Contamination by carryover can occur whenever high-concentration and low-concentration samples are sequentially analyzed. To reduce

carryover, the sample syringe is automatically rinsed with solvent between sample injections. Whenever an unusually concentrated sample is encountered, it should be followed by the analysis of a solvent blank to check for cross-contamination. Alternately, verify that the sample analyzed after the high concentration sample does not show any carryover through inspection of chromatogram and target results.

4.1.2 Contaminants from the extraction process detected in the method blank should be evaluated to determine the impact on the analysis. Interferences from any target analyte must not be present in the method blank above the reporting limit for that compound. If these types of interferences occur, corrective action is required. The source should be identified and corrective action initiated to eliminate the interference from the extraction process. Affected samples must be re-extracted and re-analyzed.

4.1.3 The analyst must take precautions to make sure that contaminants do not enter the analytical system. These precautions include systematic procedures designed to eliminate interferences.

4.2 Some compounds analyzed by this method are unstable or sensitive to extraction and/or instrument conditions:

- Benzidine is easily oxidized during extraction. Neutral extraction may enhance the recovery of this compound.
- Hexachlorocyclopentadiene breaks down photochemically and can decompose from high temperatures, particularly in the injection port of the GC. This compound can also react with acetone in solution.
- 1,2-Diphenylhydrazine is unstable even at room temperature and readily converts to azobenzene.
- Phenols are sensitive to active sites and can give a low response or exhibit poor chromatography by tailing. Therefore, it is important the GC is maintained in the best possible condition. See Section 10.1 for proper daily maintenance.
- N-Nitrosodiphenylamine decomposes in the gas chromatographic inlet and cannot be distinguished from diphenylamine.
- 3-Methylphenol cannot be separated from 4-methylphenol by the conditions specified in this method. They are reported as 3 and 4-methylphenol.
- Pyridine may perform poorly at the GC injection port temperatures listed in this SOP. Lowering the injection port temperature may reduce the amount of degradation.

5.0 Safety

Employees must abide by the policies and procedures in the Corporate Environmental Health and Safety Manual (CW-E-M-001) and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum.

5.1. Specific Safety Concerns or Requirements

The gas chromatograph and mass spectrometer contain zones that have elevated temperatures. The analyst needs to be aware of the locations of those zones, and must cool them to room temperature prior to working on them.

The mass spectrometer is under deep vacuum. The mass spectrometer must be brought to atmospheric pressure prior to working on the source.

There are areas of high voltage in both the gas chromatograph and the mass spectrometer. Depending on the type of work involved, either turn the power to the instrument off, or disconnect it from its source of power.

5.2. Primary Materials Used

The following is a list of the materials used in this method, which have a serious or significant hazard rating. **Note: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the MSDS for each of the materials listed in the table.** A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the MSDS for each material before using it for the first time or when there are major changes to the MSDS.

Material (1)	Hazards	Exposure Limit (2)	Signs and symptoms of exposure
Methanol	Flammable Poison Irritant	200 ppm-TWA	A slight irritant to the mucous membranes. Toxic effects exerted upon nervous system, particularly the optic nerve. Symptoms of overexposure may include headache, drowsiness and dizziness. Methyl alcohol is a defatting agent and may cause skin to become dry and cracked. Skin absorption can occur; symptoms may parallel inhalation exposure. Irritant to the eyes.
Methylene Chloride	Carcinogen Irritant	25 ppm-TWA 125 ppm-STEL	Causes irritation to respiratory tract. Has a strong narcotic effect with symptoms of mental confusion, light-headedness, fatigue, nausea, vomiting and headache. Causes irritation, redness and pain to the skin and eyes. Prolonged contact can cause burns. Liquid degreases the skin. May be absorbed through skin.
Toluene	Flammable Poison Irritant	200 ppm-TWA 300 ppm-Ceiling	Inhalation may cause irritation of the upper respiratory tract. Symptoms of overexposure may include fatigue, confusion, headache, dizziness and drowsiness. Peculiar skin sensations (e. g. pins and needles) or numbness may be produced. Causes severe eye and skin irritation with redness and pain. May be absorbed through the skin.
Dimethyl-dichloro-silane	Flammable	none	Can be corrosive to the respiratory tract causing severe irritation and tissue damage. Harmful if absorbed through the skin. May cause severe irritation and systemic damage. Severely irritating to the skin and eyes. Harmful if swallowed. Can cause abdominal discomfort, nausea, vomiting, diarrhea, and irritation to the mouth, throat and stomach.
1 – Always add acid to water to prevent violent reactions.			
2 – Exposure limit refers to the OSHA regulatory exposure limit.			

6.0 Equipment and Supplies

6.1 Gas chromatograph/mass spectrometer system

6.1.1 Gas chromatograph: An Agilent/HP 6890/7890/900 Intuvo (or equivalent) houses the capillary column. The GC provides a splitless injection port and allows the column to be directly coupled to the mass spectrometer. The oven is temperature programmable to meet the requirements of the method. An HP/Agilent 7673/7683/7963 autosampler (or equivalent) with a 10 ul syringe provides automatic injection of sample extracts while the instrument is unattended.

6.1.2 Analytical Column: 30m x 0.25mm ID, 0.25 um film thickness, Restek Rxi-5Sil MS, Catalog #13623

6.1.3 Mass spectrometer: Agilent (HP) 5972, 5973, 5975 or 5977A Mass Selective Detector (MSD) Capable of scanning from 35 to 500 amu every 1 sec or less, using 70 volts electron energy in the electron ionization mode. The mass spectrometer must be capable of producing a mass spectrum for 50 ng of decafluorotriphenylphosphine (DFTPP) which meets the criteria in Section 9.2.1 when 2 ul of the 25 ug/ml GC/MS tuning standard is injected through the GC.

6.1.4 GC/MS interface: Any GC-to-MS interface may be used that gives acceptable calibration points at 50 ng per injection for each compound of interest and achieves acceptable tuning performance criteria.

6.1.5 Data system: The data system is interfaced to the mass spectrometer and accommodates continuous acquisition and storage of GC/MS data throughout the duration of the chromatographic program. The data system consists of a Hewlett-Packard Chemstation equipped with Mustang software used for instrument control and data acquisition. This, in turn, is interfaced to Eurofins's Chrom software for data processing. Data from sample extract analysis can be accessed in real-time, while sample data reports and library searches can be performed on data files from previously run samples. The software is also capable of searching any GC/MS data file for ions of a specific mass whose abundances can be plotted versus time or scan number which allows integration of abundances for any extracted ion between specified times or scan-number limits. Library searches utilize a NIST 02.1 Mass Spectral Library.

6.2 Bottles, glass with polytetrafluoroethylene (PTFE)-lined screw caps or crimp tops.

6.3 Injection port liners, splitless

6.4 Injection port septa

6.5 Injection port graphite seals

6.6 Pre-silanized glass wool (Supelco 2-0411 or equivalent)

6.7 Syringes, Assorted sizes 10ul - 1000ul; gas-tight

6.8 Bottles, 10 and 5ml amber screw cap with Teflon liner

6.9 Vials, 2ml amber screw cap with Teflon liner

6.10 Wheaton microvials 100ul (or equivalent)

6.11 Volumetric Flasks, Class A with ground glass stoppers (2ml - 100ml)

6.12 Analytical balance, ASP Model SP-180 (or equivalent), capable of accurately weighing to 0.0001 gr.

7.0 Reagents and Standards

The following items are recommended for performing this procedure. Equivalent items should only be used when they result in an improvement in quality, efficiency, productivity, or cost. An item can be considered equivalent if with its use, the analytical and QA/QC requirements in this SOP can be met. Please refer to the MSDS prior to the use of any reagent or standard.

The preparation of standards, surrogates and spiking solutions is documented in the TALS Reagent Module. Formulary reports can be generated upon request.

7.1. Reagents:

7.1.1. Methylene Chloride: J.T.Baker Resi-Analyzed, used for Organic Residue Analysis (P/N 9266-V8 or equivalent).

7.1.2. Methanol: J.T.Baker Purge and Trap Grade (P/N 9077-02 or equivalent).

7.1.3. Sylon-CT: Supelco (P/N 33065-U or equivalent). Sylon-CT is a highly reactive silanizing reagent consisting of 95% Toluene and 5% Dimethyldichlorosilane (DMDCS).

7.1.4. Each lot of solvent is screened for contaminants before being used for analysis as detailed in Eurofins Corporate Quality SOP No. CA-Q-S-001 (*Solvent & Acid Lot Testing & Approval*) and Eurofins Edison SOP No. ED-GEN-023 (*Bulk Solvent Testing and Approval*).

7.2. Standards:

7.2.1. **Calibration Standards (Full Scan Analysis)**: Stock analytical standard solutions are purchased mainly from Restek Corporation. Other standards are prepared in the laboratory as needed using neat compounds or prepared solutions purchased from Agilent, SPEX CertiPrep, Chem Service,

Accustandard, Supelco or other suppliers. Standards prep instructions are detailed for the following full scan analyte list options:

- Full Volume Aqueous Prep; and,
- Reduced Volume Aqueous Prep and Soils

Secondary dilutions are either made from purchased stock solutions as listed below or from prepared solutions as listed in the following table:

NOTE: Second sources (from certified separate lots) are used for ICV standards.

Table 3 – Full Scan Stock Standards			
Target Analyte Standard Name	**Conc. (PPM)**	**Vendor**	**Catalog #**
1,2,3,4-TCDD	50	SPEX	SVO-TANJ-12
Agilent Mix (contains compounds listed in Table 4 below)	2000 *	Agilent	Cus 0456
8270 List 1/ Std #1 Megamix	Varied	Restek	571995
8270 List 1/ Std#9	2000	Restek	569730
8270 List 1/ Std#11	2000	Restek	569732
8270 Surrogate Standard	5000*	Restek	567685
8270 Internal Standard	2000	Restek	567684
8270 List 1/ Std#10	2000	Restek	569731
Bisphenol-A	1000	Agilent	Cus-0457

*Agilent Mix, 8270 list1/std#9 and 8270 Surrogate standard are diluted to 100ppm prior to the preparation of the 1.0ppm and 0.5ppm standards.

Table 4	
Agilent Mix Catalog No. Cus-0456	
Analyte	**Concentration (PPM)**
Pentachloronitrobenzene	2000
2 -tert-butyl-4-Methylphenol	2000
2,6-Di-tert-butyl-4-Methylphenol	2000
Coumarin	2000
Phenyl ether	2000
N,N'-Dimethylaniline	2000
N-Methylaniline	2000
Carbamazepine	2000
Benzonitrile	2000
1,3-Dimethylnaphthalene	2000

7.2.1.1. Individual calibration standards for full scan analysis are prepared in one of several ways depending upon the technique (full volume aqueous prep, soils prep, reduced volume prep with LVI) as well as the target analyte list. The following tables detail the preparation of calibration standard solutions for each of these techniques and analyte lists. Prepare by combining the indicated volumes of each stock solution using volumetric flask. Dilute to the volume marker with methylene chloride.

Table 5
Full Volume Aqueous Prep and Soils
Working Standards Preparation

Solution Name	120 PPM	80 PPM	50 PPM	20 PPM	10 PPM	5 PPM	2 PPM	1 PPM	0.5 PPM
8270 List 1/ Std #1 Megamix	3000 ul	2000 ul	2500 ul	500ul	250ul	250ul	100ul	50ul	25ul
8270 List 1/ Std #9	1500 ul	1000 ul	1250 ul	250ul	125ul	125ul	50ul	500ul*	250ul *
8270 List 1/ Std #10	1500 ul	1000 ul	1250 ul	250ul	125ul	125ul	-	-	-
Agilent custom Mix	1500 ul	1000 ul	1250 ul	250ul	125ul	125ul	50ul	500ul*	250ul *
1,2,3,4-TCDD	-	-	500ul	-	-	-	-	-	-
8270 Surrogate Standard	600ul	400ul	500ul	100ul	50ul	50ul	20ul	500ul*	250ul *
8270 Internal Standard	500ul	500ul	1000 ul	500ul	500ul	1000 ul	1000 ul	1000 ul	1000 ul
Bisphenol-A	3000 ul	2000 ul	2500 ul	500ul	250ul	250ul	100ul	-	-
8270 List 1/ Std #11	400ul	300ul	500ul	200ul	125ul	125ul	50ul	25ul	-
Final Volume (ml)	**25**	**25**	**50**	**25**	**25**	**50**	**50**	**50**	**50**

Note: The 1.0ppm and 0.5pmm standards (above) are prepared using the 100ug/ml standard for Agilent custom Mix, 8270 List1/std#9 and 8270 Surrogate Standard.

Table 6
Reduced Volume Extraction/LVI
Working Standards Preparation

Solution Name	24 PPM	16 PPM	10 PPM	4 PPM	2 PPM	1 PPM	0.4 PPM	0.2 PPM	0.1 PPM
120 ppm (see Table 5)	2.0mL								
80 ppm (see Table 5)		2.0 mL							
50 ppm (see Table 5)			2.0 mL						
20 ppm (see Table 5)				2.0 mL					

Table 6 Reduced Volume Extraction/LVI Working Standards Preparation									
Solution Name	**24 PPM**	**16 PPM**	**10 PPM**	**4 PPM**	**2 PPM**	**1 PPM**	**0.4 PPM**	**0.2 PPM**	**0.1 PPM**
10 ppm (see Table 5)					2.0 mL				
5.0 ppm (see Table 5)						2.0 mL			
2.0 ppm (see Table 5)							2.0mL		
1.0 ppm (see Table 5)								2.0 mL	
0.5 ppm (see Table 5)									2.0mL
Final Volume (ml)	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**	**10**

7.2.1.2. **Initial Calibration Verification (full scan)**: Second source ICVs for full scan analysis are prepared in one of several ways depending upon the technique (full volume aqueous prep, soils prep, reduced volume prep with LVI) as well as the target analyte list. The following tables detail the preparation of ICVs for each of these techniques and analyte lists. Prepare by combining the indicated volumes of each stock solution using volumetric flask. Dilute to the volume marker with methylene chloride.

Table 7 8270/625 ICV Working Standards Preparation	
Solution Name	**25 PPM**
8270 List 1/ Std #1 Megamix (2nd Lot)	250ul
8270 List 1/ Std #9 (2nd Lot)	125ul
8270 List 1/ Std #10 (2nd Lot)	125ul
Agilent custom Mix (2nd Lot)	125ul
8270 Internal Standard	200ul
8270 List 1/ Std#11	125ul
Bisphenol-A (2nd Lot)	250ul
Final Volume (ml)	**10**

7.2.1.3. **Surrogate Standards (Full Scan Analysis):** A 5000ppm Surrogate Standard is purchased from Restek for use in spiking blanks, samples and associated QC prior to extraction (reference the applicable sample prep SOPs for spiking instructions).

Table 8 Full Scan Surrogate Standards Solution Restek Catalog No. 567685	
Surrogate Standard Compounds	**Concentration (PPM)**
Nitrobenzene-d5	5000
p-Terphenyl-d14	5000
2,4,6-Tribromophenol	5000
Phenol-d5	5000
2-Fluorobiphenyl	5000
2-Fluorophenol	5000

7.2.1.4. **Internal Standards** (**Full Scan Analysis**): The Internal Standards Solution at 2000ppm is purchased from Restek (Catalog # 567684). The Internal Standard solution is stored in 10ml amber screw cap bottles with Teflon liners in the dark at 4°C. The Internal standard solution is used in preparing all analytical standards. Inject 20ul of this solution (2000ppm) per ml of sample extract prior to analysis resulting in a concentration of 40ppm (ug/ml) in the extract.

Table 9 Full Scan Internal Standards Solution Restek Catalog No. 567684	
Internal Standard Compounds	**Concentration (PPM)**
1,4-Dichlorobenzene-d4	2000
Phenanthrene-d10	2000
Naphthalene-d8	2000
Chrysene-d12	2000
Acenaphthene-d10	2000
Perylene-d12	2000

7.2.2. **Calibration Standards (SIM analysis)**: The Edison lab currently analyzes only a select list of compounds by 8270E SIM (see Sections 1.0 and 2.0). Stock analytical SIM standard solutions are purchased mainly from Agilent. Working standards are prepared from these solutions as listed in the tables in Section 7.2.2.1:

Table 10 Stock SIM Standards			
Standard Name	**Concentration**	**Vendor**	**Catalog #**
Pentachlorophenol	1000ppm	AGILENT	PH-180-1
n-Nitrosodimethylamine	100ppm	AGILENT	NS-100-1
Hexachlorobenzene	100ppm*	AGILENT	CH-151-1
PAH Mix	100ppm	AGILENT	PAH-605-1
Bis(2-chloroethyl)ether	100ppm*	AGILENT	BEC-110-1
4,6-Dinitro-2-methylphenol	1000ppm**	AGILENT	PH-150
1,4-Dioxane	1000ppm**	AGILENT	NV-152-1

*Hexachlorobenzene and Bis(2-chloroethyl)ether are diluted to 10ppm prior to SIM Standards prep

** 4,6-Dinitro-2-methylphenol and 1,4-Dioxane is diluted (10x) to 100ppm prior to SIM Standards prep

NOTE: Second sources (from separate lots are used for ICV standards).

7.2.2.1 Individual calibration standards for SIM analysis are prepared in one of two ways depending upon the technique (full volume aqueous prep or reduced volume prep with LVI) as well as the target analyte list. The following tables detail the preparation of calibration standard solutions for each of these techniques and analyte lists. Prepare by combining the indicated volumes of each stock solution using volumetric flask. Dilute to the volume marker with methylene chloride.

Table 11
Full Volume Aqueous Prep – SIM
Working Standards Preparation

	0.025 PPM	**0.05 PPM**	**0.1 PPM**	**0.5 PPM**	**1.0 PPM**	**5.0 PPM**
Pentachlorophenol	2.5uL	2.5uL	12.5uL	10uL	20uL	50uL
n-Nitrosodimethylamine	25uL	25uL	125uL	100uL	200uL	500uL
PAH mix	6.25uL	5uL	25uL	50uL	100uL	200uL
Hexachlorobenzene	25uL	25uL	250uL	1000uL	2000uL	500uL*
Bis(2-chloroethyl)ether	25uL	25uL	250uL	1000uL	2000uL	500uL*
4,6-dinitro-2-methylphenol	50ul	50ul	250ul	200ul	400ul	1000ul
1,4-Dioxane	25ul	50ul	250ul	200ul	400ul	1000ul
ISTD	500uL	200uL	500uL	200uL	200uL	200uL
Final Volume (ml)	**25**	**10**	**25**	**10**	**10**	**10**

*For Hexachlorobenzene and Bis(2-chloroethyl)ether the 5.0 ppm level is prepared using the 100ppm standard.

Table 12
Reduced Volume Extraction/LVI – SIM
Working Standards Preparation

	0.005 PPM	**0.01 PPM**	**0.02 PPM**	**0.10 PPM**	**0.20 PPM**	**1.0 PPM**
0.025 PPM Std (see Table 11)	1.0 mL					
0.05 PPM Std (see Table 11)		1.0 mL				
0.1 PPM Std (see Table 11)			1.0 mL			
0.5 PPM Std (see Table 11)				1.0 mL		
1.0 PPM Std (see Table 11)					1.0 mL	
5.0 PPM Std (see Table 11)						1.0 mL
Final Volume (ml)	**5**	**5**	**5**	**5**	**5**	**5**

7.2.2.2 Initial Calibration Verification (SIM): A 0.1 ppm separate lot SIM ICV is prepared as detailed in Table 13 using the stock standards detailed in Section 7.2.2 (above)

Table 13 0.1ppm SIM ICV preparation	
Pentachlorophenol	25uL
n-Nitrosodimethylamine	25uL
PAH mix	5uL
Hexachlorobenzene	5uL
1,4-Dioxane	5ul
4,6-Dinitro-2-methylphenol	100ul
ISTD	**100uL**
Final Volume	**5 ml**

7.2.2.3 Internal Standard solution (SIM): A 50 ppm Internal Standard solution for SIM analysis is prepared by adding 125ul of the 2000ppm stock ISTD (see Section 7.2.1.4) and bringing to volume with Methylene Chloride in a 5ml volumetric flask.

7.2.2.3.1 For SIM analysis inject 20ul of this solution (50ppm) per ml of sample extract prior to analysis resulting in a concentration of 1ppm (ug/ml) in the extract.

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7.2.3. Calibration Standards (Isotope Dilution SIM – 1,4-Dioxane): The Edison lab currently analyzes only for 1,4-dioxane by 8270E isotope dilution SIM (see Sections 1.0 and 2.0). Stock analytical isotope dilution SIM standard solutions are purchased mainly from Accustandard and Restek. Working standards are prepared from these solutions as listed in the tables below.

Table 14 - Stock 1,4-Dioxane Isotope Dilution SIM Standards			
Standard Name	**Concentration**	**Vendor**	**Catalog #**
1,4-Dioxane	1000ppm*	Accustandard	APP-9-096

* 1,4-Dioxane is diluted (10x) to 100ppm prior to SIM Standards prep

Table 15 - Stock Labeled 1,4-Dioxane SIM Surrogate/Internal Standard (added at prep)			
Standard Name	**Concentration**	**Vendor**	**Catalog #**
1,4-Dioxane-d8	2000ppm	Restek	30614

Table 16 - Stock 1,4-Dioxane Isotope Dilution SIM Internal Standard (added to extract)			
Standard Name	**Concentration**	**Vendor**	**Catalog #**
1,4-Dichlorobenzene-d4	2000ppm	Accustandard	AZ-014J-3

7.2.3.1 Individual calibration standards for 1,4-dioxane isotope dilution SIM analysis are prepared at the concentrations detailed in the following tables. Prepare by combining the appropriate volumes of each stock solution using volumetric flask. Dilute to the volume marker with methylene chloride.

Table 17 Reduced Volume Extraction/LVI – 1,4-Dioxane Isotope Dilution SIM ICAL Standard Concentrations (ug/ml)									
	Lev 1	**Lev 2**	**Lev 3**	**Lev 4**	**Lev 5**	**Lev 6**	**Lev 7**	**Lev 8**	**ICV***
1,4-Dioxane	0.02	0.04	0.1	0.2	0.5	1	2	10	0.2
1,4-Dioxane-d8	4	4	4	4	4	4	4	4	4
1,4-Dichlorobenzene-d4	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2

***:** The ICV is prepared from the second source stock in Table 13.

7.2.4. GC/MS Instrument Performance Check (DFTPP): The DFTPP standard is prepared by is prepared at 25 ppm by adding 2.5ml of EPA 8270 GC/MS Tuning Solution II (Restek Catalog # 31615) to a 100ml volumetric flask and bringing to volume with Methylene Chloride.

7.2.5. Information on prepared standard solutions must be recorded in the TALS Reagent Module. Information such as standard supplier, lot number, original concentration, a description of how the standard was made, are required along with the laboratory lot number, analyst's initials, date prepared, expiration date and verification signature. Standards must be remade every 6 months, or sooner, if the standards expire or begin to show signs of unacceptable degradation. Class "A" volumetric must be used at all times and syringes, preferably gas-tight syringes when available, should be checked for accuracy using an analytical balance. Class "A" pipettes should also be used if volumes permit.

7.2.6. Please refer to Eurofins Edison SOP No. ED-GEN-008, Standard Operating Procedure for Preparation, Purity and storage of Reagents and Standards.

- Shelf Life of Standard: 1 year after preparation or stock standard manufacture expiration, whichever comes first;
- Storage Requirements: Stock standards are stored at 4°C and Working Standards stored at -10°C to -20°C.

8.0 Sample Collection, Preservation, Shipment and Storage

8.1 Samples from chlorinated water sources must be treated with sodium thiosulfate (0.008% solution) at the time of collection to remove chlorine. NOTE: containers pre-preserved with sodium thiosulfate must be requested in bottle orders for samples from chlorinated water sources.

8.2 All samples must be stored at 4ºC (± 2ºC) upon receipt.

8.3 Sample Extract Storage. Samples extracts must be protected from light and refrigerated at 4ºC (± 2ºC) from time of extraction until analysis.

8.4 Sample Extract Holding Time. All sample extracts must be analyzed within 40 days of extraction.

Matrix	Sample Container	Min. Sample Size	Preservation	Holding Time	Reference
Waters	Amber glass, 1L	1000 ml or 250 ml (1)	Cool 4 ± 2ºC	7 days to extraction; Analyze within 40 days of extraction	EPA Method SW846 8270E
Solids	Wide mouth glass, 8 or 16 oz.	50g	Cool 4 ± 2ºC	14 days to extraction; Analyze within 40 days of extraction	EPA Method SW846 8270E

(1) : Reduced volume extraction (RVE) LVI option

9.0 Quality Control

9.1. **Sample QC** - The following quality control samples are prepared with each batch of samples.

Quality Controls	Frequency	Control Limit
Method Blank (MB)	1 in 20 or fewer samples	< Rpt. Limit
Laboratory Control Sample (LCS)[1]	1 in 20 or fewer samples	Statistical Limits [4]
Matrix Spike (MS)[2]	1 in 20 or fewer samples	Statistical Limits [4]
MS Duplicate (MSD)[2]	1 in 20 or fewer samples	Statistical Limits [4]
Surrogates	every sample[3]	Statistical Limits [4]
Internal Standards	Every sample	Response within -50% to +100% of CCV

[1] LCS Duplicate (LCD) is performed only when insufficient sample is available for the MS/MSD or when requested by the client/project/contract.

[2] The sample selection for MS/MSD are randomly selected, unless specifically requested by a client….predetermined by the extraction lab.
[3] Analytical and QC samples (MB, LCS, MS/MSD, Method Blank)
[4] Statistical control limits are determined annually and are updated into TALS limit group..

9.1.1. Method blanks are extracted with every sample batch on each day that samples are extracted. To be considered acceptable, the method blank must contain less than the reporting limit of all target compounds except for phthalates, which can be present at up to 5x the MDL. For method 8270E the method blank is generally acceptable if target analyte concentrations are less than the one half the reporting limit.

If method blanks are unacceptably contaminated with target compounds that are also present in field samples, all affected samples must be re-extracted and re-analyzed. Corrective action must be taken to identify and eliminate the contamination source. Demonstrate that acceptable blanks can be obtained before continuing with sample extraction and analysis. Method blanks must be analyzed on each instrument on which the associated samples are analyzed.

9.1.1.1. Surrogate recoveries for the method blank are compared to laboratory generated limits. If two or more surrogates for any one fraction (base-neutral or acid) are outside of recovery limits or if any one surrogate recovers at <10%, the sample must be re-extracted and re-analyzed to confirm matrix interference.. If any surrogate is still outside limits, all samples and QC samples associated with that method blank must be re-extracted (volume permitting).

9.1.2. Matrix Spike (MS)/Matrix Spike Duplicate (MSD): A matrix spike/matrix spike duplicate (MS/MSD) pair is extracted and analyzed with every 20 environmental samples of a specific matrix (defined as a sample batch). Full compound list spiking is employed for MS/MSDs and LCSs. These spikes are prepared and extracted concurrent with sample preparation. MS and MSD recoveries are calculated and compared to lab generated acceptance criteria. See the current active TALS 8270 Method Limit Group for QC limits. The MS/MSD spiking solution should the same as used for the calibration standards.

9.1.2.1 A Laboratory Control Sample Duplicate (LCSD) is extracted and analyzed only when insufficient client sample is available for preparation of an MS/MSD pair. The LCS/LSCD is evaluated in the same manner as the MS/MSD (see Section 9.1.2)

9.1.2.2 An LCS/LCSD may be substituted for the MS/MSD if insufficient sample volume is available.

9.1.3. Laboratory Control Sample (LCS)/Laboratory Control Sample Duplicate (LCSD): A Laboratory Control Sample (LCS) (aka blank spike) must be extracted and analyzed with each batch of 20 environmental samples. The LCS data is used to assess method performance if the MS/MSD recoveries fall outside of the lab generated limits (See the current active TALS 8270 Method Limit Group for QC limits). If the LCS recovery is within the current lab generated limits, the MS/MSD recoveries are attributed to matrix interference.

9.1.3.1 A Laboratory Control Sample Duplicate (LCSD) is extracted and analyzed only when insufficient client sample is available for preparation of an MS/MSD pair. The LCS/LSCD is evaluated in the same manner as the MS/MSD (see Section 9.1.2)

9.1.3.2 Spike recovery limits are lab generated and are updated annually. Certain state regulatory programs have defined recovery limits which, where applicable, are used for spike recovery evaluations. The TALS Method Limit Groups detail these regulatory program criteria.

9.1.4. Surrogate Standards: All full scan samples, blanks and QC samples are spiked with a six (6) component surrogate standard mix (see Section 7.2.1.3). The percent recovery of the surrogate standards is calculated and compared to lab generated limits (See the current active TALS 8270 Method Limit Group for QC limits).

If any two or more surrogates for any one fraction (base-neutral or acid) are outside of recovery limits or if any one surrogate recovers at <10%, the sample must be re-extracted and re-analyzed to confirm matrix interference. If a surrogate is diluted to a concentration below that of the lowest calibration standard, no corrective action is necessary.

9.1.4.1 Surrogate recovery limits are lab generated and are updated annually. Certain state regulatory programs have defined recovery limits which, where applicable, are used for spike recovery evaluations. The TALS Method Limit Groups detail these regulatory program criteria.

9.1.5. Internal Standards: The response (area count) of each internal standard in the sample must be within -50 +100% of its corresponding internal standard in the CCV or, the ICAL midpoint for samples analyzed under the initial calibration range. Failure to meet these criteria is indicative of sample matrix effects. All samples failing these criteria must be reanalyzed to confirm matrix effects.

9.2. Instrument QC

9.2.1 GC/MS Instrument Performance Check (DFTPP): (**Note**: the DFTPP performance check applies only to full scan analyses and is not evaluated for SIM analysis). The GC/MS system is tuned using Perfluortributylamine

(PFTBA) such that an injection of 50ng of Decafluorotriphenylphosphine (DFTPP) meet the abundance criteria listed in the table below. Prior to the analysis of any calibration standards or samples, the GC/MS system must meet all DFTPP key ion abundance criteria. This analysis will verify proper tuning of the system for a period of 12 hours post-injection. After 12 hours, the instrument performance must again be verified prior to the analysis of standards, QC or samples. Daily tune verification is not required for 8270E CCV.

DFTPP Key Ions and Abundance Criteria	
Mass	**Ion Abundance Criteria**
51	30-60% of mass 198
68	<2% of mass 69
69	reference only
70	<2% of mass 69
127	40-60% of mass 198
197	<1% of mass 198
198	Base Peak, 100% relative abundance
199	5-9% of mass 198
275	10-30% of mass 198
365	>1% of mass 198
441	present but less than mass 443
442	>40% of mass 198
443	17-23% of mass 442

9.2.1.1. Evaluate DFTPP using three scan averaging and background subtraction techniques. Select the scan at the peak apex, add +1 scan from the apex and -1 scans from the apex.

9.2.1.2. The mass spectrum of DFTPP may be background subtracted to eliminate column bleed or instrument background ions. Background subtract DFTPP by selecting a scan for subtraction ≤20 scans before the apex scan of DFTPP.

9.2.1.3. Check column performance using pentachlorophenol and the benzidine peaks (these compounds are included in the DFTPP solution). Benzidine & Pentachlorophenol should respond normally without significant peak tailing (Tailing Factor should be <2 measured at 10% peak height). If responses are poor and excessive peak tailing is present, corrective action for the GC/MS instrument may be required. Corrective actions may include:

9.2.1.3.1 Retune the GC/MS;
9.2.1.3.2 Clip the injector end of the GC column;
9.2.1.3.3 Replace the septum and injection port liner;
9.2.1.3.4 Change the injection port seal;

9.2.1.3.5 Replace the GC column;
9.2.1.3.6 Clean the injection port with MeCl2
9.2.1.3.7 Clean the MS ion source;
9.2.1.3.8 Place a service call.

9.2.1.4. The breakdown of 4, 4-DDT into 4,4-DDD and 4,4'DDE may also be used to assess GC column performance and injection port inertness. If so evaluated the breakdown must be <20%.

9.2.1.5. DFTPP parameter settings are stored in a tune file, which will be used in all subsequent analysis of standards and sample extracts.

9.2.2 Initial Calibration Range and Initial Calibration Verification

9.2.2.1. Initial Calibration: The initial calibration range consists of a minimum of five concentration levels of analytical standards (six for second order regression) prepared as described in Section 7.2. and analyzed once the DFTPP instrument performance check has met the criteria in Section 9.2.1. .

9.2.2.2. Initial Calibration Verification (ICV): An Initial Calibration Verification (ICV) standard is analyzed immediately after the Initial Calibration Range and before any samples are analyzed. The ICV is prepared as detailed in Section 7.2. The ICV must be from a source (or lot) separate from the standards used in the Initial Calibration Range.

9.2.3 Continuing Calibration Verification (CCV) and Low Level Continuing Calibration Verification (LLCCV): A mid-point Continuing Calibration Verification (CCV) must be analyzed every 12 hours after the DFTPP instrument performance check (when applicable).. The CCV is prepared as detailed in Section 7.2. (typically, 50 ug/ml for full volume aqueous and soils, 10 ug/ml for LV, 0.02 ug/ml for LVI SIM) and 0.2 for isotope dilution SIM). Additionally a Low Level Continuing Calibration Verification (LLCCV) is analyzed after the CCV for full scan analysis. The LLCCV is the same as the lowest calibration level analyzed with the initial calibration range (See Section 7.2).

9.2.4 Calibration Acceptance Summary

9.2.4.1. Retention Time Windows: Retention time windows must be established to compensate for minor shifts in absolute retention times as a result of sample loading and normal chromatographic variability. Obtain the retention time for all compounds from the analysis of the midpoint standard for the calibration curve. Establish the center of the retention time window by using the absolute retention time for each analyte, internal standard and surrogate from the calibration verification standard at the beginning of the analytical shift. For samples run during the

same shift as an initial calibration, use the retention time of the mid-point standard of the initial calibration. For qualitative identification to be acceptable the retention time of the relative retention time (automatically calculated in Chrom) must be within 0.8 - 1.2 RRT units of its assigned internal standard. The relative retention times of each compound in the five calibration standards must agree within .06 relative retention time units.

9.2.4.2. Initial Calibration Range: Internal standard calibration is employed for this method. After the initial calibration range has been analyzed the relative response factor (RRF) for each target/surrogate compound at each concentration level is determined using the following equation.

$$RRF = \frac{A_x}{A_{is}} \times \frac{C_{is}}{C_x}$$

Where:
A_x = Area characteristic ion (see Table 21) for the compound
Ais = Area characteristic ion (see Table 21) of associated internal standard
Cis = Concentration of internal standard
Cx = Concentration of compound in standard

9.2.4.2.1. Determine the mean RRF for each compound. Minimum response factors must be met for each of the compounds listed in Table 18 (below). Any compound that fails the minimum response factor must be reported as estimated for detects and must have a demonstration of sensitivity in the analytical batch to report non-detects. To demonstrate adequate sensitivity for out of criterion compounds analyze the low level point of the calibration (LLCCV) in the analytical sequence. The criterion for the LLCCV is detection only but the standard qualitative identification criteria in the method must be met.

Table 18:
Minimum Response Factors

Compound	Minimum Response Factor
Benzaldehyde	0.010
Phenol	0.800
Bis(2-chloroethyl) ether	0.700
2-Chlorophenol	0.800
2-Methylphenol	0.700
2,2-Oxybis-(1-chloropropane)	0.010
Acetophenone	0.010
4-Methylphenol	0.600

Table 18: Minimum Response Factors	
Compound	**Minimum Response Factor**
N-Nitroso-di-n-propylamine	0.500
Hexachloroethane	0.300
Nitrobenzene	0.200
Isophorone	0.400
2-Nitrophenol	0.100
2,4-Dimethylphenol	0.200
Bis(2-chloroethoxy)methane	0.300
2,4-Dichlorophenol	0.200
Naphthalene	0.700
4-Chloroaniline	0.010
Hexachlorobutadiene	0.010
Caprolactam	0.010
4-chloro-3-methylphenol	0.200
2-Methylnaphthalene	0.400
Hexachlorocyclopentadiene	0.050
2,4,6-Trichlorophenol	0.200
2,4,5-Trichlorophenol	0.200
1,1'-Biphenyl	0.010
2-Chloronaphthalene	0.800
2-Nitroaniline	0.010
Dimethyl phthalene	0.010
2,6-Dinitrotoluene	0.200
Acenaphthylene	0.900
3-Nitroaniline	0.010
Acenaphthene	0.900
2,4-Dinitrophenol	0.010
4-Nitrophenol	0.010
Dibenzofuran	0.800
2,4-Dinitrotoluene	0.200
Diethyl phthalate	0.010
1,2,4,5-Tetrachlorobenzene	0.010
4-chlorophenyl-phenyl ether	0.400
Fluorene	0.900
4-Nitroanailine	0.010
4,6-Dinitro-2-methylphenol	0.010
4-Bromophenyl-phenyl ether	0.100
N-Nitrosodiphenylamine	0.010
Hexachlorobenzene	0.100
Atrazine	0.010
Pentachlorophenol	0.050
Phenanthrene	0.700
Anthracene	0.700
Carbazole	0.010
Di-n-butyl phthalene	0.010

Table 18: Minimum Response Factors	
Compound	**Minimum Response Factor**
Fluoranthene	0.600
Pyrene	0.600
Butyl benzyl phthalate	0.010
3,3'-Dichlorobenzidine	0.010
Benzo(a)anthracene	0.800
Chrysene	0.700
Bis-(2-ethylhexyl)phthalate	0.010
Di-n-octyl phthalate	0.010
Benzo(b)fluoranthene	0.700
Benzo(k)fluoranthene	0.700
Benzo(a)pyrene	0.700
Indeno(1,2,3-cd)pyrene	0.500
Dibenz(a,h)anthracene	0.400
Benzo(g,h,i)perylene	0.500
2,3,4,6-Tetrachlorophenol	0.010
Pentachloronitrobenzene	0.050

9.2.4.2.2. Calculate the Standard Deviation (SD) and Percent Relative Standard Deviation (% RSD) of the response factors for each compound:

$$\% \text{ RSD} = \frac{\text{Standard Deviation of RRFs}}{\text{Mean RRF}}$$

9.2.4.2.3. The % RSD of the RRF's must be ≤20% for each target analyte listed in Table 18. The % RSD of each target analytes must be ≤20% in order for the calibration range to be acceptable. Additionally for 8270E, the calculated concentration or amount of each analyte of interest in the CCV standard should fall within ±20%. If more than 10% of the compounds included with the initial calibration exceed the 20% RSD limit or do not meet the minimum correlation coefficient (0.99) or Relative Standard Error (≤20%) for alternate curve fits (see below) then appropriate corrective maintenance action must be performed. If more than 10% of the compounds included with the initial calibration exceed the 20% RSD limit **AND** do not meet the minimum correlation coefficient (0.99)) or Relative Standard Error (≤20%) then recalibration is necessary.

9.2.4.2.4. If the above listed criteria is met, the system can be assumed to be linear and sample analysis may begin and the average RF from the initial calibration range is used to quantitate all samples.

9.2.4.2.4.1 Certain state regulatory programs have defined calibration acceptance limits which, where applicable, are used for calibration evaluations. The TALS ICAL Limit Groups detail these regulatory program criteria.

9.2.4.2.5. An alternative calibration technique may be employed for those any compounds exceeding the 20% RSD criteria:

9.2.4.2.5.4 Calculate the first order linear regression for any compound which did not meet the 20% criteria. First order linear regression calibration may be employed if alternative average response calibration procedures were not applicable. The r value (Correlation Coefficient) of the equation must be ≥0.99 or the Relative Standard Error (RSE) (≤20%) for the calibration to be employed.

9.2.4.2.5.2 Second order regression calibration can be used for any compound that has an established history as a non-linear performer.

9.2.4.2.5.3 If second order regression calibration is used a minimum of six (6) calibration levels must be analyzed.

9.2.4.2.5.4 If second order regression calibration is used, the r^2 (Correlation Coefficient) value must be ≥ 0.99 or the Relative Standard Error (RSE) (≤20%) for the calibration to be employed.

9.2.4.2.5.5 Any compound that fails to meet the 20% RSD or 0.99 correlation coefficient or RSE (≤20%) criteria must be flagged as estimated for detects (or must be noted in the narrative). If there are non-detects the compounds may be reported if there is adequate sensitivity to detect at the quantitation limit. To demonstrate adequate sensitivity analyze the low level point of the initial calibration in each analytical batch (LLCCV) The criteria for demonstrating adequate sensitivity is detection in the LLCCV using the standard qualitative identification criteria.

9.2.4.2.5.6. When calculating the calibration curve using the linear calibration model a minimum quantitation check on the viability of the lowest calibration point should be performed by re-fitting the response from the low concentration back into the curve. The recalculated concentration of the low calibration point should be within ±50% of the

standard's concentration. This evaluation can be checked using the Initial Calibration %Drift Report in Chrom. Any detects for analytes calibrated using the linear model and failing this readback criterion must be flagged as estimated or detailed in the narrative.

9.2.4.3. **Calibration Point Read-back Criteria**: Whichever calibration model above is selected, it should be subjected to an additional check to establish the representativeness of the data that were used to produce it. This check is the refitting of each calibration point response back to the calibration model, or the comparison of the calculated amount of the standard against the expected amount.

- CHROM software provides an Initial Calibration %Drift report which shows the % Error for each calibration point. This report must be reviewed in addition to the %RSD / Linear Response Factor.

- The absolute value of the % Error for each calibration point should be < 30%. For the lowest calibration point, the % Error may be <50%.

- See Section 11.8 for the Calculation of Percent (%) Error.

9.2.4.4. **Initial Calibration Verification (ICV):**.Once the initial calibration has been analyzed and has met the above criteria, a second source Initial Calibration Verification (ICV) (as prepared in Section 7.2) must be analyzed and evaluated. The ICV must meet the criteria of 70-130% recovery for all compounds with the exception of the poor performing compounds listed in Attachment 1 which are allowed to be within 50-150% : An NCM must be initiated to denote any ICV non-conformances.

9.2.4.5. The ICV must meet the criteria of 70-130% recovery for all compounds however up to 10% of the compounds are allowed to exceed these criteria as long as their recoveries are within 65-135%. For the poor performers (see Attachment 1) the range is 50-150%. If the criterion is not met, a second ICV may be analyzed after corrective measures are taken. If a second ICV analysis fails to meet criteria proceed with corrective action and the analysis of a new initial calibration range. Flagging: If the ICV limits are outside of criteria (high) for an analyte and that analyte is undetected in the sample, no flagging or narration is required. If the ICV limits are outside of criteria (low) for an analyte and that analyte is undetected in a sample, narrate the non-conformance in an NCM. When that out of spec analyte is detected in a sample, describe the issue in the narrative, or flag as estimated.

9.2.4.6. Continuing Calibration Verification (CCV): A CCV consisting of a standard at or near the midpoint of the Initial Calibration Range is analyzed every 12 hours of instrument operation or at the beginning of an analytical sequence to verify the initial calibration. The calibration verification consists of a DFTPP instrument performance check (not required for 8270E), and analysis of a calibration verification standard. **Note:** Certain state regulatory programs have defined calibration acceptance limits which, where applicable, are used for calibration evaluations. The TALS ICAL Limit Groups detail these regulatory program criteria.

9.2.4.5.1 Tune Verification: Follow the procedure for verifying the instrument tune described in section 9.2.1 using a 50 ng injection of DFTPP. If the tune cannot be verified, analysis must be stopped, corrective action taken and a return to "control" demonstrated before continuing with the calibration verification process. For 8270E analysis only, tune verification is required just prior to ICAL.

9.2.4.5.2 Calibration Verification: Analyze the calibration verification standard immediately after a DFTPP that meets criteria. Daily analysis of the DFTPP is not required as part of the CCV for 8270E analysis. .When samples are analyzed after an ICAL the last ICAL standard may be used as the starting time reference for evaluation. Use the mid point calibration standard (approximately 50ug/l). NOTE: The calibration standard contains internal standards; Dichlorobenzene d_4, Naphthalene d_8, Acenaphthene d_{10}, Phenanthrene d_{10}, Chrysene d_{12}, and Perylene d_{12} at 40ug/l (0.1ug/L for SIM). The calibration check standard must also include all the target analytes from the original calibration.

9.2.4.5.3 The RFs must meet the criteria for the compounds in Table 18. Any compound that fails the minimum response factor must be reported as estimated for detects and must have a demonstration of sensitivity to report non-detects. To demonstrate adequate sensitivity for out of criterion compounds analyze the low level point of the calibration (LLCCV) in the analytical sequence. The criterion for the LLCCV is detection only but the standard qualitative identification criteria in the method must be met

9.2.4.5.4 The percent difference (when using average response factor) or percent drift (when using linear regression) of the compounds in Table 18 must be ≤20% for at least 80% of the total analyte list. If more than 20% of the compound list fail to 20% difference or drift criterion then appropriate corrective action must be taken prior to the analysis of the samples. Any individual compound that fails must be reported as estimated for detects and must have a demonstration of sensitivity to report non-detects. To demonstrate adequate sensitivity for out of criterion compounds analyze the low level point of the calibration (LLCCV) in the analytical sequence. The criterion for the LLCCV is detection only (%D criteria are not applied) but the standard qualitative identification criteria in the method must be met.

9.2.4.5.5 **CCV Poor Performers**: Refer to Attachment 1 for the identification of poor and/or erratic performing analytes. These analytes are allowed a %D >20% but must be <50 %D to be acceptable. If there are poor performers that exceed 50%D, the data may be reported provided results are noted as estimated. An NCM must be initiated to denote this situation.

9.2.4.5.6 The retention times of the internal standards from the calibration check must be within ±30 seconds of the internal standards from the mid point standard of the original calibration. If the retention time for any internal standard changes by more than 30 seconds from the latest daily (12 hour) calibration standard, the chromatographic system is inspected for malfunctions, and corrections made as required. If corrective action does not result in the retention time criteria being achieved, the system must be re-calibrated using four additional standards.

9.2.4.5.7 The response (area count) of each internal standard in the calibration verification standard must be within 50 - 100% of its corresponding internal standard in the mid-level calibration standard of the active calibration curve. If the EICP area for any internal standard changes by more than a factor of two (-50% +100%), the mass spectrometer system must be inspected for malfunction and corrections made as appropriate. When corrections are made, re-analysis of samples analyzed while the system was malfunctioning is required.

9.2.4.5.8 The relative retention times of each compound in the calibration verification standard must agree within .06 relative retention time units of its value in the initial calibration.

9.2.4.5.9 Use the average response factors from the original five-point calibration for quantitative analysis of target analytes identified in field samples.

9.2.4.5.10 Prepare a calibration summary or list indicating which compounds did not meet the 20% average percent difference criteria. Record this information in that run log.

9.2.4.7. Low Level Continuing Calibration Verification (LLCCV): An LLCCV consisting of the low level standard from the initial calibration range is analyzed every 12 hours of instrument operation after the CCV. The purpose and evaluation of the LLCCV is described in Section 9.2.4.4.4.

10.0 Procedure

10.1. Gas Chromatograph/Mass Spectrometer Operation

10.1.1. The sequence of events for GC/MS analysis involves many steps. First the injection system and column performance and calibration must be verified. Maintenance operations are performed as needed.

10.1.2. Preparation of the Injection Port Liner and Installation Procedure: Prior to the start of initial calibration and each daily analysis of sample extracts, a new liner for the injection port must be prepared. Once a liner has been used it is no longer inert and will cause serious chromatography problems with phenols and other compounds. When preparing the liner, proper laboratory protection must be worn and the liner must be prepared in a well-ventilated hood. When the procedure is completed all traces of toluene, Sylon-Ct and methanol will be removed immediately so that extraction solvents and preparation of sample extracts will not come into contact with these solvents and become contaminated.

10.1.2.1 Remove one liner from a 40ml VOA bottle containing other liners immersed in Sylon-Ct solution. Rinse off the liner with Toluene and wipe dry. Insert 1cm of pre-silanized glass wool partially into one end of the liner and trim neatly. Push the glass wool into the center of the liner so that it is 1 1/4" from the bottom. Do not use glass wool or solvents that are dirty (i.e. suspended particles) or use liners which are chipped on the ends, deformed or fractured. Inspect the glass wool for cleanliness after it has been inserted.

10.1.2.2 Using a Pasteur pipette flush out the interior of the liner containing the glass wool with Sylon-Ct. Rest the liner horizontally on a small beaker and allow the Sylon-Ct to re-deactivate the interior surfaces and the glass wool. There should be no air bubbles caught in the glass wool. After several

minutes flush out the Sylon-Ct with toluene and finally with methanol. Dry the outer surface of the liner and rest it on the injection port housing until the remaining methanol is boiled off

10.1.2.3 Insert the liner with the newly silanized glass wool plug into the injection port. Verify that the column extends up into the injection port and is perpendicular. Inspect the graphite seal and replace it if the edges are knife-shaped.

10.1.2.4 The septum is always replaced daily. Bake out the column at 300^{O}C for 15 minutes after the vacuum in the analyzer has returned to normal.

10.1.2.5 Performance may enhanced by clipping a small portion of the column at the injection port end. Document this activity in the maintenance record.

10.1.3. Prior to calibration or sample analysis always verify that the analyzer is under sufficient vacuum and that the column has proper carrier gas flow.

10.1.4. Establish the following GC/MS operating conditions:

10.1.4.1 Full Scan Operating Mode

Full Scan Mode – Standard Injection Volume
Mass Range: 35 to 500amu
Scan Time: 1 sec/scan
Transfer Line Temperature: 300^{O}C
Source Temperature: Preset by H.P. at 280^{O}C
Scan start time: 1.0 minutes
Initial Column Temperature and Hold Time: 45^{O}C for 0.5 minutes
Column Temperature Program: 20°C /min to 100°C 25°C/min to 270°C 10° C/min to 310°C
Final Column Temperature Hold: 310^{O}C for 5 minutes
Carrier Gas: Ultra High Purity Grade Helium at 1.3ml/min
Injector Temperature: 275^{O}C
Injector: Grob-type, pulse, splitless
Injection Volume: 1ul
Splitless Valve Time: 0.3 minutes

Full Scan Mode – Large Volume Injection (LVI)
Mass Range: 35 to 500amu
Scan Time: 1 sec/scan
Transfer Line Temperature: 300^{O}C
Source Temperature: Preset by H.P. at 280^{O}C
Scan start time: 1.0 minutes
Initial Column Temperature and Hold Time: 45^{O}C for 0.5 minutes
Column Temperature Program: 20°C /min to 100°C 25°C/min to 270°C 10° C/min to 310°C
Final Column Temperature Hold: 310^{O}C for 5 minutes
Carrier Gas: Ultra High Purity Grade Helium at 1.3ml/min
Injector Temperature: 275^{O}C
Injector: Grob-type, pulse, splitless
Injection Volume: 5ul
Splitless Valve Time: 0.3 minutes

10.1.4.2 SIM Operating Mode

SIM Mode
Mass Range: 35 to 500amu
Scan Time: 1 sec/scan
Transfer Line Temperature: 300^{O}C
Source Temperature: Preset by H.P. at 280^{O}C
Scan start time: 1.5 minutes
Initial Column Temperature and Hold Time: 40^{O}C for 0.5 minutes
Column Temperature Program: 20°C /min to 100°C 25°C/min to 270°C 10° C/min to 310°C
Final Column Temperature Hold: 310^{O}C for 3 minutes
Carrier Gas: Ultra High Purity Grade Helium at 1.3ml/min
Injector Temperature: 275^{O}C
Injector: Grob-type, pulse splitless
Injection Volume: 1ul
Splitless Valve Time: 0.3 minutes

10.1.4.3 Isotope Dilution Selected Ion Monitoring Mode :

SIM Parameters

Group 1
Plot 1 Ion: 74.0

Ions/Dwell in Group	(Mass Dwell)	(Mass Dwell)	(Mass Dwell)
	42.0 50	43. 0 50	68.0 50
	74.0 50	128.0 50	129.0 50
	136.0 50	150.0 50	152.0 50
	93.0 50	66.0 50	
	58.0 50		
	88.0 50		

Group 2
Group Start Time: 6.00
Plot 1 Ion: 152.0

Ions/Dwell in Group	(Mass Dwell)	(Mass Dwell)	(Mass Dwell)
	151.0 50	152.0 50	153.0 50
	154.0 50	162.0 50	164.0 50
	165.0 50	166.0 50	

Group 3
Group Start Time: 7.80
Plot 1 Ion: 188.0

Ions/Dwell in Group	(Mass Dwell)	(Mass Dwell)	(Mass Dwell)
	94.0 50	101.0 50	142.0 50
	178.0 50	179.0 50	188.0 50
	202.0 50	264.0 50	266.0 50
	284.0 50		

Group 4
Group Start Time: 10.50
Plot 1 Ion: 228

Ions/Dwell in Group	(Mass Dwell)	(Mass Dwell)	(Mass Dwell)
	120.0 50	228.0 50	229.0 50
	240.0 50		

Group 5
Group Start Time: 12.00
Plot 1 Ion: 252.0

Ions/Dwell in Group	(Mass Dwell)	(Mass Dwell)	(Mass Dwell)
	138.0 50	139.0 50	252.0 50
	253.0 50	260.0 50	264.0 50
	267.0 50	276.0 50	278.0 50

Table 19: Target Compound - Primary and Monitoring Ions

Compound	1	2	3

Compound	1	2	3
1,4-Dioxane-d8	96	64	62
1,4-Dioxane	88	58	57
1,4-Dichlorobenzene-d4	152	150	

10.1.5. The above listed instrument conditions are used for all analytical standards for calibration and for all sample extracts analyzed by this method.

10.1.5.1 The column conditions, scan start time, and splitless valve time for analysis of DFTPP only are as follows are as follows:

Initial Column Temperature and Hold Time: 140^{o}C for 0.5 minutes
Column Temperature Program: 140^{o} to 320^{o}C at 22^{o}C/minute
Final Column Temperature Hold: 320C for 0.5 minutes
Scan Start Time: approx. 5 minutes
Splitless Valve Time: 0.3 minutes
Injection Volume: 2 ul

10.2. Analytical Sequence

10.2.1. Dilutions are made based on initial GC/MS analysis. Dilutions are made in 1-ml vials using microsyringes. Calculate the dilution factor using the equation below:

$$DF = Ph / 5 \times Is$$

Where:

DF = Dilution Factor
Ph = Sample Peak Height
Is = Internal Standard Peak Height

When DF >1 but <2, combine 500ul of sample extract with 500ul methylene chloride in a 1 ml amber vial, add20 ul internal standard and crimp seal

Use **Table 20** to determine dilution and internal standard amount.

Table 20 Dilution Factor Calculations			
DF Value	**Volume of Sample (ul)**	**Volume of Methylene Chloride (ul)**	**Volume of ISTD (ul)**
<1	1,000	None	None
>1, <2	500	500	10
>4, <5	200	800	16
>10, <20	100	900	36
>20	500*	500	10
*Prepare this dilution by serially diluting the >10, <20 dilution			

10.2.2. Instrument Performance and Calibration Sequence

10.2.2.1. Once the GC/MS instrument has been setup and maintained as detailed in Section 10.1, the first operations to be performed are the performance checks and calibration standards.

10.2.2.2. Analyze the Instrument Performance Check Standard (DFTPP) as discussed in Section 9.2.1.

10.2.2.3. Initially and as required, analyze the Initial Calibration Range (minimum 5 points, six points for second order regression) as detailed in Sections 7.2.1 and 9.2.4.2. Evaluate the acceptability of the Initial Calibration Range as detailed in Section 9.2.4.2.

10.2.2.4. Immediately after the Initial Calibration Range only, analyze the Initial Calibration Verification (ICV) as detailed in Sections 7.2. and 9.2.4.3. Evaluate the acceptability of the ICV as detailed in Section 9.2.4.3.

10.2.2.5. Every 12 hours, reanalyze and evaluate the Instrument Performance Check Standard (DFTPP), not required for 8270E followed by the Continuing Calibration Verification (CCV) and Low Level Continuing Calibration Verification (LLCCV) as detailed in Section 9.2.3, 9.2.4.4 and 9.2.4.5. Evaluate the acceptability of the CCV and LLCCV as detailed in Section 9.2.4.4

10.2.2.6. Client samples and QC samples are analyzed (as detailed in Section 10.2.3) after acceptable Instrument Performance and Calibration Checks and until the 12 hour clock expires. Repeat the sequence as required. The automation of GC/MS runs is accomplished via the “SEQUENCE” macro of the ChemStation.

10.2.3. Sample Analysis Sequence

10.2.3.1. Sample extracts are normally prepared on the same day as analysis. The GC/MS operator will prepare the extracts that will be run on his or her instrument. Volume adjustments to the extracts will be made at the discretion of the supervisor.

10.2.3.2. Prior to the start of sample analysis the GC/MS operator will generate a sequence program containing the list of the sample extracts to be analyzed, the position on the autosampler tray, and the proper acquisition and tune methods that are to be used. This sequence program contains all the necessary information on the samples to be analyzed and how the GC/MS system is to analyze them. The sample extracts are loaded onto the autosampler (ALS) tray. Their position is verified by checking them against the ALS number on the sequence. This batch analysis will be performed automatically over the 12-hour period.

10.2.3.3. The analytical run log is printed as a record of samples analyzed. The analyst will annotate the run log with any required information regarding anomalies or unusual events. The run log must be signed by the analyst and a reviewed and signed by a trained peer or manager

10.3. Data Processing

10.3.1. Prior to processing any standards or samples, target compound lists and sublists must be assembled. Chrom's auto-processing system queries TALS (LIMS) for each sample's processing parameters (including target compounds lists) and downloads the required processing methods from LIMS to analyze data. These lists are required for processing of all data files including calibration files. The data includes compound names, retention time data, quantitation ions, qualitative identification ions, and the assigned internal standard for qualitative and quantitative identification.

10.3.2. Key data is manually entered the first time a compound list is used for data processing. Processing data using a compound list automatically generates response factor data and updates retention information.

10.3.3. The characteristic ions for target compounds, surrogate compounds, and internal standards which can be determined using SW 8270E are listed in Table 21.

10.4. Interpretation and Qualitative Identification: Qualitative identification of target compounds is based on retention time and mass spectral comparison with characteristic ions in the target compound list. The reference mass spectrum is taken from a standard of the target compound analyzed by this method. The

characteristic ions are the three ions of greatest relative intensity or any ions over 30% relative intensity if less than three such ions occur in the reference spectrum. Compounds are identified as present when the following criteria are met:

10.4.1 Target Analytes: Qualitative identification of target compounds is based on retention time and mass spectral comparison with characteristic ions in the target compound list. The reference mass spectrum is taken from a standard of the target compound analyzed by this method. The characteristic ions are the three ions of greatest relative intensity or any ions over 30% relative intensity if less than three such ions occur in the reference spectrum. Compounds are identified as present when the following criteria are met:

10.4.1.1. Once the GC/MS instrument has been setup and maintained as detailed in Section 10.1, the first operations to be performed are the performance checks and calibration standards.

10.4.1.2. The intensities of the characteristic ions of a compound maximize in the same scan or within one scan of each other.

10.4.1.3. The relative retention time (RRT) of the sample component is within ± 0.06 RRT units of the RRT of the standard component.

10.4.1.4. The most abundant ion in the standard target spectrum that equals 100% MUST also be present in the sample target spectrum.

10.4.1.5. All other ions that are greater than 10% in the standard target spectra should also be present in the sample.

10.4.1.6. The relative intensities of the characteristic ions agree within 30% of the relative intensities of these ions in the reference spectrum. (Example: For an ion with an abundance of 50% in the reference spectrum, the corresponding abundance in a sample spectrum can range between 20% and 80%).

10.4.1.7. If the compound does not meet all of the criteria listed above, but is deemed a match in the technical judgment of the mass spectral interpretation specialist, the compound will be positively identified and reported with documentation of the identification noted in the raw data record.

10.4.2 Non-Target Analytes: Upon client request a library search to identify non-target Tentatively Identified Compounds (TIC) is performed. The NIST/EPA/NIH mass spectral library is used to identify non-target compounds (not including internal standard and surrogate compounds) of greatest apparent concentration by a forward search of the library. The following guidelines are used by the analyst when making TIC identifications:

10.4.2.1. Relative intensities of major ions in the reference spectrum (ions greater than 10% of the most abundant ion) should be present in the sample spectrum.

10.4.2.2. The relative intensities of the major ions should agree within ±20%. (Example: For an ion with an abundance of 50% in the standard spectrum, the corresponding sample ion abundance must be between 30 and 70%).

10.4.2.3. Molecular ions present in the reference spectrum should be present in the sample spectrum.

10.4.2.4. Ions present in the sample spectrum but not in the reference spectrum should be reviewed for possible background contamination or presence of co-eluting compounds.

10.4.2.5. Ions present in the reference spectrum but not in the sample spectrum should be reviewed for possible subtraction from the sample spectrum because of background contamination or co-eluting peaks. Data system library reduction programs can sometimes create these discrepancies.

10.4.2.6. If, in the technical judgement of the mass spectral interpretation specialist, no tentative identification can be made, the compound will be reported as 'Unknown'. If the compound can be further classified the analyst may do so (i.e, 'Unknown hydrocarbon', 'Unknown acid' , etc.).

10.5. Data Reporting

10.5.1. Final Report. The Chom data system automatically produces a data report consisting of hardcopy reports corresponding to specific data reporting requirements, which is uploaded to the TALS LIMS System for the report production group.

10.5.1.1. Total Ion Chromatogram. Full length chromatogram depicting the full length of the GC/MS acquisition.

10.5.1.2. Spectra of all detected target compounds. A page for each detected target compound spectra with a standard reference spectrum for comparison.

10.5.1.3. The calculations of the concentrations of each target compound in the sample, reported in units of ppb, ug/kg or ug/l.

10.5.1.4. Data summaries for each method blank indicating which samples were extracted with the indicated blank.

10.5.1.5. A copy of the initial calibration range together with the calibration verification report, and tune report.

10.5.1.6. Quality Control (QC) data report for each batch including surrogate recoveries, internal standard area summaries, LCS, MS/MSD and RPD summaries.

10.6. The low-level calibration standard establishes the reporting limit. All reported data must be at a concentration at or above the low concentration standard. Any quantitative values below the report limit must be qualified as estimated.

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11.0. Calculations/Data Reduction

11.1. Target Compounds: are quantitated using the internal standard method (see the formula in Section 11.3).

11.1.1. Identified target compounds are quantitated using the integrated abundance from the EICP of the primary characteristic ion. The internal standard used shall be the one nearest the retention time of the analyte).

11.1.2. The average response factor (RRF) from the initial calibration is used to calculate the target analyte concentration in client samples using the formula found in Section 11.3. See Section 9.2.4 for discussion of RRF.

11.1.3. Secondary ion quantitation is utilized only when there are sample interferences preventing use of the primary characteristic ion. If secondary ion quantitation is used an average relative response factor (RRF) must be calculated using that secondary ion.

11.2. Non-Target Compounds (Tentatively Identified Compounds): An estimated concentration for non-target (tentatively identified compounds) is calculated using the internal standard method (see formula in Section 11.3). For quantiation, the nearest eluting internal standard free of interferences is used. The procedure used for calculating the concentration of non-target compounds is the same as that used for target compounds (see Section 11.1) with the following revisions:

11.2.1. The total area count of the non-target compound is used for As (instead of the area of a characteristic ion).

11.2.2. The total area count of the chosen internal standard is used as Ais (instead of the area of a characteristic ion).

11.2.3. A RF on 1.0 is assumed.

11.2.4. The resulting concentration is qualified as estimated ('J') indicating the quantitative uncertainties of the reported concentration.

11.3. Internal Standard Calculation:

11.3.1. Aqueous Samples

$$\text{Concentration } (\mu g/L) = \frac{(As)(Cis)(D)}{(Ais)(RF)(Vs)\ (Vi)\ (1000)}$$

Where:

As	=	Area of the characteristic ion for the target analyte in the sample
Cis	=	Concentration of the internal standard (ug/L)
D	=	Dilution factor, if the sample or extract was diluted prior to analysis. If no dilution is performed, D = 1.
Vi	=	Volume of the extract injected (ul)
Ais	=	Area of the characteristic for the associated internal standard
RF	=	Average response factor from the initial calibration.
Vs	=	Volume of sample extracted (ml)

The 1000 in the denominator represents the number of ul in 1 ml.

11.3.2. Solid Samples

$$\text{Concentration } (\mu g/KG) = \frac{(As)(Cis)(D)(Vt)}{(Ais)(RF)(Ws)\ (Vi)\ (1000)}$$

Where:

As	=	Area of the characteristic ion for the target analyte in the sample
Cis	=	Concentration of the internal standard (ug/L)
D	=	Dilution factor, if the sample or extract was diluted prior to analysis. If no dilution is performed, D = 1.
Vi	=	Volume of the extract injected (ul)
Ais	=	Area of the characteristic for the associated internal standard
RF	=	Average response factor from the initial calibration.
Vt	=	Volume of concentrated extract (ul)
Ws	=	Weight of sample (g)

The 1000 in the denominator represents the number of ul in 1 ml.

11.4. Relative Response Factors

$$RRF = \frac{A_x}{A_{is}} \times \frac{C_{is}}{C_x}$$

Where:

A_x = Area characteristic ion for the compound (see Table 21)
Ais = Area characteristic ion of associated internal std (See Table 21)
Cis = Concentration of internal standard
Cx = Concentration of compound in standard

11.5. Percent Relative Standard Deviation (% RSD) : as discussed in Section 9.2.4.4 (Initial calibration):

$$\% \text{ RSD} = \frac{\text{Standard Deviation of RRFs}}{\text{Mean RRF}}$$

11.6. Percent Difference (% D):as discussed in Section 9.2.4.4 (Continuing calibration):

$$\% D = \frac{RRF_c - \overline{RRF_i}}{\overline{RRF_i}} \times 100$$

Where: RRFc = RRF from continuing calibration

$\overline{RRF_i}$ = Mean RRF from current initial calibration

11.7. Percent Recovery (% R): Surrogates and Spikes

$$\text{Recovery (\%)} = \frac{\text{Concentration (or amount) found}}{\text{Concentration (or amount) added}} \times 100$$

11.8. Calculation of Relative Standard Error (RSE)

$$\%\,RSE = 100\% \times \sqrt{\frac{\sum_{i=1}^{N}\left[\frac{C_i - PC_i}{C_i}\right]^2}{(N-P)}}$$

Where:

N = Number of points in the curve
P = Number of parameters in the curve (= 1 for average response factor, 2 for linear, 3 for quadratic)
CI = True concentration for level i
PCi = Predicted concentration for level

11.9. Calculation of Percent (%) Error

$$\%Error = \frac{x_i - x_i'}{x_i} x\,100$$

Where:

x_i ' = Measured amount of analyte at calibration level *i*, in mass or concentration units

x_i = True amount

11.10. Dry Weight Correction: All solid samples must be corrected for dry weight using the following formula for dry weight determination.

$$DW = \frac{Gd}{Gw} \times 100$$

Where:

DW	=	Percent % Dry Weight
Gd	=	Dry weight of selected sample aliquot
Gw	=	Wet weight of selected sample aliquot

Multiply the DW value times the wet weight of the sample extracted. NOTE: This calculation can also be performed automatically by the target system provided the DW value is available and entered into the system.

12.0. Method Performance

12.1. Method Detection Limit Study (MDL)

A Method Detection Limit (MDL) study, as described in the Eurofins corporate Detection and Quantitation Limits SOP, CA-Q-S-006, must be performed initially and whenever a significant change affecting sensitivity is made to the analytical system. The MDL must be re-evaluated from quarterly MDL points at least every 12 months.

12.2. Demonstration of Capabilities

For DOC procedure refer to Section 19 in the most current revision of Eurofins Edison's Quality Assurance Manual (ED-QA-LQM).

12.3. Lower Limit of Quantitation Verification

The lowest calibration standard analyzed establishes the LLOQ or Reporting Limit. The capability to reliably detect this concentration through the preparation, clean-

up and analytical procedure is verified through the annual analysis of a standard at the LLOQ/RL. The LLOQ verification shall also be performed whenever significant changes are made to the preparation and/or analytical procedure.

12.3.1 The LLOQ verification standard shall be prepared at a concentration 0.5-2 times the LLOQ/RL, and be taken through all of the same preparation and clean-up methods as client samples.

12.3.2 The LLOQ verification standard for aqueous matrix shall be prepared using laboratory deionized water and for the solid matrix using clean Ottawa sand. Other clean matrices may be used in addition, for project specific requirements.

12.3.3 The annual LLOQ verification is completed and documented with the required annual MDL evaluation.

12.3.4 Recovery of each analyte must meet the laboratory established LCS recovery limits + 20%. (For example, if the LCS recovery limits are 70-130%, the LLOQ verification must meet recovery limits of 50-150%.) Once sufficient points have been generated, LLOQ based statistical limits may be used in place of limits based on LCS recovery.

NOTE: The lower recovery limit for the LLOQ can be no lower than 10%.

12.4. Training Requirements

Refer to Eurofins SOP No. ED-GEN-022, (*Training*), for the laboratory's training program.

13.0. Pollution Control

13.1 It is Eurofins's policy to evaluate each method and look for opportunities to minimize waste generated (i.e., examine recycling options, ordering chemicals based on quantity needed, preparation of reagents based on anticipated usage and reagent stability). Employees must abide by the policies in Section 13 of the Corporate Environmental Health and Safety Manual (CW-E-M-001) for "Waste Management and Pollution Prevention."

14.0. Waste Management

14.1 Waste management practices are conducted consistent with all applicable rules and regulations. Excess reagents, samples and method process wastes are disposed of in an accepted manner. Waste description rules and land disposal restrictions are followed. Waste disposal procedures are incorporated by reference to Eurofins Edison SOPs Nos. ED-SPM-007 (*Disposal of Samples and Associated Laboratory Waste, current revision)* and ED-SPM-008 (*Laboratory Waste Disposal Procedures, current revision).* The following waste streams are produced when this method is carried out:

- Auto sampler vials and expired standards: These vials are collected in satellite accumulation within the instrument laboratory. The vials are then placed into a 55 steel open top drum in the waste room. When the drums are full, the drum will be collected by the waste vendor for disposal. This waste is treated for incineration.

  Teris Profile Number: 50016652
  Onyx Profile WIP Number: 282493

- Mixed Solvent Waste: Mixed solvent waste is collected in a small beaker inside the bench top hood. This waste is then transferred into the satellite accumulation container in the Organic Prep. Lab. on a daily basis. This material is transferred into 5 gallon solvent cans as satellite accumulation. These cans are emptied every 24 hours into a steel drum in the waste room. This drum is kept in the walk in hood until it is full. The full drum is then removed from the hood and placed on secondary containment in the waste room.

  Teris Profile Number: 50016624
  Onyx Profile WIP Number: 545240

14.1. Pollution Prevention

14.2.1. Pollution prevention encompasses any technique that reduces or eliminates the quantity or toxicity of waste at the point of generation. Numerous opportunities for pollution prevention exist in laboratory operation. The USEPA has established a prevention hierarchy of environmental management techniques that places pollution prevention as the management option of first choice. Whenever feasible, laboratory personnel should use pollution prevention techniques to address their waste generation. When wastes cannot be feasibly reduced at the source, the agency recommends recycling as the next best option.

14.2.2. The quantity of chemical purchased should be based on expected usage during its shelf life and disposal cost of unused material. Actual reagent preparation volumes should reflect anticipated usage and reagent stability.

15.0. References / Cross-References

15.1. United States Environmental Protection Agency, “Method SW8270D, Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry”, Test Methods for Evaluating Solid Wastes, SW846 Third Edition, Laboratory Manual, Physical/Chemical Methods, Revision 5, July 2014..

15.2. United States Environmental Protection Agency, “Method SW8270E, Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry”, Test Methods for Evaluating Solid Wastes, SW846 Update IV, Laboratory Manual, Physical/Chemical Methods, Revision 6, June 2018.

15.3. United States Environmental Protection Agency, "Method SW8000D: Determinative Chromatographic Separations", Test Methods for Evaluating Solid Wastes, SW846, Laboratory Manual, Physical/Chemical Methods, Update V, Revision 4, October 2012..

15.4. Eurofins Edison Document No. ED-QA-LQM, *Laboratory Quality Manual*, current revision.

15.5. Eurofins Edison SOP No. ED-ORP-002, *SW846 Method 3510C-Extraction of Semi-Volatile Organic Compounds in Water by Separatory Funnel,* current revision.

15.6. Eurofins Edison SOP No. ED-ORP-043, *SW846 Method 3580A - Waste Dilution Prep for Analysis of BNAs by SW846 Method 8270,* current revision.

15.7. Eurofins Edison SOP No. ED-ORP-044, *Procedure for the Microwave Extraction of Solids, SW3546, current revision.*

15.8. Eurofins Document No. CW-E-M-001, Corporate Environmental Health and *Safety Manual,* current revision.

15.9. Eurofins Corporate Quality SOP No. CA-Q-S-001, *Solvent & Acid Lot Testing & Approval*, current revision.

15.10. Eurofins Edison SOP No. ED-GEN-023 (*Bulk Solvent Testing and Approval*), current revision.

15.11. Eurofins Edison SOP No. ED-GCS-001, *Preparation and Screening of Semivolatile Organic Extracts for GC/MS Analysis*, current revision.

15.12. Eurofins Edison Work Instruction Document No. EDS-WI-012, *Client Complaint/Corrective Action Form,* current revision.

15.13. Eurofins Edison SOP No. ED-GEN-003, *Standard Operating Procedure for Control of Non-Conformances and Corrective Action,* current revision.

15.14. Eurofins Edison SOP No. ED-ORP-001, *Extraction of Semivolatile Organic Compounds in Water, EPA Method 625.1,* current revision.

15.15. Eurofins Edison SOP No. ED-GEN-022, *Training,* current revision.

15.16. Eurofins Corporate Quality Memorandum, CA-Q-QM-002, *GC/MS Tuning Policy*, current revision.

15.17. Eurofins Corporate Quality SOP No. CA-Q-S-006, *Detection and Quantitation Limits,* current revision.

16.0. Method Modifications:

Method 8270E requires the DFTPP tune standard to be analyzed once prior to an ICAL

and not daily prior to sample analysis. Until such time as 8270D is removed from lab capabilities and in order to satisfy both 8270D and 8270E The laboratory will analyze the DFTPP tune daily, prior to QC and sample analysis. The laboratory will use the tighter criteria from Methods 8270C/8270D for tune evaluation, rather than the criteria suggested in Table 3 of Method 8270E.

17.0. Attachments

Attachment 1 Poor Performing Analytes

18.0. Revision History

- Revision 10, date 10/18/2022
    - Updated to Eurofins branding throughout.
    - Section 8.1: updated to include procedure for sampling chlorinated water sources.
    - Section 9 updated throughout to include ICAL evaluation with Relative Standard Error (RSE).
    - Section 11.8: added formula for calculation of Relative Standard Error (RSE)

- Revision 9, date 03/15/2021
    - Updated as needed to reflect 1,4-dioxane RL of 0.2 ug/l.
    - Updated Tables 11 and 12 to reflect new low ICAL standard concentration of 1,4-dioxane..

- Revision 8, date 06/29/2020
    - Updated to Eurofins branding.
    - Updated throughout to include 8270E requirements.
    - Removed references to SW846 3550B/C prep methods (no longer in use for this method at Edison lab).
    - Update equipment listed in Section 6.0.Updated analytical column in Section 6.1.2.
    - Updated, deleted and renumbered tables as required.
    - Made extensive updates to Standards (sources and preparation) in Section 7.2.
    - Removed all references to Aromatic Amines. Deleted all tables specific to Aromatic Amine analysis. Renumbered remaining tables in document and updated text references.
    - Throughout document clarified tune requirements for 8270E.
    - Following added to Section 9.1.1: For method 8270E the method blank is generally acceptable if target analyte concentrations are less than the one half the reporting limit.
    - Calibration Point Read-back Criteria was added to Section 9.2.4.3. The calculation for percent error was added to Section 11.8.
    - Section 9.2.4.2.3: added following for 8270E: the calculated concentration or amount of each analyte of interest in the CCV standard should fall within ±20%.
    - Section 9.2.4.2.5.6: added ‘The recalculated concentration of the low calibration point should be within ±50% of the standard’s concentration.”

- Section 12.1 revised to reflect the updated MDL procedure.
- Added Section 12.3: annual Lower Limit of Quantitation Verification
- Added Corporate SOP CA-Q-S-006, Detection and Quantitation Limits to references.
- Section 16.0: added a Method Modification regarding tuning check requirements.

- Revision 7, date 06/08/2018

  - Section 2.3: revised to clarify that RVE/LVI is lab standard procedure.
  - Section 9.1.3: removed statement regarding allowance for up to five analytes to recover outside of lab acceptance limits in LCS/LCSD.
  - Section 9.2.4.3: Replace table 'ICV Poor Performers (50-150% Recovery) with expanded list of 'Poor Performing Analytes' in Attachment 1.
  - Added Section 9.2.4.4.5: CCV Poor Performers
  - Corrected number in section 9.2.4.5
  - Added Attachment 1 – Poor Performing Analytes

- Revision 6, date 01/12/2018:

  - Section 7.2.5 included to specify reagent and standard storage conditions.
  - Revised Section 9.1.3 to clarify requirements for specific LCS/LCSD evaluation criteria regarding the # of out of criteria analytes.
  - Revised Section 9.2.4.3 to add 2,4-Dimethylphenol as a poor performing analyte, increased the range for the poor performers to 50-150 and also expanded the guidelines for flagging the ICV outliers.

- Revision 5, dated 09/29/2017:
  - Revised Section 9.1.1 to clarify requirements for surrogate recovery in method blanks.

- Revision 4, dated 08/21/2017:
  - Updated throughout to add a procedure for the analysis of 1,4-dioxane by isotope dilution selected ion monitoring (SIM)
  - Added tables for isotope dilution SIM standards. Renumbered all tables as necessary.
  - Section 7.2.1: added a list of full scan calibration list options.
  - Table 3: Renamed 'Full Scan Stock Standards'.
  - Section 9.2.1: noted that DFTTP applies only to full scan analysis.
  - Section 9.2.3: updated CCV concentrations
  - Added reference to GC/MS Tuning Policy in Section 15.16.

- Revision 3, dated 01/07/2016:
  - Tables 1 and 2: added SIM as option for 1,4-Dioxane.
  - Section 2.3: removed SW3541 (Soxtherm) as option for soils prep (lab has discontinued use of this method). Also removed SW3541 SOP reference from Section 15.0.
  - Tables 19 and 20: added source and prep instructions for 1,4-Dioxane SIM standard. Updated source and prep instructions for 4,6-Dinitro-2-methylphenol.
  - Table 22: added prep instructions for 1,4-Dioxane and 4,6-Dinitro-2-methylphenol

SIM ICV standard.
- Corrected the information in the 'DFTPP Key Ions and Abundance Criteria' table in Section 9.2.1 to match the info found in SW846 8270C.
- Section 10.1.4.2: updated "SIM Parameters" to included ion masses/dwell times for 1,4-Dioxane.

- Revision 2, dated 01/28/2015:
  - Extensively reformatted the SOP. Placed tables that had been in rear of document into the body of the text. Renumbered tables as applicable and fixed text references to tables.
  - Section 1.1, Table 1: Revised table to include all current analytes. Also footnoted those compounds which are currently analyzed by SIM.
  - Section 2.3: added options for extraction of solids by SW846 3456 (Microwave Extraction) and by SW3580A (Waste Dilution) and added SOP references. Deleted reference to SOP ED-ORP-005 (SW3550B – Low Level); Updated Section 15 (References).
  - Section 2.5: added text detailing the RVE/LVI options.
  - Section 2.6: added table which includes all analytes routinely analyzed by SIM.
  - Section 6: updated to include newer GC, MS and autosampler models currently in use.
  - Section 6.1.3: added Zebron ZB column as an option.
  - Section 7.2: extensively revised standards information to reflect switch to Restek standards.
  - Table 3:Added Custom Aromatic Amine Surrogate Standard and revised Table 8 to include initial calibration prep instructions for the Aromatic Amine surrogates.
  - Throughout document: removed references to Target and replaced with Chrom.
  - Section 7.2.1: Added reference to section 10.2.1.2 for LVI.
  - Added Section 7.2.1.3.1 and Table 17A both of which discuss use of Aromatic Amine surrogates.
  - Section 7.2.1.2: Added reference to Tables 9,10 and 11 (ICV Preparation)
  - Section 8.0: Added Sample container and minimum sample size (250 ml) for Reduced volume extraction.
  - Sections 9.1.2, 9.1.3, 9.1.4 and 9.2.4: added statement that certain state regulatory programs have defined recovery limits which, where applicable, are used for spike and calibration evaluations.
  - Section 9.1.2: Deleted sentence "A minimum of 16 spiked analytes are reported to in client reports (the full list is reported at least once during each 2 year period because we employ full spiking list.
  - Section 9.1.4: Added note regarding use of Aromatic Amine Surrogates.
  - Section 9.2.2.2: Added reference to ICV Preparation tables in Section 7.2.
  - Section 9.2.3: added more specific info as to the concentration of the CCVs for all techniques.
  - Section 9.2.4.2.1: Changed to reflect that each analyte should meet minimum RF's, not the average across the calibration. Added LLCCV requirement.
  - Section 10.3.1: added explanation of Chrom's interaction with TALS. Removed references to Target.
  - Section 9.2.4.2.5.5: Added: (or can be noted in the narrative)
  - Section 9.2.4.2.5.6: Revised last sentence to read: "This evaluation can be checked using the Initial Calibration %Drift Report in Chrom."
  - Section 9.2.4.3: Removed 65-135% criteria and added "poor performing" analyte list and associated criteria of 60-140%.

- Section 9.2.4.4.3: Added LLCCV criterion for RFs
- Section 9.2.4.4.4: Added LLCCV criterion for %D
- Section 10.1.4: Updated GC/MS operating conditions for full scan, SIM and DFTPP.
- Section 10.1.4.1: added a table detailing operating conditions for LVI option.
- Table 2: Added 2-ethylaniline, 2,4-dimethylaniline, 3,4-dimethylaniline, 2,3-dimethylaniline, 2,4,5-trimethylaniline and 4-chloro-o-toluidine to Working Standards preparation information.
- Table 25: updated to include all current analytis/surrogates/internal standards and associated ions.
- Throughout document: updated LQM section references as appropriate as some have changed with the latest LQM revision.

- Revision 1, dated 11/07/2011

  - Section 1.1, Table 1: Added Pentachloronitrobenzene and associated CAS# to the analyte list.
  - Section 7.2.1: Added Pentachloronitrobenzene standard information.
  - Table 2: Added Pentachloronitrobenzene to Working Standards preparation information.
  - Table 4: Added Pentachloronitrobenzene and associated minimum RF.
  - Table 8: Added Pentachloronitrobenzene and associated ions.

- Revision 0, dated 02/22/2011: NEW

Table 21
Characteristic Ions Of Semi-Volatile Organic Compounds

Compound	Primary Ion	Secondary Ion(s)
1,1'-Biphenyl	154	153,76
1,2,4,5-Tetrachlorobenzene	216	214, 179
1,2,4-Trichlorobenzene	180	182, 145
1,2-Dichlorobenzene	146	148, 111
1,2-Diphenylhydrazine	77	105, 182
1,3-Dichlorobenzene	146	148, 111
1,3-Dimethylnaphthalene	156	141, 115
1,4-Dichlorobenzene	146	148, 111
1,4-Dichlorobenzene d4 **(ISTD)**	152	150, 115
1,4-Dioxane	88	58, 43
1-Methylnaphthalene	142	141, 115
1-Naphthylamine	143	115, 116
2,2'-oxybis[1-chloropropane]	45	77, 121
2,3,4,6-Tetrachlorophenol	232	131, 230
2,3,7,8-TCDD (screen)	320	322, 324
2,3-Dihydroindene		
2,3-Dimethylaniline	106	129

Table 21 Characteristic Ions Of Semi-Volatile Organic Compounds		
Compound	**Primary Ion**	**Secondary Ion(s)**
2,4,5-Trichlorophenol	196	198, 200
2,4,5-Trimethylaniline	102	55, 56
2,4,6-Tribromophenol **(Surrogate)**	330	132, 141
2,4,6-Trichlorophenol	196	198, 200
2,4-Dichlorophenol	162	164, 98
2,4-Xylidine	121	120, 106
2,4-Dimethylphenol	122	107, 121
2,4-Dinitrophenol	184	63, 154
2,4-Dinitrotoluene	165	63, 89
2,6-Dinitrotoluene	165	63, 89
2-Chloronaphthalene	162	127, 164
2-Chlorophenol	128	64, 130
2-Ethylaniline	106	122,104
2-Fluorobiphenyl **(Surrogate)**	172	171
2-Fluorophenol **(Surrogate)**	112	64
2-Methylnaphthalene	142	141
2-Methylphenol	108	107
2-Naphthylamine	143	115, 116
2-Nitroaniline	65	108, 138
2-Nitrophenol	139	109, 65
2-tert-butyl-4-Methylphenol	149	121, 91
2-Toluidine	107	106, 77
3,3'-Dichlorobenzidine	252	254, 126
3,4-Dimethylaniline	106	129, 127
3,5-Di-tert-butyl-4-Hydroxytol	205	220, 145
3-Nitroaniline	138	108, 65
4,6-Dinitro-2-methylphenol	198	51, 105
4-Bromophenyl phenyl ether	248	250, 141
4-chloro-2-methylaniline	106	144, 142
4-Chloro-3-methylphenol	107	144, 142
4-Chloroaniline	127	129
4-Chloroaniline-d4 **(Surrogate)**	131	133
4-Chlorophenyl phenyl ether	204	206, 141
4-Methylphenol	108	107
4-Nitroaniline	138	108, 65
4-Nitrophenol	139	109, 65
Acenaphthene	154	153, 152
Acenaphthene d10 **(ISTD)**	164	162, 160
Acenaphthylene	152	151, 153
Acetophenone	105	77, 51
Aniline	93	66
Aniline-d5 (**Surrogate**)	98	71,42
Anthracene	178	176, 179
Atrazine	200	173,215
Benzaldehyde	77	105,106
Benzidine	184	92, 185

Table 21 Characteristic Ions Of Semi-Volatile Organic Compounds		
Compound	**Primary Ion**	**Secondary Ion(s)**
Benzo(a)anthracene	228	229, 226
Benzo(a)pyrene	252	253, 125
Benzo(b)fluoranthene	252	253, 125
Benzo(g,h,i)perylene	276	138, 277
Benzo(k)fluoranthene	252	253, 125
Benzoic Acid	122	105, 77
Benzyl Alcohol	108	79, 77
Bis(2-chloroethoxy)methane	93	95, 123
Bis(2-chloroethyl)ether	93	63, 95
Bis(2-ethylhexyl)phthalate	149	167, 279
Bisphenol-A	213	228, 119
Butyl benzyl phthalate	149	91, 206
Caprolactam	113	55,56
Carbamazepine	193	236, 135
Carbazole	167	166, 139
Chrysene	228	226, 229
Chrysene d12 **(ISTD)**	240	120, 136
Coumarin	146	118, 63
Dibenz(a,h)anthracene	278	139, 279
Dibenzofuran	168	139
Diethylphthalate	149	177, 150
Dimethylphthalate	163	194, 164
Di-n-butylphthalate	149	150, 104
Di-n-octylphthalate	149	167, 43
Fluoranthene	202	101, 203
Fluorene	166	165, 167
Hexachlorobenzene	284	142, 249
Hexachlorobutadiene	225	223, 227
Hexachlorocyclopentadiene	237	235, 272
Hexachloroethane	117	201, 199
Indeno(1,2,3-cd)pyrene	276	138, 227
Isophorone	82	95,138
Kepone	272	237, 355
N,N-Dimethylaniline	120	122, 104
Naphthalene	128	129, 127
Naphthalene d8 **(ISTD)**	136	68
n-decane	43	57
Nitrobenzene	77	123, 65
Nitrobenzene-d5 **(Surrogate)**	82	128, 54
N-Nitrosodimethylamine	42	74, 44
N-Nitroso-di-n-propylamine	170	42,101,130
N-Nitrosodiphenylamine	169	168, 167
n-Octadecane	57	43, 85
o-Toluidine-d9 **(Surrogate)**	114	112, 42
Pentachloronitrobenzene	237	214,295
Pentachlorophenol	266	264, 268

Table 21 Characteristic Ions Of Semi-Volatile Organic Compounds		
Compound	**Primary Ion**	**Secondary Ion(s)**
Perylene d12 **(ISTD)**	264	260, 265
Phenanthrene	178	179, 176
Phenanthrene d10 **(ISTD)**	188	94, 80
Phenol	94	65, 66
Phenol-d5 **(Surrogate)**	99	42, 71
Phenyl ether	170	77, 115
Pyrene	202	200, 203
Pyridine	79	52, 51
Terphenyl-d14 **(Surrogate)**	244	122, 212

Attachment 1
Poor Performing Compounds

1,2,4,5-Tetrachlorobenzene
1,4-Dioxane
1-Naphthylamine
2,3,4,6-Tetrachlorophenol
2,4-Dimethylphenol
2,4-Dinitrophenol
2-Chloroaniline
2-Naphthylamine
3&4-Methylphenol
3'3-Dichlorobenzidine
4,6-Dinitro-2-methyl- phenol
4-Chloroaniline
4-Nitrophenol
Aniline
Atrazine
Benzaldehyde
Benzidine
Benzoic Acid
Benzyl Alcohol
Biphenyl
Caprolactam
Diphenylamine
Hexachlorocyclopentadiene
Hexachloroethane
n-Decane
n-Nitrosodimethylamine
o,o,o-Triethylphosphorothioate
o-Toluidine
Pentachloronitrobenzene
Pentachlorophenol
Phenol
Pyridine

These analytes are exempt from the ICV and CCV criteria as detailed in this SOP

Title: Closed System Purge and Trap and Extraction for Volatile Organics in Soil , SW846 Method 5035A

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1.0 Scope and Application

1.1 Analytes, Matrix(s), and Reporting Limits

1.1.1 This method describes a closed system purge and trap procedure for the analysis of volatile organic compounds in soils, sediments and solid wastes.

1.1.2 This method is designed for use on samples containing low levels of volatile compounds (0.5 to 200ug/kg), and requires the use of hermetically sealed sample vials, which limits a samples exposure to the atmosphere, thereby minimizing the loss of volatile compounds.

1.1.3 Method 5035A can be used for most volatile organic compounds that have boiling points below 200°C and are insoluble or slightly soluble in water. Water-soluble compounds can be included in this technique, but will have higher quantitation limits due to poor purging efficiency.

1.1.4 Method 5035A also includes sample collection and preparation procedures for medium and high concentration soil samples (i.e., >200 ug/kg). Medium and high level soil samples are prepared either by field preservation of a soil sample in methanol or by creating a methanol extract from a soil sample that was collected as bulk soil.

1.1.5 The preparation steps described for medium and high level samples will be followed by the aqueous purge and trap procedure detailed in Eurofins Edison SOP No. ED-MSV-001(*Purge and Trap for Aqueous Samples, SW846 Method 5030, current revision*).

1.1.6 The preparation and sample introduction steps described for low-level soils will be followed by analysis using Eurofins Edison SOP Nos. ED-GCV-006 (*Gasoline Range Organics using GC FID Method SW846 8015, current revision*) or ED-MSV-005 (*SW846 Method 8260B Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry, current revision*) as applicable.

1.1.7 On occasion clients may request modifications to this SOP. These modifications are handled following the procedures outlined in Sections 7 (*Review of Work Request*) and 19 (*Test Methods and Method Validation*) of Eurofins Edison's Quality Assurance Manual (ED-QA-LQM).

2.0 Summary of Method

2.1 **Low Level Soils:** Volatile organic compounds are determined by collecting a 5g-soil sample with a specially designed sampling device (ex., En Core® Sampler) in which the sample is stored without headspace. Upon receipt and within 48 hours of sampling, the soil is placed in a pre-weighed vial containing 5 mL of reagent water and a stir bar. The vial containing the soil is then frozen extending the hold time to 14 days. The same samples may be received from the field in a 40 mL vial with 5 mL water (ex., Terra Core® Sampler). Immediately prior to analysis, the soil is thawed, reagent water, surrogate spiking solution and/or internal standard

spiking solution are added to the vial by the automatic sampler, without opening the vial to the atmosphere. The sample vial is heated and purged with helium while being magnetically stirred. The volatile components travel through a transfer line to a sorbent trap. When purging is complete, the trap is heated and backflushed with helium to desorb the sample components on to a GC column for separation and analysis by the appropriate determinative method.

2.2 **Medium Level Soils:** Medium level soils are soils that were originally intended to be analyzed by a low level soil method, but show contaminants >200ug/kg when screened. A methanol extract is prepared by extracting 5g of soil with 10mL of methanol. The volatiles are effectively transferred from the soil to the methanol. A portion of the methanol extract is introduced into the GC or GC/MS system by using the purge and trap Method SW846 5030 followed by the appropriate determinative method.

2.2.1 Samples may also arrive from the field as 5 mL or 10 mL methanol preserved samples. These are considered to be medium level prepared samples.

2.3 **High Level Soils:** The high level soil method acts as a combined preservation and extraction technique. 25mL of methanol /surrogate solution is placed in each VOA vial and weighed prior to field sampling. Approximately 10g of soil is added to each vial in the field. Upon returning to the lab, the vial is weighed again, and the difference between the two weights is recorded as the initial weight of sample. As with the medium level method, the volatiles are effectively transferred to the methanol. A portion of the methanol extract is introduced into the GC or GC/MS system by using the purge and trap Method SW846 5030 followed by the appropriate determinative method.

2.4 **Waste Dilution:** Organic waste samples are prepared by extracting 1g of sample with 10mL of methanol / surrogate solution. A portion of the methanol extract is introduced into the GC or GC/MS system by using the purge and trap Method SW846 5030 followed by the appropriate determinative method.

3.0 Definitions

3.1 For a complete list of definitions refer to Appendix 5 in the most current revision of Eurofins Edison's Quality Assurance Manual (ED-QA-LQM).

4.0 Interferences

4.1 This method and the determinative methods that follow are susceptible to contamination from a number of sources. Potential sources of contamination include organic solvents used in other laboratory procedures, impurities in the purge gas, improper cleaning of syringes or purge vessels, and carryover from high level samples. Samples can be contaminated by the diffusion of volatile organics through the septum during shipment or storage. Steps have been taken to ensure that these potential problems are eliminated from the laboratory.

4.2 The volatile laboratory is located in a separate building, away from the organic extraction area where large quantities of organic solvents are used. No organic solvents are used or stored in the volatile laboratory.

4.3 The nitrogen used as purge gas passes through a solvent trap prior to its inlet into the purge and trap units.

4.4 A trip blank prepared from organic-free reagent water is carried through the sampling, storage, and analysis of each group of samples to check for such contamination.

4.5 Individual samples are each handled with a unique syringe that has been baked in a drying oven at 105°C to ensure the absence of volatile compounds.

4.6 Purge vessels are removed from the autosampler units after each use, rinsed, baked, returned to the units and pre-purged before the next use.

4.7 Carryover can occur anytime a high level sample is analyzed. Screening procedures are employed to ensure that a sample is analyzed at an appropriate dilution to minimize potential carryover. When a high level sample is analyzed, it is followed by the analysis of a reagent water blank. If another sample was analyzed after the high level sample, this sample is inspected carefully for signs of carryover. If this sample does not contain any of the compounds found in the high level sample, the system can be considered contamination free.

4.8 The analytical system is checked daily with the analysis of a method blank. This blank must meet all quality control criteria for the method before sample analysis may take place.

4.9 Potential cross-contamination of samples stored in lab refrigerators is monitored by preparation, analysis and evaluation of storage blanks. Storage blanks are prepared by filling 40 mL VOA vials with reagent water and placing one in each refrigerator. After one week, the storage blanks are removed and analyzed. Additional details can be found in Eurofins Edison SOP No. ED-SPM-004, *Sample Storage & Handling Procedures for Mitigation of Sample and Laboratory Contamination,* current revision.

5.0 Safety

Employees must abide by the policies and procedures in the Corporate Environmental Health and Safety Manual (CW-E-M-001) and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum.

Any questions pertaining to safety issues or procedures should be brought to the department manager or Edison Safety Officer.

5.1 Specific Safety Concerns or Requirements

5.1.1 Latex, nitrile and vinyl gloves all provide adequate protection against the methanol used in this method.

5.1.2 Purge vessels on purge-and-trap instruments can be pressurized by the time analysis is completed. Vent the pressure prior to removal of these vessels to prevent the contents from spraying out.

5.2 Primary Materials Used

The following is a list of the materials used in this method, which have a serious or significant hazard rating. **Note: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the MSDS for each of the materials listed in the table.** A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the MSDS for each material before using it for the first time or when there are major changes to the MSDS.

Material (1)	Hazards	Exposure Limit (2)	Signs and symptoms of exposure
Methanol (MeOH)	Flammable Poison Irritant	200 ppm-TWA	A slight irritant to the mucous membranes. Toxic effects exerted upon nervous system, particularly the optic nerve. Symptoms of overexposure may include headache, drowsiness and dizziness. Methyl alcohol is a defatting agent and may cause skin to become dry and cracked. Skin absorption can occur; symptoms may parallel inhalation exposure. Irritant to the eyes.
1 – Always add acid to water to prevent violent reactions.			
2 – Exposure limit refers to the OSHA regulatory exposure limit.			

6.0 Equipment and Supplies

6.1 Instrumentation

6.1.1 Purge and trap units from several different manufacturers are used, depending upon the sample matrix and preparatory technique required. A purge and trap unit consists of three parts: the sample purge unit, the trap, and the concentrator. Unit configurations currently in use are:

- OI Analytical 4551 Automatic Sampler/4560 concentrator;
- Archon 5100A Automatic sampler/ OI Analytical 4560 concentrator;
- EST Centurion Autosampler/ EST Encon concentrator;
- Archon Autosampler/EST Encon concentrator.

6.1.2 A VOCARB 3000 trap from Supelco is used in the Encon concentrator. The trap is 25cm long with an inside diameter of 0.105 inches. The trap is packed with 10.0cm Carbopack B, 6.0 cm Carboxin 1000, and 1cm Carboxin 1001

6.1.3 An OI analytical purge trap #10 is used for the OI 4560 concentrator. The trap is 25cm long with an inside diameter of 0.105 inches. The trap is packed to contain the following absorbents: Tenax/silica gel/carbon molecular sieve.

6.1.4 Alternate traps may be used provided the adsorption and desorption characteristics are equivalent to those of the trap recommended by the method.

6.1.5 Both the Encon and OI concentrators are capable of rapidly heating the trap to 260°C and holding at that temperature for the duration of the desorb time.

6.1.6 Gas chromatograph: HP 5890/Agilent 6890/7890 equipped with temperature programming capability.

6.1.7 GC column: reference the applicable determinative method for column specifics.

6.1.8 Detector: Flame Ionization Detector or Mass Spectrometer (HP5971/5972/Agilent 5973). Reference the applicable determinative method for detector specifics.

6.1.9 Data system: HP Chemstation II for data acquisition and HP UNIX based TARGET software for data processing.

6.2 Equipment and Supplies

6.2.1 Freezer: Capable of holding a temperature of -7°C to -20°C.

6.2.2 Refrigerator: Capable of holding a temperature of 4°C ±2°C

6.2.3 Top loading analytical balance.

6.2.4 Portable field balance. Capable of weighing to 0.01g.

6.2.5 Microsyringes: 10 uL to 1000 uL.

6.2.6 Syringes: 5mL, 10mL, and 30mL gas-tight.

6.2.7 Volumetric flasks: Class “A” glassware, 10mL , 50mL , and 100 mL.

6.2.8 VOA vials: 40 mL glass with PTFE –faced septum.

6.2.9 En Core® Sampler. Designed to take a 5g-soil sample. Sealed to prevent loss of volatiles.

6.2.10 Vials: 2mL amber glass with screw cap with Teflon-faced septa.

6.2.11 Spatula: Narrow, stainless steel.

6.2.12 Stir bars: PTFE coated, small enough to spin freely inside a VOA vial.

7.0 Reagents and Standards

7.1 Reagents

7.1.1 Organic free reagent water. Distilled water purchased from Poland Spring.

7.1.2 Methanol. Purge and trap grade, purchased from JT Baker. (Cat # 9077-02)

7.1.2.1 Each lot of methanol and hydrochloric acid is screened for contaminants before being used for analysis as detailed in Eurofins Corporate Quality SOP No. CA-Q-S-001 (*Solvent & Acid Lot Testing & Approval*) and Eurofins Edison SOP No. ED-GEN-023 (*Bulk Solvent Testing and Approval*).

7.2 Standards

7.2.1 Calibration standard preparation and use is described in detail in each of the determinative methods.

7.2.2 Method 8260 Methanol/Surrogate solution (2.5 ppm) is prepared using purge and trap grade methanol and neat a,a,a-Triflurotoluene solution. Initially a primary solution is prepared at 2500 ppm:

Standard Name	Vendor	Catalog #	Volume added	Concentration of Stock Std.	Concentration of Standard	Total Volume Volume of MeOH
1°Surrogate Mix: 4-Bromofluorobenzene Toluene-d8 1,2-Dichloroethane-d4	Sigma Aldrich	 B67201 151998 396540	 1585 ul 2678 ul 1932 ul	Neat	2500ppm	1000 ml

The 2500 ppm solution is used to prepare a 2.5 ppm Method 8260 Methanol/Surrogate working solution by diluting 1.0 ml of 2500 ppm stock to 1000ml with purge and trap grade methanol.

7.2.3 Method 8015 (GRO) Methanol/Surrogate solution (1.25 ppm) is prepared by diluting 0.5ml of the 2500 ppm stock (see Section 7.1.4) to 1000 ml with purge and trap grade methanol.

8.0 Sample Collection, Preservation, Shipment and Storage

8.1 Low Level Soils

Sample containers used to collect low-level soils are 40 mL VOA vials with PTFE-faced septa (closed system purge and trap), En Core® Samplers, Terra Core® kits or bulk soil.

8.1.1 For the 40 mL VOA vial (closed system purge and trap) collection procedure, add 1 clean magnetic stir bar and 5 mL of reagent water to each vial.

8.1.1.1. Cap the vial and weigh to the nearest 0.01g. Record this as the tare weight.

8.1.1.2. Collect approximately 5g of soil using an appropriate sampling device and add 5g to each of 3 vials for low level analysis.

8.1.1.3. Collect a fourth aliquot for field methanol preservation into a pre-weighed vial containing 10 mL of methanol.

8.1.1.4. Closed system purge and trap collection vials are re-weighed to determine actual sample weight. Record the sample weight on the sample vial.

8.1.1.5. Within 48 hours of sampling the collection vials are placed into a freezer (on their side to prevent breakage) at -7°C to -20°C. Freezing in this manner extends the holding time to 14 days from sampling.

8.1.2 For En Core® Sampler collection, collect up to 3 En Core® Sampler for low level preservation via freezing and a fourth for medium level preservation with methanol (Section 8.2 details the medium level preservation procedures for En Core® samplers). The low level preservation procedures are:

8.1.2.1. The En Core® device is received at the lab sealed without headspace with a cap and viton o-rings.

8.1.2.2. For each En Core® requiring low level preservation, add 5ml of reagent water and a magnetic stir bar to a 40 ml vial. Cap the vial.

8.1.2.3. Weigh each vial to the nearest 0.01g. Record this as the tare weight.

8.1.2.4. Transfer the contents of each En Core® to separate preweighed vials within 48 hours of sampling.

8.1.2.5. Reweigh the vial. Record the weight on each sample vial.

8.1.2.6. The vials are placed into a freezer (on their side to prevent breakage) at -7°C to -20°C. Freezing in this manner extends the holding time to 14 days from sampling.

8.1.2.7. A bulk soil sample must also be collected for the purposes of percent moisture analysis for dry weight determination.

8.1.2.8. Vials are removed from the freezer the day of analysis for thawing.

8.1.2.9. Stir bars may be reused after the vial is analyzed. Retrieve the stir bar from each vial using the magnetic stir bar retriever, rinse the stir bar with methanol and bake at 105°C for 2 hours.

8.1.3 Terra Core® Kits. This option requires samples to be field preserved:

8.1.3.1. The sample kit typically includes two pre-weighed 40 mL vials containing 5 mL of water with a small magnet stir bar and one or two pre-weighed 40 mL vials containing pre-measured and recorded amount of methanol.

8.1.3.2. Approximately 5g of sample is placed into each vial by the field sampler.

8.1.3.3. The vials containing the samples are re-weighed in the lab and the net sample weight is recorded for each vial. The vials containing the sample and water are frozen up until the time of analysis.

8.1.3.4. The methanol preserved samples are considered to be medium level prepared samples and do not require freezing but they must be refrigerated at 4°C until time of analysis.

8.1.3.5. A bulk soil sample must also be collected for the purposes of percent moisture analysis for dry weight determination.

8.1.3.6. Stir bars may be reused after the vial is analyzed. Retrieve the stir bar from each vial using the magnetic stir bar retriever, rinse the stir bar with methanol and bake at 105°C for 2 hours.

8.1.4 Bulk soil. Typically consists of soil collected in 8-oz or 16-oz glass jars. At client request bulk soil samples can be sub-sampled, preserved and analyzed for volatile organics. Soils collected for low level VOA analysis as bulk soil in jars will be preserved as described above in Section 8.1.1. Documentation of preservation is recorded in the Soil Preservation Logbook.

8.2 Medium Level Soils

8.2.1 Medium level refers to any soil sample extracted in methanol not preserved in the field. The fourth Encore sample collected (as described in Section 8.1.2 above) will be prepared as a medium level soil in case the analysis of a low level preserved aliquot exhibits concentrations of target compounds exceeding 200 ug/kg. All medium level extracts must be refrigerated at 4°C until time of analysis.

8.2.1.1. Prepare the medium level soil by adding 5 g of soil or Encore to 10 mL of Methanol / Surrogate solution (either the 8260 solution as described in Section 7.1.4 ***or*** the 8015 solution as described in Section 7.1.5. depending upon the method to be analyzed). All medium level extracts shall be prepared within 48 hours of collection. The weight of soil used to prepare the extract is recorded on the sample vial.

8.2.1.2. Since methanol extract results tend to increase with time as the sample contact time increases, a minimum contact time of one day is allowed ***or*** the soil is sonicated for 20 minutes.

8.2.1.3. Any soil requiring medium level preservation but collected out of compliance with method 5035A (bulk soil without preservative or not in an Encore device) will be prepared in the same manner as in section 8.2.1.1. Documentation will be noted in the soil preservation log.

8.3 High Level Soils

8.3.1 High level soils are field collected using laboratory prepared 40 ml VOA vials (with PTFE-faced septa) containing 25 mL of the Methanol/Surrogate solution (either the 8260 solution as described in Section 7.1.4 ***or*** the 8015 solution as described in Section 7.1.5. depending upon the method to be analyzed).

8.3.2 The vials containing the Methanol/Surrogate solution are weighed using a barcode reader and an analytical balance. The bottle ID and weight (Weight 1) are recorded in the methanol-tracking program.

8.3.3 The containers are issued to the field as required.

8.3.4 Field samplers are directed to weigh 10 g of sample using a field balance. They must carefully add the 10 g sample to the sample vial containing the Methanol/Surrogate solution, taking care not to spill any of the solution from the vial.

8.3.5 Field samplers are directed to wipe the neck of the vial carefully to remove any soil around the threads. This helps to ensure a good seal once the vial is capped. Field samplers are further directed to cap the vial, shake gently, dispersing the soil into the methanol. An additional aliquot of soil without any methanol or preservative must be collected for use in determining percent moisture (i.e., for dry weight determination).

8.3.6 Upon the return to the laboratory, the sample vials (now containing both the Methanol/Surrogate solution and approximately 10g of soil) are reweighed using the barcode reader and analytical balance. Record this weight (Weight 2) in the methanol tracking system. Calculate the initial weight of soil by subtracting Weight 1 from Weight 2.

8.3.7 All samples for volatile analysis are protected from light and stored at 4°C±2°C in an area free of organic solvents. No standards or solvents are stored in the sample refrigerators or in the surrounding area.

8.3.8 All samples preserved in this manner must be analyzed within 14 days of collection.

9.0 Quality Control

9.1 Specific quality control procedures are outlined in each of the determinative methods that follow this purge and trap technique of sample introduction. Standard quality assurance practices are used with all methods.

9.2 Reagent water blanks are analyzed to ensure that reagents and/or sample dilutions are free of interferences.

9.3 Method blanks are prepared and analyzed in the same manner as samples, and are carried through the entire analytical procedure to show that each system is in control.

9.4 Potential cross-contamination of samples stored in lab refrigerators is monitored by preparation, analysis and evaluation of storage blanks. Storage blanks are prepared by filling 40 mL VOA vials with reagent water and placing one in each refrigerator. After one week, the storage blanks are removed and analyzed. Additional details can be found in Eurofins Edison SOP No. ED-SPM-004, *Sample Storage & Handling Procedures for Mitigation of Sample and Laboratory Contamination,* current revision.

9.5 An initial demonstration of accuracy and precision is performed for each determinative method. This demonstration is done for each sample introduction technique.

10.0 Procedure

10.1 This section provides guidance for the analysis of low level soils using a closed system purge and trap procedure. Reference the SOPs for the determinative methods for additional details as applicable: Eurofins Edison SOP Nos. ED-GCV-006 (*Gasoline Range Organics using GC FID Method SW846 8015, current revision*) or ED-MSV-014 (*SW846 Method 8260D Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry, current revision*).

10.2 Instrument operating parameters are set at the beginning of a method of analysis and remain constant throughout the entire analytical procedure. Again, reference the SOP for the applicable determinative method for specifics. Sample operating conditions are listed here:

Example Instrument Operating Parameters

Purge and trap unit	
Purge Time	11 minutes
Dry Purge	1 Minutes
Purge Gas	Helium
Purge Flow	40-45 ml/min
Purge Temp	Water - Ambient; Solids - 40^{0}C
Trapping Temp	Ambient, <30^{0}C
Desorb Time	1-2 Minutes
Desorb Temp	Vocarb - 260^{0}C
Gas chromatograph	
Injector	180^{0}C
Carrier Gas	Helium
Carrier Flow	6 ml/min
Oven Program	35 - 250^{0}C
Run Time	30 Minutes
Mass Spectrometer	
Electron Energy	70 volts (nominal)
Mass range	35-260 AMU
Scan time	0.9 sec./scan
Source Temp	200^{0}C
Separator Temp	180^{0}C

10.3 All samples are screened prior to analysis, using the procedure outlined in Eurofins Edison SOP No. ED-GCV-001, *Screening for Volatile Organics, Static Headspace with GC FID SW846 Method 5021(modified),* current revision. In addition to reducing excessive instrument contamination and/or extensive instrument clean up, screen data provides the analyst with an approximate dilution factor and is used to determine which sample preparation technique should be used for a particular sample. If the estimated concentration from the screening procedure shows concentrations below 200 ug/kg, follow the low concentration closed system purge and trap method. If the screen result shows concentrations >200 ug/kg, follow the medium level procedure.

10.4 Low Level Soil Procedure

10.4.1 Low level soils are field collected as described in Section 8.1 using 40 mL VOA vials with PTFE-faced septa (closed system purge and trap), En Core® Samplers, Terra Core® kits or bulk soil.

10.4.2 Set up the purge and trap autosampler (Archon 5100A or EST Centurion, see Section 6.1) for the closed system method for low-level soils. The purge and trap autosampler will add 5 mL reagent water, and 1uL of the internal standard and/or surrogate spiking solution to the sample vials. The heating block will heat each sample to 40° C and hold for 0.5 minutes before purging begins.

10.4.3 Tuning, calibration, and method blank analysis:

- Tuning and calibration is accomplished as detailed in the SOP for the applicable determinative method.

- The volume of water used when purging a calibration standard must be the same as the volume of water purged during a sample analysis. Since the low-level soils have 5 mL water added at vial preparation plus the 5 mL of reagent water added by the purge and trap autosampler prior to purging, a total volume of 10 mL is required for calibration standards.

- Internal standard (if required by the determinative method) is added to each calibration standard by the purge and trap autosampler, in the same manner it will be added to the samples.

- After successful calibration, analyze a method blank. The method blank must meet all criteria in the determinative method. A successful method blank shows that the system is free of interferences and sample analysis may begin.

10.5 Medium Level Soil Procedure

10.5.1 Medium level soils are typically field collected using laboratory prepared 40 ml VOA vials (with PTFE-faced septa) containing 25 mL of the Methanol/Surrogate solution (either the 8260 solution as described in Section 7.1.4 ***or*** the 8015 solution as described in Section 7.1.5 depending upon the method to be analyzed).

10.5.2 When preparing a medium level soil from a bulk soil sample, do not decant any supernatant liquids. Quickly mix the contents of the sample container with a narrow spatula. Weigh out 5g of soil into a 40ml vial, add 10ml of Methanol/Surrogate mix solution (either the 8260 solution as described in Section 7.1.4 ***or*** the 8015 solution as described in Section 7.1.5 depending upon the method to be analyzed) and cap the container and proceed with Section 10.5.6.

10.5.3 For samples collected in the Encore sampling device, break open one end and push the aliquot of soil out into a vial. Add 10ml of the Methanol/Surrogate mix solution (either the 8260 solution as described in Section 7.1.4 ***or*** the 8015 solution as described in Section 7.1.5 depending upon the method to be analyzed) and cap the vial and proceed with Section 10.5.6.

10.5.4 For Method 8260 samples collected as Terra Cores® in 5 mL or 10 mL methanol add 5 uL and 10 uL of the 2500 ppm 8260 Methanol/Surrogate mix (see Section 7.1.4) respectively to extract and proceed with Section 10.5.6.

10.5.5 For Method 8015 (GRO) samples collected as Terra Cores® in 5 mL or 10 mL methanol add 2.5 uL and 5 uL of the Methanol/Surrogate Mix surrogate solution (see Section 7.1.5) respectively and proceed with Section 10.5.6.

10.5.6 Cap and shake the extract for 2 minutes. Allow soil to settle.

10.5.7 Transfer 2 mL of the extract to a 2 mL amber glass vial for storage with minimal headspace.

10.5.8 Refrigerate at 4°C until the time of analysis.

10.5.9 Analyze a portion of this extract using Method 5030 purge and trap for aqueous samples (Eurofins Edison SOP No. ED-MSV-001, *Purge and Trap for Aqueous Samples, SW846 Method 5030, current revision*). The appropriate dilution factor is calculated from the low-level analysis.

10.6 High Level Soil Procedure

10.6.1 High level soils have been preserved in the field by sampling either 10 g of soil into vials containing 25 mL Methanol/Surrogate mix solution (either the 8260 solution as described in Section 7.1.4 ***or*** the 8015 solution as described in Section 7.1.5 depending upon the method to be analyzed) or 5 g of soil into vials containing 10 mL Methanol/Surrogate mix solution (again, either the 8260 solution as described in Section 7.1.4 ***or*** the 8015 solution as described in Section 7.1.5 depending upon the method to be analyzed).

10.6.2 Screen high level soils by Method 5021 to determine the proper dilution factor prior to analysis (see Eurofins Edison SOP No. ED-GCV-001, *Screening for Volatile Organics,Static Headspace with GC FID SW846 Method 5021(modified),* current revision.

10.6.3 Transfer 2 ml of the extract to a 2 mL amber glass vial for storage with minimal headspace.

10.6.4 Analyze a portion of this extract using Method 5030 purge and trap for aqueous samples.

10.7 Sample Analysis

10.7.1 Remove sample vials from storage and allow thawing to ambient temperature before analysis. Shake the vial gently to ensure that the contents move freely within the vial. Place the sample vials in the autosampler tray.

10.7.2 Schedule the autosamplers to run the samples using the low level soil method. 5 mL of reagent water plus 1 uL of internal standard/ surrogate spiking solution is added to the sample vial directly through the septum.

10.7.3 Prior to purging, the sample is heated to 40°C for 0.5 minutes.

10.7.4 Purge the sample with helium for 11 minutes while agitating with magnetic stirring.

10.7.5 The purgeable compounds will flow out of the vial through a glass lined transfer line to a sorbent trap.

10.7.6 Desorb the contents of the trap on to the GC column by rapidly heating the trap to 260 °C and backflushing it with helium.

10.7.7 Begin the GC temperature program and data acquisition.

10.7.8 Re-condition the trap after desorb by baking at 260° C for 8-12 minutes.

10.7.9 Perform quantitative and qualitative analysis using TARGET software. Evaluate data according to each determinative method.

10.7.10 If a re-analysis is required, perform the re-analysis using the second frozen sample vial.

10.7.11 If a dilution is required, analyze the methanol preserved aliquot by Method 5030.

10.7.12 Technical acceptance criteria for sample analysis. (Note: these are general guidelines; please see the SOP for the determinative method for more specific acceptance criteria)

- The samples must be analyzed on a GC or GC/MS system meeting the initial calibration, continuing calibration and blank technical acceptance criteria.
- The sample must be analyzed within the required holding time.
- The sample must have an associated method blank meeting the blank technical acceptance criteria.
- The percent recovery of each of the system monitoring compounds in the sample must be within the acceptance windows.
- After analyzing a sample that exceeds the initial calibration range the analyst must either analyze an instrument blank (using the same purge inlet if using an auto sampler) which must meet technical acceptance criteria for blank analysis or monitor the sample analyzed immediately after the contaminated sample for all compounds that were in the contaminated sample that exceeded the calibration range.

10.7.13 Corrective Action for Sample Analysis (Note: these are general guidelines; please see the SOP for the determinative method for more specific corrective actions):

- Samples must meet technical acceptance criteria before reporting data.

- Corrective action for failure to meet instrument performance checks, initial, continuing calibration and method blanks must be completed prior to sample analysis.

- Corrective action for system monitoring compounds and internal standard compounds that fail to meet acceptance criteria must be completed prior to sample analysis.

- If any of the system monitoring compounds and internal standard compounds fail to meet acceptance criteria, check all calculations, instrument logs, the system monitoring compound and internal standard compound spiking solutions and the instrument operation. If the calculations were incorrect, correct calculations and verify that the system monitoring compound recoveries and internal standard compound responses meet acceptance criteria.

- Check the preparation of the internal standards and system monitoring compounds for concentration and expiration.

- Verify that the instrument is operating correctly.

- Data that fails to meet minimum acceptance criteria will be annotated (flagged) with qualifiers and/or appropriate narrative comments defining the nature of the outage. If applicable, a Corrective Action Reports will be initiated in order to provide for investigation and follow-up.

11.0 Calculations / Data Reduction

11.1 Methanol volume correction for soil moisture content (medium/high level methods):

$$Vt\ (\mu L\ solvent/water) = [\ ml\ of\ solvent + \frac{(\%moisture \times g\ of\ sample)}{100}] \times 1000\ uL/mL$$

12.0 Method Performance

12.1 Method Detection Limit Study (MDL)

The method detection limit (MDL) is the lowest concentration that can be detected for a given analytical method and sample matrix with 99% confidence that the analyte is present. The MDL is determined according to the laboratory's MDL procedure in Section 20 (Test Methods and Method Validation) of Eurofins Edison's Quality Assurance Manual (ED-QA-LQM). MDLs reflect a calculated (statistical) value determined under ideal laboratory conditions in a clean matrix, and may not be achievable in all environmental matrices. The laboratory maintains MDL studies for analyses performed.

12.2 Demonstration of Capabilities

For DOC procedure refer to Section 19 in the most current revision of Eurofins Edison's Quality Assurance Manual (ED-QA-LQM).

12.3 Training Requirements

Refer to Eurofins SOP No. ED-GEN-022, *Training* (latest revision) for the laboratory's training program.

13.0 Pollution Control

13.1 It is Eurofins's policy to evaluate each method and look for opportunities to minimize waste generated (i.e., examine recycling options, ordering chemicals based on quantity needed, preparation of reagents based on anticipated usage and reagent stability). Employees must abide by the policies in Section 13 of the Corporate Environmental Health and Safety Manual (CW-E-M-001) for "Waste Management and Pollution Prevention."

14.0 Waste Management

14.1 Waste management practices are conducted consistent with all applicable rules and regulations. Excess reagents, samples and method process wastes are disposed of in an accepted manner. Waste description rules and land disposal restrictions are followed. Waste disposal procedures are incorporated by reference to Eurofins Edison SOPs Nos. ED-SPM-007 (*Disposal of Samples and Associated Laboratory Waste, current revision)* and ED-SPM-008 (*Laboratory Waste Disposal Procedures, current revision).* The following waste streams are produced when this method is carried out.

- Laboratory Generated Aqueous Waste (aqueous VOA vials – used and unused). This waste may have a pH of less than 2.0. These vials are collected in satellite accumulation. The vials are then transferred to the waste room. These vials are passed through a vial crusher and the liquid portion is separated from the solid portion. The solid is dumped into the municipal garbage. The liquid is pumped into the neutralization system where it is neutralized to a pH of 6 to 9 with sodium bicarbonate (Seidler Chemical SC-0219-25). When neutralization is complete, the material is transferred to the municipal sewer system**.**

- Expired Standards – The vials are collected in a 1 gallon polyethylene bucket. These vials are then transferred to an open top 55 gallon steel or polyethylene waste drum. These drums are transported to a waste facility for proper disposal.

- Soil Retain Samples - These samples if not flagged in the system for any hazardous constituents are transferred to poly-lined cubic yard boxes. These

boxes when full are sent to stabilization or incineration. These materials are sent out as hazardous for lead and chromium

Teris Profile Number (incineration): 50016710
Onyx Profile Number: (stabilization) 402535

- Methanol Preserved Samples - Methanol preserved sample vials are collected in satellite accumulation and then transferred to a 55 gallon open top steel waste drum in the waste room. This drum is then removed by a waste vendor for incineration.

  Teris Profile Number: 50016652
  Onyx Profile Number: 282493

- Returned Methanol Preservative - Methanol preserved vials are collected in satellite accumulation and then transferred to 55 gallon open top steel waste drums in the waste room. These waste drums are then removed by a waste vendor for incineration.

  Teris Profile Number: 50016652
  Onyx Profile Number: 282493

15.0 References / Cross-References

15.1 United States Environmental Protection Agency, *Method 5035A: Closed System Purge and Trap and Extraction for Volatile Organics in Soil and Waste Samples*, Test Methods for Evaluating Solid Wastes, SW846 Third Edition, Volume 1B: Laboratory Manual, Physical/Chemical Methods, Revision 0, December 1996.

15.2 Eurofins Edison Document No. ED-QA-LQM, *Laboratory Quality Manual*, most current revision.

15.3 Eurofins Edison SOP No. ED-GCV-001, *Screening for Volatile Organics,Static Headspace with GC FID SW846 Method 5021(modified),* current revision.

15.4 Eurofins Edison SOP No. ED-MSV-001, *Purge and Trap for Aqueous Samples, SW846 Method 5030, current revision*.

15.5 Eurofins Edison SOP Nos. ED-GCV-008, *Gasoline Range Organics using GC FID Method SW846 8015D, current revision.*

15.6 Eurofins Edison SOP No ED-MSV-014, *SW846 Method 8260D Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry, current revision.*

15.7 United States Environmental Protection Agency, *Method 8000C: Determinative Chromatographic Determinations*, Test Methods for Evaluating Solid Wastes, SW846 Third Edition, Volume 1B: Laboratory Manual, Physical/Chemical Methods, Revision 3, March 2003

15.8 Eurofins Edison SOP No. ED-SPM-004, *Sample Storage & Handling Procedures for Mitigation of Sample and Laboratory Contamination,* current revision.

15.9 Eurofins Corporate Environmental Health and Safety Manual (CW-E-M-001)

15.10 Eurofins SOP No. ED-GEN-022, *Training*, latest revision.

15.11 Eurofins Edison SOPs Nos. ED-SPM-007, *Disposal of Samples and Associated Laboratory Waste, current revision.*

15.12 Eurofins Edison SOP No. ED-SPM-008, *Laboratory Waste Disposal Procedures,* current revision.

16.0 Method Modifications:

16.1 N/A

17.0 Attachments

17.1 N/A

18.0 Revision History

- Revision 11, effective date: 08/01/2024
  - Throughout document: updated to Eurofins branding.
  - Updated references to reflect current revisions
  - Updated list of signatories to reflect recent organizational change.

- Revision 10, effective date: 4/11/2019
  - Section 8.2.1: Added temperature preservation requirement for Medium level extracts.

- Revision 9, effective date: 11/27/2012
  - Updated referenced Lab Quality Manual section and appendix numbers as appropriate

- Revision 8, effective date: 12/6/2010
  - Section 3: revised to reference new location for definitions.
  - Sections 8.2.1.4 and 8.3.9 referencing methanol solvent adjustment for solid samples with significant moisture content (>10%) was removed.

- Revision 7, effective date: 11/4/2008:
  - Revised SOP format in accordance with Eurofins Corporate Quality SOP No. CW-QS-002 (Rev 0) Writing a Standard Operating Procedure (SOP).
  - Updated the SOP to comply with SW846 Method 5035A (was 5035). Retitled SOP accordingly.

- Section 1.1.5: Added reference to Eurofins Edison SOP No. ED-MSV-001(*Purge and Trap for Aqueous Samples, SW846 Method 5030, current revision*).
- Section 1.1.6: Added references to Eurofins Edison SOP Nos. ED-GCV-006 (*Gasoline Range Organics using GC FID Method SW846 8015, current revision*) and ED-MSV-005 (*SW846 Method 8260B Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry, current revision*)
- Section 1.1.7: Added reference to Quality Assurance Manual for method modifications.
- Section 3: revised to reference new location for definitions.
- Section 4: revised to include a reference to storage blanks and the applicable SOP: Eurofins Edison SOP No. ED-SPM-004, *Sample Storage & Handling Procedures for Mitigation of Sample and Laboratory Contamination*, current revision.
- Section 5 (Safety): Revised to include most up to date corporate health and safety references and information.
- Section 6: Updated with current instrumentation and configurations.
- Section 7.0: added details of the solvent testing and approval program.
- Section 7.2: Updated standards sources and catalog numbers.
- Section 8: Updated with additional details for each type of preservation/analysis (low level, medium level, high level). Added used of Terra Core® Sampling Kits (Section 8.1.3).
- Section 8: Updated to include requirement to adjust the methanol volume (medium/high level) for soil moisture content.
- Section 9.0: Added details of storage blanks and reference to Eurofins Edison SOP No. ED-SPM-004, *Sample Storage & Handling Procedures for Mitigation of Sample and Laboratory Contamination,* current revision..
- Section 10: Revised and expanded to include instrument operating conditions and specific sample prep details for low level, medium and high level preps.
- Section 11: Deleted reference to SOP for Organic Calculations. Added statement that calculations can now be found in the applicable determinative methods.
- Section12.0: added reference to Training SOP.
- Section 13.0: Revised to include most up to date company policy on Pollution Control as well as to include corporate health and safety references and information.
- Section 14.0: Revised to include most up to date company policy on Waste Management as well as to include corporate health and safety references and information.
- References: Expanded to include more specific SOP references.
- Revision history: updated.

Title: Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS) by SW846 Method 8260D

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Approvals (Signature/Date):

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1.0 Scope and Application

1.1 Analytes, Matrix(s), and Reporting Limits

1.1.1 USEPA SW846 Method 8260D is used for the determination of volatile organic compounds in a variety of aqueous and solid matrices by purge and trap gas chromatography (GC)/mass spectrometery (MS). The methods are applicable to the compounds listed in Table 1 (below). Actual target compound lists are determined through regulatory or project specifications. Method performance criteria for each target analyte will be determined prior to sample analysis.

1.1.2 This SOP also describes the optional procedure for analyses of compounds using 8260D Selected Ion Monitoring (SIM). SIM analyses is specific to target compounds: 1,2-dibromoethane, 1,2-dibromo-3-chloropropane, 1,2,3-Trichloropropane and 1,4-Dioxane. Benzene and Chloroform if needed.

Table 1: Method Analytes

Compound	CAS #	Compound	CAS #
1,1,1,2-Tetrachloroethane	630-20-6	cis-1,2-Dichloroethene	156-59-2
1,1,1-Trichloroethane	71-55-6	cis-1,3-Dichloropropene	10061-01-5
1,1,1-Trifluoro-2,2-dichloroethane	306-83-2	Cyclohexane	110-82-7
1,1,2,2-Tetrachloroethane	79-34-5	Cyclopentene	142-29-0
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	Dibromomethane	74-95-3
1,1,2-Trichloroethane	79-00-5	Dichlorobromomethane	75-27-4
1,1-Dichloroethane	75-34-3	Dichlorodifluoromethane	75-71-8
1,1-Dichloroethene	75-35-4	Dichlorofluoromethane	75-43-4
1,1-Dichloropropene	563-58-6	Dimethylnaphthalene (total)	28804-88-8
1,1-Difluoroethane	75-37-6	Epichlorohydrin	106-89-8
1,2,3-Trichlorobenzene	87-61-6	Ethanol	64-17-5
1,2,3-Trichloropropane **(1)**	96-18-4	Ethyl acetate	141-78-6
1,2,3-Trimethylbenzene	526-73-8	Ethyl acrylate	140-88-5
1,2,4,5-Tetramethylbenzene	95-93-2	Ethyl ether	60-29-7
1,2,4-Trichlorobenzene	120-82-1	Ethyl methacrylate	97-63-2
1,2,4-Trimethylbenzene	95-63-6	Ethylbenzene	100-41-4
1,2-Dibromo-3-Chloropropane **(1)**	96-12-8	Ethylene Dibromide **(1)**	106-93-4
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	Hexachlorobutadiene	87-68-3
1,2-Dichloro-1,1,2-trifluoroethane	354-23-4	Hexane	110-54-3
1,2-Dichlorobenzene	95-50-1	Indan	496-11-7
1,2-Dichloroethane	107-06-2	Iodomethane	74-88-4
1,2-Dichloroethene, Total	540-59-0	Isobutyl alcohol	78-83-1
1,2-Dichloropropane	78-87-5	Isopropyl acetate	108-21-4
1,3,5-Trichlorobenzene	108-70-3	Isopropyl alcohol	67-63-0
1,3,5-Trimethylbenzene	108-67-8	Isopropyl ether	108-20-3
1,3-Dichlorobenzene	541-73-1	Isopropylbenzene	98-82-8
1,3-Dichloropropane	142-28-9	Methacrylonitrile	126-98-7
1,3-Dichloropropene, Total	542-75-6	Methyl acetate	79-20-9

Compound	CAS #	Compound	CAS #
1,4-Dichlorobenzene	106-46-7	Methyl acrylate	96-33-3
1,4-Dioxane **(1)**	123-91-1	Methyl methacrylate	80-62-6
1-Chloropropane	540-54-5	Methyl tert-butyl ether	1634-04-4
2,2,4-Trimethylpentane	540-84-1	Methylcyclohexane	108-87-2
2,2-Dichloropropane	594-20-7	Methylene Chloride	75-09-2
2,4,4-Trimethyl-1-pentene	107-39-1	Methylnaphthalene (total)	1321-94-4
2-Butanone (MEK)	78-93-3	Monochloropentafluoroethane	76-15-3
2-Chloro-1,3-butadiene	126-99-8	m-Xylene & p-Xylene	179601-23-1
2-Chloroethyl vinyl ether	110-75-8	Naphthalene	91-20-3
2-Chloropropane	75-29-6	n-Butanol	71-36-3
2-Chlorotoluene	95-49-8	n-Butyl acetate	123-86-4
2-Hexanone	591-78-6	n-Butyl acrylate	141-32-2
2-Methyl-1,3-butadiene	78-79-5	n-Butylbenzene	104-51-8
2-Methyl-2-propanol	75-65-0	n-Heptane	142-82-5
2-Nitropropane	79-46-9	n-Propyl acetate	109-60-4
2-Octanol	123-96-6	N-Propylbenzene	103-65-1
2-Octanone	111-13-7	o-Xylene	95-47-6
4-Chlorotoluene	106-43-4	p-Diethylbenzene	105-05-5
4-Ethyltoluene	622-96-8	Pentane	109-66-0
4-Isopropyltoluene	99-87-6	Propene	115-07-1
4-Methyl-2-pentanone (MIBK)	108-10-1	Propionitrile	107-12-0
Acetaldehyde	75-07-0	sec-Butylbenzene	135-98-8
Acetone	67-64-1	Styrene	100-42-5
Acetonitrile	75-05-8	Tert-amyl methyl ether	994-05-8
Acrolein	107-02-8	Tert-butyl ethyl ether	637-92-3
Acrylonitrile	107-13-1	tert-Butylbenzene	98-06-6
Allyl chloride	107-05-1	Tetrachloroethene	127-18-4
Amyl acetate (mixed isomers)	628-63-7	Tetrahydrofuran	109-99-9
Benzene **(1)**	71-43-2	Toluene	108-88-3
Benzyl chloride	100-44-7	Total BTEX	STL00431
Bromobenzene	108-86-1	trans-1,2-Dichloroethene	156-60-5
Bromoform	75-25-2	trans-1,3-Dichloropropene	10061-02-6
Bromomethane	74-83-9	trans-1,4-Dichloro-2-butene	110-57-6
Butadiene	106-99-0	Trichloroethene	79-01-6
Butyl Methacrylate	97-88-1	Trichlorofluoromethane	75-69-4
Camphene	79-92-5	Vinyl acetate	108-05-4
Camphor	76-22-2	Vinyl chloride	75-01-4
Carbon disulfide	75-15-0	Xylenes, Total	1330-20-7
Carbon tetrachloride	56-23-5	1,4-Dichlorobenzene-d4 **(ISTD)**	3855-82-1
Chlorobenzene	108-90-7	1,4-Dioxane-d8 **(ISTD)**	17647-74-4
Chlorobromomethane	74-97-5	2-Butanone-d5 **(ISTD)**	24313-50-6
Chlorodibromomethane	124-48-1	Chlorobenzene-d5 **(ISTD)**	3114-55-4
Chlorodifluoromethane	75-45-6	Fluorobenzene **(ISTD)**	462-06-6
Chloroethane	75-00-3	TBA-d9 **(ISTD)**	25725-11-5
Chloroform **(1)**	67-66-3	1,2-Dichloroethane-d4 **(Surrogate)**	17060-07-0
Chloromethane	74-87-3	4-Bromofluorobenzene **(Surrogate)**	460-00-4

Compound	CAS #	Compound	CAS #
Chlorotrifluoroethene	79-38-9	Dibromofluoromethane **(Surrogate)**	1868-53-7
Chlorotrifluoromethane	75-72-9	Toluene-d8 **(Surrogate)**	2037-26-5
2-ethylhexyl acrylate	103-11-7		

(1) Compound can be analyzed by full scan or Selected Ion Monitoring (SIM).

1.1.3 Method 8260D can be used to quantitate most volatile organic compounds that have boiling points below 200°C, and that are insoluble or slightly soluble in water. Water-soluble compounds can be included in this method, but quantitation limits will be higher due to poor purging efficiency.

1.1.4 The standard reporting limit (RL) is established at or above the low-level standard in the calibration curve (1 ug/l for most compounds). For a complete list of method detection limits (MDLs) and RLs, please see reference the current TALS (LIMS) active Method Limit Group database.

1.1.5 On occasion clients may request modifications to this SOP. These modifications are handled following the procedures outlined in Sections 7 (*Review of Work Request*) and 20 (*Test Methods and Method Validation*) of Eurofins Edison's Quality Assurance Manual (ED-QA-LQM).

1.1.6 Any variation in procedure shall be completely documented using an NCM. The NCM is approved by the supervisor and then automatically sent to the laboratory Project Manager by e-mail so that the client can be notified as appropriate. The QA department also receives NCMs by e-mail for tracking and trending purposes. The NCM process is described in more detail in Eurofins Edison SOP No. ED-GEN-003, *Standard Operating Procedure for Control of Non-Conformances and Corrective Action,* current revision NCM shall be filed in the project file and addressed in the case narrative. Any unauthorized deviations from this procedure must also be documented as a nonconformance, with a cause and corrective action described.

2.0 Summary of Method

2.1 Method 8260D is used to determine volatile organic compounds in aqueous, non-aqueous and solid matrices. Sample preparation techniques vary, depending on the matrix and the level of contamination expected. Purge and trap techniques are used to introduce the sample to the GC/MS system. Refer to Eurofins Edison SOP Nos. ED-MSV-001*, Purge and Trap for Aqueous Samples, SW846 Method 5030*, current revision and ED-MSV-002, *Closed-System Purge-and-Trap and Extraction for Volatile Organics in Soil and Waste Samples, SW846 Method 5035A,* current revision.

2.2 All soil samples are screened by GC/FID static headspace or MS analysis to provide the analyst with appropriate initial dilution factors. Aqueous samples without historical results are also screened. For additional details see Eurofins Edison SOP No. ED-GCV-001, *Screening for Volatile Organics, Static Headspace with GC FID, SW846 Method 5021*, current revision.

2.3 An aliquot of sample containing internal standard and surrogate spiking solution is purged with nitrogen in a closed sparging vessel. The volatile compounds are transferred from the aqueous phase to the vapor phase. The vapor is swept through a sorbent column where the volatiles are trapped. After purging is complete, the sorbent column is heated and backflushed with helium to desorb the volatiles onto a gas chromatograph column.

2.4 Analytes eluted from the capillary chromatograhy column are introduced into the mass spectrometer via a direct connection. Identification of target analytes is accomplished by comparing their mass spectra with the electron impact spectra of authentic standards. Quantitation is accomplished by comparing the response of a major (quantitation) ion relative to an internal standard using a minimum of a five-point calibration curve.

2.5 For aqueous VOA samples submitted for New Jersey Groundwater Quality Standard (NJ GWQS) evaluation, a full scan analysis is initially performed using the 8260 methodology No further analysis by SIM is required if all of the following compounds are present above the full scan RL: 1,2-dibromoethane, 1,2-dibromo-3-chloropropane, 1,2,3-Trichloropropane and 1,4-dioxane, chloroform, vinyl chloride and benzene. If any of these compounds are undetected in the undiluted, full scan analysis, the sample must be analyzed via 8260D SIM for those compounds.

2.6 In order to meet lower reporting limits of 0.5ug/L for most analytes, 2.5 ug/L for ketones and generally lower limits for other non-routine analytical compounds, samples must be analyzed against an initial calibration with a low point at those levels. The corresponding TALS login method for low level aqueous analysis is 8260_LL. See Table 3b for initial calibration levels and spike amounts.

3.0 Definitions

3.1 For a complete list of definitions refer to Appendix 2 in the most current revision of Eurofins Edison's Quality Assurance Manual (ED-QA-LQM).

4.0 Interferences

4.1 This method is susceptible to contamination from a number of sources, including organic solvents used in other laboratory procedures, impurities in the purge gas, improper cleaning of syringes or purge vessels, and carryover from high level samples. Samples can be contaminated by the diffusion of volatile organics through the septum during shipment or storage. Steps have been taken to ensure that these potential problems are eliminated from the laboratory.

4.2 The volatiles analytical laboratory is housed in a separate building, away from the organic extraction lab area where large quantities of organic solvents are used. No organic solvents are used or stored in the volatiles laboratory.

4.3 The nitrogen used as purge gas passes through a solvent trap prior to its inlet into the purge and trap units.

4.4 Trip Blanks are shipped to clients with aqueous bottle ware as requested. The purpose of the trip blank is to detect and identify any VOC contamination of the samples while in transit to and from the lab. The blank is created at the laboratory by completely filling the volatile vial container with lab grade organic free deionized water and sealing the container Trip Blanks accompany bottle ware and samples through the sampling, storage and analysis stages as a check on contamination that may occur at these points.

4.5 Individual samples are each handled with a unique syringe that has been baked in a drying oven at 105°C to ensure the absence of volatile compounds.

4.6 Carryover can occur anytime a high level sample is analyzed. Screening procedures are employed to ensure that a sample is analyzed at an appropriate dilution to minimize potential carryover. When a high level sample is analyzed, it is followed by the analysis of a reagent water blank. If another sample was analyzed after the high level sample, this sample is inspected carefully for signs of carryover. If this sample does not contain any of the compounds found in the high level sample, the system can be considered contamination free.

4.7 The analytical system is checked daily with the analysis of a method blank. This blank must meet all quality control criteria for the method before sample analysis may take place.

5.0 Safety

Employees must abide by the policies and procedures in the Corporate Environmental Health and Safety Manual (CW-E-M-001) and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum.

Any questions pertaining to safety issues or procedures should be brought to the department manager or Edison Safety Officer.

5.1 Specific Safety Concerns or Requirements

5.1.1 Latex, nitrile and vinyl gloves all provide adequate protection against the methanol used in this method.

5.1.2 Purge vessels on purge-and-trap instruments can be pressurized by the time analysis is completed. Vent the pressure prior to removal of these vessels to prevent the contents from spraying out.

5.1.3 The gas chromatograph and mass spectrometer contain zones that have elevated temperatures. The analyst needs to be aware of the locations of those zones, and must cool them to room temperature prior to working on them.

5.1.4 The mass spectrometer is under deep vacuum. The mass spectrometer must be brought to atmospheric pressure prior to working on the source.

5.1.5 There are areas of high voltage in both the gas chromatograph and the mass spectrometer. Depending on the type of work involved, either turn the power to the instrument off, or disconnect it from its source of power.

5.2 Primary Materials Used

The following is a list of the materials used in this method, which have a serious or significant hazard rating. **Note: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the MSDS for each of the materials listed in the table.** A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the MSDS for each material before using it for the first time or when there are major changes to the MSDS.

Material (1)	Hazards	Exposure Limit (2)	Signs and symptoms of exposure
Methanol (MeOH)	Flammable Poison Irritant	200 ppm-TWA	A slight irritant to the mucous membranes. Toxic effects exerted upon nervous system, particularly the optic nerve. Symptoms of overexposure may include headache, drowsiness and dizziness. Methyl alcohol is a defatting agent and may cause skin to become dry and cracked. Skin absorption can occur; symptoms may parallel inhalation exposure. Irritant to the eyes.
1 – Always add acid to water to prevent violent reactions.			
2 – Exposure limit refers to the OSHA regulatory exposure limit.			

6.0 Equipment and Supplies

6.1 Instrumentation

6.1.1 Purge and trap units from several different manufacturers are used, depending upon the sample matrix and preparatory technique required. A purge and trap unit consists of three parts: the sample purge unit, the trap, and the concentrator. Unit configurations currently in use are:

- OI Analytical 4551, 4100 Automatic Sampler/4660,4760 concentrator;
- Archon 5100A Automatic sampler/ OI Analytical 4660,4760 concentrator;
- EST Centurion Autosampler/ EST Encon concentrator;
- Archon Autosampler/EST Encon concentrator.
- Archon/EST Evolution

6.1.2 A VOCARB 3000 trap from Supelco is used in the Encon concentrator. The trap is 25cm long with an inside diameter of 0.105 inches. The trap is packed with 10.0cm Carbopack B, 6.0 cm Carboxin 1000, and 1cm Carboxin 1001.

6.1.3 An OI analytical purge trap #10 is used for the OI 4560,4660 and 4760 concentrator. The trap is 25cm long with an inside diameter of 0.105 inches. The trap is packed to contain the following absorbents: Tenax/silica gel/carbon molecular sieve.

6.1.4 Alternate traps may be used provided the adsorption and desorption characteristics are equivalent to those of the trap recommended by the method.

6.1.5 Both the Encon and OI concentrators are capable of rapidly heating the trap to 260°C and holding at that temperature for the duration of the desorb time.

6.1.6 Gas chromatograph: HP Agilent 6890/7890 equipped with temperature programming capability.

6.1.7 GC column: 30M long x 0.25mm ID, 1.4um film thickness, 20M x 0.18mm x 1um DB-624 and 20M long x 0.18 mm ID Restek Rtx-VMS capillary column with 1um film thickness or similar phase.

6.1.8 Mass Spectrometer (Agilent 5973/5975/5977): scanning from 35-260 amu every 0.9 seconds, utilizing 70 volts (nominal) electron energy in the electron ionization mode and producing a mass spectrum which meets all EPA performance criteria when 50 ng of 4-Bromofluorobenzene (BFB) is injected through the gas chromatograph inlet.

6.1.9 GC/MS Interface: transfer lines heated to 180°C .

6.1.10 Data system: HP Chemstation II for data acquisition and Eurofins Chrom for data processing.

6.2 Supplies

- Microsyringes: 10 ul to 1000 ul.
- Syringes: 5 ml to 25 ml gas-tight.

- Injection port liners: HP 18740-80200 or equivalent
- Volumetric flasks: Class "A" glassware, 5 ml to 500 ml.
- VOA vials: 20-ml and 40-ml glass with PTFE – faced septum.
- Vials: 2-ml amber glass with screw cap with Teflon-faced septa.
- Top loading analytical balance.
- Spatula: Narrow, stainless steel.
- Stir bars: PTFE coated, small enough to spin freely inside a VOA vial.

7.0 Reagents and Standards

7.1 Reagents

7.1.1 Organic free reagent water: High purity water that meets the requirements for a method blank when analyzed. (See section 9.1.1) Reagent water is obtained from Millipore system. Other methods of preparing reagent water are acceptable, provided that the water produced meets method blank criteria.

7.1.2 Methanol: Ultra Resi-Analyzed, purge and trap grade, purchased from JT Baker or equivalent. (Cat # 9077-02)

7.1.2.1 Each lot of methanol is screened for contaminants before being used for analysis as detailed in Eurofins Corporate Quality SOP No. CA-Q-S-001 (*Solvent & Acid Lot Testing & Approval*) and Eurofins Edison SOP No. ED-GEN-023 (*Bulk Solvent Testing and Approval*).

7.2 Standards

7.2.1 **Calibration Standards** Stock target compound analytical standard solutions are purchased mainly from Restek, Supelco, Inc, Absolute Standards and Spex although standards of similar quality from other suppliers may be substituted as required. Standards noted with an asterisk (*) are custom mixes made especially for Eurofins Edison.

Target Analyte Standard Name	Concentration	Vendor	Catalog #
8260 List 1 / Std #3 Gases*	2500 ppm	Restek	569722
8260 List 1 / Std #3 Gases – (SS)*	2500 ppm	Restek	569722 sec
8260 List 1 / Std #1 MegaMix*	1250-62500 ppm	Restek	569720
8260 List 1 / Std #1 MegaMix (SS)*	1250-62500 ppm	Restek	569720 sec
8260 List 1 / Std #2 Ketones *	12500 ppm	Restek	569721
8260 List 1 / Std #2 Ketones * (SS)	12500 ppm	Restek	569721 sec
8260 List 1 / Std #5 Acrolein *	20,000 ppm	Restek	568720
8260 List 1 / Std #5 Acrolein (SS)	20,000 ppm	Restek	568720 sec
8260 List 1 /Std #4 2 CEVE *	2500 ppm	Restek	569723

Target Analyte Standard Name	Concentration	Vendor	Catalog #
8260 List 1 /Std #4 2 CEVE (SS) *	2500 ppm	Restek	569723 sec
8260 List 1 /Std #6 Vinyl Acetate *	5000 ppm	Restek	569724
8260 List 1 /Std #6 Vinyl Acetate (SS) *	5000 ppm	Restek	569724 sec
8260 List 2 / Std #1 Additions *	2500-62500ppm	Restek	568725
8260 List 2 / Std #1 Additions (SS) *	2500-62500 ppm	Restek	568725 sec
8260 List 3 / Std #1 Polar Additions *	2500-100000ppm	Restek	568728
8260 List 3 / Std #1 Polar Additions (SS) *	2500-100000 ppm	Restek	568728 sec
VOC Extra Standard 2015 *	2500-5000 ppm	Absolute	98593
VOC Extra Standard 2015 * (SS)	2500-5000 ppm	Absolute	98593
Epichlorohydrin	1000 ppm	Absolute	70377
Acrolein	5000 ppm	Restek	91980
Acrolein *	Neat	Sigma	110221
2-Freon Mix quote # 12258 *	2500ppm	Absolute	12258
2-Freon Mix quote # 12258 * (SS)	2500ppm	Absolute	12258
1,4-Dioxane	Neat	Sigma	360481
Epichlorohydrin	Neat	Sigma	45340
2-Chloroethylvinyl ether	Neat	Sigma	109983
1,4-Dioxane	1000 ppm	Absolute	70373
1,4-Dioxane	10000 ppm	Absolute	92785
Benzene	1000 ppm	Absolute	70025
Chloroform	1000 ppm	Absolute	70076

(1): The separate source for this material is not available as a distinct catalog number. Analyst must ensure that a separate lot of the material is selected and used as required.

An asterisk (*) indicates a custom standard mix.

7.2.1.1. Prepare stock solutions at volumes and concentrations indicated in Table 2 (Working Standards Preparation) by combining the indicated volumes of each stock solution into a volumetric flask corresponding to the total final volume. Dilute to the volume marker with methanol.

7.2.1.2. Prepare individual calibration standards as applicable per Section 9.2.2.1, Table 3, Initial Calibration Standards Preparation, Low Level Soil, Table 3a, Initial Calibration Standards Preparation (Low Level), Aqueous or Table 3B Initial Calibration Standards Preparation, Aqueous.

7.2.1.3. The 'Second Source' standards listed are used in the preparation of the Initial Calibration Verification (ICV) standard (see Tables 4 and 4a for ICV preparation instructions) and the Laboratory Control Standard (LCS) (see Section 9.1.3 and Tables 4 and 4a).

7.2.2 **Surrogate Standards:** Surrogate standard solutions are prepared from the stock solution (2500ppm)

Surrogate Standard Name	Concentration	Vendor	Catalog #
4-Bromofluorobenzene	2500ppm	Restek	567650
Toluene-d8			
1,2-Dichloroethane-d4			
Dibromofluoromethane			

7.2.2.1 A primary surrogate stock solution (2500 ppm each) is prepared from the neat standards as follows:

7.2.2.2 Secondary surrogate standard solutions are prepared at two (2) levels using the 2500 ppm primary stock solution as detailed in the table below:

Standard Name	Vendor	Catalog #	Volume added	Concentration of Stock Std.	Concentration of Standard	Total Volume Volume in MeOH/Total volume of MeOH
8260 Surrogate Mix: 4-Bromofluorobenzene Toluene-d8 1,2-Dichloroethane-d4 Dibromofluoromethane	Restek	567650	1ml	2500ppm	250ppm	10mL 9.0mL TV/M
8260 Surrogate Mix: 4-Bromofluorobenzene Toluene-d8 1,2-Dichloroethane-d4 Dibromofluoromethane	Restek	567650	1ml	2500ppm	50ppm	50mL 9.0mL TV/M

7.2.2.3 Methanol/Surrogate solution (2.5ug/mL): For methanol sampling field kits. Prepared by adding 1mL of 2500 ug/ml primary surrogate stock solution (see Section 7.2.2.1) to 1 L purge and trap grade methanol.

7.2.3 **Internal Standards:** Internal Standards Solutions are purchased from Restek:

Standard Name	Concentration	Vendor	Catalog #
8260 Internal Standard Mix: *Chlorobenzene-d5 *1,4-Dichlorobenzene-d4 *Fluorobenzene *1,4-Dioxane-d8 *TBA-d9	250-5000ppm	Restek	567649

7.2.4 **Internal Standard/Surrogate Mix (125 ppm each):** A solution containing both Internal Standards and Surrogates at 125 ppm is prepared in a 10ml volumetric flask as detailed below using the 2500

ppm surrogate stock solution prepared in Section 7.2.2.1 and the 2500 ppm internal standard mix detailed in Section 7.2.3:

Standard Name	Concentration of Stock Std.	Volume added to final volume of 20ml MeOH	Final Concentration of Standard
8260 Internal Standard/Surrogate Mix (125 ppm) For Aquatek Autosampler	2500 ppm Surrogate Mix	1.0ml	125 ppm each component
	250 Internal Std Mix	10 ml	

7.2.5 **Internal Standard/Surrogate Mix (SIM) (2.5/50 ppm each):** A solution containing both Internal Standards and Surrogates at 25 ppm is prepared in a 10ml volumetric flask as detailed below using the 2500 ppm surrogate stock solution prepared in Section 7.2.2.1 and the 250 ppm internal standard mix detailed in Section 7.2.3:

Standard Name	Concentration of Stock Std.	Volume added to final volume of 10ml MeOH	Final Concentration of Standard
8260 Internal Standard/Surrogate Mix (25 ppm) (SIM)	2500 ppm Surrogate Mix	10ul	2.5/50 ppm each component
	250 Internal Std Mix (Restek)	10ul	
1,4-Dioxane-d8	10000 ppm	50ul	

7.2.6 **GC/MS Instrument Performance Check (BFB):** The instrument performance check solution consists of 4-Bromofluorobenzene in addition to the other three surrogates in methanol. Prepare the solution at **50ppm as specified in section 7.2.2.2**. Assign an expiration date of 6 months.

7.2.7 All standards preparation information must be logged into the TALS Reagent Module. All pertinent information must be entered: Date prepared, Lot #'s, Expiration dates, Solvents used, Lab Lot # (expiration date), Manufacturer and Verification signature. Additionally, all prepped standards are typically given a unique Lot# and all information pertaining to standard preparation is entered into the GC/MS VOA Standard Preparation Log Book. Information such as standard supplier, lot number, original concentration, a description of how the standard was made, are required along with the laboratory lot number, analyst's initials, date prepared, expiration date and verification signature. Class "A" volumetric must be used at all times and syringes, preferably gas-tight syringes when available, should be checked for accuracy using an analytical balance. Class "A" pipettes should also be used if volumes permit.

7.2.8 Please refer to Eurofins Edison SOP No. ED-GEN-008, *Standard Operating Procedure for Preparation, Purity and Storage of Reagents and Standards*, current revision. For Method 8260D:

- Shelf Life of Standard:
  - Stock standards (Non-gases) - 6 months after opening vendor stock of up to 2000ppm, 3 years for 10,000ppm, 5 years for over 50,000ppm, or manufacturer's expiration date whichever comes first.
  - Stock Standards (Gases) - 2 months after opening vendor stock, or manufacturer's expiration date whichever comes first.
  - Working/Secondary dilution Standards (Non-gases) – 6 months after preparation, or manufacturer's expiration date whichever comes first.
  - Working/Secondary dilution Standards (Gases) – 1 week from the date of preparation for 50ppm and 2 weeks for 500ppm, or manufacturer's expiration date whichever comes first.
  - Daily Calibration Standards – 24 hours after preparation.

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- Storage Requirements:
  Aqueous standards are stored at 4°C and Methanol standards are stored at -10°C to -20°C.

8.0 Sample Collection, Preservation, Shipment and Storage

Sample container, preservation techniques and holding times may vary and are dependent on sample matrix, method of choice, regulatory compliance, and/or specific contract or client requests. Listed below are the holding times and the references that include preservation requirements.

Matrix	Sample Container	Min. Sample Size	Preservation	Holding Time	Reference
Waters	Glass 40 ml vials	40 mLs	HCl, pH < 2; Cool 4 °C ± 2°C	14 Days / preserved 7 Days / unpreserved	SW846 Method 5030
Waters	Glass 40 ml vials	40mLs	TSP,pH>11 Cool 4 °C ± 2°C	14 Days / preserved	SW846 Method 5030
Soils (Low)	Encore or Terracore (40 ml vials)	5 grams in 5 mls DI H_2O	Frozen Stored -7°C to -20°C	14 Days	SW846 Method 5035A

Matrix	Sample Container	Min. Sample Size	Preservation	Holding Time	Reference
Soils (Med)	Encore or Terracore (40 ml vials)	5 grams in 10 mls MeOH	Cool 4 °C ± 2°C	14 Days	SW846 Method 5030
Soils (High)	Glass (Lab Prepared Kits)	10 grams in 25 mls MeOH	Cool 4 °C ± 2°C	14 Days	SW846 Method 5030

8.1.1 There are several methods of sampling soil. The recommended method is to take samples using an EnCore™ sampler or using a Terra Core™ sampling kit. At specific client request, unpreserved soil samples in 4oz jars may be accepted. For EnCore and Terra Core sampling, a separate jar is required for percent solids/moisture determination, unless one is supplied for another analysis.

8.1.2 For EnCore™ samplers, the 5g sample is extruded into a pre-weighed 40mL vial containing 5mL of methanol (medium level analysis) or reagent water (for low level, <50 µg/kg, analysis). The exact samples weight is determined as the difference between the vial + preservative weight and weight after the sample is added.

- Samples must be transferred (extruded from the sampler) and preserved within 48 hours of sampling.
- Water preserved samples are then frozen at <10°C. Methanol preserved samples may be stored at > 0.0 °C but < 6° °C or frozen.
- Methanol preserved samples are shaken for at least 2 minutes, and a portion of the methanol extract after settling may be transferred to a smaller Teflon-lined capped vial for storage below 6 °C
- Normally one (1) medium level and two (2) low-level samples are taken and preserved.
- One vial with a clean matrix of each preservation type is prepared at the same time as samples, to be used for LCS analysis. Spikes are not added until the time of analysis.
- Samples are spiked with internal standards and surrogates at the time of analysis.

8.1.3 Terra Core™ sampling kits are pre-preserved for use and immediate samples preservation in the field. Kits are shipped that include one (1) methanol preserved and two (2) reagent water preserved vials, along with a 4oz jar for solids/moisture analysis volume.

- Terra Core™ vials are immediately placed in the freezer (<-10°C) upon receipt at the lab. Methanol preserved vials are shaken for at least two (2) minutes to break up the solid and create the methanol extract.
- Terra Core™ vials are labeled with the weight of the vial and preservative. The vials are re-weighed prior to analysis to determine the weight of the solid sample added. It is important that labels NOT

be added to these vials prior to weighing, because the weight of the label will add to the sample weight. Vials may be marked with indelible marker, or placed in a labeled, sectioned box until ID labels can be added after weighing.

8.2 Unpreserved soils - At client request, unpreserved soils packed into glass jars or brass tubes may be accepted and subsampled in the lab. A 5g portion of the sample is transferred to a 40mL vial and mixed with reagent water and/or methanol for analysis. Since this procedure is not compliant with SW5035A an NCM and case narrative statement describing the non-conformance must be included with any resulting data reported to the client.

8.3 Aqueous samples are stored in 40mL glass vials with Teflon lined septa at >0 and ≤ 6.0°C. Vials are required to have no headspace larger than a small pea.

8.3.1 Samples from chlorinated water sources must be treated with sodium thiosulfate (0.008% solution) at the time of collection to remove chlorine. NOTE: containers pre-preserved with sodium thiosulfate must be requested in bottle orders for samples from chlorinated water sources

8.3.2 Regulatory requirements for 2-Chloroethyl vinyl ether:

- 2-Chloroethyl vinyl ether: The stability of this compound is reduced when subjected to low pH, therefore samples for analysis to include 2-CEVE must be taken without acid preservation. Unpreserved samples must be analyzed within 7 days.

- SW846 Update V removed special preservation requirements for Acolein and Acylonitrile. These compounds may be analyzed for using a preserved sample vial.

8.4 Soil samples and water samples preserved to pH <2 with HCl have a maximum holding time is 14 days from sampling until the sample is analyzed. If water samples are known to be unpreserved, the holding time is 7 days from sampling to analysis.

8.4.1 Preserved water samples are checked to confirm the preservation pH AFTER analysis because the vials must not be opened prior to analysis. If the pH is found to be >2, this must be addressed in the case narrative.

8.5 Medium level solid methanol extracts, if taken at the time of preservation, are aliquoted into 4 mL glass vials with Teflon lined caps and stored at > 0.0 °C but ≤6.0°C or frozen. The extracts are stored with minimum headspace.

8.6 Storage blanks are prepared by filling 40 mL VOA vials with reagent water and placing one in each refrigerator. After 1-2 weeks, the storage blanks are removed and analyzed. Additional details can be found in Eurofins Edison SOP No. ED-SPM-004, *Sample Storage & Handling Procedures for Mitigation of Sample and Laboratory Contamination,* current revision.

9.0 Quality Control

9.1 **Sample QC** - The following quality control samples are prepared with each batch of samples:

Quality Controls	Frequency	Control Limit
Method Blank (MB)	1 in 20 or fewer samples	< Rpt. Limit
Laboratory Control Sample (LCS)[1]	1 in 20 or fewer samples	Statistical Limits [4]
Matrix Spike (MS)[2]	1 in 20 or fewer samples	Statistical Limits [4]
MS Duplicate (MSD)[2]	1 in 20 or fewer samples	Statistical Limits [4]
Surrogates	every sample[3]	Statistical Limits [4]
Internal Standards	Every samples	Response within -50% to +100% of CCV

[1] LCS Duplicate (LCD) is performed only when insufficient sample is available for the MS/MSD or when requested by the client/project/contract.
[2] The sample selection for MS/MSD are randomly selected, unless specifically requested by a client….predetermined by the extraction lab.
[3] Analytical and QC samples (MB, LCS, MS/MSD)
[4] Statistical control limits are updated annually and are updated into LIMS.

9.1.1. **Method blanks** are analyzed every 12 hours immediately after successful calibration verification (ICV and CCV) and before any samples are analyzed during the 12 hour clock. Analyze the blank in the same manner as the associated samples.

9.1.1.1. Prepare an aqueous blank by filling a 40 mL vial with reagent water and placing it in the autosampler. The autosampler will add the internal standard and/or surrogate standard.

9.1.1.2. Prepare a medium or high level blank in a 50 mL volumetric flask by adding 1.0 mL of purge and trap grade methanol to reagent water and bringing up to volume with the reagent water. The appropriate volume of this mix is added to the purge vessel. The autosampler will automatically internal standard and/or surrogate standard.

9.1.1.3. Prepare a low- level soil blank in a 40 ml VOA vial by adding a magnetic stir bar and 5 ml of reagent water and placing the vial in the autosampler tray. An additional 5mL of reagent water plus 1uL of 250ppm Internal Standard/Surrogate Mix (see Section 7.2.4) will be added by the Archon prior to purging.

9.1.1.4. To be considered acceptable, the method blank must not have any target analytes above the reporting limit. For method 8260D method blank is acceptable when target analyte concentrations are less than one-half of the reporting limit. Method blanks may contain analyte concentrations greater than acceptance limits if the associated samples in the batch are unaffected or sample

concentrations/responses are >10x the blank If method blanks are unacceptably contaminated with target compounds that are also present in field samples, all affected samples must be re-extracted and re-analyzed. Re-analysis is not necessary if the analyte concentration falls well below the action or regulatory limit or if the analyte is deemed not important for the project. Corrective action must be taken to identify and eliminate the contamination source. Demonstrate that acceptable blanks can be obtained before continuing with sample extraction and analysis. Method blanks must be analyzed on each instrument on which the associated samples are analyzed. Method blanks, trip blanks and other field blanks must be carried out through all stages of sample preparation and analysis.

9.1.1.5. Surrogate recoveries for the method blank must be within the laboratory generated limits. (Method 8260D requires the use of a minimum of three (3) surrogates. Since we are spiking with four (4) surrogates, either 1,2-Dichloroethane-d4 or dibromofluoromethane can be recovered outside of control limits without corrective action) .Internal standard area counts in the method blank must be within method specified limits. If any surrogate or internal standard is outside the limits, the method blank must re-analyzed.

9.1.2. Matrix Spike (MS)/Matrix Spike Duplicate (MSD): A matrix spike/matrix spike duplicate (MS/MSD) pair is extracted and analyzed with every 20 environmental samples of a specific matrix (defined as a sample batch which may contain up to 20 samples, and additional samples can be added to the batch for 14 days after the first sample was analyzed). Full compound list spiking is employed for MS/MSDs and LCSs. These spikes are prepared (as described in Section 9.1.2.1) concurrent with sample preparation. MS and MSD recoveries are calculated and compared to lab generated acceptance criteria which are updated annually. For acceptance limits, reference the current TALS (LIMS) active Method Limit Group database.

9.1.2.1. Prepare the MS/MSD as follows:

9.1.2.1.1 Low Level Soil: The low level soil MS/MSD is prepared as detailed in the following table. This is prepared in duplicate (one for the MS, the other for the MSD) in a 5 ml syringe filled with reagent water. Once prepped the solution is added to separate 40 ml vials each containing 5 gram aliquots of the sample to be spiked :

Standard Solution (Reference Table 2, Lab Names)	Concentration	Volume of Standard (ul) Added to 5.0 ml of Reagent Water	Final Concentration (ug/kg)
Gas Mix Li	50ppm	2	20

Standard Solution (Reference Table 2, Lab Names)	Concentration	Volume of Standard (ul) Added to 5.0 ml of Reagent Water	Final Concentration (ug/kg)
8260 combined	50ppm	2	20
Acrolein	500 ppm	3	300
Propenes	50ppm (varied)	2	20 (varied)
Freons	50 ppm	2	20

9.1.2.1.2 Aqueous Samples: The MS/MSD for aqueous samples is prepared as detailed in the following table. This is prepared in duplicate (one for MS, the other for MSD) in 50 ml volumetric flasks filled with an aliquot of sample to be spiked. Once prepped the solution is poured into a 40 ml VOA vial and loaded onto the purge and trap autosampler:

Standard Solution (Reference Table 2, Lab Names)	Concentration	Volume of Standard (ul) Added to 50 ml of Sample	Final Concentration(ug/L)
Gas Mix Li	50ppm	20	20
8260 combined	50ppm	20	20
Acrolein	500 ppm	4	40
Propenes	50ppm (varied)	20	20 (varied)
Freons	50	20	20

9.1.2.1.3 Medium & High Level Soils: The MS/MSD for medium/high level soils is prepared as detailed in the following table. This is prepared in duplicate (one for MS, the other for MSD) in 50 ml volumetric flasks filled with reagent water which has been previously spiked with the methanol sample extract. Once prepped the solution is poured into a 40 ml VOA vial, the and loaded onto the purge and trap autosampler:

Standard Solution (Reference Table 2, Lab Names)	Concentration	Volume of Standard (ul) Added to 50 ml of Reagent Water containing sample methanol extract	Final Concentration (ug/L)
Gas Mix Li	50ppm	20	20
8260 conbined	50ppm	20	20
Acrolein	500ppm	4	40
Propenes	50ppm (varied)	20	20 (varied)
Freons	50 ppm	20	20

9.1.2.1.4 SIM: The MS/MSD for SIM samples is prepared as detailed in the following table. This is prepared in duplicate (one for MS, the other for MSD) in 100 ml

volumetric flasks filled with an aliquot of sample to be spiked. Once prepped, two separate 10ml solution is poured into 40 ml VOA vials, 2ul of SIM IS/S is then added to each vial and loaded onto the purge and trap autosampler:

Standard Solution	Concentration	Volume of Standard Added to 100 ml of Sample (ul)	Final Concentration (ug/L)
8260SIM Mix1	10ppm	0.5	0.05
1,4-Dioxane	50ppm (varied)	10	5
Benzene/Chloroform	10ppm	0.5	0.05

9.1.2.2. An Laboratory Control Sample (LCS) /Laboratory Control Sample Duplicate (LCSD) may be substituted for the MS/MSD if insufficient sample volume is available (see Section 9.1.3).

9.1.3. Laboratory Control Sample (LCS)/Laboratory Control Sample Duplicate (LCSD): A Laboratory Control Sample (LCS) (aka blank spike) must be prepared analyzed with each batch of 20 environmental samples. The LCS data is used to assess method performance if the MS/MSD recoveries fall outside of the lab generated limits (see For acceptance limits, reference the current TALS (LIMS) active Method Limit Group database). If the LCS recovery is within the current lab generated limits, the MS/MSD recoveries are attributed to matrix interference. If the LCS recovery results are outside the method specified, the LCS is reanalyzed. If, upon reanalysis, the LCS is it is still outside of limits the entire batch must be reanalyzed. For 8260D, when an LCS is prepared in the same manner as CCV, the same standard can be used as both the LCS and CCV.

9.1.3.1 For LCS preparation instructions please refer to Section 9.1.2.1 for low level soil introduction technique (note: use reagent water only, no solid matrix is used when preparing the LCS) and Sections 9.1.2.1.2 and 9.1.2.1.3 as applicable for aqueous/medium or high level solids introduction (note: use reagent water only, no sample or sample extract is used when preparing the LCS).

9.1.3.2 The LCS for SIM samples is prepared as detailed in the following table. This is prepared in a 200 ml volumetric flasks filled with organic free reagent water. Once prepped, 10ml of the solution is poured into a 40 ml VOA vial and 2ul IS/SS added manually and loaded onto the purge and trap autosampler

Standard Solution	Concentration	Volume of Standard Added to 200 ml of Reagent Water (ul)	Final Concentration (ug/L)
8260 Mix1	10ppm	1	0.05
1,4-Dioxane	50ppm	20	5
Benzene/Chloroform	10ppm	1	0.05

9.1.3.3 A Laboratory Control Sample Duplicate (LCSD) is analyzed only when insufficient client sample is available for preparation of an MS/MSD pair. The LCS/LSCD is evaluated in the same manner as the MS/MSD (see Section 9.1.2)

9.1.4. Surrogate Standards: All samples, blanks and QC samples are spiked with a four (4) component surrogate standard mix (see Section 7.2.2). The percent recovery of the surrogate standards is calculated and compared to lab generated limits (For acceptance limits, reference the current TALS (LIMS) active Method Limit Group database).

9.1.4.1. Surrogate recovery limits are lab generated and are updated annually.

9.1.4.2. Surrogate recoveries are calculated for the blank, samples, and QC samples. Surrogate recovery is calculated as:

$$\frac{\text{Concentration found}}{\text{Concentration added}} \times 100 = \%\ \text{RECOVERY}$$

9.1.4.3. If the surrogate recoveries of any blank, sample, or QC sample fails to meet the current recovery criteria, the sample must be re-analyzed. If a surrogate is diluted to a concentration below that of the lowest calibration standard, no corrective action is necessary. Method 8260D requires the use of a minimum of three (3) surrogates. As we spike with four (4) surrogates, one can be recovered outside of control limits without corrective action.

9.1.5. Internal Standards: All samples, blanks, standards and QC samples are spiked with a five (5) component internal standard mix (See Section 7.2.3). The response (area count) and retention time of each internal standard in all samples, standards, blanks and QC samples are monitored.

9.1.5.1. The internal standard responses must be within -50 +100% of its corresponding internal standard in the mid-level calibration standard or the active calibration curve. Failure to meet these criteria is indicative of sample matrix effects. All samples failing these criteria must be reanalyzed to confirm matrix effects.

9.1.5.2. Internal standard retention time is evaluated immediately after acquisition. The retention times of the internal standards must be within ±30 seconds of the internal standards from the mid point standard of the initial calibration or the calibration verification standard. Any blank, sample, or QC sample that fails to meet these criteria must be re-analyzed.

9.2 Instrument QC

9.2.1 GC/MS Instrument Performance Check (BFB): The GC/MS system is tuned using Perfluortributylamine (PFTBA) such that an injection or purging of 50ng of 4-Bromofluorobenzene (BFB) meets the abundance criteria listed in the table below. Prior to the analysis of any calibration standards or samples, the GC/MS system must meet all BFB key ion abundance criteria. This analysis will verify proper tuning of the system for a period of 12 hours post-injection. After 12 hours, the instrument performance must again be verified prior to the analysis of standards, QC or samples. For method 8260D tune checks are only required prior to initial calibration. (**NOTE**: see Method Modifications in Section 16.0).

BFB Key Ions and Abundance Criteria	
Mass	**Ion Abundance Criteria**
50	15.0-40.0 percent of the base peak
75	30.0-60.0 percent of the base peak
95	Base peak, 100% relative abundance
96	5.0-9.0 percent of the base peak
173	Less than 2.0% of mass 174
174	Greater than 50% of the base peak
175	5.0-9.0 percent of mass 174
176	Greater than 95.0% but less than 101% of mass174
177	5.0-9.0 percent of mass 176

9.2.1.1. The BFB mass spectrum may be evaluated using one of the procedures listed below. The spectrum may be background subtracted using a single peak no more than 20 scans before the peak apex. The BFB spectrum must meet the technical acceptance criteria listed in the table above:

- A single scan on the peak;
- An average of the peak;
- Use of three scan averaging and background subtraction techniques. Select the scan at the BFB peak apex, add +1 scan from the apex and -1 scans from the apex;

9.2.1.2. BFB parameter settings are stored in a tune file, which ill be used in all subsequent analysis of standards and samples.

9.2.2 Initial Calibration Range and Initial Calibration Verification

9.2.2.1. **Initial Calibration:** The initial calibration range consists of a five-point concentrations (six points for second order regression) of analytical standards prepared as described in Tables 3, 3A and 3B as applicable (attached). The initial calibration range must be analyzed only after the BFB instrument performance check has met the criteria in Section 9.2.1. A separate initial calibration range is analyzed for each sample introduction technique. The last initial calibration standard may be used to be the start of the 12 hour clock for samples analyzed after initial calibration. Verify closely eluting isomers resolution in the mid-point concentration of the ICAL. Isomers are considered resolved if the peaks are at least 50% resolved (i.e., the height of the valley between two isomer peaks is less than or equal to 50% of the average of the two peak heights. This should also be checked in the daily CC's.

9.2.2.2. If analysis by the SIM technique is required, prepare calibration standards for, Vinyl Chloride, Chloroform, Benzene 1,2-dibromoethane, 1,2,3-Trichloropropane and 1,2-dibromo-3-chloropropane at concentrations of 0.02, 0.04, .05, 0.10, 0.20, 0.50, 1.0 and 2.0 ppb; 1,4-Dioxane at 0.4, 1, 5, 10, 20, 30, 40 and 50ppb. See Table 5 that summarizes the preparation information.

9.2.2.3. **Initial Calibration Verification (ICV):** An Initial Calibration Verification (ICV) standard is analyzed immediately after the Initial Calibration Range and before any samples are analyzed. The ICV is prepared as detailed in Section 7.2.1.3 and Tables 4 and 4a (full scan) and Table 6 (SIM) (attached). The ICV must be from a source separate from the standards used in the Initial Calibration Range.

9.2.3 **Continuing Calibration Verification (CCV):** A approximately mid-point (20ug/ml and 0.050/5ug/ml for SIM) Continuing Calibration Verification (CCV) must be analyzed every 12 hours after the BFB instrument performance check. BFB is not a requirement for 8260D CCV verification. The CCV is prepared as detailed in Section 7.2.1.1 and Table 3 (attached).

9.2.4 **Calibration Acceptance Summary**

9.2.4.1. **Retention Time:** The relative retention times of each compound in the five calibration standards must agree within 0.06 relative retention time units.

9.2.4.2. **Initial Calibration Range:** Internal standard calibration is employed for this method. After the initial calibration range has been analyzed as detailed in Section 10.3.3 the relative response factor (RRF) for each target/surrogate compound at each concentration level is determined using the following equation.

$$RRF = \frac{A_x}{A_{is}} \times \frac{C_{is}}{C_x}$$

Where:
A_x = Area characteristic ion for the compound (see attached Table 7)
Ais = Area characteristic ion of internal standard (see attached Table 7)
Cis = Concentration of internal standard
Cx = Concentration of compound in standard

9.2.4.2.1. Determine the mean RRF for each compound using the five or six RFs from the initial calibration range.

9.2.4.2.2. The average RFs of the target analytes listed in the table below must meet the indicated minimum RF criteria:

Minimum Relative Response Factor	
Common Target Analytes	**Minimum RF**
Dichlorodifluoromethane	0.100
Chloromethane	0.100
Vinyl Chloride	0.100
Bromomethane	0.100
Chloroethane	0.100
Trichlorofluoromethane	0.100
1,1-Dichloroethene	0.100
1,1,2-Trichloro-1,2,2-trifluoroethane	0.100
Acetone *	0.050
Carbon disulfide	0.100
Methyl Acetate *	0.005
Methylene chloride	0.100
trans-1,2-Dichloroethene	0.100
cis-1,2-Dichloroethene	0.100
Methyl tert-Butyl Ether	0.100
1,1-Dichloroethane	0.200
2-Butanone *	0.050
Chloroform	0.200
1,1,1-Trichloroethane	0.100
Cyclohexane	0.100
Carbon tetrachloride	0.100
Benzene	0.500
1,2-Dichloroethane	0.100
Trichloroethene	0.200
Methylcyclohexane	0.100
1,2-Dichloropropane	0.100
Bromodichloromethane	0.200
cis-1,3-Dichloropropene	0.200
trans-1,3-Dichloropropene	0.100
4-Methyl-2-pentanone *	0.050
Toluene	0.400

Minimum Relative Response Factor	
Common Target Analytes	**Minimum RF**
1,1,2-Trichloroethane	0.100
Tetrachloroethene	0.200
2-Hexanone*	0.050
Dibromochloromethane	0.100
1,2-Dibromoethane	0.100
Chlorobenzene	0.500
Ethylbenzene	0.100
meta-/para-Xylene	0.100
ortho-Xylene	0.300
Styrene	0.300
Bromoform	0.100
Isopropylbenzene	0.100
1,1,2,2-Tetrachloroethane	0.300
1,3-Dichlorobenzene	0.600
1,4-Dichlorobenzene	0.500
1,2-Dichlorobenzene	0.400
1,2-Dibromo-3-chloropropane	0.050
1,2,4-Trichlorobenzene	0.200

Note: Alternate ions chosen for the analytes in the table above may result in lower than recommended value

* These values are lower than method recommended values.

9.2.4.2.3. Any individual analyte that fails the minimum response factor above must have a demonstration of sensitivity in the analytical batch to report non-detects. The demonstration of sensitivity is analysis of a low level CCV (at or below the reporting limit). The criterion for a passing LLCCV is detection only, and a passing LLCCV allows non-detects to be reported without flagging. The low level CCV would normally be analyzed immediately after the mid-level CCV

9.2.4.2.4. Calculate the Standard Deviation (SD) and Percent Relative Standard Deviation (% RSD) of the response factors for each compound:

$$\% \text{ RSD} = \frac{\text{Standard Deviation of RRFs}}{\text{Mean RRF}}$$

The % RSD of the common target compounds listed above must be ≤20% for average RF in order for the calibration range to be acceptable. If more than 10% of the compounds exceed the 20%RSD limit and do not meet the minimum correlation coefficient (0.99) or Relative Standard Error (RSE) of ≤20% for alternative curve fits, appropriate instrument maintenance like source cleaning should be performed. Any compound that do not meet the 20%

RSD or 0.99 correlation coefficient/RSE criteria must be flagged as estimated for detects.

9.2.4.2.5. For all compounds (including those analyzed by SIM): in order to assume linearity, the % RSD of the RRF's for each target analyte must be ≤20%.

9.2.4.2.6. If the above listed criteria is met, the system can be assumed to be linear, sample analysis may begin and the average RF from the initial calibration range may be used to quantitate all samples.

9.2.4.2.7. An alternative calibration technique may be employed for those any compounds exceeding the 20% RSD criteria:

9.2.4.2.5.4 Linear regression: Calculate the first order linear regression for any compound which did not meet the 20% RSD criteria the r^2 (Correlation Coefficient) value must be $\geq$ 0.99 or the Relative Standard Error (RSE) (≤20%) for the calibration to be employed.

9.2.4.2.5.4 Quadratic (or second order) regression: may be used if the linear regression correlation coefficient exceeds criteria. Quadratic regression requires the use of a minimum six calibration points. If second order regression calibration is used, , the r^2 (Correlation Coefficient) value must be $\geq$ 0.99 or the Relative Standard Error (RSE) (≤20%) for the calibration to be employed.

9.2.4.2.8. If neither of the alternative calibration techniques meets acceptance criteria i.e for more than 10% of the analytes fail both 20%RSE and 0.990 the calibration is not valid. Corrective action must be taken and the initial calibration range reanalyzed.

9.2.4.2.9. Non-detect results for any analyte that fails both 20%RSD/RSE and 0.990 correlation coefficient may be reported without flagging if (and only if) there has been a successful analysis of a LLCCV (CCV at the reporting limit) in the same analytical batch. The criterion for the LLCCV is detection only (%D criteria are not applied) but the standard qualitative criteria in the method must be met. Flagging of detected analytes results as estimated is discouraged when the 20%RSD/RSE and 0.990 criteria fails. In general no more than one or two of the poorest performing analytes should fail both criteria.

9.2.4.2.10. Due to significant bias to the lower portion of a calibration curve using the linear regression fit model a quantitation check on the viability of the lowest calibration point should be performed by re-fitting the response from the low concentration calibration standard back into the curve as if it were an unknown sample (rename the lower point calibration file as a separate data file before re-processing). The results should be within ±30% of the standard's true concentration. This is not required for average RF or quadratic fits. Additionally forcing a linear regression through zero will meet the requirement of not re-fitting. Analytes which do not meet the minimum quantitation calibration re-fitting criteria should be considered 'out of control'. Report those target analyte outliers as estimated when the concentration is at or near the lowest calibration point and/or report to the next reporting level (i.e., the next higher calibration point for the analyte).

9.2.4.2.11. For additional detail refer to Eurofins Edison Work Instruction No. EDS-WI-096, *8260C ICAL Procedure*, latest revision.

9.2.4.3. Calibration Point Read-back Criteria: Whichever calibration model above is selected, it should be subjected to an additional check to establish the representativeness of the data that were used to produce it. This check is the refitting of each calibration point response back to the calibration model, or the comparison of the calculated amount of the standard against the expected amount.

- CHROM software provides an Initial Calibration %Drift report which shows the % Error for each calibration point. This report must be reviewed in addition to the %RSD Linear Response Factor.

- The absolute value of the % Error for each calibration point should be < 30%. For the lowest calibration point, the % Error may be < 50%. Relative standard error (RSE) can also be used and must be ≤ 20% for each calibration point. See section 11.10 for the Calculation of the %Error.

9.2.4.4. Initial Calibration Verification (ICV): Once the initial calibration has been analyzed and has met the above criteria, a second source Initial Calibration Verification (ICV) (as prepared in Section 9.2.2.2) must be analyzed and evaluated. The ICV must meet the criteria of 70-130% recovery for all compounds however up to 10% of the compounds are allowed to exceed

this criteria as long as their recoveries are within 65-135%. For the poor performers the range is 50-150%. If the criterion is not met, a second ICV may be analyzed after corrective measures are taken. If a second ICV analysis fails to meet criteria proceed with corrective action and the analysis of a new initial calibration range. Flagging: If the ICV limits are outside of criteria (high) for an analyte and that analyte is undetected in the sample, no flagging or narration is required. If the ICV limits are outside of criteria (low) for an analyte and that analyte is undetected in a sample, narrate the non-conformance in an NCM. When that out of spec analyte is detected in a sample, describe the issue in the narrative, or flag as estimated.

9.2.4.5. Continuing Calibration Verification (CCV): A CCV consisting of a standard at or near the midpoint of the Initial Calibration Range is analyzed every 12 hours of instrument operation or at the beginning of an analytical sequence to verify the initial calibration. The calibration verification consists of a BFB instrument performance check, and analysis of a calibration verification standard.

9.2.4.4.1 Tune Verification: Follow the procedure for verifying the instrument tune described in section 9.2.1 using a 50 ng injection of BFB. If the tune cannot be verified, analysis must be stopped, corrective action taken and a return to "control" demonstrated before continuing with the calibration verification process. For method 8260D, tune verification is not required for daily CCV.

9.2.4.4.1.1 Calibration Verification: Analyze the calibration verification standard immediately after a BFB that meets criteria. For method 8260D, BFB is not needed. Use the mid point calibration standard (20ug/L). **NOTE:** The same sample introduction technique employed for the initial six-point calibration must be used for the calibration verification.

9.2.4.4.1.2 Calculate response factors (RF) for each compound using the internal standard method.

9.2.4.4.1.3 The RFs must meet the minimum RF criteria listed in the table in Section 9.2.4.2.2.

9.2.4.4.1.4 Calculate the % Difference for each response factor in the calibration check standard vs. the response factors from the initial calibration.

9.2.4.4.1.5 If the percent difference/drift (%D) for the compounds listed in the table in Section 9.2.4.2.2 is ≤20%, the initial calibration is assumed to be valid. If the ≤20% D criteria is not met for more than 20% of the compounds in the initial calibration, corrective action/ investigation may be taken. After corrective action, another calibration verification standard may be injected. If the response for the analyte is still not ≤20%, a new initial calibration range must be generated.

9.2.4.4.1.6 For the poor performing compounds listed below that fail the 20%D or 50%D criteria adequate sensitivity may be demonstrated by including a low level standard (LLCCV) in the analytical batch.

Poor Performers	
Acetone	Acrolein
Carbon disulfide	1,4-Dioxane
2-Butanone	Cyclohexane
2-Hexanone	Methyl cyclohexane
4-Methyl-2-pentanone	Benzyl chloride
Chlorodibromomethane	Naphthalene
1,2-Dibromo-3-chloropropane	Cis-Dichloropropene
Bromomethane	Trans-Dichloropropene
Chloroethane	All Alcohols

When samples have non-detects for an analyte that fails the SOP criteria with low recovery a low level CCV must be analyzed in the batch as a demonstration of adequate sensitivity. The criterion for a passing LLCCV is detection only, and a passing LLCCV allows non-detects to be reported without flagging. Any sample detects for an analyte that fails the SOP criteria must be flagged as estimated, or detailed in the case narrative. In all cases every effort should be made to re-analyze on an instrument with a passing CCV.

9.2.4.4.1.7 Percent drift is used instead of percent difference in calibrations employing either the linear or second order regression modes.

9.2.4.4.1.8 For the compounds not listed in the table in Section 9.2.4.2.2: No one individual compound of interest may exceed 50%D. For SIM analysis the %D is 20%.

9.2.4.4.1.9 The retention times of the internal standards from the calibration check must be within ±30 seconds of the internal standards from the mid point standard of the original calibration. If the retention time for any internal standard changes by more than 30 seconds from the latest daily (12 hour) calibration standard, the chromatographic system is inspected for malfunctions, and corrections made as required. If corrective action does not result in the retention time criteria being achieved, the system must be re-calibrated using four additional standards.

9.2.4.4.1.10 Internal standard area response is also evaluated immediately after acquisition. The response (area count) of each internal standard in the calibration verification standard must be within 50% - 100% of its corresponding internal standard in the mid-level calibration standard of the initial calibration curve. If the EICP area for any internal standard changes by more than a factor of two (-50% to +100%), the mass spectrometer system must be inspected for malfunction and corrections made as appropriate. When corrections are made, re-analysis of samples analyzed while the system was malfunctioning is required.

10.0 Procedure

10.1. Gas Chromatograph/Mass Spectrometer Operation

10.1.1. The instrument operating parameters are set as follows at the beginning of a method of analysis and remain constant throughout the entire analytical procedure

10.1.1.1 Full Scan Operating Mode

Purge and trap unit

Purge Time:	11 minutes
Dry Purge:	1 Minutes
Purge Gas:	Nitrogen
Purge Flow:	40-45 ml/min
Purge Temp:	Water: Ambient; Solids: 40°C
Trapping Temp:	Ambient, <30°C

Desorb Time:	1 Minute
Desorb Temp:	VOCARB: 260°C, #10: 190°C

Gas chromatograph

Injector:	180°C
Carrier Gas:	Helium
Carrier Flow:	6 ml/min, 6890: 0.8 ml/min
Oven Program:	40°C for 1 min, 8°C/min to 90°C, 20°C/ min to 250°C for 3 min; 6890: 40°C for 1 min, 8°C/min to 100°C, 24°C/min to 220°C for 2 min
Run Time:	15 - 20 Minutes

Mass Spectrometer

Electron Energy:	70 volts (nominal)
Mass range:	35-260 AMU
Scan time:	0.9 sec./scan
Source Temp:	200°C
Separator Temp:	180°C

10.1.1.2 SIM Operating Mode

Purge and trap unit

Purge Time:	11 minutes
Dry Purge:	1 Minutes
Purge Gas:	Nitrogen
Purge Flow:	40-45 ml/min
Purge Temp:	Water: Ambient; Solids: 40°C
Trapping Temp:	Ambient, <30°C
Desorb Time:	1 Minute
Desorb Temp:	VOCARB: 260°C, #10: 190°C

Gas chromatograph

Injector:	180°C
Carrier Gas:	Helium
Carrier Flow:	6 ml/min, 6890: 0.8 ml/min
Oven Program:	40°C for 1 min, 8°C/min to 90°C, 20°C/ min to 250°C for 3 min; 6890: 40°C for 1 min, 8°C/min to 100°C, 24°C/min to 220°C for 2 min
Run Time:	15 - 20 Minutes

Mass Spectrometer

Electron Energy:	70 volts (nominal)
Mass range:	35-260 AMU
Scan time:	0.9 sec./scan
Source Temp:	200°C
Separator Temp:	180°C

SIM Parameters:

Group 1
Plot 1 Ion: 51.0/96

Ions/Dwell in Group	(Mass	Dwell)	(Mass	Dwell)	(Mass	Dwell)
	51.0	100	58.0	100	65.0	100
	67.0	100	70.0	100	88.0	100
	96.0	100	78.0	100	83.0	100
	85.0	100	62.0	100	64.0	100

Group 2
Group Start Time: 6.20
Plot 1 Ion: 82/117

Ions/Dwell in Group	(Mass	Dwell)	(Mass	Dwell)	(Mass	Dwell)
	82.0	100	107.0	100	109.0	100
	117.0	100				

Group 3
Group Start Time: 8.50
Plot 1 Ion: 75/157

Ions/Dwell in Group	(Mass	Dwell)	(Mass	Dwell)	(Mass	Dwell)
	75.0	100	95.0	100	150.0	100
	152.0	100	152.0	100	157.0	100
	174.0	100				

10.2. Sample Preparation

10.2.1. Screening: All soil samples extracts must be screened by GC/FID static headspace or MS analysis to provide the analyst with appropriate initial dilution factors. Aqueous samples without historical results are also screened. For additional details see Eurofins Edison SOP No. ED-GCV-001, *Screening for Volatile Organics, Static Headspace with GC FID, SW846 Method 5021*, current revision.

10.2.2. Aqueous Samples: Unopened 40 mls vials with aqueous samples are placed in an Archon autosampler. 1 uL of Internal Standard/Surrogate Mix (see Section 7.2.4) is added by the Archon as the 5 mL of the sample passes through the sample loop.

10.2.3. **Medium or high level soils:** Medium or high level extracts that will be run on an Archon autosampler are prepared in 50mL volumetric flasks. The Archon can be set up to add 1uL of 250ppm Internal Standard/Surrogate separately (see Section 7.2.3 and 7.2.2.2) to each sample as the 5mL portion passes through the sample loop.

10.2.4. **Low level soils:** Low level soils must be run on an Archon autosampler. 1uL of 250ppm Internal Standard/Surrogate separately (see Section 7.2.3 and 7.2.2.2) and 5mL reagent water is added to each sample vial by the Archon immediately before the sample is purged.

10.2.5. **SIM analysis:** Aliquot 10ml of sample and manually add 2ul of 2.5/50ppm of internal standard/surrogate mix. Load to soil section of the autosampler for heated purge.

10.3. Instrument Performance and Calibration Sequence

10.3.1. Once the GC/MS instrument has been setup and maintained as detailed in Section 10.1, the first operations to be performed are the performance checks and calibration standards.

10.3.2. Analyze the Instrument Performance Check Standard (BFB) as discussed in Section 9.2.1.

10.3.3. A unique initial calibration is then prepared for each sample introduction technique.:

10.3.3.1 **40 ml VOA Vial (Aqueous/Medium-High Level Soils):** Prepare aqueous calibration standards at six concentration levels for each parameter by adding the volumes of working standards listed in Table 3 to a 50mL volumetric flask of reagent water. Pour the calibration standards into 40mL VOA vials and load into the autosampler tray. If the internal standard is to be added by the Archon/OI autosamplers the addition of internal standard into the 50ml volumetric flaks may be omitted.

10.3.3.2 **40 ml VOA Vial (Low Level Soils):** If the calibration is for low-level soils prepared according to Method 5035AA, the calibration standards must be prepared by adding the volumes of working standards listed in Table 3 into a 5 mL syringe filled with reagent water and pouring the prepared standards into 40 mL VOA vials containing a magnetic stir bar.

10.3.4. Purge the standard for 11 minutes.

10.3.5. After purging is complete, desorb the sample onto the GC column by rapidly heating the trap to 260°C for VOCARB, 190°C for #10 and backflushing it with helium.

10.3.6. Begin the GC temperature program and data acquisition.

10.3.7. Re-condition the trap by baking for 12 minutes at 260°C for VOCARB, 210°C for #10.

10.3.8. Cool the trap to (<31°C). The trap is now ready for the next sample.

10.3.9. Transfer data to network, and process using CHROM software.

10.4. Sample Analysis Sequence

10.4.1. Once the initial calibration has been verified by successful analysis of an ICV and Method Blank, analysis of samples may begin.

10.4.2. Samples must be analyzed under the same instrument conditions and using the same injection volume as the calibration standards.

10.4.3. Equilibrate all samples to room temperature prior to analysis.

10.4.4. If the sample concentration exceeds that of the range, the sample must be diluted and re-analyzed.

10.4.5. The analytical run log is printed as a record of samples analyzed. The analyst will annotate the run log with any required information regarding anomalies or unusual events. The run log must be signed by the analyst and a reviewed and signed by a trained peer or manager

10.5. Data Processing

10.5.1. Prior to processing any standards or samples, target compound lists and sublists must be assembled in the Chrom system. These lists are required for processing of all data files including calibration files. The data includes compound names, retention time data, quantitation ions, qualitative identification ions, and the assigned internal standard for qualitative and quantitative identification.

10.5.2. Key data is manually entered the first time a compound list is used for data processing. Processing data using a compound list automatically generates response factor data and updates retention information.

10.5.3. Data is transferred from the acquisition PC to the network for auto-processing with CHROM software.

10.5.4. Each data file is checked for correct information including sample number, job number, QA batch, dilution factor, initial volume, final volume, and % moisture.

10.5.5. The data processing service from Chrom queries LIMS for the sample processing parameters.

10.5.6. Each data file is processed using calibration factors from the most recent initial calibration, quantitation from the daily calibration verification standard is not permitted.

10.5.7. The characteristic ions for target compounds, surrogate compounds, and internal standards which can be determined using SW8260D are listed in Table 7.

10.6. Interpretation and Qualitative Identification:

10.6.1 Target Analytes: Qualitative identification of target compounds is based on retention time and mass spectral comparison with characteristic ions in the target compound list. The reference mass spectrum is taken from a standard of the target compound analyzed by this method. The characteristic ions are the three ions of greatest relative intensity or any ions over 30% relative intensity if less than three such ions occur in the reference spectrum. Compounds are identified as present when the following criteria are met:

10.6.1.1. Once the GC/MS instrument has been setup and maintained as detailed in Section 10.1, the first operations to be performed are the performance checks and calibration standards.

10.6.1.2. The intensities of the characteristic ions of a compound maximize in the same scan or within one scan of each other.

10.6.1.3. The relative retention time (RRT) of the sample component is within ± 0.06 RRT units of the RRT of the standard component.

10.6.1.4. The most abundant ion in the standard target spectrum that equals 100% MUST also be present in the sample target spectrum.

10.6.1.5. All other ions that are greater than 10% in the standard target spectra should also be present in the sample.

10.6.1.6. The relative intensities of the characteristic ions agree within 30% of the relative intensities of these ions in the reference spectrum. (Example: For an ion with an abundance of 50% in the reference spectrum, the corresponding abundance in a sample spectrum can range between 20% and 80%).

10.6.1.7. Structural isomers that produce very similar mass spectra should be identified as individual isomers if they have sufficiently different GC retention times. Otherwise, structural isomers are identified as isomeric pairs.

10.6.1.8. If the compound does not meet all of the criteria listed above, but is deemed a match in the technical judgment of the mass spectral interpretation specialist, the compound will be positively identified and reported with documentation of the identification noted in the raw data record.

10.6.2 Non-Target Analytes: Upon client request a library search to identify non-target Tentatively Identified Compounds (TIC) is performed. The NIST/EPA/NIH mass spectral library is used to identify non-target compounds (not including internal standard and surrogate compounds) of greatest apparent concentration by a forward search of the library. The following guidelines are used by the analyst when making TIC identifications:

10.6.2.1 Relative intensities of major ions in the reference spectrum (ions greater than 10% of the most abundant ion) should be present in the sample spectrum.

10.6.2.2 The relative intensities of the major ions should agree within ±20%. (Example: For an ion with an abundance of 50% in the standard spectrum, the corresponding sample ion abundance must be between 30 and 70%).

10.6.2.3 Molecular ions present in the reference spectrum should be present in the sample spectrum.

10.6.2.4 Ions present in the sample spectrum but not in the reference spectrum should be reviewed for possible background contamination or presence of co-eluting compounds.

10.6.2.5 Ions present in the reference spectrum but not in the sample spectrum should be reviewed for possible subtraction from the sample spectrum because of background contamination or co-eluting peaks. Data system library reduction programs can sometimes create these discrepancies.

10.6.2.6 If, in the technical judgement of the mass spectral interpretation specialist, no tentative identification can be made, the compound will be reported as 'Unknown'. If the compound can be further classified the analyst may do so (i.e, 'Unknown hydrocarbon', 'Unknown acid' , etc..).

10.7. Data Reporting

10.7.1. Final Report. LIMS TALS system automatically produces a data report consisting of key, hardcopy reports corresponding to specific data reporting requirements.

10.7.1.1. Total Ion Chromatogram. Full length chromatogram depicting the full length of the GC/MS acquisition.

10.7.1.2. Spectra of all detected target compounds. A page for each detected target compound spectra with a standard reference spectrum for comparison.

10.7.1.3. The calculations of the concentrations of each target compound in the sample, reported in units of ppb, ug/kg or ug/l.

10.7.1.4. Data summaries for each method blank indicating which samples were extracted with the indicated blank.

10.7.1.5. A copy of the initial calibration range together with the calibration verification report, and tune report.

10.7.1.6. Quality Control (QC) data report for each batch including surrogate recoveries, internal standard area summaries, LCS, MS/MSD and RPD summaries.

11.0. Calculations / Data Reduction

11.1. Target Compounds: are quantitated using the internal standard method.

11.1.1. Identified target compounds are quantitated using the integrated abundance from the EICP of the primary characteristic ion. The internal standard used shall be the one nearest the retention time of the analyte).

11.1.2. The average response factor (RRF) from the initial calibration is used to calculate the target analyte concentration in client samples using the formula found in Section 11.3.. See Section 9.2.4.2 for discussion of RRF.

11.1.3. Secondary ion quantitation is utilized only when there are sample interferences preventing use of the primary characteristic ion. If secondary ion quantitation is used an average relative response factor (RRF) must be calculated using that secondary ion.

11.1.4. Aqueous Samples

$$\text{Concentration } (\mu g/L) = \frac{(As)(Cis)(D)}{(Ais)(RRF)(Vs)}$$

Where:

As = Area of the characteristic ion for the target analyte in the sample

Cis = Concentration of the internal standard (ug/L)

D = Dilution factor, if the sample or extract was diluted prior to analysis. If no dilution is performed, D = 1.

Ais = Area of the characteristic for the associated internal standard

RRF = Average relative response factor from the initial calibration.

Vs = Volume of sample purged (ml)

11.1.5. Low Level Solid Samples

$$\text{Concentration (µg/Kg) (dry wt)} = \frac{(As)(Cis)}{(Ais)(RRF)(Ws)\,(DW)}$$

Where:

As = Area of the characteristic ion for the target analyte in the sample

Cis = Concentration of the internal standard (ug/L)

DW = Dry wt correction = $\frac{100 - \%\ \text{moisture}}{100}$

Ais = Area of the characteristic for the associated internal standard

RRF = Average relative response factor from the initial calibration.

Ws = Weight of sample purged (g)

11.1.6. Medium Level Solid Samples

$$\text{Concentration (µg/Kg) (dry wt)} = \frac{(As)(Cis)(Vt)(1000)(D)}{(Ais)(RRF)(Va)(Ws)(DW)}$$

Where:

As = Area of the characteristic ion for the target analyte in the sample

Cis = Concentration of the internal standard (ug/L)

D = Dilution factor, if the sample or extract was diluted prior to analysis. If no dilution is performed, D = 1

DW = Dry wt correction = $\frac{100 - \% \text{ moisture}}{100}$

Ais = Area of the characteristic for the associated internal standard

RRF = Average relative response factor from the initial calibration.

Va = Volume of the aliquot of sample methanol extract added to reagent water for purging in ul

Vt = Total volume of methanol extract in milliliters

Ws = Weight of sample purged (g)

11.2. Non-Target Compounds (Tentatively Identified Compounds): An estimated concentration for non-target (tentatively identified compounds) is calculated using the internal standard method . For quantiation, the nearest eluting internal standard free of interferences is used. The procedure used for calculating the concentration of non-target compounds is the same as that used for target compounds (see Section 11.1) with the following revisions:

11.2.1. The total area count of the non-target compound is used for As (instead of the area of a characteristic ion).

11.2.2. The total area count of the chosen internal standard is used as Ais (instead of the area of a characteristic ion).

11.2.3. A RF on 1.0 is assumed.

11.2.4. The resulting concentration is qualified as estimated ('J') indicating the quantitative uncertainties of the reported concentration.

11.3. Relative Response Factors

$$RRF = \frac{A_x}{A_{is}} \times \frac{C_{is}}{C_x}$$

Where:

A_x = Area characteristic ion for the compound (see Table 7)
Ais = Area characteristic ion of associated internal standard (See Table 7)
Cis = Concentration of internal standard
Cx = Concentration of compound in standard

11.4. Percent Relative Standard Deviation (% RSD) : as discussed in Section 9.2.4.2. (Initial calibration):

$$\% \text{ RSD} = \frac{\text{Standard Deviation of RRFs}}{\text{Mean RRF}}$$

11.5. Percent Difference (% D):as discussed in Section 9.2.4.4 (Continuing calibration):

$$\% \text{ D} = \frac{RRF_c - \overline{RRF_i}}{\overline{RRF_i}} \times 100$$

Where: RRFc = RRF from continuing calibration

$\overline{RRF_i}$ = Mean RRF from current initial calibration

11.6. Percent Recovery (% R): Surrogates and Spikes

$$\text{Recovery (\%)} = \frac{\text{Concentration (or amount) found}}{\text{Concentration (or amount) added}} \times 100$$

11.7. Dry Weight Correction: All solid samples must be corrected for dry weight using the following formula for dry weight determination.

$$DW = \frac{Gd}{Gw} \times 100$$

Where:

DW	=	Percent % Dry Weight
Gd	=	Dry weight of selected sample aliquot
Gw	=	Wet weight of selected sample aliquot

Multiply the DW value times the wet weight of the sample extracted. NOTE: This calculation can also be performed automatically by the target system provided the DW value is available and entered into the system.

11.8. Accuracy:

$$\text{ICV , CCV and LCS \% Recovery} = \frac{\text{observed concentration}}{\text{known concentration}} \times 100$$

$$\text{MS \% Recovery} = \frac{\text{(spiked sample) - (unspiked sample)}}{\text{spiked concentration}} \times 100$$

11.9. Precision (RPD):

$$\text{Matrix Duplicate (MD)} = \frac{|\text{orig. sample value - dup. sample value}|}{[(\text{orig. sample value + dup. sample value})/2]} \times 100$$

11.10. Calculation of Percent (%) Error:

$$\%Error = \frac{x_i - x_i'}{x_i} x\,100$$

Where:

x_i ' = Measured amount of analyte at calibration level *i*, in mass or concentration units
x_i = True amount

11.11. Relative Standard Error (RSE):

$$\%\,RSE = 100\% \times \sqrt{\frac{\sum_{i=1}^{N}\left[\frac{C_i - PC_i}{C_i}\right]^2}{(N-P)}}$$

Where:

N = Number of points in the curve
P = Number of parameters in the curve (= 1 for average response factor, 2 for linear, 3 for quadratic)
CI = True concentration for level i
PCi = Predicted concentration for level

12.0 Method Performance

12.1. Method Detection Limit Study (MDL)

A Method Detection Limit (MDL) study, as described in the Eurofins corporate Detection and Quantitation Limits SOP, CA-Q-S-006, must be performed initially and whenever a significant change affecting sensitivity is made to the analytical system. The MDL must be re-evaluated from quarterly MDL points at least every 12 months.

12.2. Demonstration of Capabilities

For DOC procedure refer to Section 19 in the most current revision of Eurofins Edison's Quality Assurance Manual (ED-QA-LQM).

12.3. Lower Limit of Quantitation Verification

The lowest calibration standard analyzed establishes the LLOQ or Reporting Limit. The capability to reliably detect this concentration through the preparation, clean-

up and analytical procedure is verified through the annual analysis of a standard at the LLOQ/RL. The LLOQ verification shall also be performed whenever significant changes are made to the preparation and/or analytical procedure. The annual LLOQ verification is completed and documented with the required annual MDL evaluation

12.3.1 The LLOQ verification standard shall be prepared at a concentration 0.5-2 times the LLOQ/RL, and be taken through all of the same preparation and clean-up methods as client samples.

12.3.2 The LLOQ verification standard for aqueous matrix shall be prepared using laboratory deionized water and for the solid matrix using clean Ottawa sand. Other clean matrices may be used in addition, for project specific requirements.

12.3.3 The LLOQ shall be verified annually on each instrument used for client sample analysis.

12.3.4 Recovery of each analyte must meet the laboratory established LCS recovery limits + 20%. (For example, if the LCS recovery limits are 70-130%, the LLOQ verification must meet recovery limits of 50-150%.) Once sufficient points have been generated, LLOQ based statistical limits may be used in place of limits based on LCS recovery.

NOTE: The lower recovery limit for the LLOQ can be no lower than 10%.

12.4. Training Requirements

Refer to Eurofins SOP No. ED-GEN-022, (*Training*), for the laboratory's training program.

13.0 Pollution Control

13.1. It is Eurofins's policy to evaluate each method and look for opportunities to minimize waste generated (i.e., examine recycling options, ordering chemicals based on quantity needed, preparation of reagents based on anticipated usage and reagent stability). Employees must abide by the policies in Section 13 of the Corporate Environmental Health and Safety Manual (CW-E-M-001) for "Waste Management and Pollution Prevention."

14.0 Waste Management

14.1. Waste management practices are conducted consistent with all applicable rules and regulations. Excess reagents, samples and method process wastes are disposed of in an accepted manner. Waste description rules and land disposal restrictions are followed. Waste disposal procedures are incorporated by reference to Eurofins Edison SOP No. ED-SPM-008, *Laboratory Waste Disposal Practices*, current revision. The following waste streams are produced when this method is carried out.

- Laboratory Generated Aqueous Waste (aqueous VOA vials – used and unused). This waste may have a pH of less than 2.0. These vials are collected in satellite accumulation. The vials are then transferred to the waste room. These vials are passed through a vial crusher and the liquid portion is separated from the solid portion. The solid is dumped into the municipal garbage. The liquid is pumped into the neutralization system where it is neutralized to a pH of 6 to 9 with sodium bicarbonate (Seidler Chemical SC-0219-25). When neutralization is complete, the material is transferred to the municipal sewer system**.**

- Expired Standards – The vials are collected in a 1 gallon polyethylene bucket. These vials are then transferred to an open top 55 gallon steel or polyethylene waste drum. These drums are transported to a waste facility for proper disposal.

- Soil Retain Samples - These samples if not flagged in the system for any hazardous constituents are transferred to poly-lined cubic yard boxes. These boxes when full are sent to stabilization or incineration. These materials are sent out as hazardous for lead and chromium

  Teris Profile Number (incineration): 50016710
  Onyx Profile Number: (stabilization) 402535

- Methanol Preserved Samples/Returned Methanol Preservative - Methanol preserved sample vials are collected in satellite accumulation and then transferred to a 55 gallon open top steel waste drum in the waste room. This drum is then removed by a waste vendor for incineration.

  Teris Profile Number: 50016652
  Onyx Profile Number: 282493

15.0 References / Cross-References

15.2. .United States Environmental Protection Agency, “Method 8260D, Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)”, Test Methods for Evaluating Solid Waste, SW846, Update VI, Revision 4, June 2018.

15.3. United States Environmental Protection Agency, “Method SW8000D: Determinative Chromatographic Separations”, Test Methods for Evaluating Solid Wastes, SW846, Laboratory Manual, Physical/Chemical Methods, Update V, Revision 4, October 2012.

15.4. U.S. EPA. 2003. "Method 5030C (SW-846): Purge-and-Trap for Aqueous Samples," Revision 3. Washington, DC.

15.5. U.S. EPA. 2002. "Method 5035A (SW-846): Closed-System Purge-and-Trap and Extraction for Volatile Organics in Soil and Waste Samples," Draft Revision 1. Washington, DC.

15.6. Eurofins Edison Document No. ED-QA-LQM, *Laboratory Quality Manual*, most current revision.

15.7. Eurofins Document No. CW-E-M-001, Corporate Environmental Health and *Safety Manual,* current revision.

15.8. Eurofins Edison SOP Nos. ED-MSV-001*, Purge and Trap for Aqueous Samples, SW846 Method 5030*, current revision.

15.9. Eurofins Edison ED-MSV-002, *Closed-System Purge-and-Trap and Extraction for Volatile Organics in Soil and Waste Samples, SW846 Method 5035A,* current revision.

15.10. Eurofins Edison SOP No. ED-GCV-001, *Screening for Volatile Organics, Static Headspace with GC FID, SW846 Method 5021*, current revision.

15.11. Eurofins Corporate Quality SOP No. CA-Q-S-001, *Solvent & Acid Lot Testing & Approval*, current revision.

15.12. Eurofins Edison SOP No. ED-GEN-023, *Bulk Solvent Testing and Approval*, current revision.

15.13. Eurofins Edison SOP No. ED-GEN-008, *Standard Operating Procedure for Preparation, Purity and Storage of Reagents and Standards*, current revision

15.14. Eurofins Edison SOP No. ED-SPM-004, *Sample Storage & Handling Procedures for Mitigation of Sample and Laboratory Contamination,* current revision

15.15. Eurofins Edison Work Instruction No. EDS-WI-096, *8260C ICAL Procedure*, current revision.

15.16. Eurofins Edison SOP No. ED-GEN-022, *Training*, current revision.

15.17. Eurofins Edison SOP No. ED-SPM-008, *Laboratory Waste Disposal Practices*, current revision

15.18. Eurofins Edison Work Instruction Document No. EDS-WI-012, *Client Complaint/Corrective Action Form,* current revision.

15.19. Eurofins Corporate Quality Memorandum, CA-Q-QM-002, *GC/MS Tuning Policy*, current revision.

15.20. Eurofins Edison SOP No. ED-GEN-003, *Standard Operating Procedure for Control of Non-Conformances and Corrective Action,* current revision

16.0 Method Modifications:

16.1 Method 8260D requires the BFB tune standard to be analyzed once prior to an ICAL and not daily after that prior to sample analysis. The laboratory will analyze the BFB tune daily, prior to QC and sample analysis. The laboratory will use the

tighter criteria from Methods 8260B/8260C for tune evaluation, rather than the criteria suggested in Table 3 of Method 8260D.

17.0 Attachments

N/A

18.0 Revision History

- Revision 10, dated 08/09/2023
    - Throughout: added analyte 2-ethylhexyl acrylate
    - Sections 2.3 and 10.2.1: Screening clarified to indicate which samples are screened and samples that derive their dilutions from historical data.

- Revision 9, dated 10/17/2022
    - Updated throughout to Eurofins branding throughout the document.
    - Removed all references to 8260C
    - Section 8.3.1: added requirements for handing aqueous samples from chlorinated sources.
    - Section 9.2.2: updated throughout to detail requirements for Relative Standard Error (RSE) evaluation if ICAL.
    - Section 11.11: added formula for calculation of RSE.

- Revision 8, dated 07/16//2020
    - Updated throughout to include requirements of SW 8260D and 8000D.
    - Updated Table 1 with full current analyte list.
    - Add text to Section 1.1.6 detailing procedures for documenting method variations via NCMs.
    - Section 2.6: clarified text regrading lower than standard RLs.
    - Section 4.4: clarified text regarding trip blanks.
    - Section 7.1.1: revised source and details of organic free water.
    - Section 8.0: added handling and preservation details for various soil and aqueous sample types.
    - Section 9.1.1.4: Added that concentrations allowed in blanks (one half of RL), how blank concentration relates to sample concentration (<1/10) and some guidance on re-analysis when concentration exceeds criteria.
    - Section 9.1.3: added that CCV/LCS can be the same run.
    - Tune verifications as not required for daily CCV updated throughout.
    - Section 9.2.2.1.: Allowance for last calibration standard to be the start of 12-hour clock for samples analyzed after initial calibration. Calculations for verifying peak resolution
    - New Section 9.2.4.2 added: Calibration Point Read Back Criteria
    - Section 11.10: added formula for calculation of Percent Error.

- Section 12 (Method Performance) updated to include new MDL procedure and annual LLOQ procedure.
- Updated references in Section 15 as necessary.

- Revision 7, dated 04/01/2020:

  - Updated formatting and branding to Eurofins
  - Sec 7.2.8: Revised Expiration dates based on concentration level and corrected storage requirements.
  - Sec 8.1: Changed Storage Blanks storage period from 1 week to 1-2 weeks.

- Revision 6, dated 01/17/2018:

  - Revised Table 5 and 6: revised to add additional levels plus Benzene and chloroform and to updated concentration level of ICV to current level.

  - 7.2.1 and Table 2: Table in Section 7.2.1 and Table 2 updated to include complete list of standards currently in use as well as to update vendor catalog number for several items.

  - Section 7.2.5: SIM IS/SS mix corrected to reflect lower concentration of IS mix .

  - Section 9.1.2.1.4: SIM MS/MSD preparation revised.

  - Section 9.1.3.2: SIM LCS/LCSD preparation revised.

  - Section 9.2.2.2: additional SIM levels added.

  - Section 9.2.3: SIM CCV level concentration revised to reflect lower concentration.

  - Section 10.2.5: New SIM analysis preparation narrative added

  - Section: 6.1: New instrumentation added.

  - Section: Section: 9.1.4.3: Revised to have any one surrogate out without the need for corrective action. This corrects previous narrative of one surrogate out of two.

- Revision 5, dated 12/11//2015:

  - Revised Table 5: new concentration of low standard (1,4-dioxane only).

- Revision 4, dated 12/08//2014:

  - Section 9.2.4.2.2: Table revised to reflect minimum RF of 0.050 for following compounds: acetone, 2-butanone, 4-methyl-2-pentanone, 2-hexanone.

  - Section 9.2.4.3: added statement ‘for poor performers the range is 50-150%’.

- Revision 3, dated 11/10/2014:

- Tables 1 and 7: added 1,2,4,5-Trimethylbenzene, 1,4-Diethylbenzene, Butadiene, 1,4-Difluorobenzene, 1-Chlorohexane, Freon 114, Freon 123a, Isooctane, 4-Ethyltoluene, t-Amyl Alcohol, Chlorofluoroethylene to list of target compounds and list of standard sources.

- Section 2.5: added chloroform, vinyl chloride and benzene to the list of SIM analytes addressed in this section.

- Section 2.6: revised the concentration of the low ketone standard to 2.5 ug/l.

- 7.2.1 and Table 2: Table in Section 7.2.1 and Table 2 updated to include complete list of standards currently in use as well as to update vendor catalog number for several items. All standards prep tables revised to reflect current standard prep instructions.

- Section 8. Preservation by TSP and holding time is added.

- Section 9.1.2.1: updated source of standards used in various spiking solutions.

- Section 9.1.3: LCS/MS/MSD. Preparation tables now indicate using calibration mix and not the second source mix.

- Sections 9.1.4.3 and 9.1.1 : Revised to indicate that we are now spiking with 4 surrogates instead of the method required 3. One surrogate is now allowed to be out of limit criteria for either 1,2-Dichloroethane-d4 and Dibromofluoromethane.

- Section 9.2.2: Chloroform, Vinyl Chloride and Benzene added as SIM compounds.

- Section 9.2.4.2.3.1. A list of 'poor performing compounds' is added with a ICAL RSD criteria of 50%.

- Section 9.2.4.3: now specifies that up to 10% of the compounds are allowed to exceed the 70-130% ICV recovery criteria as long as their recoveries are within 65-135%..

- Section 9.2.4.4.1.6: Added the following to the first sentence: '…or 50%D for the poor performing compounds'.

- Section 10.1.1.2: updated masses/dwell time for Group 1 under SIM Parameters.

- Throughout document as appropriate: Replaced references to Target with references to CHROM

- Added Section 10.5.5: "The data processing service from Chrom queries LIMS for the sample processing parameters."

- Revision 2, dated 11/04/2013:

- Tables 1 and 7: added methyl acrylate, 1-methylnaphthalene and 2-methylnapthalene.

- Revision 1, dated 09/16/2011:

  - Tables 1 and 7: added cyclopentene, 2-chloro-1,3-butadiene, methacrylonitrile, propionitrile, ethyl methacrylate, 2-nitropropane, indan and isobutyl alcohol to list of target compounds and list of standards sources.

  - Section 7.2.1 and Table 2: Table in Section 7.2.1 and Table 2 updated to include complete list of standards currently in use as well as to update vendor catalog number for several items.

  - Table 3: Initial Calibration Standards Preparation: is now split into three tables to include aqueous low level analysis.

  - Table 5: added following footnote:
    Levels 1 and 2 respectively are prepared in 500ml and 100ml final volumes
    [1]This level is also used as the Continuing Calibration Verification.

- Revision 0, dated 02/15/2011: New

Table 2: Working Standards Preparation							
Target Compound Standard Name	**Lab Name**	**Vendor**	**Cat. #**	**Vol. Std. Added**	**Conc. of Stock Std.**	**Concentration of Standard**	**Final Vol/ Total vol of MeOH**
Gas Mix Hi	Gas (Hi)	Restek	567645	5ml mL	2000 ppm	500 ppm	20mL 15mL TV/M
Gas Mix Li	Gas (Li)	Restek	567645	500 uL	2000 ppm	50 ppm	20mL 19.5mL TV/M
8260Mix 1	Mix 1 (Hi)	Restek	567641 567646 567642 568022	2.5ml 2.5 ml 2.5 ml 2.5 ml	2000 ppm	500 ppm	10ml
8260 combined	Mix 1 (Li)	Restek	567641 567646 567642 568022 567643 568018 568713 568722 568723	1.0ml 1.0ml 1.0ml 1.0ml 1.0ml 1.0ml 1.0ml 1.0ml 1.0ml	2000 ppm	50 ppm	40ml 31ml TV/M
Acrolein	AC	Restek	82402	1.0ml	20000 ppm	500 ppm	40ml 39ml TV/M
8260 Mix 2	Mix 2 (Hi)	Restek	567643 568722 568019-fl 568713-fl	2.5ml 2.5 ml 2.5 ml 2.5 ml	2000 ppm	500 ppm	10mL
8260 Mix 3	Mix 3 (Hi)	Restek	568723 568021-fl	2.5ml 2.5ml	2000 ppm	500 ppm	10ml 5ml TV/M
1,4-Dioxane	1,4-Dioxane	Supelco	360481	483.6ul	Neat	50000 ppm	10ml/9.52TVM
1,4-Dioxane	1,4-Dioxane	Supelco	NA	100ul	50000 ppm	500 ppm	10ml/9.90TVM
Propenes*	Propenes	Supelco	21240202	NA	1000/2000 ppm	NA	NA
Propenes*	Propenes	Supelco	21240202	1ml	1000/2000 ppm	50 ppm (varied)	20ml/ 19ml
Gas SS	Gas SS	Restek	567645.sec	1ml	2000ppm	50 ppm	40ml 39ml/TV/M
8260 Mix 1 SIM	8260 Mix 1 SIM	Supelco	5-02111	50 ul	2000ppm	10 ppm	10ml 9.95 TV/M
1,4-Dioxane SIM	1,4-Dioxane	Supelco	NA	100 ul	50000 ppm	500 ppm	10ml/9.90TVM

Table 2: Working Standards Preparation

Target Compound Standard Name	Lab Name	Vendor	Cat. #	Vol. Std. Added	Conc. of Stock Std.	Concentration of Standard	Final Vol/ Total vol of MeOH
8260 SS	8260 SS	Restek	567641.sec 567646.sec 567642.sec 568022- sl 567643.sec 568019- sl 568713- sl 568722.sec 568723.sec 568021- sl	1 ml 1 ml 1 ml 1 ml 1 ml 1 ml 1 ml 1 ml 1 ml 1 ml	2000 ppm	50 ppm	40 ml 30 ml TV/M
Acrolein SS	AC SS	Restek	568720.sec	1 ml	20000 ppm	500 ppm	40 ml 39 ml TV/M
Propenes SS	Propenes SS	Supelco		1 ml	1000/2000 ppm	50/100 ppm	40 ml 39 ml TV/M
8260Mix 1 SIM SS	SIM MIX1 SS	Supelco	5S-02111	50ul	2000 ppm	10 ppm	10ml 9.95 TV/M
Benzene/ Chloroform	Ben/chl	Absolute	70025/ 70076	100ul each	1000ppm	10ppm	10ml 9.90 TV/M
1,4-Dioxane (SS)	1,4-Dioxane	Absolute	70373	1ml	1000 ppm	500 ppm	2ml/1ml TV/M

Asterisk (*) indicates a custom standard mix.

Table 3: Initial Calibration Standards Preparation, Low Level Soil

Standard Solution	Final Volume Reagent Water (ml)	Volume of Standard Added to Reagent Water (ul)					
		1ppb *	5ppb*	20ppb[1]	50ppb	200ppb	500ppb
Gas Mix (50ppm)	5	-	-	2.0	5	-	-
	50	1.0	5.0			-	-
Gas Mix (500ppm)	5	-	-	-		2.0	5.0
		-	-	-			
Mix 1 (combined) (50ppm)	5	-	-	2.0	5	-	-
	50	1.0	5.0			-	-
Mix 1 (Hi) (500ppm)	5	-	-	-	-	2.0	5.0
		-	-	-	-	-	-
Freon Mix							
AC (500ppm)	5	-	-	3.0	4.0	5.0	6.0
	50	10	20			-	-
Mix 2 (Hi) (500ppm)	5	-	-	-	-	2.0	5.0
		-	-	-	-		
Mix 3 (500ppm)	5					2.0	5
Propenes (50ppm)	-	-	-	-	-	-	-
	50	10.0	20.0		-	-	-
Propenes (Hi)(500ppm)	5	-	-	2.0	5.0	20	50
	-	-	-	-	-	-	-

[1]**This level is also used as the Continuing Calibration Verification.**

Table 3a: Initial Calibration Standards Preparation, Aqueous (LOW LEVEL)

Standard Solution	Volume of Standard Added to Reagent Water (ul)						
	0.5ppb*	1ppb*	5ppb*	20ppb[1]	50ppb	200ppb	500ppb
Gas Mix (500ppm)	0.5	1	1	2	5	20	50
Mix 1 (Hi) (500ppm)	0.5	1	1	2	5	20	50
Mix 2 (Hi) (500ppm)	0.5	1	1	2	5	20	50
Mix 3 (varied)	0.5	1	1	2	5	20	50
AC (500ppm)	2	4	4	4	10	20	40
1,4-Dioxane (500ppm)	15	30	-	-	-	-	-
Freons mix	0.5	1	1	2	5	20	50
Propenes (1000/2000ppm)	0.5	0.5	0.5	1	2.5	10	25
Methanol Compensate	3000	2800	610	300	280	190	0
Final vol. (reagent water)	500ml	500 ml	100ml	50 ml	50ml	50ml	50ml

[1]This level is also used as the Continuing Calibration Verification.

Table 3b: Initial Calibration Standards Preparation, Aqueous

Standard Solution	Volume of Standard Added to Reagent Water (ul)					
	1.0ppb*	5ppb*	20ppb[1]	50ppb	200ppb	500ppb
Gas Mix (500ppm)	1	1	2	5	20	50
Mix 1 (Hi) (500ppm)	1	1	2	5	20	50
Mix 2 (Hi) (500ppm)	1	1	2	5	20	50
Mix 3 (varied)	1	1	2	5	20	50
AC (500ppm)	4	4	4	10	20	40
1,4-Dioxane (500ppm)	30	-	-	-	-	-
Freons Mix	1	1	2	5	20	50
Propenes (1000/2000ppm)	0.25	0.5	1	2.5	10	25
Methanol Compensate	2800	610	300	280	190	0
Final vol. (reagent water)	500 ml	100ml	50 ml	50ml	50ml	50ml

[1]This level is also used as the Continuing Calibration Verification.

Table 4 : ICV Standard Preparation, Low Level Soil

Standard Solution	Concentration	Volume of Standard Added to 5.0 ml of Reagent Water (ul)	Final Concentration (ug/L)
GAS SS (Separate lot)	50ppm	2	20
8260 SS (Separate lot)	50ppm (+varied)	2	20
AC SS (separate lot)	500ppm	3	300
Freon SS (Separate lot)	50ppm	2	20
Propenes SS(separate lot)	50ppm (varied)	2	20 (varied)

Table 4a: ICV Standard Preparation, Aqueous

Standard Solution	Concentration	Volume of Standard Added to 50 ml of Reagent Water (ul)	Final Concentration (ug/L)
GAS SS (Separate lot)	50ppm	20	20
8260 SS (Separate lot)	5000ppm (varied)	20	20
AC SS (separate lot)	500ppm	4	400
Freons SS (Separate lot)	50ppm	20	20
Propenes (second source)	50ppm (varied)	20	20 (varied)

Table 5: SIM Initial Calibration Standards Preparation

Standard Solutions	Volume Standard Solution Added to Reagent Water (Final Concentration)							
8260 Mix 1 SIM (10ppm)	1 ul (0.02 ppb)	2 ul (0.04 ppb)	1 ul (0.05 ppb)	1 ul (0.1 ppb)	1 ul (0.2 ppb)	2.5 ul (0.5 ppb)	5 ul (1 .0 ppb)	10 ul (2.0 ppb)
1,4-Dioxane (500ppm)	4 ul (0.4 ppb)	2 ul (1.0 ppb)	1 ul (5.0 ppb)	1 ul (10 ppb)	1 ul (20 ppb)	2.5 ul (30 ppb)	5 ul (40 ppb)	10 ul (50 ppb)
SIM (ben/chl) 10ppm	1 ul (0.02 ppb)	1 ul (0.02 ppb)	1 ul (0.05 ppb	1 ul (0.1 ppb)	1 ul (0.2 ppb)	2.5 ul (0.5 ppb)	5 ul (1.0 ppb)	10 ul (2.0 ppb)
Final Vol. (reagent water)	**500ml**	**500ml**	**200ml**	**100ml**	**50ml**	**50ml**	**50ml**	**50ml**

levels 1 and 2 are respectively prepared in 500ml and 100ml final volumes
[1]**This level is also used as the Continuing Calibration Verification.**

Table 6 : SIM ICV Standard Preparation

Standard Solution	Concentration	Volume of Standard Added to 200 ml of Reagent Water (ul)	Final Concentration (ug/L)
SIM MIX1 SS (Second source)	10ppm	1	0.05
1,4-Dioxane SS	50ppm	20	5

TABLE 7
Characteristic Ions of Volatile Organic Compounds

Parameter	Primary ion	Secondary ion
1,1,1-Trichloroethane	97	99,117,119
1,1,2,2-Tetrachloroethane	83	85,131,133,166
1,1,2-Trichloroethane	97	83,85,99,132,134
1,1-Dichloroethane	63	65,83,85,98,100
1,1-Dichloroethene	96	61,98
1,1-Dichloropropene	75	110. 77
1,2,3-Trichlorobenzene	180	182
1,2,3-Trichloropropane	110	75
1,2,4-Trichlorobenzene	180	182, 145
1,2,4-Trimethylbenzene	105	120
1,2-Dibromo-3-Chloropropane	75	155, 157
1,2-Dibromomethane	107	109
1,2-Dichloroethane	62	64,100,98
1,2-Dichloroethene	96	61,98
1,2-Dichloropropane	63	65,114
1,2-Dichlorotrifluoroethene	67	117
1,2-Difluorotetrachloroethene	101	103, 167
1,3,5-Trimethylbenzene	105	120
1,3-Dichlorobenzene	146	148, 111
1,4-Dichlorobenzene	146	148, 111
1,4-Dioxane	88	58
1-Chloropropane	63	78
1-Methylnaphthalene	142	141
1-Propene	41	42
2,2-Dichloropropane	77	97

TABLE 7 Characteristic Ions of Volatile Organic Compounds		
2,4,4-trimethyl-1-pentene	41	57, 97
2-Butanone	72	57
2-Chloroethyl vinyl ether	63	65, 106
2-Chloropropane	78	63
2-Chlorotoluene	91	126
2-Chloro-1,3-butadiene	88	53
2-Hexanone	43	58,100
2-Methylnaphthalene	142	141, 115
2-Nitropropane	39	42, 44
2-Octane	43	58
2-Octanol	45	55
4-Chlorotoluene	91	126
4-Methyl-2-Pentanone	43	58,100
Methacrylonitrile	67	41
Acetone	43	58
Acetonitrile	39	40, 41
Acrolein	56	55
Acrylonitrile	53	52
Allyl Alcohol	57	40, 39
Allyl Chloride	76	41
Amyl Acetate	43	70, 61
Benzene	78	--
Benzyl Chloride	91	126, 65
Bromobenzene	156	77, 158
Bromochloromethane	129	49, 130
Bromodichloromethane	83	85
Bromoform	173	171,175,
Bromomethane	94	96
Butyl Acetate	73	56, 43
Butyl Acrylate	73	56, 55
Butyl methacrylate	87	69
Camphene	93	121
Camphor	95	81
Carbon disulfide	76	78
Carbon tetrachloride	117	119,121
Chlorobenzene	112	114
Chloroethane	64	66
Chloroform	83	85
Chloromethane	50	52
Chlortrifluoroethene	116	118
cis-1,3-Dichloropropene	75	77

TABLE 7 Characteristic Ions of Volatile Organic Compounds		
Cyclohexane	56	84, 69
Cyclopentene	67	68, 68, 53
Dibromochloromethane	129	208,206
Dibromomethane	93	95, 174
Dichlorodifluoromethane	85	87
Dimethylnaphthalene (total)	141	156, 155
Epichlorohydrin	57	62, 49
Ethanol	46	45
Ethyl Acetate	70	61, 43
Ethyl Acrylate	55	56
Ethyl Ether	59	74, 75
Ethylbenzene	106	91,
Ethyl methacrylate	69	41, 99
Freon TF	101	103, 151, 85
Hexachlorobutadiene	225	223
Hexane	56	57, 86
Indan	117	118, 58
Iodomethane (methyl iodide)	142	127
Isobutyl Alcohol (Isobutanol)	43	41, 42
Isoprene	67	53, 59
Isopropanol	45	59
Isopropyl Acetate	43	61, 87
Isopropyl Ether (DIPE)	45	87
Isopropylbenzene	105	120
Methyl Acetate	43	74
Methyl Acrylate	55	85, 42
Methyl cyclohexane	83	55, 98
Methyl Methacrylate	100	69
Methyl tert-butyl ether (MTBE)	73	57
Methylene chloride	84	49,51,86
Methylnaphthalene (total)	142	141, 115
Naphthalene	128	--
n-Butanol	56	41, 43
n-Butylbenzene	91	92, 134
n-Heptane	57	43, 71
n-Pentane	72	57
N-Propanol	60	59
n-Propylbenzene	91	120
P-Isopropyltoluene`	119	134, 91
Propyl Acetate	43	61, 73
Propionitrile	54	52, 54

TABLE 7 Characteristic Ions of Volatile Organic Compounds		
sec-Butylbenzene	105	134
Styrene	104	78,103
Tert-Amyl Methyl Ether	73	55, 87
Tert-butyl Alcohol	59	--
Tert-Butyl Ethyl Ether	59	87
Tert-Butylbenzene	119	91, 134
Tetrachloroethene	164	129,131,166
Tetrahydrofuran	42	72, 71
Toluene	92	91
Total Xylenes	106	91
trans,-1,3-Dichloropropene	75	77
Trans-1,4-dichloro-2-butene	53	75
Trichloroethene	130	95,97,132
Trichlorofluoromethane	101	103
Vinyl acetate	43	86
Dichlorofluoromethane	67	69
Chlorotrifluoroethene	116	118
1,2-tetrachlorodifluoroethane	101	103,167
1,2-Dichlorotrifluoroethane	67	117
Vinyl chloride	62	64
Isooctane	57	41, 56
1- Chlorohexane	91	93, 55, 56
1,2,4,5-Tetramethylbenzene	119	134, 91
4-EthylToluene	105	120, 77
Chlorotrifluoroethylene	66	116,118,85
Freon 114	85	87,135,137
t-Amyl Alcohol	59	55, 73, 43
1,4-Difluorobenzene	114	63
1,4-Diethylbenzene	119	105,134
Freon 123a	67	69, 117, 119
Butadiene	54	53, 39
4-Bromofluorobenzene (sur)	95	174,176
1,2-Dichloroethane-d4 (sur)	65	102, 104
Toluene-d8 (sur)	98	70,100
Fluorobenzene (istd)	96	77
Chlorobenzene-d5 (istd)	117	82,119
1,4-Dichlorobenzene-d4 (istd)	152	115,150

Title: Mercury Analysis for Water and Wastewater using EPA 245.1 and SW846 7470A; Mercury in Drinking Water using EPA 245.1; Leeman Mercury Analyzer (Cold Vapor Technique)

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Approvals (Signature/Date):

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1.0 Scope and Application

1.1. Analytes, Matrix(s), and Reporting Limits

EPA Method 245.1 and SW846 Method 7470A are applicable to the determination of mercury in water matrices. Mercury may be found in water in both inorganic and organic forms. Organomercury compounds must first be broken down to respond to the cold vapor atomic absorption technique.

The typical detection limit using a 30 ml sample size is 0.2ug/L Hg.

On occasion clients may request modifications to this SOP. These modifications are handled following the procedures outlined in Sections 7 (Review of Work Request) and 19 (Test Methods and Method Validation) of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

2.0 Summary of Method

A digested sample is analyzed using cold vapor atomic absorption. The mercury is reduced to the elemental state and aerated from solution in a closed system. The mercury vapor passes through a cell positioned in the light path of an atomic absorption spectrophotometer. Absorbance is measured as a function of mercury concentration.

3.0 Definitions

For a complete list of definitions refer to Appendix 2 in the most current revision of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

4.0 Interferences

4.1 The addition of potassium persulfate during the digestion step can eliminate the possible interference from sulfide in the sample without affecting the recovery of inorganic mercury.

4.2 Copper may also be a potential interference although no effect has been observed for samples containing up to 10 mg/l total copper.

4.3 Samples that contain high levels of chloride have a potential to interfere due to a reaction that takes place during the oxidation step. During this step chloride is converted to free chlorine which absorbs light at 253.7 nm. The analyst must not allow the chlorine to be swept into the optical cell. The possibility of the chlorine interfering with the analysis can be minimized by using an excess of up to 7.5 ml hydroxylamine sulfate.

5.0 Safety

Employees must abide by the policies and procedures in the Corporate Environmental Health and Safety Manual (CW-E-M-001) and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum.

5.1 Specific Safety Concerns or Requirements

Samples that contain high concentrations of carbonates or organic material or samples that are at elevated pH can react violently when acids are added.

5.2 Primary Materials Used

The following is a list of the materials used in this method, which have a serious or significant hazard rating. **Note: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the MSDS for each of the materials listed in the table.** A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the MSDS for each material before using it for the first time or when there are major changes to the MSDS.

Material (1)	Hazards	Exposure Limit (2)	Signs and symptoms of exposure
a)Mercury b)(1,000 PPM in Reagent)	Oxidizer Corrosive Poison	0.1 mg/M^3 Ceiling (Mercury Compounds)	Extremely toxic. Causes irritation to the respiratory tract. Causes irritation. Symptoms include redness and pain. May cause burns. May cause sensitization. Can be absorbed through the skin with symptoms to parallel ingestion. May affect the central nervous system. Causes irritation and burns to eyes. Symptoms include redness, pain, and blurred vision; may cause serious and permanent eye damage.
Sulfuric Acid	Corrosive Oxidizer Dehydrator Poison	1 mg/M^3-TWA	Inhalation produces damaging effects on the mucous membranes and upper respiratory tract. Symptoms may include irritation of the nose and throat, and labored breathing. Symptoms of redness, pain, and severe burn can occur. Contact can cause blurred vision, redness, pain and severe tissue burns. Can cause blindness.

Material (1)	Hazards	Exposure Limit (2)	Signs and symptoms of exposure
Nitric Acid	Corrosive Oxidizer Poison	2 ppm-TWA 4 ppm-STEL	Nitric acid is extremely hazardous; it is corrosive, reactive, an oxidizer, and a poison. Inhalation of vapors can cause breathing difficulties and lead to pneumonia and pulmonary edema, which may be fatal. Other symptoms may include coughing, choking, and irritation of the nose, throat, and respiratory tract. Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and stain skin a yellow or yellow-brown color. Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
Hydrochloric Acid	Corrosive Poison	5 PPM-Ceiling	Inhalation of vapors can cause coughing, choking, inflammation of the nose, throat, and upper respiratory tract, and in severe cases, pulmonary edema, circulatory failure, and death. Can cause redness, pain, and severe skin burns. Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
Potassium Permanganate	Oxidizer	5 Mg/M^3 for Mn Compounds	Causes irritation to the respiratory tract. Symptoms may include coughing, shortness of breath. Dry crystals and concentrated solutions are caustic causing redness, pain, severe burns, brown stains in the contact area and possible hardening of outer skin layer. Diluted solutions are only mildly irritating to the skin. Eye contact with crystals (dusts) and concentrated solutions causes severe irritation, redness, and blurred vision and can cause severe damage, possibly permanent.
1 – Always add acid to water to prevent violent reactions.			
2 – Exposure limit refers to the OSHA regulatory exposure limit.			

6.0 Equipment and Supplies

6.1 Instrumentation

6.1.1. Leeman Laboratories Inc. Hydra II AA Automated Hg Analyzer

6.1.2. Computer and Monitor with Leeman Envoy software

6.1.3. Block digestor (Environmental Express or SCP Science): Adjustable and capable of maintaining a temperature of 90 -95°C.

6.2 Supplies

6.2.1. 50 ml Hot Block Digestion Cups

6.2.2. 100 ml graduated cylinder

6.2.3. Eppendorf Pipettes and tips in various sizes

6.2.4. 100 ml volumetric flasks

6.2.5. 15 ml sample cups

6.2.6. 10 liter carboy container

6.2.7. Pump tubing:

- Sample, viton, blue tab
- Reductant, red tab
- Drain, blue tab
- Rinse, black tab

6.2.8. Drying Tube – Purchased pre-packed with Magnesium Perchlorate from Leeman Labs. Located prior to the optical cell.

6.2.9. Nitrogen or Argon supply - capable of producing 80 PSI.

7. Reagents and Standards

7.1. Reagents

Storage requirements: store at room temperature

Life of Reagent: - Concentrated acids: refer to manufacturer's instructions
- Laboratory prepared reagents and diluted acids: one year

Document prepared reagents in the Reagent module located in the TestAmerica Laboratory System (TALS).

7.1.1 Sulfuric acid - Concentrated (Trace Grade or Equivalent); store at room temperature; for stability information, refer to manufacturer's instructions.

7.1.2 Nitric acid - Concentrated (Trace Grade or Equivalent)

7.1.3 Hydrochloric acid-Concentrated (Trace Grade or Equivalent)

7.1.4 Potassium Permanganate (ACS Grade); for stability information, refer to manufacturer's instructions.

7.1.5 Sodium Chloride (analytical reagent grade); for stability information, refer to manufacturer's instructions.

7.1.6 Hydroxylamine Hydrochloride (ACS Grade); for stability information, refer to manufacturer's instructions.

7.1.7 Stannous Chloride (ACS Grade); for stability information, refer to manufacturer's instructions.

7.1.8 Potassium Persulfate (ACS Grade); for stability information, refer to manufacturer's instructions.

7.1.9 Deionized water - 18 megohm minimum

7.1.10 10% Hydrochloric Acid- Add approximately 5 liters of deionized water into an 8 liter carboy container. Cautiously add 800 ml of concentrated HCl and bring the final volume up to 8 liters with deionized water.

7.1.11 10% Stannous chloride solution - Add 50 g of $SnCl_2$ to 500 ml 10% HCl solution.

7.1.12 Sodium chloride/Hydroxylamine Hydrochloride solution - Dissolve 120 g of NaCl and 120 g of hydroxylamine hydrochloride in deionized water and dilute to 1 liter using deionized water.

7.1.13 Potassium Permanganate ($KMnO_4$) 5% solution w/v - Dissolve 100 g of $KMnO_4$ in deionized water and dilute to 2 liters using deionized water.

7.1.14 0.15% Nitric Acid- Add approximately 5 liters of deionized water into an 8 liter carboy container. Cautiously add 12mL of concentrated HNO_3 and bring the final volume up to 8 liters with deionized water.

7.1.15 Potassium Persulfate ($K_2O_8S_2$) 5% solution w/v: Dissolve 50 g of potassium persulfate in 1 liter of deionized water.

7.2 Standards

Storage requirements: all standards are stored at room temperature
Shelf-life: Stock standards – refer to manufacturer's instructions
Intermediate standards – made fresh daily
Working standards – made fresh daily

(Note: expiration date must not go beyond the expiration date of the source stock).

Concentration: see Attachment 1 for example certificates of analysis (COA) for all of the standards mixes listed below. The COA lists the manufacturer's part number, certified concentration and shelf life.

Document standard preparation in TALS (see Section 11.5.2).

7.2.1 Stock Mercury Calibration (10 ppm Hg) - Purchase from SCP Science; store at room temperature; for stability information, refer to manufacturer's instructions.

7.2.2. Stock Mercury Quality Control Standard (10 ppm Hg) - Purchase from Inorganic Ventures; store at room temperature; for stability information, refer to manufacturer's instructions. This stock standard must be purchased from a second source vendor.

7.2.3. Intermediate Calibration Standard (DCAL-Int): Dilute 1 ml of Stock Mercury Calibration (Sec 7.2.1) to 100 ml with 0.15% HNO_3. The resulting solution will contain 100ppb Hg.

7.2.4. Intermediate Quality Control Standard (DQCS-Int): Dilute 1 ml of Stock Mercury Calibration Verification Standard (Sec 7.2.2) solution to 100 ml with 0.15% HNO_3. The resulting solution will contain 100ppb Hg.

7.2.5. Calibration Standard Preparation: Use six 50 ml hot block digestion cups to prepare the standards. Add small portion of 0.15% HNO_3 to each cup. Working in increasing order, spike the appropriate cup with 0.0, 0.06, 0.3, 0.6, 1.5, and 3.0 ml of working solution DCAL-Int (Sec 7.2.3). Bring to final volume of 30 ml and mix thoroughly. The corresponding concentrations are 0.0ppb, 0.2ppb, 1.0ppb, 2.0ppb, 5.0ppb, and 10.0ppb mercury respectively. For drinking water analysis, the 2.0ppb standard is also analyzed as the Maximum Contaminant Level (MCL) standard

7.2.6. Quality Control Standard (QCS) Preparation: Add a small portion of 0.15% HNO_3 to a 30 ml hot block digestion cup and spike 1.5 ml of DQCS-Int (Sec 7.2.4). Bring up to final volume and mix thoroughly. The resulting solution will contain 5.0 ppb of Hg.

7.2.7. Initial Calibration Verification (ICV) standard: Add a small portion of 0.15% HNO3 to a 30 ml hot block digestion cup and spike 1.5 ml of DQCS-Int (Sec 7.2.4). Bring up to final volume and mix thoroughly. The resulting solution will contain 5.0 ppb of Hg.

7.2.8. Continuing Calibration Verification (CCV) standard 5.0ppb: The 5.0 ppb

prepared from the calibration standards (Sec 7.2.5) is used as the Continuing Calibration Verification standard (CCV).

7.2.9. Maximum Contaminant Level (MCL) standard 2.0 ppb *for drinking water analysis:* The 2.0ppb standard prepared from the calibration standards (Sec 7.2.5) is analyzed as the Maximum Contaminant Level (MCL) standard.

7.2.10. Reporting limit check standard (CRI) 0.2 ppb: The 0.2ppb standard prepared from the calibration standards (Sec 7.2.5) is analyzed as the CRI standard. This standard is being analyzed as part of some client's special projects.

8.0 Sample Collection, Preservation, Shipment and Storage

Sample container, preservation techniques and holding times may vary and are dependent on sample matrix, method of choice, regulatory compliance, and/or specific contract or client requests. Listed below are the holding times and the references that include preservation requirements.

Matrix	Sample Container	Min. Sample Size	Preservation	Holding Time [2]	Reference
Waters	P. FP, G[1]	250 ml	HNO_3, pH < 2 prior to shipment; if not, acidify upon receipt in lab; Cool 4±2°C	28 Days	40 CFR Part 136.3

[1] Polyethylene, fluoropolymer, glass
[2] Inclusive of digestion and analysis
[3] Acid preservation may be omitted for shipping; however, acid must be added upon receipt in the lab. Following acidification, mix the sample and hold for at least 16 hours for method 245.1 drinking water and 24 hours for non-potable water. Just prior to digestion or direct analysis, verify pH<2. If pH≥2, repeat steps (i.e., add acid, hold for 24hrs, verify ph<2).

9.0 Quality Control

9.1. Sample QC - The following quality control samples are prepared with each batch of samples.

Quality Controls	Frequency	Control Limit
Method Blank (MB)	1 in 20 or fewer samples	**245.1**: < RL or; <10%sample concentration (whichever is greater) **7470A**: < RL; **or;** < 5% of the reg limit; **or,** < 5% of the measured sample concentration (whichever is greater)
Laboratory Control Sample (LCS)	1 in 20 or fewer samples	**245.1**: 85-115% **7470A**: 80-120%
Matrix Duplicate (DUP)[1]	1 in 20 or fewer samples	20% RPD
Matrix Spike (MS)[1]	**245.1**: 1, if 10 samples or less; 2 if 11-20 samples **7470A**: 1 in 20 or fewer samples	**245.1**: 70-130% **7470A**: 75-125%
Matrix Spike Duplicate (MSD)	When requested by client	**245.1**: 70-130% **7470A**: 75-125% **For both 245.1** & **7470A**: If MS and MSD are both ≥ 5X CRDL, then 20% RPD. If MS and MSD are less than the CRDL, the RPD is not calculated; otherwise ±CRDL.
Serial Dilution (SD) for 7470A	1 in 20 or fewer samples	±10%

[1] The sample for DUP and MS are randomly selected, unless specifically requested by a client. Use the same environmental sample for the matrix spike and matrix duplicate sample whenever possible. If insufficient sample amount is available, another environmental sample may be used for the duplicate sample.

9.1.1 **Method Blank:** One laboratory method/preparation blank will be analyzed with each batch of samples prepared together (not to exceed 20 samples). Preparation blank is used to identify possible contamination during acid digestion. If the Mercury concentration in the MB is above the specified control limit, the batch must be prepared again and the samples reanalyzed.

- For 7470A, results must be less than RL, 5% of the regulatory limit for that analyte, or 5% of the measured concentration in the sample, whichever is greater.
- For 245.1, results must be less than RL or less than 10% of the determined Mercury concentration in the sample, whichever is greater.

9.1.2 **Laboratory Control Sample (LCS):** A laboratory control sample must be analyzed with each batch of samples digested. A blank is spiked with 0.1

ug of mercury (0.30 ml of standard DCAL-Int). This is equivalent to 1.0 ppb Hg if a 30 ml portion of sample is digested. Results of the aqueous LCS must fall within ±15% of the true value for Method 245.1 and ±20% for Method 7470A.

9.1.3 **Matrix Duplicate (DUP):** A duplicate is analyzed for each batch of samples digested. If original sample and duplicate are both ≥ CRDL, then 20% RPD. If original sample and duplicate are less than the CRDL, the RPD is not calculated; otherwise, ±CRDL.

9.1.4 **Matrix Spike (MS):** A matrix spike is prepared and analyzed for each batch of samples. A portion of sample is spiked with 0.1 ug of mercury (0.30 ml of standard DCAL-Int). This is equivalent to 1.0 ppb Hg if a 30 ml portion of sample is digested. A recovery of 70-130% for Method 245.1 and 75-125% for Method 7470A is required.

9.1.5 **Matrix Spike Duplicate (MSD):** When requested by the client, a matrix spike duplicate is prepared and analyzed for each batch of samples. A portion of sample is spiked with 0.1 ug of mercury (0.30 ml of standard DCAL-Int). This is equivalent to 1.0 ppb Hg if a 30 ml portion of sample is digested. A recovery of 70-130% for Method 245.1 and 75-125% for Method 7470A is required. For both 245.1 & 7470A: if original sample and duplicate are both ≥ CRDL, then 20% RPD. If original sample and duplicate are less than the CRDL, the RPD is not calculated; otherwise, ±CRDL.

9.1.6 **Serial Dilution (SD):** For method 7470A, a five fold serial dilution must be performed on one sample per batch. The sample should contain a sufficiently high concentration; minimally a factor of 25 times above the estimated detection limit. Dilute the sample by a minimum of five fold (1+4) and reanalyze. Results must agree within 10% of the original determination. If not, a chemical or physical effect should be suspected.

9.2 Instrument QC

9.2.1. **Initial Calibration Verification (ICV):** Initial calibration is verified after calibration. The ICV solution should be prepared using a second source vendor; see section 7.2.7 for preparation instructions. Use a concentration of mercury at the midpoint of the calibration range (5.0ppb). The Cal standard containing 5ppb is analyzed as the ICV; see Sec 7.2.7 for preparation instructions. For 245.1, the results must not differ from the true value by more than 5%. For 7470A, the results must be within 10% of the true value. If it's outside of the acceptable limits, terminate the analysis, correct the problem and recalibrate the instrument.

9.2.2. **Continuing Calibration Verification (CCV):** Calibration verification is performed after the calibration, after every 10 samples, and at the end of the run. The CCV solution should be prepared from the same CAL

standard as used to prepare the calibration solutions. Use a concentration of mercury at the midpoint of the calibration range (5.0ppb). The Cal standard containing 5ppb is analyzed as the CCV.

For 245.1 and 7470A, CCV must not differ from the true value by more than 10%. If it does, stop the analysis and recalibrate. Re-analyze the previous ten samples following the last good calibration verification.

9.2.3. **Initial and Continuing Calibration Blank (ICB/CCB):** ICB and CCB must be analyzed after the calibration curve, every 10 samples and at the end of the analytical run. For methods 245.1 and 7470A, the absolute value of the calibration verification blank must not exceed the reporting limit. If it does, terminate the analysis, correct the problem, recalibrate and reanalyze the samples following the last good CCB. The calibration verification blank is the same blank solution as used for the calibration blank.

9.2.4. **Maximum Contaminant Level (MCL):** For drinking water analysis, one MCL standard shall be analyzed per calibration. The 2.0ppb standard prepared from the calibration standards (Sec 7.2.5) is analyzed as the Maximum Contaminant Level (MCL) standard. The result must be within 50% of the true value. If it's outside of the acceptable limit, terminate the analysis, correct the problem, and recalibrate the instrument.

9.2.5. **Quality Control Standard (QCS):** The calibration is verified after calibration using a second source vendor; see Sec 7.2.6 for preparation instructions. For 245.1 and 7470A, the results must not differ from the true value by more than 10%. If it's outside of the acceptable limits, terminate the analysis, correct the problem and recalibrate the instrument.

9.2.6. **Reporting limit check standard (CRI):** At the beginning of the analysis, verify the accuracy at the reporting limit (RL) by analyzing a solution at the RL level. RL check solution is analyzed to demonstrate that the mercury analyzer is capable of detecting the target analyte at the reporting limit (RL). Laboratory limits are 50-150% of the true value. This standard is being analyzed as part of some client's special projects.

10.0 Procedure

10.1 Sample Preparation

10.1.1 Filtration Procedure for Dissolved Mercury not filtered in the Field

10.1.1.1 The unpreserved sample must be filtered through a 0.45um filter unit as soon as practical after collection.
10.1.1.2 Collect the required volume of filtrate by using a 0.45um filter unit and a vacuum pump.
10.1.1.3 Acidify the filtrate with 1:1 HNO_3 to a pH of <2.
10.1.1.4 The method blank (MB) must be filtered and digested under the

same conditions as the lab filtered samples.

10.1.2 If sample is preserved in laboratory, hold sample for 16 hours for method 245.1 drinking water and 24 hours for wastewater following acidification. Verify and record if sample pH is < 2.0 after 16 or 24 hours (depending on the analysis- drinking water or wastewater) and prior to digestion/analysis. If pH is > 2.0, add HNO3, hold for 24 hours and verify pH.

10.1.3 Transfer 30 ml sample (DI water for MB and LCS) or standard, or an aliquot diluted to 30 ml, to an appropriately identified 50 ml hot block digestion cup. For QA samples, transfer 3 aliquots of 30 ml sample to three digestion cups labeled as SAMPLE, DUP and MS. Spike LCSW and MS with 0.1 µg of mercury (0.3 ml of DCAL-INT standard).

10.1.3.1. Due to insufficient sample volume or an unusual matrix (e.g., samples with potentially high interferences), it may be necessary to perform a pre-digestion dilution. For example, a 10X pre-digestion dilution can be performed by transferring 3 mL of sample to 50 mL hotblock cup. Add 27 ml of deionized water. Record 3 mL initial volume and 30 mL final volume in TALS (see Sec 11.5.2). Continue to section 10.1.3.

10.1.4 Add 1.5 ml concentrated H_2SO_4 and 0.75 ml concentrated HNO_3 mixing well after each addition.

10.1.5 Add 4.5 ml of potassium permanganate solution to each bottle. Mix well and let stand for 15 minutes (minimum); if the color is still present, then proceed to section 10.1.6; if the color has disappeared, then see section 10.1.5.1.

10.1.5.1 Discard the aliquot. Using a new 50mL hot block digestion cup, dilute the sample so that the final volume is 30mL. For example, for a 3X dilution: add 20mL of 0.15 Nitric Acid (sec 7.1.14), 10mL of sample, and mix. Record the initial and final volumes in TALS. Add 4.5mL of potassium permanganate as described in sec 10.1.5 and wait 15min. If purple color is still present, proceed to sec 10.1.6; if not, a larger dilution is necessary.

10.1.6 Add 2.4 ml potassium persulfate solution to each bottle.

10.1.7 Heat for 2 hours in a 95^{o} C hot block digestor. Remove from block digestor and cool.

10.1.8 Add 1.8 ml Sodium chloride - Hydroxylamine hydrochloride solution to reduce the excess permanganate. Mix well; solution should become colorless. If necessary additional Sodium chloride - Hydroxylamine HCl solution may be added.

10.1.9 Due to differing rates of evaporation, the final volume of the standards/samples maybe different. The standards and samples, including all QC, must be at the same final volume before analysis; if not, find the sample or standard with the highest final volume (e.g., 41 mL) and add deionized water to any sample or standard to bring them to the same final volume . Mix well. Wait at least 30 seconds after decolorization before analyzing.

10.2 Calibration

10.2.1. The instrument must be calibrated daily or once every 24 hours and each time the instrument is set up. The instrument is calibrated according to the manufacturer's specifications and must contain at least four standards and a blank. The laboratory currently uses five standards and a blank. The correlation coefficient of the calibration curve must be ≥0.995. If it does not, the problem must be corrected, and the instrument must be recalibrated. Standard preparations must be documented in TALS (see Sec 11.5.2).

10.2.2. Prepare five calibration standards, blank and calibration verification standard as detailed in sections 7.2.5 and 7.2.6.

10.2.3. Calibration Curve Read-Back:

10.2.1.1 Low-Level Readback (at the RL) – evaluate the 0.2 ug/L calibration standard. The %RE (relative error) must be +/- 20% of the true value (see Sec 11.4). If %RE is outside of criteria limits, stop the analysis and recalibrate.

10.2.1.2 Mid- Level Readback – evaluate the 5.0 ug/L calibration standard (the mid-level calibration standard). The %RE (relative error) must be +/- 10% of the true value (see Sec 11.4). If %RE is outside of criteria limits, stop the analysis and recalibrate.

10.3 Sample Analysis

10.3.1 Following a sample digestion procedure, the samples are ready for instrumental analysis. It is advisable to investigate each matrix for any complexities, which might adversely affect the acquisition of valid data.

10.3.2 The following analytical run sequence is currently used:

Instrument Calibration (Blank and five standards)

ICV
ICB

CRI
QCS
MCL (for drinking water analysis)
CCV
CCB
10 Samples
CCV
CCB
Repeat until run is completed
CCV
CCB

10.3.3 Instrument Operation:

10.3.3.1. Turn on Computer, Monitor and the Hg analyzer (Hydra IIAA).

10.3.3.2. Plumbing the Reagent Lines:

10.3.3.2.1. One at a time, feed each of the pump tubes into a pump cassette, sliding the tube through the plastic clips at the bottom until the plastic tab is secure. Then, holding the tube taut, slide the loaded cassette onto the pump head and click the clamp, lever up. The tab end of the tube should be located at the front of the pump head.

10.3.3.2.2. Reductant (Red): Connect tab end of tube to the reductant tubing that is connected to the reductant bottle and the other end to the mixing tee.

10.3.3.2.3. Sample (Blue): Connect tab end of tube to the autosampler probe and the other end to the mixing tee.

10.3.3.2.4. Drain (Blue): Connect the tab end of tube to the sample discharge tube connected on the Liquid/Gas separator and the other end to the waste line.

10.3.3.2.5. Rinse (Black): Connect tab end of tube to rinse tubing that is connected to the rinse bottle. Connect the other end to the rinse tubing leading to the rinse cup.

10.3.3.3. Preparation of Reagents:

10.3.3.3.1. Pour the 10% $SnCl_2$ solution into the reductant bottle.

10.3.3.3.2. Pour the 10% HCl solution into the rinse reservoir bottle.

10.3.3.4. Start the Program:

10.3.3.4.1. Click the Envoy icon on the computer desktop
10.3.3.4.2. Click Method, select 245.1_7470A, and select OK
10.3.3.4.3. On the main screen, click the StartUp icon. Wait 15 minutes before analyzing calibrating.
10.3.3.4.4. Click Sequence Tab on bottom of screen
10.3.3.4.5. Click Sequence on top of screen
10.3.3.4.6. Select Open, then select New
10.3.3.4.7. Using the Prep Batch Sheet and hand scanner, enter the sample barcodes into the Sample ID column. Include the Serial Dilution and all needed sample dilutions
10.3.3.4.8. Pour out the digested calibration standards and samples into the proper locations on the autosampler.
10.3.3.4.9. Click the Run Sequence icon to begin calibration and to run samples.

10.3.3.4.10. To shut down the instrument, click the Stop icon on the main screen.

11.0 Calculations / Data Reduction

11.1 Accuracy:

$$\text{ICV / CCV, LCS \% Recovery} = \frac{\text{observed concentration}}{\text{known concentration}} \times 100$$

$$\text{MS \% Recovery} = \frac{\text{(spiked sample) - (unspiked sample)}}{\text{spiked concentration}} \times 100$$

11.2 Precision (RPD):

$$\text{Matrix Duplicate (MD)} = \frac{|\text{orig. sample value - dup. sample value}|}{[(\text{orig. sample value + dup. sample value})/2]} \times 100$$

11.3. Final results calculation in aqueous samples :

$$\text{Concentration = mg/ L} = \frac{C \times V1 \times D}{V2}$$

Where:
C= Element concentration from instrument (ppb)

V1= Final volume of sample digested (in liters)
D= Dilution performed on sample

V2= Initial volume of sample digested (in liters).

11.4. Relative Error (%RE):

% Relative Error = (100) (MC-TC)/TC

MC = Measured Concentration of the calibration standard
TC = True Concentration for the calibration standard

11.5. Data Processing:

11.5.1. All data is recorded directly in TALS' Analyst Desktop II program.

11.5.2. Record standard/sample preparations in the Analyst Desktop II program located in the TestAmerica Laboratory System (TALS) Reagent module. The analyst must enter the following information: Source standard, Initial and final sample volume, spike name and amount used, all reagents and their corresponding lot numbers, creation and expiration dates.

11.5.3. Record the following reagents and the volume used for sample preparation in the batch information page under "batch comments" in TALS Analyst Desktop II: concentrated sulfuric acid, concentrated nitric acid, potassium permanganate, potassium persulfate and sodium chloride-hydroxylamine hydrochloride. Record reagents in TALS by opening the prep batch, click on "edit" and then right click to choose "view batch information." Enter the information in the "batch comments" section.

11.5.4. Import Data to TALS

Click the Analysis tab

11.5.4.1. Select the analytical run that needs to be imported
11.5.4.2. Select Statistics
11.5.4.3. Click Load and select TALS Import, click OK
11.5.4.4. Click Report, click CSV File
11.5.4.5. Name the import file (e.g., batch name, today's date)
11.5.4.6. The newly created import file is in the Import Folder on the desktop Send to TALS Import Folder

11.5.5. Creating the Raw Data PDF:

11.5.5.1. Click the Analysis Tab, select Detailed

11.5.5.2. Click Load, select Use This To Make PDF

11.5.5.3. Click Report, Click Printer

11.5.5.4. Include the calibration curve graph:

11.5.5.4.1. Go to Methods Tab and click Calibration, click Print

11.5.5.5. Combine both documents using the PDF Creator program. The new document is located in the Documents folder on the C:\ drive. Add this document to the "Doc's" location in the analytical batch.

11.5.6. Complete the Data Review Checker (DRC) in TALS: Prior to data submission (i.e., prior to 1st leveling data in the Analyst Desktop II module in TALS), the analyst must execute the DRC (Data Review Checker) program in the applicable analytical batch.

11.5.6.1. Open the analytical batch and click on the Edit tab above to enter the Edit Mode.

11.5.6.2. Press F8 command key on the computer keyboard or right click anywhere on the batch worksheet then click on 'Run checklist.'

11.5.6.3. Acknowledge by filling in responses to all unacknowledged findings.

11.5.6.3.1. Highlight the checklist with findings, then highlight the associated list of findings; right click and choose 'Acknowledge Item.'

11.5.6.3.2. Fill in appropriate comments in the response box, then hit 'OK.'

11.5.6.3.3. Acknowledge all Finding items in the 'Manual Batch Checklist' except for the *"2nd Level review complete?"* this is to be completed by the 2nd level reviewer

12. Method Performance

12.1. Method Detection Limit Study (MDL)

The method detection limit (MDL) is the lowest concentration that can be detected for a given analytical method and sample matrix with 99% confidence that the analyte is present. The MDL is determined according to the laboratory's MDL procedure in Section 19 (Test Methods and Method Validation) of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM). MDLs reflect a calculated (statistical) value determined under ideal laboratory conditions in a clean matrix, and may not be achievable in all environmental matrices. The laboratory maintains MDL studies for analyses performed; these are verified at least annually unless method requirements require a greater frequency.

12.2 Instrument Detection Limit:

The IDL for each analyte must be determined for each wavelength used on each instrument. The IDL must be determined annually or if the instrument is adjusted in any way that may affect the IDL. For 245.1, the IDL is determined by multiplying the average of the standard deviations obtained from the analysis of 10 reagent blanks by 3. For 7470A, the IDL is determined by multiplying the average of the standard deviations obtained from the analysis of 7 reagent blanks by 3.14

12.3 Linear Dynamic Range (LDR)

The upper limit of the LDR must be established. It must be determined from a linear calibration prepared from a minimum of three different concentration standards, one of which is close to the upper limit of the linear range. The LDR should be determined by analyzing succeedingly higher standard concentrations of mercury until the observed analyte concentration is no more than 10% below the stated concentration of the standard. The determined LDR must be documented and kept on file. The LDR which may be used for the analysis of samples should be judged by the analyst from the resulting data. Determined sample analyte concentrations that are greater than 90% of the determined upper LDR limit must be diluted and reanalyzed. The LDR should be verified annually or whenever, in the judgement of the analyst, a change in analytical performance caused by either a change in instrument hardware or operating conditions would dictate they be redetermined.

12.4 Demonstration of Capabilities

For DOC procedure refer to Section 19 in the most current revision of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

12.5 Training Requirements

Refer to TestAmerica SOP No. ED-GEN-022, Training, for the laboratory's training program.

12.6 Lower Limit of Quantitation (LLOQ)

12.6.1. LLOQ verification: prior to analyzing samples under method 7470A, after any change that may affect the LLOQ, and quarterly, the LLOQ must be verified. The LLOQ is initially verified by the analysis of 7 replicate samples spiked at the LLOQ (0.2 ppb). The seven replicates must be digested prior to analysis. The LLOQ is verified when the mean recovery of the 7 replicates is +/-30% of the true value and the RSD < 20%.

12.6.2. LLOQ on-going verification: the LLOQ is re-verified quarterly by the analysis of a method blank (MB) and 1 blank sample (deionized water spiked at the LLOQ (0.2 ppb). The MB and LLOQ samples must be digested prior to analysis. The LLOQ is re-verified if the MB result is +/- 0.5 times the reporting limit for each analyte and when the recovery of the LLOQ sample is +/-30% of the .true value.

13. Pollution Control

It is TestAmerica's policy to evaluate each method and look for opportunities to minimize waste generated (i.e., examine recycling options, ordering chemicals based on quantity needed, preparation of reagents based on anticipated usage and reagent stability). Employees must abide by the policies in Section 13 of the Corporate Environmental Health and Safety Manual (CW-E-M-001) for "Waste Management and Pollution Prevention."

14. Waste Management

14.1. Waste management practices are conducted consistent with all applicable rules and regulations. Excess reagents, samples and method process wastes are disposed of in an accepted manner. Waste description rules and land disposal restrictions are followed. Waste disposal procedures are incorporated by reference to TestAmerica SOP No. ED-SPM-008 (Laboratory Waste Disposal Procedures).

14.2. The following waste streams are produced when this method is carried out.

- Digested Samples: Corrosive Acid- Materials that are not above regulatory limits will be submitted for elementary neutralization with 50% sodium hydroxide solution (Siedler Chemical SC-1824-03). Major concern is heat generated from the neutralization process. Initial volume of acid waste to be neutralized should be no more than 15 gallons. Finished neutralization with sodium bicarbonate (Siedler Chemical SC-0219-25) to a pH of 6 – 9 in the primary tank. Once pH has been established the primary tank is transferred through filter housing to a secondary tank. The pH is rechecked. If the pH is within specifications, the secondary tank is released to the municipal sewer system.

- Samples above regulatory limits and expired RCRA metals standards (Waste Corrosive Liquid, Acidic, Inorganic, n.o.s.) are collected in satellite accumulation and sent off site through a Waste disposal vendor.
  Onyx Profile WIP Number: 590598
  Teris Profile Number 50016653

15. References / Cross-References

15.1. Determination of Mercury in Water by Cold Atomic Absorption Spectrometry, EMSL-Cincinnati, EPA/600/R-94/11, May 1994; Method 245.1 Revision 3.0.

15.2. Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW846), Third Edition, September 1986, Final Update I, July 1992, Final Update IIA, August 1993, Final Update II, September 1994; Final Update IIB, January 1995; Final Update III, December 1996.

15.3. TestAmerica Edison Document No. ED-QA-LQM, *Laboratory Quality Manual*, most current revision.

15.4. TestAmerica Edison SOP ED-GEN-022, *Training*, most current revision.

15.5. TestAmerica Edison SOP No. ED-SPM-008, *Laboratory Waste Disposal Procedures*, current revision.

15.6. Corporate Environmental Health and Safety Manual CW-E-M-001, most current revision.

15.7. Leeman Hydra II AA Operating Manual

16. Method Modifications:

Item	Method No.	Modification
Sample Preparation	SW 7470A	Stannous Chloride is automatically added via the instrument versus the manual addition of Stannous Chloride as stated in the method. This is an instrument manufacturer's improvement that will reduce error due to loss of Mercury.
Sample Preparation	SW 7470A EPA 245.1	The hotblock has replaced the hot-water bath for digestion. This modification has been made to reduce cross-contamination (the hotblock tubes are disposable).
Sample Preparation	SW 7470A EPA 245.1	The typical prep sample size is reduced to 30ml (previously 100ml). This modification was made to allow for limited available sample volumes. Reagent volumes were adjusted to maintain sample to reagent volume ratio
Sample Preparation	EPA 245.1	The Initial Calibration Verification (ICV) will be prepared from a secondary source (as required in Method SW7470A), rather than the calibration standard source. Method 7470A and 245.1 will be prepared and analyzed in the same batch which improves efficiency and reduces waste. CCV will be prepared using the same source as the calibration standards.
Sample Preparation	SW 7470A EPA 245.1	When KMnO4 is added to the sample and the purple color is not present in the sample in the 15 minute period, the aliquot is discarded and a dilution is preformed using a lesser amount of sample. The purple color is checked after 15 minutes and the reporting limit is adjusted to reflect the dilution.

17. Attachments

Attachment 1: Example Certificate of analysis (10 ppm Hg)

18. Revision History

- Revision 15, dated 20 September 2023
  - Sec 10.1.5: Revised to remove instructions for adding more KMnO4 to all samples and standards when purple color persist after 15 minutes of addition.
  - Sec 10.1.5.1: Added sample dilution instructions for a sample that doesn't maintain the purple color for 15 minutes.
  - Sec 16: Added method modification notation for samples that don't maintain the purple color after 15 minutes.

- Revision 14, dated 11 August 2022
  - Sec 12.6: Added the lower limit of quantitation (LLOQ), associated instructions and recovery limits.

- Revision 13, dated 13 September 2021
  - Sec 7.2.10 & 9.2.6: Revised to clarify use of CRI standard.

- Revision 12, dated 03 August 2020
  - Updated header with Eurofins logo.
  - Sec 6.1.1: Replaced Hydra AA with Hydra IIAA
  - Sec 6.1.2: Updated Hg software from WinHg to Envoy.
  - Sec 8.0: Revised the required sample volume from 500ml to 250ml.
  - Sec 9.1: Revised MB control limits for 245.1 and 7470A to <RL; added MSD to the QC table.
  - Sec 9.1.1: Updated the control criteria for 245.1 and 7470A from <MDL to <RL.
  - Sec 9.1.3: Updated the criteria for the matrix duplicate to reflect current laboratory practices.
  - Sec 9.1.5: Added MSD to the list of Sample QC.
  - Sec 9.2.2: Revised the CCV recovery limit for method 7470A to 10%.
  - Sec 10.2.3: Added calibration curve read-back criteria.
  - Sec 10.3.3.4: Updated instructions for the instrument/software operation.
  - Sec 11.4: Added Relative % error calculation.
  - Sec 11.5.2: Added reagent/standard information to document in TALS ADII.
  - Sec 11.5.3.: Added requirements to record reagent volumes in the batch information page of TALS ADII; subsequent sections adjusted accordingly.
  - Sec 11.5.4 & 11.5.5: Updated instructions for data import and raw data pdf generation.
  - Sec 11.5.6: Added Data Review Checker (DRC) instructions.
  - Sec 15.7 & 15.8: Deleted work instructions EDS-WI-007 (TestAmerica Edison Metals Data Review Checklist) and WI EDS-WI-125 (TestAmerica Edison Metals Initial-Calibration Data Review Mercury checklist), not applicable.

- Revision 11, dated 25 April 2018
  - Sec 8: Added footnote 3 to clarify instructions for metals sample preservation (verify pH <2.0 prior to digestion).
  - Sec 10.1.2: Added procedure for samples which pH are >2.0 and acid preservation is performed in laboratory.
  - Sec 12.3: Added procedure for the determination of linear dynamic range.

- Revision 10, dated 05 February 2018
  - Sec 7.2.10: Added CRI to the list of standards.
  - Sec 9.2.6: Added CRI to the list of instrument QC.
  - Sec 10.3.2: Revised the instrument sequence list to include CRI.

- Revision 9, dated 09 December 2015
  - Sec 7.2.7: Revised preparation procedure for ICV, standard solution should be obtained from a source different from the calibration standard. Removed reference to CCV.
  - Sec 7.2.8: Added CCV preparation procedure; standard solution same source as the calibration standard. Subsequent sections adjusted accordingly.
  - Sect 9.2.1: Revised - ICV solution should be prepared from a separate source.
  - Section 16: Added Method Modifications for using the secondary source when preparing the ICV standard for method EPA 245.1.

- Revision 8, dated 13 January 2014
  - Sec 7.1.8: Added the stock standard Potassium Persulfate to the list of reagents; subsequent sections adjusted accordingly.
  - Sect 7.1.15: Added preparation instructions for the 5% Potassium Persulfate solution.
  - Sec 7.1: Revised to include recording of reagent prep information in TALS and discontinue the use of Mercury Prep Logbook.
  - Sec 7.2.5 & 7.2.6: Revised the spiking amount to add when preparing calibration standards in 30 ml final volume; also replaced the 100 ml flasks with 50 ml digestion cups.
  - Sec 9.0: The matrix spike (MS) frequency for Method 245.1 has been revised to 1 per 10 samples to comply with the method.
  - Sec 11.4.4: Added the Mercury calibration checklist (EDS-WI-125).
  - Sec 15.8: Added WI# ED-WI-125 on the list of references; subsequent sections adjusted accordingly.
  - Sec 17: Updated the attached COA for the Hg standards.

- Revision 7, dated 02 December 2011
  - Sec 1.1: Revised detection limit to 0.2 ug/L Hg to reflect actual laboratory limits.
  - Sec 1 & 12: Revised the LQM reference for DOC and Test Methods and Method Validation to Section 19.
  - Sec 3: Revised LQM reference for the definitions.
  - Sec 5: Revised in accordance with TestAmerica Corporate Quality SOP No. CW-QS-002, Writing a Standard Operating Procedure (SOP), most current revision.
  - Sec 7.1: Added requirements that all prepared reagents are recorded in TestAmerica Edison Mercury Std Prep Log.
  - Sec 7.2 & 10.2.1: Revised the documentation of standard preparation from logbook to TALS.
  - Sec 7.2.5: Replaced cal std 0.1 ug/L (Hg) with 0.2 ug/L.
  - Sec 9.1 and 9.1.1: Expanded MB control limit for 245.1 to reflect method's criteria.
  - Replaced PB (preparation blank) with MB (method blank) in various sections where applicable.

- Sec 10.1.1: Added procedure for filtering dissolved samples in the lab.
- Sec 10.1.2.1: Added procedure for pre-digestion dilutions.
- Sec 10.1.8: Added procedure for visually checking and adjusting final volumes for all standards and samples.
- Sec 10.3.3.11.7: Added procedure for post-digestion dilutions.

- Revision 6, dated 03 September 2009

  - Revised SOP format in accordance with TestAmerica Corporate Quality SOP No. CW-QS-002 (Rev 0) Writing a Standard Operating Procedure (SOP).
  - Combined SOP ED-MT-014 and ED-MT-015 with SOP ED-MT-017; retired SOP ED-MT-014 and ED-MT-015 at the effective date of this SOP.
  - Sec 6.1.3: Replaced water bath with block digestor.
  - Sec 6.2.1: Replaced 300 ml BOD bottles with 50 ml hot block digestion cups
  - Sec 6.2.3. Added 'Rinse Black' and changed Drain 'Black' to Drain 'Blue' in the list of Reagent lines
  - Sec 7.1: Added 0.15% HNO3 to list of reagents. Deleted Potassium Persulfate, Magnesium Perchlorate, 0.5N H2SO4 & 5% Potassium Persulfate solution to list of reagents; Reagents deleted are not applicable to this method.
  - Sec 7.2 Standards: Revised the Hg stock standard concentrations and preparation of standards.
  - Sec 7.1.9 & 7.1.13: Revised preparation procedure to reflect actual lab practices.
  - Sec 7.2.6: Renamed the second source standard 'Initial Calibration Verification standard' to 'Quality control standard.' QCS is added in the Instrument QC and analytical run sequence.
  - Section 8: Updated the section into Table format and have included the sample container, sample size requirements and method reference.
  - Changed the verification standard concentration of ICV (3ppb) to 5ppb; CCV concentration remains 5ppb.
  - Revised control limits to comply with Method 245.1
  - Sec 9.1.1: Clarified QC limits for the Preparation Blank
  - Sec 9.1.2: Revised the LCS limits for wastewater samples analyzed via Method 245.1 from ±20% to ±15%.
  - Sec 9.1.4: Revised the MS limits for wastewater samples analyzed via Method 245.1 from ±20% to ±30%.
  - Sec 9.1.5: Added Serial Dilution (L) in Sample QC
  - Sec 9.2.1: Clarified the recovery limits of ICV for method 245.1; % Rec limits were revised from 10% to 5% to reflect actual laboratory practices.
  - Sec 10.3.2: Added MCL in the analytical run sequence.
  - Sec 10.3.3.2: Added 'Rinse Black' and changed Drain 'Black' to Drain 'Blue' in the list of Reagent lines.
  - Sample size reduced from 100 ml to 30ml; preparation of the LCS (Sec 9.1.2) and MS (Sec 9.1.4) were revised to reflect this change in sample volume.
  - Sec 10.1: Adjusted reagent volume to maintain sample to reagent ratios.
  - Sec 11: Updated data processing in accordance with the new TALS.
  - Sec 15: Added applicable references.
  - Sec 16: Described the elimination of stannous chloride in the sample preparation and replacement of hot water bath as a method modification.

Attachment 1

SCP SCIENCE
Providing Innovative Solutions to Analytical Chemists

ACCREDITED

Certificate of Analysis

1.0 DESCRIPTION : ***Plasma*** **CAL – Custom Standard**

Catalogue Number : **141-110-11X**
Lot Number : **S130418021**
Matrix: 10.0% HNO3
Expiration Date : **July 2014**

2691783
ID: ME_Hg_1st_00013
Exp: 07/01/14 Post DLE
Mercury Calibration Stand

2.0 CERTIFIED VALUES AND ASSOCIATED UNCERTAINTY:

Method of Analysis: Inductively Coupled Plasma Atomic Emission Spectroscopy (ICP-AES)

Traceability: Applicable NIST Standard Reference Materials (see list below):

3101a	Al	3109a	Ca	3117a	Eu	3126a	Fe	3134	Mo	3142a	Pr	3151	Ag	3159	Th	3167a	Y
3102a	Sb	3110	Ce	3118a	Gd	3127a	La	3135a	Nd	3143	Re	3152a	Na	3160a	Tm	3168a	Zn
3103a	As	3111a	Cs	3119a	Ga	3128	Pb	3136	Ni	3144	Rh	3153a	Sr	3161a	Sn	3169	Zr
3104a	Ba	3112a	Cr	3120a	Ge	3129a	Li	3137	Nb	3145a	Rb	3154	S	3162a	Ti		
3105a	Be	3113	Co	3121	Au	3130a	Lu	3138	Pd	3147a	Sm	3155	Ta	3163	W		
3106	Bi	3114	Cu	3122	Hf	3131a	Mg	3139a	P	3148a	Sc	3156	Te	3164	U		
3107	B	3115a	Dy	3123a	Ho	3132	Mn	3140	Pt	3149	Se	3157a	Tb	3165	V		
3108	Cd	3116a	Er	3124a	In	3133	Hg	3141a	K	3150	Si	3158	Tl	3166a	Yb		

Certified Concentrations:

Hg 9.96 ± 0.06 µg/ml

Note: The uncertainty of the certified value has been calculated from applicable uncertainty contributors (u_i) such as the SRM inherited uncertainty, weighing and dilution errors and instrument variability. The combined uncertainty ($u_c = \sqrt{2u_i^2}$) has been multiplied by a coverage factor (k) of 2 to provide a 95% confidence interval.

3.0 REFERENCE VALUES:

Density: **1.051 g/ml** @ **20.9 °C**

4.0 APPROVAL AND DATE OF CERTIFICATION:

Certification Approval: Yaling Sui, Chemist Yaling Sui
Certification Date: **April 19, 2013**

INORGANIC VENTURES
300 Technology Drive
Christiansburg, VA 24073 • USA
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CERTIFICATE OF ANALYSIS

1.0 **INORGANIC VENTURES** is an ISO Guide 34 "General Requirements for the Competence of Reference Material Producers" and ISO 9001 registered manufacturer. Our manufacturing laboratory is accredited to ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories."

ACCREDITED Testing Laboratory Certificate 863.01

ACCREDITED Reference Material Producer Certificate 863.02

2.0 **DESCRIPTION OF CRM** **10 µg/mL Mercury in 10% (v/v) HCL**

2035815
ID: ME_Hg_00019
Exp: 04/01/14 Prpd: CDC
Mercury Calibration Stand

Catalog Number:	MSHG-10PPM
Lot Number:	F2-HG02097
Starting Material:	Hg metal
Starting Material Purity (%):	100.0000
Starting Material Lot No:	R307HGA1
Matrix:	10% (v/v) HCL

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 9.990 ± 0.074 µg/mL

Certified Density: 1.026 g/mL (measured at 20 ± 1°C)

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Certified Value $(\bar{x}) = \frac{\Sigma x_i}{n}$ ($\bar{x}$) = mean

x_i = individual results

n = number of measurements

Uncertainty (±) = $2 [\Sigma(s_i)^2]^{½}$ 2 = the coverage factor.

$[\Sigma(s_i)^2]^{½}$ = The square root of the sum of the squares of the most common errors (where 's' stands for the standard deviation) from instrumental measurement, density, NIST SRM uncertainty, weighing, dilution to volume, homogeneity, long term stability and short term stability.

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

- "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed.,

Title: SW-846 Method 6020B, Trace Metals Analysis of Water, Wastewater, Soil, Sediment and Leachate Samples by ICP-MS

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1.0 Scope and Application

1.1 Analytes, Matrix(s), and Reporting Limits

This SOP describes the procedures used to determine the concentration of dissolved elements in water samples, various elements in groundwater, aqueous samples, industrial wastes, soils, sludges, sediments, and other solid wastes for which total (acid-soluble) elements are required by Inductively Coupled Plasma - Mass Spectrometry (ICP-MS) using EPA SW-846 Method 6020B.

The routine target analytes and reporting limits are as follows:

Table 1

Analyte List and Method Reporting Limits (RL)

Element	Digested Water RL	Soil RL
	Prep Method: 3005A &3010A (ug/L)	Prep Method: 3050B (mg/Kg)
Aluminum (Al)	40	20
Antimony (Sb)	2	1
Arsenic (As)	2	1
Boron (B)	80	40
Barium (Ba)	4	2
Beryllium (Be)	0.8	0.4
Cadmium (Cd)	2	1
Calcium (Ca)	500	100
Cobalt (Co)	4	2
Chromium (Cr)	4	2
Copper (Cu)	4	2
Iron (Fe)	120	60
Lead (Pb)	1.2	0.6
Magnesium (Mg)	200	100
Manganese (Mn)	8	4
Molybdenum (Mo)	4	2
Nickel (Ni)	4	2
Potassium (K)	200	100
Selenium (Se)	2.5	1.25
Silver (Ag)	2	0.40
Sodium (Na)	500	100
Strontium (Sr)	4	2
Thallium (Tl)	0.8	0.4
Tin (Sn)	16	8
Titanium (Ti)	4	2

Vanadium (V)	4	2
Zinc (Zn)	16	8

On occasion clients may request modifications to this SOP. These modifications are handled following the procedures outlined in Sections 7 (Review of Work Request) and 19 (Test Methods and Method Validation) of Eurofins Edison's Quality Assurance Manual (ED-QA-LQM).

2.0 Summary of Method

Prior to analysis by ICP-MS, the sample must be solubilized or digested using the sample preparation method appropriate to the matrix. Sample digestates are aspirated and nebulized into a spray chamber. A stream of argon gas carries the sample aerosol through the innermost of three concentric tubes and injects it into the middle of the donut-shaped plasma. The sample elements are dissociated, atomized, and excited to a higher energy level. The ions that are produced are entrained in the plasma and introduced, by means of an interface, into a mass spectrometer. The ions are sorted according to their mass to charge ratios and quantified with a channel mass spectrometer.

For total analysis of aqueous samples containing undissolved material, aqueous samples must undergo digestion prior to analysis using SW846 Method 3005A or 3010A. For the determination of dissolved analytes in a filtered aqueous sample, the sample doesn't require digestion prior to analysis. The sample is ready for analysis after the addition of nitric acid. Soil samples are digested using Method 3050B. Refer to Eurofins Edison SOP Nos. ED-MTP-002, ED-MTP-003 and ED-MTP-005, for the digestion procedure (see Section 15.0 for complete references).

3.0 Definitions

For a complete list of definitions refer to Appendix 2 in the most current revision of Eurofins Edison's Quality Assurance Manual (ED-QA-LQM).

4.0 Interferences

4.1. Isobaric elemental interferences are caused by isotopes of different elements which form singly or doubly charged ions of the same nominal mass-to-charge ratio and which cannot be resolved by the mass spectrometer in use. Isobaric polyatomic/molecular ion interferences are caused by ions consisting of more than one atom which have the same nominal mass-to-charge ratio as the isotope of interest and which cannot be resolved by the mass spectrometer in use. Most isobaric interferences that could affect the ICP-MS analysis for elements in this SOP have been identified. These can be managed by the selection of an alternate isotope, the use of the collision/reaction cell (used for non-potable samples only), or by the use of elemental interference equations when the collision/reaction cell is

not in use.

4.2. Krypton affects the determination of both arsenic and selenium but can be greatly reduced with the use of high purity Krypton free argon. Krypton must be analyzed for every sample and standard.

4.3. Physical interferences are effects associated with the sample nebulization and transport processes as well as ion-transmission efficiencies. Changes in viscosity can cause significant inaccuracies, especially in samples containing high concentrations of dissolved solids or high acid concentrations. These changes in matrix can cause significant signal suppression or enhancement. Dissolved solids can deposit on nebulizer tips and interface cones (reducing the orifice size and the instrument's performance). Internal standards can be used to correct for physical interferences if they are carefully matched to the analyte so that both elements react similarly to the matrix changes.

4.4. Memory interferences can occur when analytes from a previous sample contribute to signals measured from subsequent samples. The memory effects can result from analyte deposition of sample on the sample tubing, joints, nebulizer, spray chamber, torch, and/or interface cones. Routine maintenance on the sample introduction system is necessary in order to minimize the memory interferences. The memory effects must be taken into account when setting up a suitable rinse times. The evaluation of a minimum of three replicate integrations will help to determine memory problems.

4.5. Contamination of the sample can occur when the preparation glassware and/or reagents contain the target elements. Reagent blanks (method blanks) must be analyzed as a check on contamination due to the sample digestion.

5.0 Safety

Employees must abide by the policies and procedures in the Corporate Environmental Health and Safety Manual (CW-E-M-001) and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum.

5.1. Specific Safety Concerns or Requirements

The ICP plasma emits strong UV light and is harmful to vision. All analysts must avoid looking directly at the plasma.

5.2. Primary Materials Used

The following is a list of the materials used in this method, which have a serious or significant hazard rating. **Note: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the MSDS for each of the materials listed in the table.** A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the MSDS for each material before using it for the first time or when there are major changes to the MSDS.

Material	Hazards	Exposure Limit (1)	Signs and symptoms of exposure
Hydrochloric Acid	Corrosive Poison	5 ppm-Ceiling	Inhalation of vapors can cause coughing, choking, inflammation of the nose, throat, and upper respiratory tract, and in severe cases, pulmonary edema, circulatory failure, and death. Can cause redness, pain, and severe skin burns. Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
Nitric Acid	Corrosive Oxidizer Poison	2 ppm-TWA 4 ppm-STEL	Nitric acid is extremely hazardous; it is corrosive, reactive, an oxidizer, and a poison. Inhalation of vapors can cause breathing difficulties and lead to pneumonia and pulmonary edema, which may be fatal. Other symptoms may include coughing, choking, and irritation of the nose, throat, and respiratory tract. Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and stain skin a yellow or yellow-brown color. Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
1 – Exposure limit refers to the OSHA regulatory exposure limit.			

6.0 Equipment and Supplies

6.1. Instrumentation

- Agilent Agilent 7800, and Agilent 7900: inductively coupled plasma mass spectrometer with data system (microprocessor, monitor, printer) and autosampler. Mass Range 2-260 amu. Vacuum purged spectrophotometer with an axial plasma torch. Collision/Reaction Cell.

- Heat exchanger –PolyScience Model 6106T Recirculating Chiller or equivalent

- Autosampler –Agilent SPS 4 Autosampler

6.2. Supplies

- Reagent Water -18 megohm Reagent grade Type II water
- Volumetric Flasks (Class A): 50 mLs, 100 mLs, 500mls & 1000mls
- Eppendorf & Fisher Pipettes, varying volumes
- Polypropylene tubes

7.0. Reagents and Standards

7.1. Reagents

7.1.1. Concentrated Nitric Acid (HNO3) - Trace Grade or Equivalent; store at room temperature; for stability information, refer to manufacturer's instructions. The assay sheet of each lot of acid received into the lab must be reviewed to ensure the quality of the acid is sufficient for trace analysis of metals.

7.1.2. Concentrated Hydrochloric Acid (HCL) - Trace Grade or Equivalent; store at room temperature; for stability information, refer to manufacturer's instructions. The assay sheet of each lot of acid received into the lab must be reviewed to ensure the quality of the acid is sufficient for trace analysis of metals.

7.1.3. Argon supply - 99.9% (Liquid)

7.1.4. Helium and Hydrogen supply – 99.999% (Gas)

7.1.5. 18 megohm Reagent grade Type II water.

7.1.6. 5% HNO3 + 5% HCl: Add 1 liter of concentrated HNO3 and 1 liter of concentrated HCl to deionized water and bring to 20 liter volume with deionized water. Varying amounts of this reagent may be made (e.g., 10L) by proportionally adjusting the volume of acids used. Note: Always add acid to water. Record preparation in the TALS Reagent Module. Prepare every 12 months or refer to manufacturer's expiration date; store at room temperature.

7.2. Standards

Calibration and spike solutions are prepared from either certified stock solutions or from stock solutions purchased from vendors. Certificates of analysis or purity must be received with all neat compounds or stock solutions. Certificate of analysis are filed in Metals manager's office.

Storage requirements: all standards are stored at room temperature

Shelf-life: Stock standards – refer to manufacturer's instructions
Working calibration standards – two weeks
Working Initial calibration verification standard – prepared fresh daily
Interference Check Standards (A&B) – weekly
Intermediate and all other standards- 6 months
(Note: expiration date must not go beyond the expiration date of the source stock).

Concentration: Final concentrations for the calibration standards are given in Attachment 1. All standards must be prepared in 5% HNO3 / 5% HCl (Sec. 7.1.6).

Standards must be prepared in accordance to the shelf life (Sec 7.2) "or sooner if needed or required." "If needed" means the standard has been exhausted; "if required" means that the standard does not meet the QC criteria.

All standards must be prepared in 5% HNO3 / 5% HCl (Sec. 7.1.6). Final concentrations for the calibration standards are given in Attachment 1. Varying amounts of these standards may be made by proportionally adjusting the volume of standards and reagent water used.
.

7.2.1. Calibration Standards: purchased from CPI International. Refer to manufacturer's instructions for stability and storage information.

6020B RL Standard contains: 20 mg/L Ca, K, Mg, Na
12 mg/L Fe
8 mg/L B
4 mg/L Al
1.6 mg/L Sn, Zn
0.8 mg/L Mn
0.4 mg/L Ba, Co, Cr, Cu, Mo, Ni, Sr, Ti, V
0.25 mg/L Se
0.2 mg/L Ag, As, Cd, Sb,
0.12 mg/L Pb
0.08 mg/L Be, Tl

TA-CAL-1 contains: 1,000 mg/L Si

100 mg/L As, Ba, Be, Cd, Co, Cr, Cu, Li, Mn, Mo, Ni, Pb, Sb, Se, Si, Sn, Sr, Ti, Tl, V

TA-CAL-2 contains: 1,000 mg/L Al, Ca, Fe, K, Mg, Na

Single Element Standard: Ag 1,000 mg/L
Single Element Standard: B 1,000 mg/L
Single Element Standard: Zn 1,000 mg/L

7.2.2. Working Calibration Standards:

CAL5: Add 100ml of 5% HNO3 / 5% HCl (Sec 7.1.6) to a clean 200ml flask. Add 0.4ml of TA-CAL-1 and 5ml of TA-CAL-2. Add 10 ml of MS-Cal-Int (see Sec 7.2.2.1). Bring to volume with 5% HNO3 / 5% HCl.

CAL4/CCV: Add 20ml of 5% HNO3 / 5% HCl (Sec 7.1.6) to a clean 50ml polypropylene tube. Add 20ml of working Cal5 and mix.

CAL3: Add 15ml of 5% HNO3 / 5% HCl (Sec 7.1.6) to a clean 50ml polypropylene tube. Add 5ml of working Cal5 and mix.

CAL2: Add 100ml of 5% HNO3 / 5% HCl to a clean flask. Add 10ml of 6020B RL Standard. Bring to volume with 5% HNO3 / 5% HCl (Sec 7.1.6).

CAL1: Add 16ml of 5% HNO3 / 5% HCl (Sec 7.1.6) to a clean 50ml polypropylene tube. Add 4ml of working Cal2 and mix).

7.2.2.1. MS-Cal-Int: Add 100ml of 5% HNO3 / 5% HCl (Sec 7.1.6) to a clean 200ml flask. Add 2ml each of B and Zn. Add 0.4ml of Ag. Bring to volume with 5% HNO3 / 5% HCl (Sec 7.1.6).

Note: see Attachment 1 for final elemental concentrations.

7.2.3. Initial Calibration Verification Stock Standards: purchased from CPI International. Refer to manufacturer's instructions for stability and storage information. Standards must be from a different source than those used for the calibration standards.

TA-CAL1-SS contains: 1,000 mg/L Si
100 mg/L As, Ba, Be, Cd, Co, Cr, Cu, Li, Mn, Mo, Ni, Pb, Sb, Se, Si, Sn, Sr, Ti, Tl, V

TA-CAL2-SS contains: 2,000 mg/L Al, Ca, Fe, K, Mg, Na

2nd Source Single Element Standard: Ag 1,000 mg/L
2nd Source Single Element Standard: B 1,000 mg/L
2nd Source Single Element Standard: Zn 1,000 mg/L

7.2.4. ICV Working Standard: The ICV Working Standard must be at a concentration other than the concentrations used for the CCV working standard. Add 10ml of 5% HNO3 / 5% HCl (Sec 7.1.6) to a clean 50ml polypropylene tube. Add 10ml of working Interm_ICV (Sec 7.2.4.2) and mix. The final concentrations of the various elements are listed in Attachment 1. This standard is prepared fresh daily and stored at room temperature.

7.2.4.1. MS-ICV-Int: Add 100ml of 5% HNO3 / 5% HCl (Sec 7.1.6) to a clean 200ml flask. Add 2ml each of 2nd Source: B & Zn. Add 0.4ml of 2nd Source: Ag. Bring to volume with 5% HNO3 / 5% HCl (Sec 7.1.6).

7.2.4.2. Interm ICV: Add 100ml of 5% HNO3 / 5% HCl (Sec 7.1.7) to a clean 200ml flask. Add 0.32ml of TA-CAL-1-SS and 4ml of TA-CAL-2-SS. Add 8 ml of MS-ICV-Int (see Sec 7.2.4.2.1). Bring to volume with 5% HNO3 / 5% HCl.

7.2.5. Continuing Calibration Verification standard: see CAL4/CCV (Sec. 7.2.2).

7.2.6. Internal Standards: The following elements are used as the internal standards: Bi, In, Li6, Sc, Tb, and Ge.

- Internal Standard Multi-Element Mix 4 purchased from Agilent Technologies. Contains: 50 mg/L each: ^{6}Li, Sc; 25 mg/L each: Ge, Te; 10 mg/L each: Bi, In, Tb. Refer to manufacturer's instructions for stability and storage information.
- Triton X-100 (Standard Stock Solution: Non-ionic Surfactant) purchased from Fisher Scientific, p/n BP151-100. Refer to manufacturer's instructions for stability and storage information. According to the ICPMS manufacturer (Agilent Technologies), Triton-X 100 will reduce the %RSD of the triplicate analysis.

Prepare a working internal standard solution in a 1000 ml volumetric flask: Add 5 ml of Internal Standard Multi-Element Mix 4 and 0.1 ml of Triton X-100. Bring to volume with 5% HNO3 / 5% HCl.

The following are the recommended analysis masses and internal standards:

Element	IS
Be9	Li6
B11	Li6
Na23	Sc45
Mg24	Sc45
Al27	Sc45
K39	Sc45
Ca40	Sc45
Ti47	Sc45
V51	Sc45
Cr52	Sc45
Mn55	Sc45
Fe56	Sc45
Co59	Sc45
Ni60	Sc45
Cu63	Sc45
Zn 66	Sc45
As75	Sc45
Se78	Sc45
Sr88	In115
Kr83**	(none)
Mo95	In115
Ag107	In115
Cd111	In115
Sn118	In115
Sb121	In115
Ba137	Tb159
Tl205	Bi209
Pb 208*	Bi209

*Pb 208 = Pb 208 + Pb 207 + Pb 206
**Kr83 is used for monitoring Krpyton levels only.

Different masses and internal standards may be utilized as matrix issues deem necessary. Samples are analyzed using collision/reaction cell technology (helium/hydrogen gas modes). Typical Collision/Reaction Cell usage: Calcium, Iron, and Selenium are analyzed in the Hydrogen reaction mode; Beryllium, Boron and Titanium are analyzed in the No Gas mode; all other elements are analyzed in the helium collision mode.

Tune check criteria:

Instrument tunes must be performed daily, before calibration. A solution at ~10ppb of Be, Mg, Co, In, and Pb is analyzed, and the precision, mass calibration, and resolution are checked. Resolution is checked by analyzing Magnesium isotopes 24, 25, 26 and Lead isotopes 206, 207, 208.

The following limits are used to evaluate mass calibration, resolution, and instrument stability:

The following limits are used to evaluate the tune:

Mass calibration: +/-0.1 amu
Resolution check: <0.9 amu at 10% peak height
Stability (5reps): <5%

7.2.7. Spectral Interference Check (SIC) Solutions: A working stock solution may be purchased for the ICSA solution. The stock solution which is purchased from CPI International contains the following elemental concentrations:

TA-ICPMS-ICSA contains: 10000 mg/L Chloride; 2000 mg/L Carbon; 1000 mg/L ea: Al, Ca, Fe, K, Mg, Na, P, S; 20 mg/L ea: Mo, Ti

7.2.8. Working SIC Standards (ICSA):

ICSA (6020B): Add 50ml of 5% HNO3 / 5% HCl (Sec 7.1.6) to a clean 100ml flask. Add 10ml of TA-ICPMS-ICSA stock solution. Bring to volume with 5% HNO3 / 5% HCl (Sec 7.1.6). This standard is made fresh weekly; store at room temperature. Refer to Attachment 2 for final elemental concentrations.

7.2.9. ICP-MS Matrix Spiking Solution, ICPMS LCS/SPK: purchased from High-Purity Standards. Refer to manufacturer's instructions for stability and storage information. Refer to attachment 1 for final elemental concentrations. Stock solution contains the following elemental concentrations:

Element	Conc. Of Stock (mg/L)
Aluminum (Al)	500
Antimony (Sb)	5
Arsenic (As)	10
Barium (Ba)	10
Beryllium (Be)	5
Boron (B)	100

Element	Conc. Of Stock (mg/L)
Cadmium (Cd)	5
Calcium (Ca)	500
Chromium (Cr)	10
Cobalt (Co)	5
Copper (Cu)	10
Iron (Fe)	500
Lead (Pb)	5
Magnesium(Mg)	500
Manganese (Mn)	50
Molybdenum (Mo)	10
Nickel (Ni)	10
Potassium (K)	500
Selenium (Se)	10
Silver (Ag)	5
Sodium (Na)	500
Strontium (Sr)	10
Thallium (Tl)	4
Tin (Sn)	10
Titanium (Ti)	10
Vanadium (V)	10
Zinc (Zn)	50

7.2.10. EPA Tune Check

7.2.10.1. EPA Tune Check Stock Standard: 2008TS purchased from Inorganic Ventures. Refer to manufacturer's instructions for stability and storage information. Contains: 10 ug/mL each: Be, Co, In, Mg, Pb.

7.2.10.2. Working EPA Tune Check Standard: add 100ml of 5% HNO3 / 5% HCl to a clean 1000ml flask. Add 1 mL of 2008TS. Bring to volume with 5% HNO3 / 5% HCl . This solution contains 10 ug/L of Be, Co, In, Mg and Pb.

8.0. Sample Collection, Preservation, Shipment and Storage

Sample container, preservation techniques and holding times may vary and are dependent on sample matrix, method of choice, regulatory compliance, and/or specific contract or client requests. Listed below are the holding times and the references that include preservation requirements.

Matrix	Sample Container	Min. Sample Size	Preservation	Holding Time [1]	Reference
Metals Waters	Polyethylene or Glass	250 mLs	HNO_3 to pH < 2 prior to shipment; if not, acidify upon receipt in lab [2,3]	6 months	40 CFR Part 136.3
Soils	8 oz or 16 oz.Polyethylene or Glass	10 grams	Cool 4 ± 2°C	6 months	SW846 Method 6020B

[1] Inclusive of digestion and analysis.
[2] Acid preservation may be omitted for shipping; however, acid must be added upon receipt in the lab. Following acidification, mix the sample and hold for at least 24 hours. Just prior to digestion or direct analysis, verify pH<2. If pH≥2, repeat steps (i.e., add acid, hold for 24hrs, verify ph<2).
[3] Aqueous samples may be stored at room temperature.

Note: Samples for dissolved metals should be filtered in the field before acid is added to the sample. If the sample is to be filtered in the lab, no preservative is added to the sample until the sample is filtered; and NCM added that dissolved samples were not handled in accordance with 40 CFR Part 136 Table II. Properly filtered and nitric preserved samples requiring analysis for dissolved analytes don't require digestion prior to analysis.

Leachates are transferred to a plastic container after the applicable leachate extraction procedure. The sample is preserved with HNO3 to a pH<2. (If a matrix spike is necessary, then an aliquot is spiked prior to acid preservation). Leachate samples must be analyzed within 6 months of the extraction.

9.0. Quality Control

Note: If a batch of samples requires digestion, then the relating QC samples must be carried through the entire digestion process.

9.1. Sample QC - The following quality control samples are prepared with each batch of samples.

Quality Control	Frequency	Control Limit
Method blank	One per batch of twenty samples or less	<1/2 the RL; or project specific requirements; or <10% of the measured concentration in the sample

Quality Control	Frequency	Control Limit
Lab Control Sample Water (LCSW)	One per batch of twenty samples or less	80-120%
Matrix Duplicate	One in 20 or fewer samples	If original sample and dup are both ≥ 5X CRQL, then ≤ 20% RPD. If original sample and duplicate are less than the CRQL, the RPD is not calculated; otherwise ±CRQL.
Matrix Spike[1]	One per batch of twenty samples or less	75-125%
Matrix Spike Duplicate[1]	Whenever the client requests	75-125%; If original sample and dup are both ≥ 5X CRQL, then ≤ 20% RPD. If original sample and duplicate are less than the CRQL, the RPD is not calculated; otherwise ±CRQL.
Post Digestion Spike	One per batch of twenty samples or less	See Section 9.1.7
Laboratory Control Sample Soil Reference Material (LCSSRM)	1 in 20 or fewer samples	Vendor's certified limits
Serial Dilution (1/5 dilution)	One per batch of twenty samples or less	See Section 9.1.6

[1] The sample for MS/MSD is randomly selected, unless specifically requested by a client.

9.1.1. Method Blank (MB): One laboratory method blank will be analyzed with each batch of samples prepared together (not to exceed 20 samples). The method blank is used to identify possible contamination during acid digestion. Results must be less than the highest of: (i) ½ the RL, (ii)project specific requirements, or (iii)10% of the measured concentration of the sample. If any analyte concentration in the blank is above the control limit, the batch must be prepared again for the element in question and the samples reanalyzed.

9.1.2. Laboratory Control Sample Water (LCS): A laboratory control sample must be analyzed with each group of samples digested. Refer to Water Matrix Spike (MS) concentration in Attachment 1 for final elemental concentrations. Results must be within the acceptable control limits, if not, all samples prepared in association with the LCS must be redigested and reanalyzed.

- Water samples - prepare the LCS by adding 0.25 ml of ICP-MS LCS/SPK (Sec. 7.2.10) in 50 ml deionized water. Results must be within ± 20% of the true value.

- Soil samples - LCS for solid matrices (LCSSRM) is obtained from a vendor supplied solid matrix and is carried through the same preparation procedure as the samples. The results of the solid LCS must fall within the 'QC Performance acceptance limits' of the reference material used for that sample. If not, all samples prepared in association with the LCS must be redigested and reanalyzed.

9.1.3. Matrix Duplicate: A duplicate is analyzed for each batch of samples. If original sample and duplicate are both ≥ CRDL, then ≤20% RPD. If original sample and duplicate are less than the CRDL, the RPD is not calculated; otherwise, ±CRDL.

9.1.4. Matrix Spike (MS): A matrix spike is prepared and analyzed for each batch of samples digested. A recovery of 75-125% is required (an exception to this occurs if the sample concentration exceeds the spike concentration by a factor of four or more). If the recovery is not within specified limits, a post digestion spike is required (see Sec 7.2.9). See Attachment 1 for final Matrix Spike concentrations for water and soil.

9.1.4.1. For aqueous MS sample, spike 0.25 ml of ICP-MS LCS/SPK (Sec 7.2.9) into 50 ml sample.

9.1.4.2. For soil MS sample, spike 1.0 ml of ICP-MS LCS/SPK into 1 gram of sample.

9.1.5. Matrix Spike Duplicate (MSD): A matrix spike duplicate is analyzed when requested by the client. Spike the QC sample the same way as the Matrix Spike (MS) sample. If original sample and duplicate are both ≥ CRDL, then ≤20% RPD. If original sample and duplicate are less than the CRDL, the RPD is not calculated; otherwise, ±CRDL. A recovery of 75-125% is required (an exception to this occurs if the sample concentration exceeds the spike concentration by a factor of four or more). If the recovery is not within specified limits, a post digestion spike is required (see Sec 9.1.7). See Attachment 1 for final Matrix Spike concentrations for water and soil.

9.1.6. Serial Dilution QC Check: A 1/5 dilution is prepared and analyzed on one sample per batch to determine if matrix interferences are present.

9.1.6.1. Select a sample and dilute the digestate by a factor of 5 (DF=5).

9.1.6.2. Analyze the dilution using the same procedures used for the un-diluted aliquot.

9.1.6.3. Compare the results of the diluted and un-diluted aliquots of sample digestate.

9.1.6.4. If the analyte concentration is minimally a factor of 25 above the RL (Reporting Limit), then the results of the dilution should be within ±20% of the result of the undiluted sample (original sample). If not, then a chemical or physical interference effect should be suspected.

9.1.7. Post-Digestion Spike: To check for possible matrix interference, analyze a post digestion spike on a representative sample (minimum of 1 per batch).

9.1.7.1 Transfer 10mL of a digestate, preferably the same sample that was selected for the matrix spike, to a suitable vial.

9.1.7.2 Spike the sample with 0.01 ml of ICP-MS LCS/SPK (Sec 7.2.9). Analyze the spiked aliquot and an un-spiked aliquot (the un-spiked may have been analyzed previously and does not need to be reanalyzed). The final concentration of the post digestion spike is as follows:

Element	Post spike concentration (ug/L)
Aluminum (Al)	500
Antimony (Sb)	5
Arsenic (As)	10
Barium (Ba)	10
Beryllium (Be)	5
Boron (B)	100
Cadmium (Cd)	5
Calcium (Ca)	500
Chromium (Cr)	10
Cobalt (Co)	5
Copper (Cu)	10
Iron (Fe)	500
Lead (Pb)	5
Magnesium(Mg)	500
Manganese (Mn)	50
Molybdenum (Mo)	10
Nickel (Ni)	10
Potassium (K)	500
Selenium (Se)	10
Silver (Ag)	5

Element	Post spike concentration (ug/L)
Sodium (Na)	500
Strontium (Sr)	10
Thallium (Tl)	4
Tin (Sn)	10
Titanium (Ti)	10
Vanadium (V)	10
Zinc (Zn)	50

9.1.7.3 Calculate the percent recovery of the post digestion spike as follows:

$$\%REC = \frac{Cps - Cs}{C2} \otimes 100$$

Where: Cps = concentration of post digestion spike (ug/L)
Cs = concentration of un-spiked sample (ug/L)
C2 = concentration of spike (ug/L)

9.1.7.4 Recovery limits for post digestion spikes for Method 6020B are 75-125%; If both the MS and post digestion spike fail, then matrix effects are confirmed.

9.2. Instrument QC

Table 2 below describes the frequency, criteria, and corrective actions for the calibration and Quality control samples.

Table 2: Calibration, Quality control and Corrective Action Summary

QC Item	Frequency	Criteria	Corrective Action
Tune validation-Mass Calibration	Daily	Within 0.1amu from mass unit	Terminate analysis, fix problem and repeat
Tune validation-Resolution Check	Daily	<0.9 amu full width at 10% peak height	Terminate analysis, fix problem and repeat
Instrument Stability Check	Daily	<5% RSD for five replicates	Terminate analysis, fix problem and repeat
Initial Calibration: Multi-point-minimum 5 stds and 1 blank	Daily	Correlation ≥0.995	Recalibrate
Initial Calibration Verification Standard (ICV)	At the beginning of the analysis	+/- 10%	Recalibrate
Continuing Calibration	At the beginning and	Within +/- 10% of the	Fix the problem and

QC Item	Frequency	Criteria	Corrective Action
Verification Standard (CCV)	end of the analysis, and every 10 samples	true value	reanalyze the previous 10 samples.
Initial Calibration Blank (ICB)	After ICV	must be less than ½ the LLOQ (Lower limit of Quantitation)	Terminate the analysis, correct the problem and reanalyze the previous 10 samples
Continuing Calibration Blank (CCB)	After every CCV	Less than the LLOQ	
Interference check standards (ICSA)	At the beginning of an analysis and after every 12 hours of analysis	+/-20% of the true value or +/-2 times the LLOQ, whichever is greater	If an element is consistently out of the +/-20% or +/-2 times the LLOQ, the problem should be investigated.
Internal Standards	Analyzed with every standard and sample	30-140%	Standard-terminate the analysis and recalibrate Sample- a 5X dilution is required (The analyst should check the IS response for the bracketing CCV/CCBs to see if there is a similar response to the sample. Recalibration may be required.)
Linear Range Check (LRC)	After calibration	90-110%	If LRC is not within 90-110% recovery, then the linear range is the highest point in the calibration

9.2.1. Initial Calibration Verification (ICV): Analyze an initial calibration verification solution at the beginning of the run. ICV solution must have the same acid matrix as the calibration standard and it must come from a source other than the calibration standard source. The final concentrations of the various elements are listed in Attachment 1. The results for the target elements in the initial calibration verification (ICV) must be within +/-10% of the true value. If results are outside of the specified limits, terminate the analysis, correct the problem and recalibrate the instrument. See Sec 7.2.4 for the ICV standard preparation instructions.

9.2.2. Continuing Calibration Verification (CCV): The calibration of the ICP-MS must be verified every 10 samples and at the end of the analysis run by analyzing the QC Check Solutions (CCV). The same solution used for the calibration standard 3 is used for the CCV standard. The concentration of

the CCV standard must be at or near mid-range levels of the calibration. The final concentrations of the various elements are listed in Attachment 1. The results for the target compounds must be within +/-10% of the true value. If results are outside of the specified limits, terminate the analysis, correct the problem, recalibrate the instrument, and reanalyze the samples following the last good CCV. See CAL3/CCV of Sec 7.2.2 for the preparation instructions.

9.2.3. Initial and Continuing Calibration Blank (ICB/CCB):

9.2.3..1. Initial Calibration Blank (ICB) must be analyzed after the calibration curve. The value of the initial calibration verification blank must not exceed ½ LLOQ/reporting limit (RL). If it does, terminate the analysis, correct the problem, and recalibrate. The initial calibration verification blank is the same blank solution as used for the calibration blank.

9.2.3..2. Continuing Calibration Blank (CCB) must be analyzed after the calibration curve, every 10 samples and at the end of the analytical run. The result of the calibration verification blank must not exceed the LLOQ/reporting limit (RL). If it does, terminate the analysis, correct the problem, recalibrate and reanalyze the samples following the last good CCB. The calibration verification blank is the same blank solution as used for the calibration blank.

9.2.4. Spectral Interference Check (SIC) Sample (ICSA): Verify the inter-element and background corrections by analyzing the interference check solution (ICSA) at the beginning of the analysis run and after every 12 hours of analysis. The ICSA is analyzed in order to demonstrate that proper corrections are being utilized for known interferences. Analyst must evaluate this solution in order to detect trends that require corrective actions. Pay particular attention to false positives and false negatives for elements not present in the interference check solution. Results should fall within the control limit of +/-20% of the true value or +/-2 times the LLOQ of the true value, whichever is greater. See Attachment 2 for list of elements and the corresponding concentrations in ppb. See Sec 7.2.8 for preparation instructions.

9.2.5. Linear Range Standard (LRC): the LRC standards are prepared from single element stock standards of each metal obtained from a commercial source. The LRC's are prepared by taking the appropriate volume of each stock and adding it to a 500 mL volumetric flask partially filled with 5% HNO3 / 5% HCl and diluted to the mark after all elements have been

added. The tables below lists the volume of each stock solution of each metal, volume used and final concentrations:

Linear Range Check (LRC) - A			
Elements	Stock Conc (mg/L)	Volume of stock (mL)	Final Conc (mg/L)
Tl	10000	0.05	1
Be, Co, Mo	10000	0.1	2
As, Cd,Sr, V	10000	0.25	5
Ba, Cr, Pb, Cu, Mn, Ni, Zn	10000	1	20

Linear Range Check (LRC) - B			
Elements	Stock Conc (mg/L)	Volume of stock (mL)	Final Conc (mg/L)
Al, Fe, Mg, Na, K	10000	25	500

Linear Range Check (LRC) - C			
Elements	Stock Conc (mg/L)	Volume of stock (mL)	Final Conc (mg/L)
Ag	1000	0.5	1
B	1000	1	2
Sb	10000	0.05	1
Sn	10000	0.1	2
Se	10000	0.15	3
Ti	10000	0.5	10
Ca	10000	50	1000

The LRC standards are analyed after each calibration. If the results fall within the control limit of +/-10% of the true value, then the linear range at that concentration has been verified; if not, the linear range is the highest point in the calibration.

9.3. Instrument Performance Criteria

Prior to the analysis of any samples, the following must be performed.

9.3.1. Instrument Detection Limits (IDLs): The IDL for each analyte must be determined for each wavelength used on each instrument.

9.3.1.1. The IDLs for each analyte must be determined for each prep

method. The IDL is determined by analyzing 10 replicate analysis of reagent blank solution (5% HNO3 / 5% HCl). Analyze the ten blanks and calculate the standard deviation and the mean (use zero for the mean if the mean is negative). The IDL = mean + (3 x Std Dev). The IDL must be determined when the instrument is initially set up, when the instrument is adjusted in any way that may affect the IDL (e.g., detector replacement), and annually.

10.0. Procedure

10.1. Sample Preparation

10.1.1. For samples to be analyzed for total analytes by Method 6020B, follow digestion procedure in Eurofins SOP No. ED-MTP-002 (Method 3005A) or ED-MTP-003 (Method 3010A) for waters and ED-MTP-005 (Method 3050B) for soils.

10.2. Calibration

10.2.1. Turn the ICP-MS on and initiate the tune screen. Start the tune screen to allow the instrument to become thermally stable before beginning to analyze the calibration standards. While the instrument is warming up, aspirate the interference check solution (or similar solution) to precondition the cones.

10.2.2. Check the tune parameters for the proper sensitivities, precision, oxides, and double charged values following the instrument manufacturer's recommendations. Refer to sections *Preparations Before Analysis*, *Plasma ON/Executing a Startup*, and *Appendix (Recommended Values for Tuning Parameters)* of the MassHunter Workstation User Guide (*Agilent Technologies 7800/7900, p/n G7201-90403).*

10.2.3. Prior to calibration, run an EPA Tune check solution. Refer to Sec. 7.2.6 for the Tune check criteria.

10.2.4. Using method *BM New Method.icpms.template* (program in the Mass Hunter Workstation software containing calibration standards, check tables, etc.), calibrate the instrument using a blank and five standards. Refer to the section *Creating a Method* in the instrument manufacturer's instructions *Agilent ICP-MS (7800/7900) MassHunter Workstation User Guide (p/n G7201-90403)*.

10.2.5. Internal standards are added to the calibration standards, blank and

samples in-stream by the use of T-fitting.

10.2.6. Analyze the calibration standards and calibrate the ICP-MS in accordance with the manufacturer's recommendations and the Eurofins Corporate SOP No. CA-Q-S-005 Calibration Curves (General).

10.2.7. The instrument must be calibrated daily or once every 24 hours and each time the instrument is set up. The correlation coefficient (r) of the calibration curve must be ≥0.995 If not, the problem must be corrected, and the instrument must be recalibrated.

10.2.8. Calibration Curve Read-Back:

10.2.8.1. Low-Level readback for aqueous samples and for Silver for soil samples – evaluate Cal 1 which is at the LLOQ for aqueous samples. The %RE (relative error) must be +/- 20% (see Sec 11.5); if not, stop the analysis and recalibrate.

10.2.8.2. Low-Level readback for soil samples except Silver- evaluate Cal 2 which is at the LLOQ for soil samples. The %RE (relative error) must be +/- 20% (see Sec 11.5); if not, stop the analysis and recalibrate.

10.2.8.3. Mid-Level readback – evaluate Cal 4. The %RE (relative error) must be +/- 10% (see Sec 11.5); if not, stop the analysis and recalibrate.

10.3. Sample Analysis

10.3.1. All sample measurements must be made within the calibration range of the instrument. Preparation of all reference materials used for calibration must be documented.

10.3.2. Typical dilutions for samples and relating QC samples:

10.3.2.1. Water, SPLP, soil, and their relating batch QC (MB, LCS, LCSSRM, Dup, MS, MSD) samples are typically analyzed undiluted. Dilutions are prepared in 5% HNO3 / 5% HCl..

10.3.2.2. TCLP and the relating batch QC samples (LCS, Dup, MS, MSD, LB) are typically diluted at a 10X prior to analysis with the exception of the TCLP method blank (MB). The TCLP method blanks (MB) for method 3010A are typically analyzed undiluted. Dilutions are prepared in 5% HNO3 / 5% HCl.

10.3.3. The samples are analyzed only after the ICV, and ICB criteria are met.

10.3.4. The samples are analyzed in a sequence as follows:

Typical Analytical Sequence
INSTRUMENT WARM-UP (approx. 30 minutes)
TUNE CHECK
STANDARDIZATION/CALIBRATION (Blank & 5 Cal Stds)
ICV
ICB
ICSA
LRC-A
LRC-B
LRC-C
CCV
CCB
10 Samples
CCV
CCB
10 Samples
CCV
CCB
{continue until done; after 12 hrs run ICSA}

Note: The analytical sequence must end with the analysis of the CCV and CCB. The 10 samples include all QC samples/standards with the exception of CCVs and CCBs.

10.3.5. Determine the concentration of the samples and QC items using the procedures of Section 11.

10.3.5.1. The amount of sample digestate needed to prepare the desired dilution is determined from the following equation:

$$\text{V digest} = \frac{Vf\ vol}{DF}$$

Where:
Vf vol = final volume of diluted sample (mL)
V digest = volume of sample digestate used to make the dilution (mL)
DF = Dilution Factor

10.3.5.2. The dilution factor is calculated as follows:

$$\text{DF} = \frac{Vf\ vol}{V\ digest}$$

Where: Vf vol = final volume of diluted sample extract (mL)
V digest = volume of sample extract used to make the dilution (mL)

Note: The following examples are based on a final volume of 100mL. It may be more convenient to prepare dilutions at smaller final volumes.

EXAMPLE

A sample digestate is analyzed and one of the target analytes exceeds the linear range of the ICP-MS. 1.0mL of the digestate is added to a 100mL volumetric flask and the extract brought up to volume with 5% HNO3 / 5% HCl. What is the dilution factor?

$$DF = \frac{100ml}{1.0ml} = 100$$

Some samples may require multiple dilutions; that is, a dilution of a dilution will have to be made. In this case, the final dilution factor is the product of the individual dilutions.

11.0. Calculations / Data Reduction

11.1. Accuracy:

$$\text{ICV / CCV, LCS \% Recovery} = \frac{\text{observed concentration}}{\text{known concentration}} \times 100$$

$$\text{MS \% Recovery} = \frac{\text{(spiked sample) - (unspiked sample)}}{\text{spiked concentration}} \times 100$$

11.2. Precision (RPD):

$$\text{Matrix Duplicate (MD)} = \frac{|\text{orig. sample value - dup. sample value}|}{[(\text{orig. sample value + dup. sample value})/2]} \times 100$$

11.3. Aqueous and Leachate Samples:

Leachate samples are routinely reported in mg/L while the ICP-MS is routinely calibrated in ug/L. If the results are reported in ug/L, the conversion factor is omitted from the calculation.

11.3.1. The concentration of the target analyte in liquid samples is calculated as follows:

Concentration (mg/L) = $ug/L(from\ pr\,\text{int}\,out) \otimes \frac{F}{V} \otimes DF \otimes \frac{1mg}{1000ug}$

Where: F = final volume of the sample digestate (L) -usually 50mL
V= volume of sample digested (L)
DF = dilution factor

11.3.2. The Reporting Limit (RL) of the target analyte in liquid samples is calculated as follows:

Concentration(mg/L) = $RL_{table1} \otimes \frac{F}{V} \otimes DF \otimes \frac{1mg}{1000ug}$

Where: $RL_{table\ 1}$ = reporting limit from this SOP (ug/L)
F = final volume of the sample digestate (L)
V= volume of sample digested (L)
DF = dilution factor

The Table 1 Reporting Limits assumes:
F = 50ml
V = 50ml
DF = 1

11.4. Soil/Solid Samples

Soils and solids are routinely reported in mg/kg while the ICP-MS is routinely calibrated in ug/L. If the results are reported in ug/kg, the conversion factor is omitted from the calculation.

11.4.1. The concentration of the target analyte in soil and solid samples is calculated as follows:

Concentration (mg/kg,dw) = $ug/L(from\ pr\,\text{int}\,out) \otimes \frac{F}{W \otimes solids} \otimes DF \otimes \frac{1mg}{1000ug}$

Where: F = final volume of the sample digestate (L)
W = volume of sample digested (kg)
DF = dilution factor
solids = decimal equivalent of the percent solids (percent solids/100)

For example, if the percent solid is 85%, the decimal equivalent is 0.85; if the %solid is 100%, the decimal equivalent is 1.0.

11.4.2. The Reporting Limit (RL) of the target analyte in soil/solid samples is calculated as follows:

$$\text{Concentration(mg/kg,dw)} = RL_{table1} \otimes \frac{0.0010kg}{W \otimes solids} \otimes \frac{F}{0.100L} \otimes DF$$

Where:
$RL_{table\ 1}$= reporting limit from Table 1 of this SOP
W = weight of sample digested (kg)
F = final volume of the sample digestate (L)
V = volume of sample digested (L)
DF = dilution factor
solids = decimal equivalent of the percent solids (percent solids/100)
dw = dry weight

The Table 1 Reporting Limit assumes:
F = 0.100L
DF = 1
W = 0.0010kg (1.0g)
solids = 1.0

NOTE: All dry weight corrections are made in LIMS at the time the final report is prepared.

11.5. Relative Error (%RE):

% Relative Error = (100) (MC-TC)/TC

MC = Measured Concentration of the calibration standard
TC = True Concentration for the calibration standard

11.6. Data Reduction:

11.6.1. All data is recorded directly in TALS' Analyst Desktop II program.

11.6.2. Record standard preparations in TALS Reagent module.

11.6.3. Sample and standard preparations must be documented in the Analyst Desktop II program located in TestAmerica Laboratory System (TALS). The analyst must enter the following information: Source standard, Initial and

final sample volume, spike name and amount used, all reagents and their corresponding lot numbers, creation dates and expiration dates.

11.6.4. Complete the Data Review Checker (DRC) in TALS: Prior to data submission (i.e., prior to 1st leveling data in the Analyst Desktop II module in TALS), the analyst must execute the DRC (Data Review Checker) program in the applicable analytical batch.

11.6.4.1. Open the analytical batch and click on the Edit tab above to enter the Edit Mode.

11.6.4.2. Press F8 command key on the computer keyboard or right click anywhere on the batch worksheet then click on 'Run checklist.'

11.6.4.3. Acknowledge by filling in responses to all unacknowledged findings.

11.6.4.3.1. Highlight the checklist with findings, then highlight the associated list of findings; right click and choose 'Acknowledge Item.'

11.6.4.3.2. Fill in appropriate comments in the response box, then hit 'OK.'

11.6.4.3.3. Acknowledge all Finding items in the 'Manual Batch Checklist' except for the *"2nd Level review complete?"* this is to be completed by the 2nd level reviewer.

12.0. Method Performance

12.1. Method/Instrument Detection Limit Study (MDL)

The method detection limit (MDL) is the lowest concentration that can be detected for a given analytical method and sample matrix with 99% confidence that the analyte is present. The MDL is determined according to the laboratory's MDL procedure in Section 19 (Test Methods and Method Validation) of Eurofins Edison's Quality Assurance Manual (ED-QA-LQM). MDLs reflect a calculated (statistical) value determined under ideal laboratory conditions in a clean matrix, and may not be achievable in all environmental matrices. The laboratory maintains MDL studies for analyses performed; these are verified at least annually unless method requirements require a greater frequency.

12.2. Demonstration of Capabilities

For DOC procedure refer to Section 19 in the most current revision of Eurofins Edison's Quality Assurance Manual (ED-QA-LQM).

12.3. Training Requirements

Refer to Eurofins Edison SOP No. ED-GEN-022, Training, for the laboratory's training program.

12.4. Lower-Limit of Quantitation (LLOQ):

12.4.1. LLOQ verification: prior to analyzing samples under method 6020B, after any change that may affect the LLOQ, and quarterly, the LLOQ must be verified. The LLOQ is initially verified by the analysis of 7 replicate samples spiked at the LLOQ. For aqueous, prep method 3005A and 3010A, use the same concentration as Cal 1 (see Sec 7.2.2 for preparation procedures). For LLOQ soil except Silver, preparation method 3050B, use the same concentration as Cal 2 (see Sec 7.2.2 for preparation procedures). For Silver, spike 2mL of the 6020B RL standard into a clean 50mL digestion cup and prepare using method 3050B. The seven replicates must be digested prior to analysis. See SOPs ED-MTP-002, ED-MTP-003 and ED-MTP-005 for digestion instructions. The LLOQ is verified when the mean recovery of the 7 replicates is +/-35% of the true value and the RSD $\leq$ 20%.

12.4.2. LLOQ on-going verification: the LLOQ is re-verified quarterly by the analysis of a method blank (MB) and 1 blank sample (deionized water) spiked at the LLOQ. Use the same concentrations as CAL 1 (3005A and 3010A) and Cal 2 (3050B) for soil, except Silver. For Silver, spike 2mL of the 6020B RL standard into a clean 50mL digestion cup and prepare using method 3050B. See Sec 7.2.2.2 for the preparation procedures. The MB and LLOQ samples must be digested prior to analysis. See SOPs ED-MTP-002, ED-MTP-003 and ED-MTP-005 for digestion instructions. The LLOQ is re-verified if the MB result is +/- 0.5 times the reporting limit for each analyte and when the recovery of the LLOQ sample is +/-35% of the true value.

13.0. Pollution Control

It is Eurofins's policy to evaluate each method and look for opportunities to minimize waste generated (i.e., examine recycling options, ordering chemicals based on quantity needed, preparation of reagents based on anticipated usage and reagent stability). Employees must abide by the policies in Section 13 of the Corporate Environmental Health and Safety Manual (CW-E-M-001) for "Waste Management and Pollution Prevention."

14.0. Waste Management

14.1. Waste management practices are conducted consistent with all applicable rules and regulations. Excess reagents, samples and method process wastes are disposed of in an accepted manner. Waste description rules and land disposal

restrictions are followed. Waste disposal procedures are incorporated by reference to Eurofins SOP No. ED-SPM-008 (Laboratory Waste Disposal Procedures).

14.2. The following waste streams are produced when this method is carried out.

- Digested Samples: Corrosive Acid- Materials that are not above regulatory limits will be submitted for elementary neutralization. The neutralization system consists of a 55-gallon poly open top container. There is also a local snorkel exhaust for venting any noxious odors. Once the liquid is transferred into the container, the contents are sparged with air and a representative pH is measured and the amount of material is recorded in the discharge log. The pH value is recorded in the discharge log, and the liquid is neutralized to a pH of 6-9 SU using food grade sodium bicarbonate. Once the secondary pH has been taken, confirmed and recorded, the discharge valve is opened to the municipal sewer system and the neutralization process is complete. The date, type of waste stream, and volume discharged are recorded on a discharge log.

- Samples above regulatory limits and expired RCRA metals standards (Waste Corrosive Liquid, Acidic, Inorganic, n.o.s.) are collected in satellite accumulation and sent off site through a Waste disposal vendor.
  TSDF under Veolia Profile Number: 590598

- Soil Retain Samples - These containers are stored in the main sample-receiving laboratory cooler until they are designated for disposal. Once designated for disposal, the samples are transferred to the waste disposal area and placed into cubic-yard disposal containers, e.g., Jupiter-boxes. This waste is shipped directly to the TSDF under Veolia Profile Number 402535 and is subject to incineration.

15.0. References / Cross-References

15.1. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, 3rd ed.,U.S. Environmental Protection Agency, SW846 Manual, Method 6020A, Revision 1, February 2007.

15.2. TestAmerica Edison SOP ED-MTP-005, *Hot Block Digestion of Sediments and Sludges and Soils Using SW846 Method 3050B,* most current revision.

15.3. TestAmerica Edison SOP No. ED-MTP-003, *Digestion of Water and Wastewater Samples for Analysis by ICP and ICP-MS, SW846 Method No. 3010A,* most current revision.

15.4. TestAmerica Edison SOP ED-MTP-002, Digestion of Water and Wastewater

Samples for Analysis by ICP and ICPMS, SW846 Method 3005A, most current revision

15.5. TestAmerica Corporate SOP No. CA-Q-S-005, *Calibration Curves (General)*, most current revision.

15.6. TestAmerica Edison Document No. ED-QA-LQM, *Laboratory Quality Manual*, most current revision.

15.7. TestAmerica Edison SOP ED-GEN-022, *Training*, most current revision.

15.8. TestAmerica Corporate Environmental Health and Safety Manual, Document No. CW-E-M-001, most current revision.

15.9. Agilent ICP-MS (7800/7900) MassHunter Workstation User Guide, p/n G7201-90403, Rev. A, June 2017.

16.0. Method Modifications:

None

17.0. Attachments

Attachment 1: Standards and Matrix Spiking concentrations
Attachment 2: Interference Check standard elemental concentrations

18.0. Revision History

- Revision 12, dated 21 September 2024
  - Sec 7.2: Updated the preparation frequency for the working calibration standards and Intermediate standards.
  - Sec 7.2.2: Updated the preparation procedures for standards Cal1 and Cal4/CCV to reflect current procedures.
  - Sec 7.2.6: Replaced Internal standard stock solution Testamerica-1 with stock solution Internal Standard Multi-Element Mix 4. Removed stock standard MSGE-100PPM (no longer in use). Updated the Working Internal Standard preparation instructions to reflect current practices.
  - Sec 10.3.4 Removed CRI, ICSAB, and Rn Chks from the typical analytical sequence table, not applicable to this method.

- Revision 11, dated 21 April 2023
  - Updated to Eurofins branding throughout the SOP.
  - Sec 1.1, Table1: Updated the reporting limit concentrations for Ca and Na in Water to reflect current laboratory limits.
  - Sec 2.0 & Sec 8.0: Clarified instructions for the analysis of dissolved samples (i.e.,

digestion not required for the analysis of dissolved samples)
- Sec 7.2.2: Updated preparation instructions for calibration standards to reflect current lab practices.
- Sec 7.2.4: Updated preparation instructions for the ICV standard to reflect current lab practices.
- Sec 7.2.4.2: Added preparation instructions for Interm_ICV std.
- Sec 7.2.6: Added Titanium to the list of analytes that are analyzed in the No-gas mode.
- Sec 7.2.10.2: Updated preparation instructions for the working EPA Tune check standard.
- Sec 8: Added requirements to add NCM note for dissolved samples which are lab filtered.
- Sec 9.2, Table 2: Replaced minimum # of standards from 3 to 5 (and 1 blank).
- Sec 9.2.5: Updated preparation instructions for LRC-A and LRC-B; added preparation instructions for LRC-C.
- Sec 10.1: Added 'total analytes' to clarify the digestion requirements prior to analysis.
- Sec 10.3.2.1: Added LCSSRM to the list of QC items that are typically analzed undiluted.
- Sec 10.3.2.2: Updated typical dilution instructions (i.e., 10X) for TCLP analysis (exception MB).
- Sec 10.3.4: Added LRC-C in the typical analytical sequence table.

- Revision 10, dated 16 June 2022
  - Sec 1.1, Table 1 and throughout the SOP, revised to include digestion method SW846 3005A and SOP# ED-MTP-002 as prep method reference.
  - Sec 1, Table 1: Revised RL for Ag to 0.40 mg/kg.
  - Sec 14.2: Updated waste disposal procedures.
  - Sec 15.4: Added SOP# ED-MTP-002 to the list of references; adjusted subsequent sections accordingly.
  - Sec 10.2.8 and 12.4: Added information related to Ag QC spiking for LLOQ.

- Revision 9, dated 29 September 2021
  - Sec. 7.2.1 and 7.2.3: Revised the concentration of TA-CAL2 to 2,000 mg/L to reflect the concentration in the COA for the standard.
  - Sec. 7.2.4: Revised the volume of TA-CAL2-SS added in the preparation of the ICV working standard to 2.0 ml to reflect actual laboratory practices.

- Revision 8, dated 10 June 2020
  - Updated SOP header to Eurofins logo.
  - Throughout the SOP removed all method 6020A references.
  - Throughout the SOP removed all references to 2%HNO_3/0.5%HCl and replaced with 5%HNO_3/5%HCl.
  - Sec 1.1, Table 1: removed references to typical dilutions. Updated the RLs for Selenium

- Sec 6.1: Added two ICPMS instruments, Agilent 7800 & 7900. Removed reference to resolution and grating. Added instrument mass range. Updated the models of the heat exchanger and autosampler.
- Sec 7.1.6: Added preparation instructions for 5%HNO_3/5%HCl.
- Sec 7.2.1: Replaced Inorganic Ventures with CPI International as the vendor for the stock cal stds. Updated all stock standards to reflect this change.
- Sec 7.2.2: Updated preparation instructions for the working cal standards.
- Sec 7.2.2.1: Added preparation instructions for MS-Cal-Int.
- Sec 7.2.3: Updated the Initial calibration verification stock standards.
- Sec 7.2.4: Updated preparation instructions for the ICV working standard.
- Sec 7.2.4.1: Added preparation instructions for MS-ICV-Int.
- Sec 7.2.6: Updated preparation instructions for the Internal standard. Changed recommended mass for Ca from 44 to 40. Updated typical referenced internal std for As & Se from Ge to Sc. Updated typical analysis mode used for Iron, Beryllium, and Boron.
- Deleted Sec 7.2.7, LLICV; subsequent sections adjusted accordingly.
- Sec 7.2.7: Replaced Inorganic Ventures with CPI International as the vendor for the stock ICSA standard. Added stock concentrations for ICSA.
- Sec 7.2.8: Updated preparation instructions for working ICSA.
- Sec 9.1.2: Updated preparation instructions for the LCS water samples.
- Sec 9.1.4.1: Updated preparation instructions for the aqueous matrix spikes (MS).
- Deleted Sec 9.2.4, LLICV/LLCCV; subsequent sections adjusted accordingly.
- Sec 9.2.5: Updated preparation instructions for Linear Range Standard (LRC), solutions (LRC)-A and (LRC)-B. Deleted (LRC)-C.
- Deleted Sec 9.3.2, Linear Dynamic Range.
- Sec 10.2.2: Added reference material, MassHunter Workstation User Guide, for the ICPMS instruments 7800 & 7900. Removed references to ICPMS1&2 (includes Chemstation software and relating Operation Manuals) from this SOP.
- Sec 10.2.4: Added instrument method program and reference material, MassHunter Workstation User Guide, for the ICPMS instruments 7800 & 7900.
- Sec 10.2.8.1 & 10.2.8.2: Added Low-Level readback evaluation instructions for aqueous and soil samples.
- Sec 10.2.8.3: Updated Mid-Level readback evaluation instructions.
- Sec 10.3.2: Updated typical dilution instructions.
- Sec 10.3.4: Updated Typical Analytical Sequence table to reflect current laboratory practices.
- Sec 11.5: Added %Relative Error calculation equation.
- Deleted Sec 12.4 LLQC; subsequent sections adjusted accordingly.
- Sec 12.4.1: Updated preparation instructions for LLOQ.
- Sec 12.4.2: Added instructions for the On-going LLOQ verification.
- Deleted references, ICPMS Operator's Manual, Sec 15.2, 15.9, 15.10, not applicable.
- Sec 15.8: Added reference for the Agilent ICPMS 7800/7900 User Guide.
- Sec 18.0, Attachment 1: Updated calibration, ICV, CCV concentrations; removed dilution instructions.

- Sec 18.0, Attachment 2: Updated ICSA analyte list and concentrations.

- Revision 7, dated 3 July 2018
  - Sec 1.1: Added Method 6020B to the list of methods applicable to this SOP
  - Throughout the SOP removed all references to Reagent Water and replaced with 2%HNO_3/0.5%HCl
  - Sec 7.2 & Sec 7.2.4: Updated the ICV preparation frequency for method 6020B to daily.
  - Sec 7.2.8 & 7.2.9: Renamed “ICP Interference Check Solutions” and ‘Working Interference Standards” to Spectral Interference check solution (SIC).
  - Sec 7.2.9: Added ICSA preparation instructions for method 6020B
  - Sec 9.1 Table & Sec 9.1.1.2: Added MB control limit criteria for method 6020B
  - Sec 9.1.6.5: Added serial dilution control limit criteria for method 6020B
  - Sec 9.1.7.4: Added PDS control limit criteria for method 6020B
  - Sec 9.2 Table 2: Added calibration curve correlation coefficient criteria, ICB/CCB criteria, Internal Standard recovery criteria, and Linear Range Check control criteria and frequency for Method 6020B.
  - Sec 9.2.3: Added ICB and CCB control criteria for method 6020B
  - Sec 9.2.6: Added LRC preparation and control limit criteria for method 6020B
  - Sec 9.3.2.2: Added Linear Range check (LRC) to the Instrument Performance Criteria.
  - Sec 10.2.7: Added calibration curve correlation coefficient criteria for 6020A and 6020B
  - Sec 10.2.8: Added calibration curve read-back instructions for method 6020B
  - Sec 10.3.4: added LRC-A, LRC-B, LRC-C to the typical Analytical Sequence Table.
  - Sec 11.5.4: Removed the Metals Data Review Checklist. Added instructions to complete the Data Review Checker (DRC) in TALS.
  - Sec 12.5: Added LLOQ standard preparation and criteria information.
  - Remove Sec 15.11 – Removed reference to WI CA-Q-WI-044, WI not applicable.
  - Attachment 1: Added LLQC and LLOQ on this Table.

- Revision 6, dated 27 April 2018
  - Sec 7.2.11.1: Added Magnesium as one of the working tune check standard constituents.
  - Sec 9.1.2: Revised to clarify the acceptance criteria used in the COA when evaluating recoveries for LCS in soil matrix.

- Revision 5, dated 29 November 2016
  - Sec 7.1.6: removed ICPMS Reagent Dilution logbook and replaced with TALS Reagent Module.
  - Sec 7.2.1: added calibration stock standards STLNJ-STD-1 & STLNJ-STD-2
  - Sec 7.2.2: added updated preparation instructions for Cal1 to reflect lab practices
  - Sec 7.2.6: added typical analysis mode for Selenium, i.e., Hydrogen. Updated the resolution check criteria to reflect lab practices
  - Sec 11.5.4: removed reference to checklist CA-Q-WI-004 and replaced with EDS-WI-

146
- Attachment 1: updated Cal1 standard concentrations; removed the linear range column

- Revision 4, dated 13 November 2015
  - Throughout the SOP removed all reference to SOP# ED-MTP-002 (SW method 3005).
  - Sec 1.1: Revised RL for Ag to reflect actual laboratory's RL.
  - Sec 7.2.1: Removed calibration standard solution STLNJ-STD-1 and STLNJ-STD-2 (Cal 1) and added standard TA-88.
  - Sec 7.2.2: Revised preparation procedure for CAL1; replaced calibration standard solution STLNJ-STD-1 and STLNJ-STD-2 with standard TA-88. Deleted prep instructions for ME_Se_1ppm.
  - Sec 7.2.6: Updated the preparation instruction of the working internal standard solution to include Triton X-100.
  - Sec 9.1 and 9.1.5: Added Matrix Spike Duplicate (MSD) to the list of Sample QC. Subsequent sections adjusted accordingly.
  - Sec 11.5.4: Updated the metals data review checklist form number.
  - Sec 15: Removed reference to SOP ED-MTP-002 (method 3005A) in Sec 15.4; Deleted Data review checklist WI# EDS-WI-007 in Sec 15.10, checklist is referenced in the applicable digestion SOP; subsequent sections adjusted accordingly.
  - Sec 15.11: Replaced Data review checklist (EDS-WI-123) with the standardized Data review checklist WI# CA-Q-WI-043.

- Revision 3, dated 19 August 2013
  - Sec 1 & 12: Revised LQM section references to reflect the most current LQM revision.
  - Sec 7.2.11: Added EPA Tune Check stock standard including preparation and analysis instructions.
  - Sec 10.2.2 & Sec 10.2.4: Added the Operating Manual and Tuning & Application Handbook calibration information for the Mass Hunter Software (ICPMS2)
  - Sec 11.5.4: Added requirement to complete the Initial Calibration Data Review checklist (EDS-WI-123) prior to data submission.
  - Sec 15.11 & 15.12: Added reference information for the Tuning & Application Handbook and MassHunter Workstation Operator's Manual.
  - Sec 15.13: Added reference information for TestAmerica Edison Metals Initial Calibration Data Review checklist.

- Revision 2, dated 23 August 2011
  - Sec 7.2.2 Revised preparation procedure for CAL 1; changed added amount of STLNJ-STD-1 and STLNJ-STD-2 from 2 ml to 4ml

- Revision 1, dated 10 March 2011
  - Sec 1.1 Table 1: Revised RL for soil and water

- Sec 7.2.2: Revised preparation procedure for CAL1; added prep for ME_Se_1ppm.
- Attachment 1: Revised the spiking concentration for the calibration, LLICV/LLCCV and MS concentration.

Attachment 1

STANDARDS AND MATRIX SPIKING CONCENTRATIONS

Name	Mass	Cal-1	Cal-2	Cal-3	Cal-4/CCV	Cal-5	ICV	*Water*	*Soil*
		(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)	*(ug/L)*	*(mg/Kg)*
Be	9	0.8	4	50	100	200	80	*25*	*5*
B	11	80	400	125	250	500	200	*500*	*100*
Na	23	200	1000	12500	25000	50000	20000	*2500*	*500*
Mg	24	200	1000	12500	25000	50000	20000	*2500*	*500*
Al	27	40	200	12500	25000	50000	20000	*2500*	*500*
K	39	200	1000	12500	25000	50000	20000	*2500*	*500*
Ca	40	200	1000	12500	25000	50000	20000	*2500*	*500*
Ti	47	4	20	50	100	200	80	*50*	*10*
V	51	4	20	50	100	200	80	*50*	*10*
Cr	52	4	20	50	100	200	80	*50*	*10*
Mn	55	8	40	50	100	200	80	*250*	*50*
Fe	56	120	600	12500	25000	50000	20000	*2500*	*500*
Co	59	4	20	50	100	200	80	*25*	*5*
Ni	60	4	20	50	100	200	80	*50*	*10*
Cu	63	4	20	50	100	200	80	*50*	*10*
Zn	66	16	80	125	250	500	200	*250*	*50*
As	75	2	10	50	100	200	80	*50*	*10*
Se	78	2.5	12.5	50	100	200	80	*50*	*10*
Sr	88	4	20	50	100	200	80	*50*	*10*
Mo	95	4	20	50	100	200	80	*50*	*10*
Ag	107	2	10	25	50	100	40	*25*	*5*
Cd	111	2	10	50	100	200	80	*25*	*5*
Sn	118	16	80	50	100	200	80	*50*	*10*
Sb	121	2	10	50	100	200	80	*25*	*5*
Ba	137	4	20	50	100	200	80	*50*	*10*
Tl	205	0.8	4	50	100	200	80	*20*	*4*
Pb	208	1.2	6	50	100	200	80	*25*	*5*

Attachment 2

ELEMENT	ICSA (ug/L)
Sodium	100000
Magnesium	100000
Aluminum	100000
Potassium	100000
Calcium	100000
Titanium	2000
Iron	100000
Molybdenum	2000
Chloride	1000000
Carbon	200000
Phosphorus	100000
Sulfur	100000

Title: Mercury Analysis for Solid and Semisolid Waste Samples using the Leeman Mercury Analyzer (Cold Vapor Technique) by SW846 Method 7471B

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Approvals (Signature/Date):

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1.0 Scope and Application

1.1. Analytes, Matrix(s), and Reporting Limits

SW846 Method 7471B is applicable to the determination of total mercury (organic and inorganic) in soils, sediments, bottom deposits, and sludge-type materials. All samples must be digested prior to analysis. If this digestion procedure is not sufficient to dissolve a specific matrix type or sample, then this method is not applicable for that matrix.

The typical detection limit using a 0.6 gram sample size is 0.017 mg/Kg Hg.

On occasion clients may request modifications to this SOP. These modifications are handled following the procedures outlined in Sections 7 (Review of Work Request) and 19 (Test Methods and Method Validation) of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

2.0 Summary of Method

The sample is digested as described in this SOP and is analyzed using cold vapor atomic absorption. The mercury is reduced to the elemental state and aerated from solution in a closed system. The mercury vapor passes through a cell positioned in the light path of an atomic absorption spectrophotometer. Absorbance at 253.7-nm is measured as a function of mercury concentration.

3.0 Definitions

For a complete list of definitions refer to Appendix 2 in the most current revision of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

4.0 Interferences

4.1 Potassium permanganate is added to eliminate possible interferences from sulfide.

4.2 Copper may also be a potential interference although no effect has been observed for samples containing up to 10 mg/Kg Copper.

4.3 Samples high in chlorides require additional permanganate (as much as 25 mL) because, during the oxidation step, chlorides are converted to free chlorine, which also absorbs radiation of 254 nm. Care must therefore be taken to ensure that free chlorine is absent before the mercury is reduced and swept into the cell. This may be accomplished by using an excess of hydroxylamine hydrochloride reagent (25 mL).

4.4 Certain volatile organic materials that absorb at 253.7 nm may also cause interference. The analysis of the undigested sample should determine if this type of interference is present.

5.0 Safety

Employees must abide by the policies and procedures in the Corporate Environmental Health and Safety Manual (CW-E-M-001) and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum.

5.1. Specific Safety Concerns or Requirements

Samples that contain high concentrations of carbonates or organic material or samples that are at elevated pH can react violently when acids are added.

5.2. Primary Materials Used

The following is a list of the materials used in this method, which have a serious or significant hazard rating. **Note: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the MSDS for each of the materials listed in the table.** A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the MSDS for each material before using it for the first time or when there are major changes to the MSDS.

Material (1)	Hazards	Exposure Limit (2)	Signs and symptoms of exposure
Mercury (1,000 PPM in Reagent)	Oxidizer Corrosive Poison	0.1 mg/M^3 Ceiling (Mercury Compounds)	Extremely toxic. Causes irritation to the respiratory tract. Causes irritation. Symptoms include redness and pain. May cause burns. May cause sensitization. Can be absorbed through the skin with symptoms to parallel ingestion. May affect the central nervous system. Causes irritation and burns to eyes. Symptoms include redness, pain, and blurred vision; may cause serious and permanent eye damage.
Sulfuric Acid	Corrosive Oxidizer Dehydrator Poison	1 mg/M^3-TWA	Inhalation produces damaging effects on the mucous membranes and upper respiratory tract. Symptoms may include irritation of the nose and throat, and labored breathing. Symptoms of redness, pain, and severe burn can occur. Contact can cause blurred vision, redness, pain and severe tissue burns. Can cause blindness.
Nitric Acid	Corrosive Oxidizer Poison	2 ppm-TWA 4 ppm-STEL	Nitric acid is extremely hazardous; it is corrosive, reactive, an oxidizer, and a poison. Inhalation of vapors can cause breathing difficulties and lead to pneumonia and pulmonary edema, which may be fatal. Other symptoms may include coughing, choking, and irritation of the nose, throat, and respiratory tract. Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and stain skin a yellow or yellow-brown color. Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
Hydrochloric Acid	Corrosive Poison	5 PPM-Ceiling	Inhalation of vapors can cause coughing, choking, inflammation of the nose, throat, and upper respiratory tract, and in severe cases, pulmonary edema, circulatory failure, and death. Can cause redness, pain, and severe skin burns. Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.

Material (1)	Hazards	Exposure Limit (2)	Signs and symptoms of exposure
Potassium Permanganate	Oxidizer	5 Mg/M^3 for Mn Compounds	Causes irritation to the respiratory tract. Symptoms may include coughing, shortness of breath. Dry crystals and concentrated solutions are caustic causing redness, pain, severe burns, brown stains in the contact area and possible hardening of outer skin layer. Diluted solutions are only mildly irritating to the skin. Eye contact with crystals (dusts) and concentrated solutions causes severe irritation, redness, and blurred vision and can cause severe damage, possibly permanent.
1 – Always add acid to water to prevent violent reactions.			
2 – Exposure limit refers to the OSHA regulatory exposure limit.			

6.0 Equipment and Supplies

6.1. Instrumentation

6.1.1. Leeman Laboratories Inc. Hydra IIAA Automated Hg Analyzer

6.1.2. Computer and Monitor with Leeman Envoy software.

6.1.3. Top loader balance, 300gm capacity, and minimum sensitivity of ±1.0 mg

6.1.4. Hotblock digestor: Adjustable and capable of maintaining a temperature between 95 ±3°C.

6.2. Supplies

6.2.1 Pipettes and tips in various sizes

6.2.2 100 ml volumetric flasks

6.2.3 15 ml sample cups

6.2.4 Pump tubing:

- Sample, viton, blue tab
- Reductant, red tab
- Drain, blue tab

- Rinse, Black tab

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6.2.5 Drying Tube – Purchased pre-packed with Magnesium Perchlorate from Leeman Labs. Located prior to the optical cell.

6.2.6 Nitrogen or Argon supply - capable of producing 80 PSI.

7.0 Reagents and Standards

Storage requirements: store at room temperature

Life of Reagent: Concentrated acids: refer to manufacturer's instructions
Laboratory prepared reagents and diluted acids: one year

Record reagent preparations in the TALS Reagent Module.

7.1 Reagents

7.1.1 Nitric acid - Concentrated (Trace Grade or Equivalent); store at room temperature; for stability information, refer to manufacturer's instructions

7.1.2 Hydrochloric acid-Concentrated (Trace Grade or Equivalent); store at room temperature; for stability information, refer to manufacturer's instructions.

7.1.3 Potassium Permanganate (ACS Grade); store at room temperature; for stability information, refer to manufacturer's instructions.

7.1.4 Sodium Chloride (analytical reagent grade); store at room temperature; for stability information, refer to manufacturer's instructions.

7.1.5 Hydroxylamine Hydrochloride (ACS Grade); store at room temperature; for stability information, refer to manufacturer's instructions.

7.1.6 Stannous Chloride (ACS Grade); store at room temperature; for stability information, refer to manufacturer's instructions.

7.1.7 Deionized water - 18 megohm minimum

7.1.8 10% Hydrochloric Acid- Cautiously add 200 ml of concentrated HCl to a container and bring to final volume of 2 liters with deionized water. Store at room temperature; stable for one year.

7.1.9 Stannous chloride solution - Add 50 g of $SnCl_2$ to 500 ml 10% HCl solution. Store at room temperature; stable for one year.

7.1.10 Sodium chloride/Hydroxylamine Hydrochloride solution - Dissolve 120 g of NaCl and 120 g of hydroxylamine hydrochloride in deionized water and dilute to 1 liter using deionized water. Store at room temperature; stable for one year.

7.1.11 Potassium permanganate ($KMnO_4$) 5% solution w/v - Dissolve 100 g of $KMnO_4$ in deionized water and dilute to 2 liters using deionized water. Store at room temperature; stable for one year.

7.1.12 0.15% Nitric Acid- Add approximately 5 liters of deionized water into an 8 liter carboy container. Cautiously add 12mL of concentrated HNO_3 and bring the final volume up to 8 liters with deionized water.

7.2 Standards

Storage requirements: all standards are stored at room temperature

Shelf-life: Stock standards – refer to manufacturer's instructions
Intermediate standards – made fresh daily
Working standards – made fresh daily
(Note: expiration date must not go beyond the expiration date of the source stock).

Concentration: see Attachment 1 for example certificates of analysis (COA) of Hg standards listed below. The COA lists the manufacturer's Lot number, certified concentration and shelf life.

Document standard preparation in TALS, see Sec 11.5.3.

7.2.1 Stock Mercury Calibration (10 ppm Hg) - Purchase from SCP Science; store at room temperature; for stability information, refer to manufacturer's instructions.

7.2.2 Secondary Stock Mercury Calibration Standard (10 mg/L Hg) - Purchase from Inorganic Ventures; store at room temperature; for stability information, refer to manufacturer's instructions.

7.2.3 Intermediate Calibration Standard (DCAL-Int), 100 ug/L Hg: Dilute 1 ml of Hg calibration stock standard solution (Sec 7.2.1) to 100 ml with 0.15% HNO_3.

7.2.4 Intermediate Initial Calibration Verification Standard (DQCS-Int), 100 ug/L Hg: Dilute 1 ml of Hg stock Calibration Verification standard, 10ppm Hg (Sec 7.2.2) solution to 100 ml with 0.15% HNO_3.

7.2.5 Calibration Standards: Use six 50 ml hotblock cups to prepare the standards. Spike the calibrations standards cups as follows:

Calibration Standard	DCAL-Int Spike Volume (mL)	0.15% HNO_3 (mL)	Final Conc (ug/L)
Std1 (Cal Blk)	0	5	0
Std 2	0.1	4.9	0.2
Std 3	0.5	4.5	1
Std 4	1	4	2
Std 5	2.5	2.5	5
Std 6	5	0	10

Digest the standards following Sample preparation in Section 10.1.

7.2.6 Initial Verification Standard (ICV) 5.0 ppb: Using a hotblock cup, add 2.5 mL of 0.15 HNO_3 and 2.5 ml of DQCS-INT, (Sec 7.2.4). Digest the standard following Section 10.1. After digestion, the ICV will contain 5.0 ppb of Hg.

7.2.7 Continuing Calibration Verification Standard (CCV) 5.0 ppb: Follow the preparation instructions for Std 5 (see Sec 7.2.5)

8.0 Sample Collection, Preservation, Shipment and Storage

Sample container, preservation techniques and holding times may vary and are dependent on sample matrix, method of choice, regulatory compliance, and/or specific contract or client requests. Listed below are the holding times and the references that include preservation requirements.

Matrix	Sample Container	Min. Sample Size	Preservation	Holding Time [1]	Reference
Soils	Plastic Glass	5 grams	Cool 4 ± 2ºC	28 Days	SW846 Method 7471B

[1] Inclusive of digestion and analysis.

Samples are to be analyzed without drying. A separate procedure is used to determine the percent solids in the sample.

For sample homogenization procedures refer to TestAmerica Edison SOP ED-GEN-007 (Subsampling).

9.0 Quality Control

9.1. **Sample QC** - The following quality control samples are prepared with each batch of samples.

Quality Controls	Frequency	Control Limit
Method Blank (MB)	1 in 20 or fewer samples	< RL; 5% of the regulatory limit; 5% of the measured concentration in the sample
Laboratory Control Soil Sample Reference Material (LCSSRM) in soil samples	1 in 20 or fewer samples	Vendor's certified limit
Matrix Duplicate (DUP)[1]	1 in 20 or fewer samples	If original sample and dup are both ≥ 5X RL, then 20% RPD. If original sample and duplicate are less than the RL, the RPD is not calculated; otherwise ±RL.
Matrix Spike (MS)[1]	1 in 20 or fewer samples	80-120%
Matrix Spike Duplicate (MSD)[2]	1 in 20 or fewer samples	80-120%; If original sample and dup are both ≥ 5X RL, then 20% RPD. If original sample and duplicate are less than the RL, the RPD is not calculated; otherwise ±RL.
Serial Dilution (SD)	1 in 20 or fewer samples	±10%

[1] The sample for DUP and MS are randomly selected, unless specifically requested by a client; Use the same environmental sample for the matrix spike and matrix duplicate sample whenever possible. If insufficient sample amount is available, another environmental sample may be used for the duplicate sample.
[2] A MSD is prepared and analyzed when requested by the client.

9.1.1. Method Blank: One laboratory method blank will be analyzed with each batch of samples prepared together (not to exceed 20 samples). The method blank is used to identify possible contamination during acid digestion. Results must be less than the RL, 5% of the regulatory limit for that analyte, or 5% of the measured concentration in the sample. If the analyte concentration in the method blank is above this control limit, the batch must be prepared again and the samples reanalyzed.

9.1.2. Laboratory Control Sample Soil Reference Material (LCSSRM: A laboratory control sample must be analyzed with each group of samples digested. For solid matrices, a vendor supplied solid matrix with certified values is carried through the same preparation procedure as the samples. The results of the solid LCS must fall within the 'QC Performance acceptance limits' of the reference material used for that sample. If not, all samples prepared in association with the LCS must be redigested and reanalyzed.

9.1.3 Matrix Duplicate (DUP): A duplicate is analyzed for each batch of samples digested. If original sample and duplicate are both ≥ RL, then 20% RPD. If original sample and duplicate are less than the RL, the RPD is not calculated; otherwise, ±RL.

9.1.4 Matrix Spike (MS): A matrix spike is prepared and analyzed for each batch of samples. A portion of sample is spiked with 0.5 mL of DCAL-Int (Sec 7.2.3). This is equivalent to 1.0 ppb Hg (on instrument). A recovery of 80-120% is required.

9.1.5 Matrix Spike Duplicate (MSD): A matrix spike duplicate is prepared and analyzed when requested by the client. A portion of sample is spiked with 0.5 mL of DCAL-Int (Sec 7.2.3). This is equivalent to 1.0 ppb Hg (on instrument). A recovery of 80-120% is required. If matrix spike sample and matrix spike duplicate sample are both ≥ RL, then 20% RPD. If original sample and duplicate are less than the RL, the RPD is not calculated; otherwise, ±RL

9.1.6 Serial Dilution (SD): A five fold serial dilution must be performed on one sample per batch. The sample should contain a sufficiently high concentration; minimally a factor of 25 times the estimated detection limit. Dilute the sample by a minimum of five fold (1+4) and reanalyze. The results must agree within 10% of the original determination. If not, a chemical or physical effect should be suspected.

9.2. Instrument QC

9.2.1 Initial Calibration Verification (ICV): Initial calibration is verified after calibration using an independent check standard at a concentration near

the mid-point of the calibration (5.0ppb); see Sec 7.2.6 for preparation instructions. The results must be within 10% of the true value. If it's outside of the acceptable limits, terminate the analysis, correct the problem and recalibrate the instrument.

9.2.2 **Continuing Calibration Verification (CCV):** Calibration verification is performed after the calibration, after every 10 samples, and at the end of the run. Use a concentration of mercury at the midpoint of the calibration range (5.0 ppb). See Sec. 7.2.7 for preparation instructions. The value obtained must be within 10% of the true value. If not, stop the analysis and recalibrate. Re-analyze the previous ten samples following the last good calibration verification. .

9.2.3 **Initial and Continuing Calibration Blank (ICB/CCB):** ICB/ CCB must be analyzed after the calibration curve, every 10 samples, and at the end of the analytical run. The absolute value of the calibration verification blank must not exceed the reporting limit. If it does, terminate the analysis, correct the problem, recalibrate and reanalyze the samples following the last good CCB. The calibration verification blank is the same blank solution as used for the calibration blank.

10 Procedure

10.1. Sample Preparation (includes all samples, standards, and blanks)

10.1.1 Mix the sample well and weigh 0.5 - 0.6 grams of sample (including the LCSSRM) and place in the bottom of an appropriately identified 50 mL hotblock cup. For QA samples, weigh three portions of 0.5 - 0.6 grams of sample and place in the bottoms of three hotblock cups labeled as SAMPLE, DUP, and MS. Before adding any reagents, spike the MS sample with 0.5 mL of DCAL-Int standard.

10.1.2 Except the calibration standards, add 5 mL of deionized water to all hotblock cups (i.e., all field samples, MB, LCSSRM, Dup, and MS).

10.1.3 Add 1.5 ml concentrated HNO_3 and 4.5 ml concentrated HCl. Heat 2 min on the hotblock at 95 $\pm$3°C. Cool.

10.1.4 Add 15 mL deionized water and 15 mL potassium permanganate solution (Sec 7.1.11) to each hotblock cup. Mix well. The same amount of $KMnO_4$ must be added to the standards and samples.

10.1.5 Cap the hotblock cups loosely enough so that pressure does not build up but also tight enough so that the caps stay on and that volume loss due to heating is minimized. Heat 30 min on the hotblock at 95 $\pm$3°C. Cool.

10.1.6 To each hotblock cup, add 6 ml Sodium chloride - Hydroxylamine hydrochloride solution to reduce excess permanganate.

10.1.7 Using deionized water, bring to a 50 mL final volume. Cap and mix well.

10.2. Calibration

10.2.1 The instrument must be calibrated daily or once every 24 hours and each time the instrument is set up. The instrument is calibrated according to the manufacturer's specifications and must contain at least four standards and a blank. The laboratory currently uses five standards and a blank. The correlation coefficient of the calibration curve must be ≥0.995. If it does not, the problem must be corrected, and the instrument must be recalibrated. Standard preparations must be documented in the in TALS reagent module.

10.2.2 Prepare the calibration standards and Calibration Verification Standards as stated in Sections 7.2.5, 7.2.6., & 7.2.7.

10.2.3. Calibration Curve Read-Back:

10.2.3.1. Low-Level Readback (at the RL) – evaluate the 0.2 ug/L calibration standard. The %RE (relative error) must be +/- 20% of the true value (see Sec 11.4). If %RE is outside of the criteria limits, stop the analysis and recalibrate.

10.2.3.2. Mid- Level Readback – evaluate the 5.0 ug/L calibration standard (the mid-level calibration standard). The %RE (relative error) must be +/- 10% of the true value (see Sec 11.4). If %RE is outside of the criteria limits, stop the analysis and recalibrate

10.3. Sample Analysis

10.3.1 Following a sample digestion procedure, the samples are ready for instrumental analysis. It is advisable to investigate each matrix for any complexities, which might adversely affect the acquisition of valid data.

10.3.2 The following analytical run sequence is currently used for samples analyzed under Method 7471B:

Instrument Calibration (Blank and five standards)
ICV
ICB
CCV
CCB

10 Samples
CCV
CCB
10 Samples
CCV
CCB
Repeat until run is complete
CCV
CCB

10.3.3 Instrument Operation:

10.3.3.1 Turn on instrument, computer and monitor.

10.3.4 Plumbing the Reagent Lines:

10.3.4.1 One at a time, feed each of the pump tubes into a pump cassette, sliding the tube through the plastic clips at the bottom until the plastic tab is secure. Then, holding the tube taut, slide the loaded cassette onto the pump head and click the clamp, lever up. The tab end of the tube should be located at the front of the pump head.

10.3.4.2 Reductant (Red); Connect tab end of tube to the reductant bottle and the other end to the bottom of the mixing tee.

10.3.4.3 Sample (Blue); Connect tab end of tube to the autosampler probe and the other end to the top of the mixing tee.

10.3.4.4 Drain (Blue) Connect the tab end of tube to the sample discharge tube connected on the Liquid/Gas separator and the other end to the waste line.

10.3.4.5 Rinse (Black): Connect tab end of tube to rinse tubing that is connected to the rinse bottle. Connect the other end to the rinse tubing leading to the rinse cup.

10.3.5 Preparation of Reagents:

10.3.5.1 Pour the $SnCl_2$ solution into the reductant bottle and connect to the red reductant tube connector.

10.3.5.2 Pour the ten percent HCl solution into the Rinse reservoir bottle.

10.3.6 Starting Program:

10.3.6.1 Click the Envoy icon on the computer desktop

10.3.6.2 Click Method, select 7471_7471B, and select OK
10.3.6.3 On the main screen, click the StartUp icon. Wait 15 minutes before analyzing calibrating.
10.3.6.4 Click Sequence Tab on bottom of screen
10.3.6.5 Click Sequence on top of screen
10.3.6.6 Select Open, then select New
10.3.6.7 Using the Prep Batch Sheet and hand scanner, enter the sample barcodes into the Sample ID column. Include the Serial Dilution and all needed sample dilutions
10.3.6.8 Pour out the digested calibration standards and samples into the proper locations on the autosampler.
10.3.6.9 Click the Run Sequence icon to begin calibration and to run samples.

10.3.7 Creating the Raw Data PDF:

10.3.7.1 Click the Analysis Tab, select Detailed

10.3.7.2 Click Load, select Use This To Make PDF

10.3.7.3 Click Report, Click Printer

10.3.7.4 Include the calibration curve graph:

10.3.7.4.1 Go to Methods Tab and click Calibration, click Print

10.3.7.5 Combine both documents using the PDF Creator program. The new document is located in the Documents folder on the C:\ drive. Add this document to the "Doc's" location in the analytical batch.

10.3.8 Shutting Down the Instrument:

10.3.8.1 Click the Stop icon on the main screen

11.0. Calculations / Data Reduction

11.1. Accuracy:

$$\text{ICV / CCV, LCS \% Recovery} = \frac{\text{observed concentration}}{\text{known concentration}} \times 100$$

11.2. Precision (RPD):

Matrix Duplicate (MD) = $\frac{|\text{orig. sample value - dup. sample value}|}{[(\text{orig. sample value + dup. sample value})/2]} \times 100$

11.3. Concentration: (mg/Kg) = $\frac{C \times V1 \times D}{W}$

Where: C= Element concentration from instrument (ppb)
V1= Final volume of sample digested (in liters)
D= Dilution performed on sample
W= Initial weight of sample digested (in gram)

NOTE: All dry weight corrections are made in LIMS at the time the final report is prepared.

11.4. Relative Error (%RE):

% Relative Error = (100) (MC-TC)/TC

MC = Measured Concentration of the calibration standard
TC = True Concentration for the calibration standard

11.5. Data Processing:

11.5.1. All data is recorded directly in TALS' Analyst Desktop II program.

11.5.2. Import Data to TALS

11.5.2.1. Click the Analysis tab
11.5.2.2. Select the analytical run that needs to be imported
11.5.2.3. Select Statistics
11.5.2.4. Click Load and select TALS Import, click OK
11.5.2.5. Click Report, click CSV File
11.5.2.6. Name the import file (e.g., batch name, today's date)
11.5.2.7. The newly created import file is in the Import Folder on the desktop. Send to TALS Import Folder

11.5.3. Sample and standard preparations must be documented in the Analyst Desktop II program located in TestAmerica Laboratory System (TALS). The analyst must enter the following information: Source standard, Initial and final sample volume, spike name and amount used, all reagents and their corresponding lot numbers, creation and expiration dates.

11.5.4. All reagents must be recorded in TALS Reagent Module.

11.5.5. Complete the Data Review Checker (DRC) in TALS: Prior to data submission (i.e., prior to 1st leveling data in the Analyst Desktop II module in TALS), the analyst must execute the DRC (Data Review Checker) program in the applicable preparation batch.

11.5.5.1. Open the preparation batch and click on the Edit tab above to enter the Edit Mode.

11.5.5.2. Press F8 command key on the computer keyboard or right click anywhere on the batch worksheet then click on 'Run checklist.'

11.5.5.3. Acknowledge by filling in responses to all unacknowledged findings.

11.5.5.3.1. Highlight the checklist with findings, then highlight the associated list of findings; right click and choose 'Acknowledge Item.'

11.5.5.3.2. Fill in appropriate comments in the response box, then hit 'OK.'

11.5.5.3.3. Acknowledge all Finding items in the 'Manual Batch Checklist' except for the *"2nd Level review complete?"* this is to be completed by the 2nd level reviewer.

11.5.6. Record the following reagents and the volume used for sample preparation in the batch information page under "batch comments" in TALS Analyst Desktop II: concentrated sulfuric acid, concentrated nitric acid, potassium permanganate, potassium persulfate and sodium chloride-hydroxylamine hydrochloride. Record reagents in TALS by opening the prep batch, click on "edit" and then right click to choose "view batch information." Enter the information in the "batch comments" section.

12.0. Method Performance

12.1. Method Detection Limit Study (MDL)

The method detection limit (MDL) is the lowest concentration that can be detected for a given analytical method and sample matrix with 99% confidence that the analyte is present. The MDL is determined according to the laboratory's MDL procedure in Section 19 (Test Methods and Method Validation) of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM). MDLs reflect a calculated (statistical) value determined under ideal laboratory conditions in a clean matrix, and may not be achievable in all environmental matrices. The laboratory maintains MDL studies for analyses performed; these are verified at least annually unless method requirements require a greater frequency.

12.2 Instrument Detection Limit

The IDL for each analyte must be determined for each wavelength used on each instrument. The IDL must be determined annually or if the instrument is adjusted in any way that may affect the IDL. The IDL is determined by multiplying the average of the standard deviations obtained from the analysis of seven reagent blanks by 3.14.

12.3 Demonstration of Capabilities

For DOC procedure refer to Section 20 in the most current revision of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

12.4 Training Requirements

Refer to TestAmerica SOP No. ED-GEN-022, Training, for the laboratory's training program.

12.5. Lower Limit of Quantitation (LLOQ)

12.5.1. LLOQ verification: prior to analyzing samples under method 7470A, after any change that may affect the LLOQ, and quarterly, the LLOQ must be verified. The LLOQ is initially verified by the analysis of 7 replicate samples spiked at the LLOQ (0.2 ppb). The seven replicates must be digested prior to analysis. The LLOQ is verified when the mean recovery of the 7 replicates is +/-30% of the true value and the RSD < 20%.

12.5.2. LLOQ on-going verification: the LLOQ is re-verified quarterly by the analysis of a method blank (MB) and 1 blank sample (deionized water spiked at the LLOQ (0.2 ppb). The MB and LLOQ samples must be digested prior to analysis. The LLOQ is re-verified if the MB result is +/- 0.5 times the reporting limit for each analyte and when the recovery of the LLOQ sample is +/-30% of the .true value.

13.0. Pollution Control

It is TestAmerica's policy to evaluate each method and look for opportunities to minimize waste generated (i.e., examine recycling options, ordering chemicals based on quantity needed, preparation of reagents based on anticipated usage and reagent stability). Employees must abide by the policies in Section 13 of the Corporate Environmental Health and Safety Manual (CW-E-M-001) for "Waste Management and Pollution Prevention.

14.0. Waste Management

14.1. Waste management practices are conducted consistent with all applicable rules and regulations. Excess reagents, samples and method process wastes are disposed of in an accepted manner. Waste description rules and land disposal restrictions are followed. Waste disposal procedures are incorporated by reference to TestAmerica SOP No. ED-SPM-008 (Laboratory Waste Disposal Procedures).

14.2. The following waste streams are produced when this method is carried out:

- Digested Samples: Corrosive Acid- Materials that are not above regulatory limits will be submitted for elementary neutralization with 50% sodium hydroxide solution (Siedler Chemical SC-1824-03). Major concern is heat generated from the neutralization process. Initial volume of acid waste to be neutralized should be no more than 15 gallons. Finished neutralization with sodium bicarbonate (Siedler Chemical SC-0219-25) to a pH of 6 – 9 in the primary tank. Once pH has been established the primary tank is transferred through filter housing to a secondary tank. The pH is rechecked. If the pH is within specifications, the secondary tank is released to the municipal sewer system.

- Samples above regulatory limits and expired RCRA metals standards (Waste Corrosive Liquid, Acidic, Inorganic, n.o.s.) are collected in satellite accumulation and sent off site through a Waste disposal vendor.
  Onyx Profile WIP Number: 590598
  Teris Profile Number 50016653

15.0. References / Cross-References

15.1. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, 3rd ed.,U.S. Environmental Protection Agency, SW846 Manual, Method 7471B, Revision 2, January 1998.

15.2. Leeman Hydra IIAA Operating Manual.

15.3. TestAmerica Edison Document ED-QA-LQM, *Laboratory Quality Manual*, most current revision.

15.4. TestAmerica Edison SOP No. ED-SPM-008, *Laboratory Waste Disposal Procedures*, current revision.

15.5. Corporate Environmental Health and Safety Manual CW-E-M-001, most current revision.

15.6. TestAmerica Edison Subsampling SOP, *ED-GEN-007,* most current revision.

15.7. TestAmerica Edison SOP ED-GEN-022, *Training*, most current revision.

16.0. Method Modifications:

Item	Method #	Modification
1 (Sec 10.3.5.1)	7471B	Stannous Chloride is automatically added via the instrument versus the manual addition of Stannous Chloride as stated in the method. This is an instrument manufacturer's

		improvement that will reduce error due to loss of Mercury.
Sample preparation	7471B	The amount of DI water added to the sample at digestion is decreased to 15 ml from 50 ml (water bath procedure), while keeping the volume of reagents added during sample digestion the same. Sample final volume for hotblock procedure is modified to 50 ml (100 ml – water bath procedure) which allows for lesser sample volume hence less sample waste produced; hotblock digestion cup has maximum volume of 50 ml.

17.0. Attachments

Attachment 1: Certificate of Analysis of stock standards

18.0. Revision History

- Revision 5, dated 11 August 2022
  - Sec 12.5: Added the lower limit of quantitation (LLOQ), associated instructions and recovery limits.
- Revision 4, dated 03 August 2020
  - Updated SOP header with Eurofin logo.
  - Sec 6.1.1 & 15.2: Replaced Hydra AA with Hydra IIAA.
  - Sec 9.1 Table and 9.1.1: Revised MB control limits to <RL.
  - Sec 9.1, 9.1.4 and 9.1.5: Revised MS and MSD acceptance limits to 80-120%.
  - Sec 9.2.2: Revised CCV acceptance limits to +/-10%.
  - Sec 10.2.3: Added calibration curve read-back criteria.
  - Sec 11.4: Added Relative % error calculation.
  - Sec 11.5: Added Relative % error calculation.
  - Sec 11.5.6.: Added requirements to record reagent volumes in the batch information page of TALS ADII; subsequent sections adjusted accordingly.
- Revision 3, dated 12 October 2018
  - Sec 6.1.2: Removed WinHg instrument software reference and replaced with current instrument software, Envoy.
  - Sec 9.1.2: Revised to clarify the acceptance criteria used in the COA when evaluating recoveries for LCS in soil matrix
  - Sec 10.3.6: Updated the Starting Program instructions to reflect the new instrument software, Envoy.
  - Sec 10.3.7 & 10.3.8: Updated instructions for creating raw data pdf and shutting down instrument.
  - Sec 11.4.2: Updated instructions for importing data to TALS.
  - Sec 11.4.5: Replaced Metals Data Review Checklist with Data Review Checker (DRC) in TALS.

- Sec 15.8 & 15.9: Removed reference to EDS-WI-007 & EDS-WI-125; WI not applicable.

- Revision 2, dated 29 Nov 2016
  - Sec 6.1.4, Sec 10.1.3, & 10.1.5: updated the hotblock temperature range per method 7471B requirements
  - Sec 6.2.7: added Argon gas
  - Sec 7.2.4: the name of the intermediate ICV standard has been changed from DICV-Int to DQCS-Int
  - Sec 7.2.6: removed the CCV preparation instructions using the second source standard. The name of the intermediate ICV standard has been changed from DICV-Int to DQCS-Int
  - Sec 7.2.7: added preparation instructions for the CCV using the primary source standard
  - Sec 9.1: added the quality control sample MSD to the table
  - Sec 9.1.5: added quality control information for the MSD
  - Sec 11.4.5: Metals Data Review Checklist control # has been updated from ED-WI-007 to CA-Q-WI-042

- Revision 1, dated 12 May 2014
  - Sec 1.1: Revised the typical detection limit from 0.033 mg/kg to 0.017 mg/kg to reflect the 50mL final volume – hotblock procedure.
  - Sec 1 & 12: Updated LQM section references to reflect the most current LQM revision.
  - Sec 6.1.4: Added hotblock digestor to the list of equipment; removed autoclave from the list.
  - Sec 6.2: Added 50 mL hotblock digestion cups to replace the BOD bottles. Removed supplies which are no longer applicable (BOD bottles, graduated cylinders).
  - Sec 7.0 & 11.4.4: Removed Hg Reagent Logbook and replaced with TALS Reagent Module
  - Sec 7.1. Deleted Sulfuric Acid (previously referenced in Sec 7.1.1). Added 0.15% HNO_3 to list of reagents.
  - Sec 7.2.5: Updated Calibration standards' spiking instructions to reflect the 50 ml final volume.
  - Sec 7.2.6: Updated ICV/CCV spiking instructions to reflect the 50 ml final volume.
  - Sec 8.1: Added plastic container to the list of acceptable sample containers.
  - Sec 9.1 & 9.1.3: Clarified the acceptance limits for Matrix duplicate to reflect actual laboratory practices.
  - Sec 9.1.4: Revised the spiking amount added to the MS sample.
  - Replaced LCSS reference with LCSSRM in various sections of the SOP to reflect TALS QC type reference.
  - Sec 10.1: Revised sample preparation procedure to include hotblock digestor procedure; deleted all reference to autoclave digestion procedure.

- Sec 11.4.5 & 15.9: Added Work instructions EDS-WI-125 (TestAmerica Edison Metals Initial Calibration Data Review for Mercury).
- Sec 16: Added Sample prep method modification (i.e. final volume).

- Revision 0, dated 04 February 2011
  New

Attachment 1

Certificate of Analysis

Catalogue Number : 141-110-111/141-110-112/141-110-115
Description : *Plasma*CAL - **ICP-MS Verification Standard 1 Solution B**
Lot Number : **SC8298812**
Expiration Date : **January 2010**

Analysis of Solution Standard by Inductively Coupled Plasma Spectroscopy (ICP-AES) traceable to NIST Standard Reference Materials : 3133

Actual Concentrations

Hg : 9.98 µg/ml

Matrix : **10% HNO_3**
Density : **1.040 g/ml @ 22.0°C**

MS 0882
Rec'd
1/14/09

Certified by : _____
Thomas Znoj, Chemistry Manager

Certification Date : **October 28, 2008**

This ICP-AES & ICP-MS Standard is guaranteed to be stable and accurate to within plus or minus 1.0% of the actual concentration up to the expiry date, provided the solution is kept tightly capped and stored under normal laboratory conditions. For these solutions, 18 megohm/cm double deionized water, high-purity acids, Class A glassware and acid-cleaned bottles are used. The Material Safety Data Sheet and this Certificate of Analysis are available on our web site. (Également disponible en Français)

Manufactured according to an ISO 9001:2000 Quality System and ISO 17025 (in-process)
SCP SCIENCE
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CERTIFICATE OF ANALYSIS

MS0879
Rec'd 1-12-09

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1.0 **INORGANIC VENTURES** is an ISO Guide 34 "General Requirements for the Competence of Reference Material Producers" and ISO 9001:2000 registered manufacturer. Our manufacturing laboratory is accredited to ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories."

2.0 **DESCRIPTION OF CRM** **10 µg/mL Mercury in 10% (v/v) HCL**

Catalog Number:	MSHG-10PPM
Lot Number:	**B2-HG02061**
Starting Material:	Hg metal
Starting Material Purity (%):	99.999549
Starting Material Lot No:	05214TX
Matrix:	10% (v/v) HCL

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 10.027 ± 0.020 µg/mL

Certified Density: 1.019 g/mL (measured at 22° C)

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

$$\text{Certified Value } (\bar{x}) = \frac{\Sigma x_i}{n}$$

$$\text{Uncertainty } (\pm) = \frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$$

$(\bar{x})$ = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

- "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)
- This product is Traceable to NIST via an unbroken chain of comparisons to the following NIST SRMs:

Title: Digestion of Water and Wastewater Samples for Analysis by ICP and ICP-MS, SW846 Method 3005A

Once printed, this is considered an uncontrolled document

Approvals (Signature/Date):

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1.0 Scope and Application

1.1. Analytes, Matrix(s), and Reporting Limits

Method SW846 3005A covers the preparation procedures for the determination of elemental constituents in water samples, wastewater samples by inductively coupled plasma (SW846 Method 6010D) and inductively coupled plasma – mass spectrometry (SW846 Method 6020B). Use Method 3010A for the acid digestion of leachate samples.

On occasion clients may request modifications to this SOP. These modifications are handled following the procedures outlined in Sections 7 (Review of Work Request) and 19 (Test Methods and Method Validation) of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

The elements analyzed for by this method and the laboratory's reporting limits (RLs) are summarized below:

Element	Method 6010D Water (ug/L)	Method 6020B Water (ug/L)
Aluminum	200	40
Barium	200	4
Beryllium	2	0.8
Boron	50	80
Cadmium	4	2
Calcium	5000	500
Chromium	10	4
Cobalt	50	4
Copper	25	4
Iron	150	120
Manganese	15	8
Magnesium	5000	200
Molybdenum	20	4
Nickel	40	4
Potassium	5000	200
Silver	10	2
Sodium	5000	500
Strontium	20	4
Tin	50	16
Titanium	20	4
Vanadium	50	4
Zinc	30	16
Antimony	20	2
Arsenic	15	2
Lead	10	1.2
Selenium	20	2.5
Thallium	20	0.8
Silicon	500	n/a
Sulfur	200	n/a

2.0 Summary of Method

A volume of sample is heated with nitric and hydrochloric acids. After the sample is reduced in volume, it is filtered if necessary, diluted to volume, and is then ready for analysis by inductively coupled plasma (ICP) by SW846 Method 6010D or inductively coupled plasma-mass spectrometry (ICP-MS) analysis by SW846 Method 6020B.

3.0 Definitions

For a complete list of definitions refer to Appendix 5 in the most current revision of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

4.0 Interferences

4.1 Whenever reflux is required or sample is to be reduced, NEVER BOIL THE SAMPLE. Boiling could result in a significant loss of sample constituents.

4.2 See the current analytical SOPs for further information related to interferences: TestAmerica SOP Nos. ED-MT-004 *Trace Metals Analysis by Inductively Coupled Plasma Emission Spectroscopy by SW846 Method 6010D* and ED-MT-034, *SW-846 Method 6020B, Trace Metals Analysis of Water, Wastewater, Soil, Sediment and Leachate Samples by ICP-MS*.

5.0 Safety

Employees must abide by the policies and procedures in the Corporate Environmental Health and Safety Manual (CW-E-M-001) and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum.

5.1. Specific Safety Concerns or Requirements

Samples that contain high concentrations of carbonates or organic material or samples that are at elevated pH can react violently when acids are added.

5.2. Primary Materials Used

The following is a list of the materials used in this method, which have a serious or significant hazard rating. **Note: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the MSDS for each of the materials listed in the table.** A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the MSDS for each material before using it for the first time or when there are major changes to the MSDS.

Material [1]	Hazards	Exposure Limit [2]	Signs and symptoms of exposure
Hydrochloric Acid	Corrosive Poison	5 ppm-Ceiling	Inhalation of vapors can cause coughing, choking, inflammation of the nose, throat, and upper respiratory tract, and in severe cases, pulmonary edema, circulatory failure, and death. Can cause redness, pain, and severe skin burns. Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
Nitric Acid	Corrosive Oxidizer Poison	2 ppm-TWA 4 ppm-STEL	Nitric acid is extremely hazardous; it is corrosive, reactive, an oxidizer, and a poison. Inhalation of vapors can cause breathing difficulties and lead to pneumonia and pulmonary edema, which may be fatal. Other symptoms may include coughing, choking, and irritation of the nose, throat, and respiratory tract. Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and stain skin a yellow or yellow-brown color. Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
1 – Always add acid to water to prevent violent reactions.			
2 – Exposure limit refers to the OSHA regulatory exposure limit.			

6.0 Equipment and Supplies

6.1. Instrumentation

- Block Digestor: Adjustable and capable of maintaining a temperature of 90ºC-95ºC (Environmental Express or equivalent).
- AutoBlock: Environmental Express

6.2. Supplies

- watch glasses
- 75 mm funnels
- 50 ml and 100 ml Hot Block Digestion Cups
- Whatman # 41 filter paper or equivalent
- 0.45 micron filter units and vacuum pump
- Pipettes varying volumes: Eppendorfs & Fisher
- Reflux Caps, p/n SC506 Environmental Express or equivalent

7.0 Reagents and Standards

7.1. Reagents

7.1.1. Nitric Acid, Concentrated - Trace Grade or equivalent; store at room temperature; for stability information, refer to manufacturer's instructions.

7.1.2. Hydrochloric Acid, Concentrated - Trace Grade or equivalent; store at room temperature; for stability information, refer to manufacturer's instructions.

7.1.3. Reagent Grade Water 18 Megohm Minimum

7.2. Standards

7.2.1 Stock ICP Spike Standards:

7.2.1.1 Solutions A, B, C, and D (ICP-Spk), Part No. 4400-100419DD01: commercially purchased from CPI International. Store at room temperature; for stability information, refer to manufacturer's instructions. See Attachment 1 for the standards certified concentrations and catalog numbers. 1000ppm each of Silicon and Sulfur purchased from CPI International or equivalent.

7.2.2 Stock ICP-MS Spike Standards:

7.2.2.1 ICPMS LCS/SPK, Part No. SM-606-111: commercially purchased from High-Purity Standards. Store at room temperature; for stability information, refer to manufacturer's instructions. This stock standard doesn't require any pre-dilutions and is ready to be spiked directly into the QC samples. See Attachment 1 for the standards certified concentrations and catalog numbers.

7.3 Working Spike Standards:

7.3.1. ME_LCS-int (for ICP prep) - Add the following to a 1000 ml volumetric flask and bring to volume using 5% HNO_3: 50 ml each of Part No. 4400-100419DD01 Solutions A, B, C, and D (Sec 7.2.1.1). Record standard preparations in TALS Reagent module. **Note**: Standard must not exceed the earliest expiration date of any one of its components.

8.0 Sample Collection, Preservation, Shipment and Storage

Sample container, preservation techniques and holding times may vary and are dependent on sample matrix, method of choice, regulatory compliance, and/or specific contract or client requests. Listed below are the holding times and the references that include preservation requirements.

Matrix	Sample[4] Container	Min. Sample Size	Preservation	Holding Time [1]	Reference
Water	Polyethylene, glass	50 ml	HNO_3 to pH < 2 prior to shipment; if not, acidify upon receipt in lab [2,3]	180 Days	40 CFR Part 136.3

[1] Inclusive of digestion and analysis.
[2] Acid preservation may be omitted for shipping; however, acid must be added upon receipt in the lab. Following acidification, mix the sample and hold for at least 24 hours. Just prior to digestion or direct analysis, verify pH<2. If pH≥ 2, repeat steps (i.e., add acid, hold for 24hrs, verify ph<2).
[3] Aqueous samples may be stored at room temperature.
[4] All containers must be pre-washed with detergents, acids and water.

9.0 Quality Control

9.1. Sample QC - The following quality control samples are prepared with every 20 samples or every batch of samples digested whichever comes first.

Quality Controls	Frequency	Control Limit
Method Blank (MB)	1 in 20 or fewer samples	See the Quality Control Section of the referring analytical SOP (i.e., SOP No. ED-MT-004 and ED-MT-034)
Laboratory Control Sample (LCS)	1 in 20 or fewer samples	
Matrix Spike (MS)[1]	1 in 20 or fewer samples	
Sample Duplicate (DUP)[1]	1 in 20 or fewer samples	
Matrix Spike Duplicate (MSD)	When requested by the client	

[1] The sample selection for MS and Sample Duplicate is random unless specifically requested by a client. Quality control samples prepared with each set of samples digested include Matrix Spike, Sample Duplicate, Method Blank, Laboratory Control Sample and Matrix Spike Duplicate (MSD: when requested by the client). Use the same environmental sample for the matrix spike and duplicate sample whenever possible. If insufficient sample volume is available, another environmental sample may be used for the duplicate sample.

9.2 Instrument QC

None

10.0 Procedure

10.1. Sample Preparation

10.1.1. Filtration Procedure for Dissolved Metals not filtered in the Field

10.1.1.1. The unpreserved sample must be filtered through a 0.45um filter unit as soon as practical after collection.

10.1.1.2. Collect the required volume of filtrate by using a 0.45um filter unit and a vacuum pump.

10.1.1.3. Acidify the filtrate with 1:1 HNO_3 to a pH of <2.

10.1.1.4. The method blank (MB) must be filtered and digested under the same conditions as the lab filtered samples.

10.1.2. During digestion, at least 2-3 ml of sample solution must be maintained in the digestion cup. Sample must never be allowed to go to dryness. If sample should go to dryness, discard sample and redigest.

10.1.3. Pour out 50 ml of well-mixed sample into a 50 ml digestion cups *[note:100 mL hot block digestion cups can be used, except use the same sample volume (50 mL) for the entire preparation batch].* Label the cup with the sample number using a permanent marker. Prepare the QC samples as follows.

10.1.3.1. Method Blank (MB): Pour out 50 ml of deionized reagent water into the 50 ml digestion cup. Label the cup MB mm/dd/yy (this being the date the sample was prepared) and batch number. The Method Blank is carried through the complete digestion process.

10.1.3.2. Matrix Duplicate (DU): Label the digestion cup assigned for the duplicate sample with sample number and suffix 'DU'. Pour 50 ml of the well-mixed sample.

10.1.3.3. Matrix Spike Sample (MS): Measure 50 ml of well-mixed sample into the appropriately labeled 50 ml digestion cups (cup is labeled with the sample number and suffix 'MS'). The resulting elemental concentrations are listed in Attachments 2 & 3.

- For ICP preps: spike the ICP Matrix Spike sample with 1 ml of ME_LCS-int (Sec 7.3.1). If Silicon and Sulfur are needed, spike 0.2 mL each of 1000ppm Sulfur and Silicon.

- For ICP-MS preps: spike the sample with 0.25 ml ICPMS LCS/SPK (Sec 7.2.2.1).

10.1.3.4. Laboratory Control Sample (LCS): Pour out 50 ml of deionized reagent water sample into the appropriately labeled 50 ml digestion cups. Label the cup 'LCS' and the batch number. Spike the ICP-LCS and ICPMS- LCS (as appropriate) in the same way as the Matrix Spike Sample, see Sec. 10.1.3.3. Refer to Attachments 2 & 3 for final elemental concentrations.

10.1.4. Using Hot Block (if using AutoBlock, skip to section 10.1.5)

10.1.4.1. Add 1 ml concentrated HNO_3 and 2.5 ml of hydrochloric acid, cover with ribbed watch glass, place digestion cup on hot block at 90-95 ^oC, and reduce volume to approximately 15-20 ml. Do not allow sample to boil or dry.

10.1.4.2. Allow sample to cool down.

10.1.4.3. Wash down watchglass and digestion cup walls with deionized water. If necessary, accurately label a new 50 ml sample cup and filter samples through a #41 Whatman filter paper to remove any silicates and other insoluble material that could clog the nebulizer on the instrument. Bring the sample volume up to 50 ml.

10.1.4.4. Enter all batch/sample information into TALS (see Sec 11.4. for instructions). Print the sample labels from the batch and attach to the corresponding sample cups. These labels contain information such as: Job & sample number, Batch number and container number.

10.1.5. Using AutoBlock

10.1.5.1. Place a Reflux Cap (sec 6.2) on every 50 ml hotblock cup.

10.1.5.2. Turn on AutoBlock then click the *AutoBlock Plus* icon on the computer desktop.

10.1.5.3. Check the waste drum. If needed, properly dump the waste.

10.1.5.4. Check the reagents (i.e., HCL, HNO3, and Deionized Water). Refill if necessary.

10.1.5.5. Click *Operator Test* and click *Select Method.*

10.1.5.6. Select *3005A-Waters.mtd*

10.1.5.7. Under *Cell Position Selection*, click the hotblock locations where you will have the samples.

10.1.5.8. After closing the see-through plastic door, click on *Start Method.*

10.1.5.9. Don't open the door until the method has been completed.

10.1.5.10. When finished, *Method Completed* will be displayed in the software.

10.1.5.11. Wash down the watchglass and digestion cup walls with deionized water. If necessary, accurately label a new 50 ml sample cup and filter samples through a #41 Whatman filter

paper to remove any silicates and other insoluble material that could clog the nebulizer on the instrument. Bring the sample volume up to 50 ml.

10.1.5.12. Enter all batch/sample information into TALS (see Sec 11.4. for instructions). Print the sample labels from the batch and attach to the corresponding sample cups. These labels contain information such as: Job & sample number, Batch number and container number.

10.2. Calibration

10.2.1. The volume of the 50ml and 100 ml hotblock digestion cups are verified for each lot received. The 50 ml and 100 ml volume verification with the appropriate Lot number is documented in the 'Metals Labware Volume Verification Logbook.'

10.2.2. Per manufacturer's instructions, every 30 days, recalibrate the AutoBlock:

10.2.2.1. Place an empty hotblock cup on an analytical balance and 'zero' the balance.
10.2.2.2. Place that empty hotblock cup in the first position, I1, in the AutoBlock.
10.2.2.3. Click the *AutoBlock Plus* icon on the computer desktop
10.2.2.4. Click the *Manuel Screen* tab.
10.2.2.5. Under *Reagent Selection*, click *H2O(6).* This is Port 6 which contains Deionized Water.
10.2.2.6. Under *Cell Position Selection,* click *I1.*
10.2.2.7. Under *System Control*, click *Move to Position.*
10.2.2.8. In the *Injection Amount (ml)* box, type "30" and press *Inject.* The Autoblock will dispense 30 mL of DI Water into the cup.
10.2.2.9. Click *Move to Drain* and press *Exit.*
10.2.2.10. Weigh the cup containing the DI Water on the zeroed balance to determine the weight of the water.
10.2.2.11. Press the *Service Screen* tab.
10.2.2.12. Press the *Pump Cal* tab
10.2.2.13. Under *Pump 2 Actual Injection Amount (ml)*, enter the weight of the water and press *Pump 2 Save Cal.*

10.3. Sample Analysis

10.3.1. Refer to the Analytical SOP, TestAmerica Edison SOP No. ED-MT-004, and SOP No. ED-MT-034.

11.0. Calculations / Data Reduction

11.1. Accuracy:

$$\text{ICV / CCV, LCS \% Recovery} = \frac{\text{observed concentration}}{\text{known concentration}} \times 100$$

$$\text{MS \% Recovery} = \frac{\text{(spiked sample) - (unspiked sample)}}{\text{spiked concentration}} \times 100$$

11.2. Precision (RPD):

$$\text{Matrix Duplicate (MD)} = \frac{|\text{orig. sample value - dup. sample value}|}{[(\text{orig. sample value + dup. sample value})/2]} \times 100$$

11.3. Concentration:

Refer to TestAmerica SOP No. ED-MT-004 and ED-MT-034.

11.4. Documenting and Reporting

11.4.1. Sample preparations must be documented in the Analyst Desktop II program located in TestAmerica Laboratory System (TALS).

11.4.1.1. Double click the TALS icon on the computer desktop. Enter your username and password and select Login.

11.4.1.2. Under TALS Menu, click the 'plus' sign next to Analyst. Double click Analyst Desktop II. Click the 'plus' sign next to Methods.

11.4.1.3. Right click the prep method that you are using to prep the samples. Select Create New Batch-From Scratch.

11.4.1.4. The analyst must enter the following information: Sample names (use scanners), initial and final sample volume, spike name and amount used, and all reagents and their corresponding lot numbers.

11.4.1.5. After saving the batch information in TALS, select Print-Batch Sheets (which must be submitted to metals analytical dept. along with the samples) and select Print-Batch Labels (which must be attached to the corresponding final digestate sample cups in the batch).

11.4.2. Complete the Data Review Checker (DRC) in TALS: Prior to data submission (i.e., prior to 1st leveling data in the Analyst Desktop II module in TALS), the analyst must execute the DRC (Data Review Checker) program in the applicable preparation batch.

11.4.2.1. Open the preparation batch and click on the Edit tab above to enter the Edit Mode.

11.4.2.2. Press F8 command key on the computer keyboard or right click anywhere on the batch worksheet then click on 'Run checklist.'

11.4.2.3. Acknowledge by filling in responses to all unacknowledged findings.

11.4.2.3.1. Highlight the checklist with findings, then highlight the associated list of findings; right click and choose 'Acknowledge Item.'

11.4.2.3.2. Fill in the appropriate comments in the response box, then hit 'OK.'

11.4.2.3.3. Acknowledge all finding items in the 'Manual Batch Checklist' except for the *"2nd Level review complete?"* this is to be completed by the 2nd level reviewer.

12.0. Method Performance

12.1. Method Detection Limit Study (MDL)

The method detection limit (MDL) is the lowest concentration that can be detected for a given analytical method and sample matrix with 99% confidence that the analyte is present. The MDL is determined according to the laboratory's MDL procedure in Section 19 (Test Methods and Method Validation) of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM). MDLs reflect a calculated (statistical) value determined under ideal laboratory conditions in a clean matrix, and may not be achievable in all environmental matrices. The laboratory maintains MDL studies for analyses performed; these are verified at least annually unless method requirements require a greater frequency.

12.2. Demonstration of Capabilities

For DOC procedure refer to Section 19 in the most current revision of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

12.3. Training Requirements

Refer to TestAmerica SOP No. ED-GEN-022, Training, for the laboratory's training program.

13.0. Pollution Control

It is TestAmerica's policy to evaluate each method and look for opportunities to minimize waste generated (i.e., examine recycling options, ordering chemicals based on quantity needed, preparation of reagents based on anticipated usage and reagent stability). Employees must abide by the policies in Section 13 of the Corporate Environmental Health and Safety Manual (CW-E-M-001) for "Waste Management and Pollution Prevention."

14.0. Waste Management

14.1. Waste management practices are conducted consistent with all applicable rules and regulations. Excess reagents, samples and method process wastes are disposed of in an accepted manner. Waste description rules and land disposal restrictions are followed. Waste disposal procedures are incorporated by reference to TestAmerica SOP No. ED-SPM-008 (Laboratory Waste Disposal Procedures).

14.2. The following waste streams are produced when this method is carried out:

- Digested Samples: Corrosive Acid- Materials that are not above regulatory limits will be submitted for elementary neutralization. The neutralization system consists of a 55-gallon poly open top container. There is also a local snorkel exhaust for venting any noxious odors. Once the liquid is transferred into the container, the contents are sparged with air and a representative pH is measured and the amount of material is recorded in the discharge log. The pH value is recorded in the discharge log, and the liquid is neutralized to a pH of 6-9 SU using food grade sodium bicarbonate. Once the secondary pH has been taken, confirmed and recorded, the discharge valve is opened to the municipal sewer system and the neutralization process is complete. The date, type of waste stream, and volume discharged are recorded in the discharge log.

- Samples above regulatory limits and expired RCRA metals standards (Waste Corrosive Liquid, Acidic, Inorganic, n.o.s.) are collected in satellite accumulation and sent off site through a Waste disposal vendor.
  TSDF under Veolia Profile Number: 590598

- Soil Retain Samples - These containers are stored in the main sample receiving laboratory cooler until they are designated for disposal. Once designated for disposal, the samples are transferred to the waste disposal area and placed into cubic-yard disposal containers, e.g., Jupiter-boxes. This waste is shipped directly to the TSDF under Veolia Profile Number 402535 and is subject to incineration.

15.0. References / Cross-References

15.1. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, 3rd ed.,U.S. Environmental Protection Agency, SW846 Manual, Method 3005A, Revision 1, July 1992.

15.2. TestAmerica Edison Document No. ED-QA-LQM, *Laboratory Quality Manual*, most current revision.

15.3. TestAmerica Edison SOP ED-GEN-022, *Training*, most current revision

15.4. TestAmerica Edison SOP No. ED-MT-004, *Trace Metals Analysis by Inductively Coupled Plasma Emission Spectroscopy by SW846 Method 6010D*, most current revision.

15.5. TestAmerica Edison SOP No. ED-MT-034, *SW-846 Method 6020B, Trace Metals Analysis of Water, Wastewater, Soil, Sediment and Leachate Samples by ICP-MS,*

most current revision.

15.6. TestAmerica Edison SOP No. ED-SPM-008, *Laboratory Waste Disposal Procedures*, current revision.

15.7. TestAmerica Corporate Environmental Health and Safety Manual, Document No. CW-E-M-001, most current revision.

16.0. Method Modifications:

Sample initial and final volumes are modified to 50 ml which allows for lesser sample volume needed for digestion and less sample waste produced.

17.0. Attachments

Attachment 1: Certificate of Analysis of ICP and ICPMS stock standard.
Attachment 2: ICP: Laboratory Control Sample and Matrix Spike Final Concentration in Soln (ug/L)
Attachment 3: ICP-MS Matrix Spiking Solution, ICPMS LCS/SPK

18.0. Revision History

- Revision 8, dated 10 February 2022
  - SOP reinstated, updated all applicable sections to reflect the most current procedures for QC, Reagents, Standards, Calibration, Reporting and SOP references.

- Revision 7, dated 10 November 2011
  - Sec 7.2.1.1: Updated the stock ICP spike standards to reflect actual lab practices.
  - Sec 7.2.2.1: Updated the ICPMS LCS/SPK which is now purchased from High-Purity Standards.
  - Sec 7.3.1: Updated preparation procedure for ME-LCS-int to reflect actual lab practices.
  - Sec 8: Added footnote #4: 24 hr waiting period after lab acid preservations.
  - Sec 10.1.1.4: Added procedures for filtering Method blanks for dissolved metals.
  - Sec 10.1.8: Added instructions for adding TALS' generated labels to digestion cups
  - Sec 11.4: Expanded procedures for documenting and reporting information via TALS.
  - Attachment 2: Updated the ICPMS final concentration for Boron and Zinc in *LCS & Matrix Spike, Final Concentrations in Solutions* Table.
  - Attachment 3: Updated COA's of stock standards.
  - Sec 15: Added applicable references.

- Revision 6, dated 20 October 2009

  - Revised SOP format in accordance with TestAmerica Corporate Quality SOP No. CW-QS-002 (Rev 0) Writing a Standard Operating Procedure (SOP).
  - Sec1.1: Deleted analysis by FLAA spectroscopy and added analysis by ICP-MS.
  - Sec 1.2: Added reporting limit for all elements analyzed by this method.
  - Sec 6: Replaced hot plate with block digestor. Deleted glasswares, (graduated

cylinders, beakers, volumetric flasks), supplies not applicable.

- Sec. 7.2 & 7.3: Revised the source of the stock spike standards and the preparation instructions for the ICP working spike standards.
- Sec 10: Replaced beakers with hot block digestion cups
- Sec 15: Applicable references added.
- Sec 17: Attachments added.

Attachment 1

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SOLN. A
DE
4-4-11

Expiry: 21-Sep-12

Certificate of Analysis

Date Rec'd
03/22/11 MP

Part Number: **4400-100419DD01**
Lot Number: **11C157**
Shelf Life: **18 Months**

TestAmerica/Edison
Custom Standard
5% HNO3

Concentrations in ug/mL ± 0.5%

Fe	1000	Zn	500
Se	2000	Mn	500
TL	2000	NI	500
Be	50		
Cd	50		
Cr	200		
Co	500		
Cu	250		
Pb	500		
Ag	50		
Sr	500		
V	500		

This standard solution was prepared using high-purity starting materials, high-purity acid (if required) and 18-megaohm de-ionized water. The starting materials were weighed to five significant figures and diluted in volumetric glassware calibrated to five significant figures.

Starting materials were analyzed at 1000µg/mL by ICP-MS for trace impurities. The standard solution concentrations were certified instrumentally against the National Institute of Standards and Technology's SRM 3100 series, NIST approved second source and/or gravimetrically.

Accuracy and stability are guaranteed to within plus or minus 0.5% of the certified value for the stated shelf life from the date of shipment. The solution should be kept tightly capped and stored under normal laboratory conditions. See attached MSDS for proper handling information.

For questions or comments please call 1-800-878-7654 in the USA, +31 20 638 05 97 in Europe or visit our web-site at www.cpiinternational.com.

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Expiry: 21-Sep-12

Certificate of Analysis

Part Number: **4400-100419DD01** **Solution B**
Lot Number: **11C157**
Shelf Life: **18 Months**

Date Rec'd
03/22/11 MP

TestAmerica/Edison
Custom Standard
10% HNO3

Concentrations in ug/mL ± 0.5%

Al	2000
Mg	20000
K	20000
Ca	20000
Na	20000

This standard solution was prepared using high-purity starting materials, high-purity acid (if required) and 18-megaohm de-ionized water. The starting materials were weighed to five significant figures and diluted in volumetric glassware calibrated to five significant figures.

Starting materials were analyzed at 1000µg/mL by ICP-MS for trace impurities. The standard solution concentrations were certified instrumentally against the National Institute of Standards and Technology's SRM 3100 series, NIST approved second source and/or gravimetrically.

Accuracy and stability are guaranteed to within plus or minus 0.5% of the certified value for the stated shelf life from the date of shipment. The solution should be kept tightly capped and stored under normal laboratory conditions. See attached MSDS for proper handling information.

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Expiry: 21-Sep-12

Certificate of Analysis

Part Number: **4400-100419DD01** **Solution D**
Lot Number: **11C157**
Shelf Life: **18 Months**

Date Rec'd
05/22/11 MH

TestAmerica/Edison
Custom Standard
2% HNO3

Concentrations in ug/mL ± 0.5%

As	2000
Ba	2000
B	500

This standard solution was prepared using high-purity starting materials, high-purity acid (if required) and 18-megaohm de-ionized water. The starting materials were weighed to five significant figures and diluted in volumetric glassware calibrated to five significant figures.

Starting materials were analyzed at 1000µg/mL by ICP-MS for trace impurities. The standard solution concentrations were certified instrumentally against the National Institute of Standards and Technology's SRM 3100 series, NIST approved second source and/or gravimetrically.

Accuracy and stability are guaranteed to within plus or minus 0.5% of the certified value for the stated shelf life from the date of shipment. The solution should be kept tightly capped and stored under normal laboratory conditions. See attached MSDS for proper handling information.

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Expiry: 21-Sep-12

Certificate of Analysis

Part Number: **4400-100419DD01** **Solution C**
Lot Number: **11C157**
Shelf Life: **18 Months**

Date Rec'd
03/22/11 MP

TestAmerica/Edison
Custom Standard
5% HNO3 + 2% HF

Concentrations in ug/mL ± 0.5%

Sb	500
Mo	500
Sn	500
Ti	500

This standard solution was prepared using high-purity starting materials, high-purity acid (if required) and 18-megachm de-ionized water. The starting materials were weighed to five significant figures and diluted in volumetric glassware calibrated to five significant figures.

Starting materials were analyzed at 1000µg/mL by ICP-MS for trace impurities. The standard solution concentrations were certified instrumentally against the National Institute of Standards and Technology's SRM 3100 series, NIST approved second source and/or gravimetrically.

Accuracy and stability are guaranteed to within plus or minus 0.5% of the certified value for the stated shelf life from the date of shipment. The solution should be kept tightly capped and stored under normal laboratory conditions. See attached MSDS for proper handling information.

For questions or comments please call 1-800-878-7654 in the USA, +31 20 638 05 97 in Europe or visit our web-site at www.cpiinternational.com.

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Certificate of Analysis

SM-606-111
(ICPMS LCS/SPK)
Lot # 1031503

Source	Source Purity	Matrix	Standard Concentration
High Purity Metals, Salts and Oxides	99.98+%	HNO_3, 4% + Tr HF	µg/mL ± 0.5% See element list on reverse

This spectrometric standard solution has been prepared from high-purity reference materials. Sub-boiling distilled high-purity acid has been used to place the materials in solution and to stabilize the standard. The matrix is as noted above in 18 megaohm deionized water. The reference materials have been assayed by inductively coupled plasma optical emission spectrometry (ICP-OES).

The standard has been prepared gravimetrically by weighing the reference material to 5 significant figures. Volumetric glassware has been calibrated gravimetrically to 5 significant figures. The standard concentration has been verified by ICP-OES against an independent source which is directly traceable to National Institute of Standards and Technology, Standard Reference Material No. 3100 series.

This standard is valid for one year from the shipping date provided the solution is kept tightly capped and stored under normal laboratory conditions.

Theodore C. Rains

Theodore C. Rains, Ph.D.
President

Exp Date: NOV 15 2011
MSDS ATTACHED

SM-606-111
(ICPMS LCS/SPK)
Element List
(µg/mL)

Aluminum	500
Antimony	5
Arsenic	10
Barium	10
Beryllium	5
Boron	100
Cadmium	5
Calcium	500
Chromium	10
Cobalt	5
Copper	10
Iron	500
Lead	5
Magnesium	500
Manganese	50
Molybdenum	10
Nickel	10
Potassium	500
Selenium	10
Silver	5
Sodium	500
Strontium	10
Thallium	4
Tin	10
Titanium	10
Vanadium	10
Zinc	50

Attachment 2

ICP: LCS & Matrix Spike Final concentration in solution	
ELEMENT	ug/L
Aluminum	2000
Antimony	500
Arsenic	2000
Barium	2000
Beryllium	50
Cadmium	50
Calcium	20000
Chromium	200
Cobalt	500
Copper	250
Iron	1000
Lead	500
Manganese	500
Magnesium	20000
Nickel	500
Potassium	20000
Selenium	2000
Silver	50
Sodium	20000
Thallium	2000
Vanadium	500
Zinc	500
Boron	500
Molybdenum	500
Tin	500
Titanium	500
Strontium	500
Silicon	4000
Sulfur	4000

Attachment 3

ICPMS Matrix Spiking Solution, ICPMS LCS/SPK	
Element	**Matrix Spike Conc. (ug/L)**
Aluminum (Al)	2500
Antimony (Sb)	25
Arsenic (As)	50
Barium (Ba)	50
Beryllium (Be)	25
Boron (B)	500
Cadmium (Cd)	25
Calcium (Ca)	2500
Chromium (Cr)	50
Cobalt (Co)	25
Copper (Cu)	50
Iron (Fe)	2500
Lead (Pb)	25
Magnesium(Mg)	2500
Manganese (Mn)	250
Molybdenum (Mo)	50
Nickel (Ni)	50
Potassium (K)	2500
Selenium (Se)	50
Silver (Ag)	25
Sodium (Na)	2500
Strontium (Sr)	50
Thallium (Tl)	20
Tin (Sn)	50
Titanium (Ti)	50
Vanadium (V)	50
Zinc (Zn)	250

Title: Hot Block Digestion of Sediments, Sludges, and Soils by USEPA Method No(s). SW846 3050B

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Approvals (Signature/Date):

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1.0 Scope and Application

1.1. Analytes, Matrix(s), and Reporting Limits

This SOP covers the acid digestion procedure (SW846 3050B) for the determination of total recoverable elemental constituents in sediments, soils and sludges by inductively coupled plasma emission spectroscopy (EPA Method 6010D) and Inductively Coupled Plasma – Mass Spectrometry (EPA Method 6020B).

1.2. For a complete list of analytes and Reporting limits, refer to the appropriate analytical TestAmerica SOPs: SOP ED-MT-004, *Trace Metals Analysis by Inductively Coupled Plasma Emission Spectroscopy, Method No. SW846 Method 6010D;* SOP ED-MT-029; *Trace Metals Analysis for Water, Wastewater, Soil,Sediment and Leachate Samples by ICP-MS Method SW-846 6020B and* SOP ED-MT-034, *SW846 Method 6020B, Trace Metals Analysis of Water, Wastewater, Soil, Sediment, and Leachate Samples by ICPMS*

1.3. On occasion clients may request modifications to this SOP. These modifications are handled following the procedures outlined in Sections 7 (Review of Work Request) and 19 (Test Methods and Method Validation) of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

2.0 Summary of Method

A portion of sample is digested with repeated additions of nitric acid and hydrogen peroxide. Hydrochloric acid is added to the digestate and the sample is refluxed and then brought to a final volume of 100 ml. The resulting digestate is analyzed by ICP-AES or ICP-MS.

3.0 Definitions

For a complete list of definitions refer to Appendix 2 in the most current revision of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

4.0 Interferences

4.1. Interferences are discussed in the applicable analytical SOPs. Spiked samples are prepared to determine if any interference are present.

5.0 Safety

Employees must abide by the policies and procedures in the Corporate Environmental Health and Safety Manual (CW-E-M-001) and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the

assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum.

5.1. Specific Safety Concerns or Requirements

Samples that contain high concentrations of carbonates or organic material or samples that are at elevated pH can react violently when acids are added.

Hydrogen peroxide (H2O2) is a strong oxidizer and is corrosive. The digestion must be cooled sufficiently before the addition of H2O2 to avoid a reaction and possible violent effervescence, or boiling over of the digestion. A splash/splatter hazard is possible and a face shield should be worn.

5.2. Primary Materials Used

The following is a list of the materials used in this method, which have a serious or significant hazard rating. **Note: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the MSDS for each of the materials listed in the table.** A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the MSDS for each material before using it for the first time or when there are major changes to the MSDS.

Material (1)	Hazards	Exposure Limit (2)	Signs and symptoms of exposure
Hydrochloric Acid	Corrosive Poison	5 ppm-Ceiling	Inhalation of vapors can cause coughing, choking, inflammation of the nose, throat, and upper respiratory tract, and in severe cases, pulmonary edema, circulatory failure, and death. Can cause redness, pain, and severe skin burns. Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
Nitric Acid	Corrosive Oxidizer Poison	2 ppm-TWA 4 ppm-STEL	Nitric acid is extremely hazardous; it is corrosive, reactive, an oxidizer, and a poison. Inhalation of vapors can cause breathing difficulties and lead to pneumonia and pulmonary edema, which may be fatal. Other symptoms may include coughing, choking, and irritation of the nose, throat, and respiratory tract. Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and stain skin a yellow or yellow-brown color. Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
Hydrogen Peroxide	Oxidizer Corrosive	1 ppm-TWA	Vapors are corrosive and irritating to the respiratory tract. Vapors are very corrosive and irritating to the eyes and skin.
1 – Always add acid to water to prevent violent reactions.			
2 – Exposure limit refers to the OSHA regulatory exposure limit.			

6.0 Equipment and Supplies

6.1. Instrumentation

- Block digestor: Environmental Express or equivalent
- AutoBlock: Environmental Express
- Weighing balance capable of accurate weighing to 0.01g.

6.2. Supplies

- watch glasses
- 75 mm funnels
- 50 ml Hot Block Digestion Cups
- Whatman # 41 filter paper or equivalent
- Pipettes varying volumes: Eppendorfs & Fisher
- 4oz Snap Cap Cups from Fisher or equivalent
- Reflux Caps, p/n SC506 Environmental Express or equivalent

7.0 Reagents and Standards

7.1. Reagents

7.1.1. Concentrated Nitric Acid- Trace Grade or equivalent; store at room temperature; for stability information, refer to manufacturer's instructions.
7.1.2. Concentrated Hydrochloric Acid- Trace Grade or equivalent; store at room temperature; for stability information, refer to manufacturer's instructions.
7.1.3. Reagent Grade Water 18 Megohm Minimum
7.1.4. Hydrogen peroxide (30%), H_2O_2. Store at room temperature; for stability information, refer to manufacturer's instructions.

7.2. Standards -

Storage requirements: all standards are stored at room temperature
Shelf-life: Stock standards – refer to manufacturer's instructions
Intermediate standards – 12 months
Working standards – 12 month
(Note: expiration date must not go beyond the expiration date of the source stock).
Concentration: see Attachment 3 for example certificates of analysis (COA) for all of the standards mixes listed below. The COA lists the manufacturer's part number, certified concentration and shelf life.

Standards must be prepared every 12 months or sooner if needed or required. "If needed" means the standard has been exhausted; "if required" means that the standard does not meet the QC criteria.

7.2.1. Stock ICP Spike Standards:

- Solutions A, B, C, and D (ICP-Spk), Part No. 4400-100419DD01: commercially purchased from CPI International. Store at room temperature; for stability information, refer to manufacturer's instructions. See Attachment 1 for the standards certified concentrations and catalog numbers.
- Sulfur 1000 mg/L, single element standard commercially purchased from CPI International. Store at room temperature; for stability information, refer to manufacturer's instructions

7.2.2. Working Spike Standard, ICP Working Spike Solution ME_ LCS-int (for ICP prep) - Add the following to a 1000 ml volumetric flask and bring to volume using 5% HNO_3: 50 ml each of Part No. 4400-100419DD01 Solutions A, B, C, and D (Sec 7.2.1.). Record standard preparations in TALS Reagent module. **Note**: Standard must not exceed the earliest expiration date of any one of its components.

7.2.3. Stock ICPMS Spike Standards (Method 6020B)

- ICPMS LCS/SPK: commercially purchased from High-Purity Standards. Store at room temperature; for stability information, refer to manufacturer's instructions. This stock standard doesn't require any pre-dilutions and is ready to be spiked directly into the QC samples. See Attachment 3 for the standards certified concentrations and catalog numbers.

7.2.4. Laboratory Control Sample Reference Material (LCSSRM), Metals in Soil: obtained from Environmental Resource Associates. Store at room temperature; for stability information, refer to manufacturer's instructions.

8.0 Sample Collection, Preservation, Shipment and Storage

Sample container, preservation techniques and holding times may vary and are dependent on sample matrix, method of choice, regulatory compliance, and/or specific contract or client requests. Listed below are the holding times and the references that include preservation requirements.

Matrix	Sample Container[1]	Min. Sample Size	Preservation	Holding Time[2]	Reference
Soils	Glass, plastic	5 grams	Cool 4 ±2°C	6 months	SW846 Method 3050B

[1] All sample containers must be demonstrated to be free of contaminants below the reporting limit.
[2] Holding time is 6 months, however sample analysis should begin as soon as possible.

9.0 Quality Control

9.1. Sample QC - The following quality control samples are prepared with each batch of samples digested or with every Sample Delivery Group (SDG), whichever comes first.

Quality Control	Frequency	Control Limit: Method 6010D & 6020B
Method Blank (MB)	1 in 20 or fewer samples	See the quality control section of the associated analytical SOP
Laboratory Control Sample(LCSSRM)	1 in 20 or fewer samples	Vendor's certified limits
Matrix Duplicate (DU)	1 in 20 or fewer samples	See the quality control section of the associated analytical SOP
Matrix Spike (MS)[1]	1 in 20 or fewer samples	75-125%
Matrix Spike Duplicate (MSD)[1]	When requested by client	See the quality control section of the associated analytical SOP

[1] The sample for DU/MS/MSD is randomly selected, unless specifically requested by a client; predetermined by the prep lab. Use the same environmental sample for the matrix spike and matrix duplicate sample whenever possible. If insufficient sample amount is available, another environmental sample may be used for the duplicate sample.
[2] Statistical control limits are updated annually and are updated into LIMS.

9.2. Instrument QC

None

10.0 Procedure

10.1. Sample Preparation

10.1.1. All digestion cups and filtration apparatus related to a sample must be labeled with that sample number.

10.1.2. Whenever reflux is required, sample should never be allowed to boil or "bump" as this could result in significant loss of analyte. Sample must never be allowed to go to dryness or be baked.

10.1.3. Mix the sample thoroughly to achieve homogeneity. Weigh 1.00-1.50

grams of sample to the nearest .01 g into a 50 ml hot block digestion cup. QC samples are prepared as follows:

10.1.3.1. Method Blank (MB): Use a blank 50 ml digestion cup for the Method Blank. Attach the TALS (TestAmerica Laboratory Systems) generated label which contains the sample ID number and batch number. The Method Blank is carried through the complete digestion process.

10.1.3.2. Matrix Duplicate (DU): Weigh 1.00-1.50 gm of a duplicate sample to the nearest 0.01 gram into a 50 ml hot block digestion cup. Attach the TALS generated label for the matrix duplicate sample.

10.1.3.3. Matrix Spike Sample (MS): Weigh 1.00 -1.50 gram of duplicate sample to the nearest 0.01 gram into a 50 ml hot block digestion cup. Attach the TALS generated label for the matrix spike sample.

- For ICP preps: Spike 2 ml of ME_LCS-int solution (ICP predigestion spike, Sec 7.2.2) to the digestion cup. If Sulfur is needed, also spike 0.4 mL of Sulfur 1000 mg/L (sec 7.2.1). The resulting elemental amounts are listed in Table 1 (attachment 1). NOTE: the spike must be added prior to the addition of any acids.
- For ICP-MS preps: spike the ICP-MS QC sample with 1.0 ml ICPMS LCS/SPK (Sec 7.2.3). The resulting elemental concentrations are listed in Attachment 2

10.1.3.4. Laboratory Control Sample Reference Material (LCSSRM): Weigh out 1.00-1.50 gm of LCS (sec 7.2.6) to the nearest 0.01 grams into a 50 ml hot block digestion cup. Attach the TALS generated label for the laboratory control sample.

10.1.3.5. Laboratory Control Sample (LCS) for Sulfur:
Using a 50 mL hot block cup, spike 0.4 mL of 1000 mg/L Sulfur (sec 7.2.1).

10.1.3.6. Matrix Spike Duplicate (MSD): when a MSD is requested by the client, prepare the sample in the same manner as the Matrix spike sample (MS), see Matrix Spike Sample prep instructions (Sec 10.1.3.3)..

10.1.4. Using Hot Block (if using AutoBlock, skip to section 10.1.5)

10.1.4.1. Add 10 ml of 1:1 HNO_3, mix the slurry, and cover with a watchglass. Transfer digestion cup to a hot block with the dial setting so that the contents of digestion cup are at

approximately 95°C ±3
°C and reflux for 10 to 15 minutes without boiling or drying the sample.

10.1.4.2. Allow sample to cool, add 5 ml of concentrated HNO_3, replace the watchglass, and reflux for 30 minutes.

10.1.4.3. Repeat step above until no brown fumes are generated.

10.1.4.4. Using a ribbed watchglass, cover the vessel and allow the solution to either evaporate to approximately 5ml or evaporate for 2 hours without boiling. Do not allow sample to go to dryness.

10.1.4.5. After step 10.1.7 has been completed, cool the sample; add 2 ml of deionized water and 3 ml of 30% H_2O_2. Warm cup, and make certain no losses occur due to vigorous effervescence. Heat until effervescence subsides and cool cup.

10.1.4.6. Continue to add 30% H_2O_2 in 1.0 ml aliquots with warming until the effervescence is minimal until the general sample appearance is unchanged. *Note*: Do not add a total of more than 10 ml of 30% H_2O_2.

10.1.4.7. Using a ribbed watchglass, cover the vessel and allow the solution to either evaporate to approximately 5ml or evaporate for 2 hours without boiling. Do not allow sample to go to dryness.

10.1.4.8. Add 10 ml of concentrated HCL to the sample and reflux for 15 min at 95°C ±3.

10.1.4.9. Filter the sample through Whatman 41 filter paper or equivalent into a 4oz Fisher snap cap cup or equivalent. Rinse the 50ml cup using DI water and filter into the 4oz cup. Using deionized water, bring to a final volume of 100 ml. This digestate is now ready for ICP or ICP-MS analyses.

10.1.5. Using AutoBlock

10.1.5.1. Place a Reflux Cap (sec 6.2) on every 50 ml hotblock cup.

10.1.5.2. Turn on AutoBlock then click the *AutoBlock Plus* icon on the computer desktop.

10.1.5.3. Check the waste drum. If needed, appropriately dump the waste.

10.1.5.4. Check the reagents (i.e., HCL, HNO3, 1:1HNO3, 30% H2O2, Deionized Water). Refill if necessary.

10.1.5.5. In the software, click the *Manuel Screen* tab. Enter 95 in the *Temp Control* box. Click *Enable Heat.*

10.1.5.6. Place a 50ml hotblock cup filled with DI water on the autoblock. Cover with a reflux cap. After the hotblock has reached a stable temperature of 95 deg C (~15min), record the temperature using a calibrated thermometer.

10.1.5.7. In the software, click *Exit.*

10.1.5.8. Click *Operator Test* and click *Select Method.*

10.1.5.9. Select *SOILmethod3050B.*

10.1.5.10. Under *Cell Position Selection*, click the hotblock locations where you will have the samples.

10.1.5.11. After closing the see-through plastic door, click on *Start Method.*

10.1.5.12. Don't open the door until the method has been completed.

10.1.5.13. Watch for brown fumes after Nitric Acid has been added by the autoblock. If brown fumes are generated, make note to discard this sample. This sample must be prepared using a Hot Block (sec 10.1.4).

10.1.5.14. When finished, *Method Completed* will be displayed in the software. Record the temp (sec 10.1.5.5).

10.1.5.15. Filter the sample through Whatman 41 filter paper or equivalent into a 4oz Fisher snap cap cup or equivalent. Rinse the 50ml cup using DI water and filter into the 4oz cup. Using deionized water, bring to a final volume of 100 ml. This digestate is now ready for ICP or ICP-MS analyses.

10.2. Calibration

10.2.1. The volume of the 100ml cups are verified for each lot received. The 100 ml volume verification with the appropriate Lot number is documented in the 'Metals labware volume verification logbook.'

10.2.2. Per manufacturer's instructions, recalibrate the AutoBlock every 30 days.

10.2.2.1. Place an empty hotblock cup on an analytical balance and 'zero' the balance.
10.2.2.2. Place that empty hotblock cup in the first position, I1, in the AutoBlock.
10.2.2.3. Click the *AutoBlock Plus* icon on the computer desktop
10.2.2.4. Click the *Manuel Screen* tab
10.2.2.5. Under *Reagent Selection*, click *H2O(6).* This is Port 6 which contains Deionized Water
10.2.2.6. Under *Cell Position Selection,* click *I1*
10.2.2.7. Under *System Control*, click *Move to Position*
10.2.2.8. In the *Injection Amount (ml)* box, type "30" and press *Inject.* The Autoblock will dispense 30 mL of DI Water into the cup.
10.2.2.9. Click *Move to Drain* and press *Exit*
10.2.2.10. Weigh the cup containing the DI Water on the zero'd balance to determine the weight of the water
10.2.2.11. Press the *Service Screen* tab
10.2.2.12. Press the *Pump Cal* tab
10.2.2.13. Under *Pump 2 Actual Injection Amount (ml)*, enter the weight of the water and press *Pump 2 Save Cal.*
10.2.2.14. Document the calibration on the Autoblock maintenance logbook.

10.3. Sample Analysis

Refer to the appropriate Analytical SOPs listed in Sec 1.2.

11.0. Calculations / Data Reduction

11.1. Accuracy:

$$\text{ICV / CCV, LCS \% Recovery} = \frac{\text{observed concentration}}{\text{known concentration}} \times 100$$

$$\text{MS \% Recovery} = \frac{\text{(spiked sample) - (unspiked sample)}}{\text{spiked concentration}} \times 100$$

11.2. Precision (RPD):

$$\text{Matrix Duplicate (MD)} = \frac{|\text{orig. sample value - dup. sample value}|}{[(\text{orig. sample value + dup. sample value})/2]} \times 100$$

11.3. Concentration :

Refer to appropriate Analytical SOPs listed in Sec 1.2.

11.4. Documenting and Reporting

11.4.1. Sample preparations must be documented in the Analyst Desktop II program located in TestAmerica Laboratory System (TALS).

11.4.1.1. Double click the TALS icon on the computer desktop. Enter your username and password and select Login.

11.4.1.2. Under TALS Menu, click the plus sign ('+') next to Analyst. Double click Analyst Desktop II. Click the plus sign ('+') next to Methods.

11.4.1.3. Right click the prep method that you are using to prep the samples. Select 'Create New Batch' then select 'From Scratch.'

11.4.1.4. The analyst must enter the following information: Sample names (use scanners), initial and final sample volume, spike name and amount used, and all reagents and their corresponding lot numbers.

11.4.1.5. After saving the batch information in TALS, select Print-Batch Sheets (which must be submitted to metals analytical dept. along with the samples) and select Print-Batch Labels (which must be attached to the corresponding final digestate sample cups in the batch).

11.4.2. Complete the Data Review Checker (DRC) in TALS: Prior to data submission (i.e., prior to 1st leveling data in the Analyst Desktop II module in TALS), the analyst must execute the DRC (Data Review Checker) program in the applicable preparation batch.

11.4.2.1. Open the preparation batch and click on the Edit tab above to enter the Edit Mode.

11.4.2.2. Press F8 command key on the computer keyboard or right click anywhere on the batch worksheet then click on 'Run checklist.'

11.4.2.3. Acknowledge by filling in responses to all unacknowledged findings.

11.4.2.3.1. Highlight the checklist with findings, then highlight the associated list of findings; right click and choose 'Acknowledge Item.'

11.4.2.3.2. Fill in the appropriate comments in the response box, then hit 'OK.'

11.4.2.3.3. Acknowledge all Finding items in the 'Manual Batch Checklist' except for the *"2nd Level review complete?"* this is to be completed by the 2nd level reviewer.

12.0. Method Performance

12.1. Method Detection Limit Study (MDL)

The method detection limit (MDL) is the lowest concentration that can be detected for a given analytical method and sample matrix with 99% confidence that the analyte is present. The MDL is determined according to the laboratory's MDL procedure in Section 19 (Test Methods and Method Validation) of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM). MDLs reflect a calculated (statistical) value determined under ideal laboratory conditions in a clean matrix, and may not be achievable in all environmental matrices. The laboratory maintains MDL studies for analyses performed; these are verified at least annually unless method requirements require a greater frequency.

12.2. Demonstration of Capabilities

For DOC procedure refer to Section 19 in the most current revision of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

12.3. Training Requirements

Refer to TestAmerica SOP No. ED-GEN-022, Training, for the laboratory's training program.

13.0. Pollution Control

It is TestAmerica's policy to evaluate each method and look for opportunities to minimize waste generated (i.e., examine recycling options, ordering chemicals based on quantity needed, preparation of reagents based on anticipated usage and reagent stability). Employees must abide by the policies in Section 13 of the Corporate Environmental Health and Safety Manual (CW-E-M-001) for "Waste Management and Pollution Prevention."

14.0. Waste Management

14.1. Waste management practices are conducted consistent with all applicable rules and regulations. Excess reagents, samples and method process wastes are disposed of in an accepted manner. Waste description rules and land disposal restrictions are followed. Waste disposal procedures are incorporated by reference to TestAmerica SOP No. ED-SPM-008 (Laboratory Waste Disposal Procedures).

14.2. The following waste streams are produced when this method is carried out:

- Digested Samples: Corrosive Acid- Materials that are not above regulatory limits will be submitted for elementary neutralization with 50% sodium hydroxide solution (Siedler Chemical SC-1824-03). Major concern is heat generated from the neutralization process. Initial volume of acid waste to be neutralized should be no more than 15 gallons. Finished neutralization with sodium bicarbonate (Siedler Chemical SC-0219-25) to a pH of 6 – 9 in the

primary tank. Once pH has been established the primary tank is transferred through filter housing to a secondary tank. The pH is rechecked. If the pH is within specifications, the secondary tank is released to the municipal sewer system.

- Samples above regulatory limits and expired RCRA metals standards (Waste Corrosive Liquid, Acidic, Inorganic, n.o.s.) are collected in satellite accumulation and sent off site through a Waste disposal vendor.
  Onyx Profile WIP Number: 590598
  Teris Profile Number 50016653

- Soil Retain Samples - These samples if not flagged in the system for any hazardous constituents are transferred to poly-lined cubic yard boxes. These boxes when full are sent to stabilization or incineration. These materials are sent out as hazardous for lead and chromium

  Teris Profile Number (incineration): 50016710
  Onyx Profile Number: (stabilization) 402535

15.0. References / Cross-References

15.1. Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW846), Third Edition, September 1986, Final Update I, July 1992, Final Update IIA, August 1993, Final Update II, September 1994; Final Update IIB, January 1995; Final Update III, December 1996; SW-846, Method 3050B.

15.2. TestAmerica Edison Document No. ED-QA-LQM, *Laboratory Quality Manual*, most current revision.

15.3. TestAmerica Corporate Environmental Health and Safety Manual, Document No. CW-E-M-001, most current revision.

15.4. TestAmerica Edison SOP ED-GEN-022, *Training*, most current revision.

15.5. TestAmerica Edison SOP No. ED-MT-004, Trace Metals Analysis by Inductively Coupled Plasma Emission Spectroscopy via SW846 Method 6010D, most current revision.

15.6. TestAmerica Edison SOP No ED-MT-029, Trace Metals Analysis for Water, Wastewater, Soil,Sediment and Leachate Samples by ICP-MS Method SW-846 6020B, most current revision.

15.7. TestAmerica Edison SOP ED-MT-034, *SW846 Method 6020B, Trace Metals Analysis of Water, Wastewater, Soil, Sediment, and Leachate Samples by ICPMS*, most current revision.

16.0. Method Modifications:

None

17.0. Attachments

Attachment 1: Table 1, Matrix Spike concentration for Soil samples by 3050B-ICP
Attachment 2: Table 2, Matrix Spike concentration for Soil samples by 3050B-ICPMS
Attachment 3: Certificate of analysis of each stock standard.

18.0. Revision History

- Revision 15, dated 29 September 2021
  - Sec. 10.1.3.3: Revised the amount of ICPMS LCS/SPK added for ICP-MS preps to 1.0 ml to reflect actual laboratory practices.

- Revision 14, dated 30 December 2019
  - Sec 6.1: Added AutoBlock to the instrument list.
  - Sec 6.2: Added Reflux Caps to the supplies list
  - Sec 7.2.1: Added Sulfur to the stock ICP spike standards list.
  - Sec 10.1.3.3: Added matrix spiking instructions for Sulfur.
  - Sec 10.1.3.5: Added LCS preparation instructions for Sulfur.
  - Sec 10.1.5: Added instructions for using the AutoBlock.
  - Sec 10.2.1: Replaced the 50ml volume verification with a 100ml volume verification.
  - Sec 10.2.2: Added procedure for the monthly recalibration (volume dispenser) of the Autoblock.
  - Table 1: Added spike amount for Sulfur.

- Revision 13, dated 05 August 2019
  - Updated SOP header with Eurofins emblem.
  - Throughout the SOP deleted all references to Methods 6010B, 6010C, 6020 and 6020A.
  - Sec 2.0: Revised the final volume of digestates from 50ml to 100ml to reflect actual lab practices.
  - Sec 6.2: Added 4oz snap seal cups to the list of supplies.
  - Sec 10.1.3.3: Revised the spiking volume to add for ICP-MS LCS from 1ml to 2ml.
  - Sec 10.1.12: Clarified instructions for filtering digestates; added final volume of digestates.

- Revision 12, dated 06 September 2018
  - Throughout the SOP - revised to reference the analytical methods 6010D and 6020B.
  - Sec 11.4.: Updated instructions for documenting and reporting preparation batch information in TALS and instruction for using TALS Data Review Checker (DRC) program.

- Revision 11, dated 13 July 2016

  - Sec 1.1: Added method 6010C and 6020A
  - Sec 1.2: Deleted reference to SOP ED-MT-033; SOP has been combined with SOP ED-MT-004.
  - Sec 9.1: Added MSD to the list of Sample QC including the frequency and control limit requirements.
  - Sec 10.1.3.5: Added preparation instructions for MSD.
  - Sec 15.7: Removed reference to SOP No ED-MT-033, subsequent section adjusted accordingly.

- Revision 10, dated 05 June 2014

  - Sec 1.2: Removed SOP reference ED-MT-031 and added SOP reference ED-MT-033 and ED-MT-034.
  - Sec 2.0: Corrected typo error for the final volume from 100 ml to 50 ml as described in this SOP.
  - Sec 6.2: Removed 125 ml specimen cups.
  - Sec 10.1.1: Deleted the use of glassware – not applicable for this SOP.
  - Sec 15.7 & 15.8: Added TestAmerica Edison SOP No. ED-MT-033 and ED-MT-034 to the list of reference.
  - Attachment 1: Added Boron to the ICP matrix spike list.
  - Attachment 2: Added Zinc to the ICPMS matrix spike list and deleted Mercury from this list; corrected Boron's matrix spike concentration.

- Revision 9, dated 31 May 2012

  - Sec 1.3 and 12: Revised LQM references to reflect the most current LQM revision.
  - Throughout the document: Removed all references to CLP SOW ISM 01.2
  - Sec 6.1: added 'or equivalent'.
  - Sec 7.2.1: Updated the ICP stock standard to reflect current lab practices.
  - Sec 7.2.2: Updated the preparation of the working spike standard.
  - Sec 7.2.3: Replaced the vendor for the ICPMS stock standards to High-Purity Standards (former vendor- CPI International).
  - Deleted Sec 7.2.4 & 7.2.5 (CLP ISM01.2 Standards, not applicable); subsequent sections adjusted accordingly.
  - Sec 9.1 Table: MB and DU control limits have been updated and now reference the associated analytical SOP for the most current QC limits.
  - Sec 10.1.3.1 – 10.1.3.4: Updated the digestion cup labeling procedure using the TALS generated labels
  - Sec 10.1.12: Revised procedure to reflect actual lab practices - *samples are brought to a 50ml final volume and then filtered.* Final digestate volume revised from 100 ml to 50 ml.
  - Sec 10.2.1: Replaced the 125 ml hot-block cups with 50 ml size cups
  - Sec 13 & 14: Updated to comply with TestAmerica Corporate Quality SOP No. CW-QS-002, Writing a Standard Operating Procedure (SOP), most current revision.
  - Attachment 3: Replaced COAs to reflect the updated stock standards.

- Revision 8, dated 30 March 2010

  - Sec 1.1: Deleted Table which listed the 6010B RLs for soils; added Sec 1.2 to include list of analytical SOPs where the appropriate RLs can be found.
  - Sec 7: Added matrix spike and LCS standards for Method 6020 and ISM01.2
  - Sec 8: Added the holding time for soil samples analyzed by Method CLP SOW ISM01.2.
  - Sec 9.1: Added control limits for CLP SOW ISM01.2.; Deleted Blank spike and LCS duplicate.
  - Sec 10: Revised amount of sample to be weighed to 1.00-1.50 grams as per CLP Method ISM01.2
  - Sec 10: Revised hot block temperature to 95± 3 deg, to follow the more stringent setting.
  - Deleted section previously identified 10.1.3.2, Blank spike; subsequent sections adjusted.
  - Sec 10.1.3.3 & Sec 10.1.3.4: Revised to include spike procedures for ICP and ICPMS, Method 6020 and ISM01.2.
  - Sec 10.1.3.5: Deleted LCS duplicate
  - Sec 10.1.9: Section added to reflect actual lab practices; subsequent section numbers adjusted.
  - Sec 10.1.10: Text added: '*Note: For samples which are being digested for CLP SOW ISM01.2 ICP-MS, do not perform this step.'*
  - Sec 15: Added applicable references.
  - Sec 17: Added attachments 2 & 3
  - Attachment 3: Added applicable COAs
  - Added this revision history.

- Revision 7, dated June 13, 2008
  - Revised SOP format in accordance with TestAmerica Corporate Quality SOP No. CW-QS-002 (Rev 0) Writing a Standard Operating Procedure (SOP).
  - Section 1.1: Added laboratory's reporting limits in Table format.
  - Section 7 Reagents & Standards: Included storage and stability information of reagents and standards. Updated the source of the stock spike standards and the preparation instructions for the working spike standards.
  - Removed all reference related to GFAA analysis including standard solutions, digestion procedure and Table 2: Spike amount for soil samples by GFAA; clarified the digestion procedure for ICP-AES analysis.
  - Section 10.1 Sample Preparation: Deleted acid rinsing of glassware since 50 ml digestion cups are being used for digesting samples.
  - Section 10.1 Sample Preparation: Replaced hot plate setting of 2.5 to hot block setting of 95°C.
  - Section 15 References: Added applicable references

Attachment 1

TABLE 1

Matrix Spike Concentration for Soil Samples by ICP	
ELEMENT	SPIKE AMOUNT (mg/Kg)
Aluminum	200
Antimony	50
Arsenic	200
Barium	200
Beryllium	5.0
Cadmium	5.0
Boron	50
Calcium	2000
Chromium	20
Cobalt	50
Copper	25
Iron	100
Lead	50
Manganese	50
Magnesium	2000
Molybdenum	50
Nickel	50
Potassium	2000
Selenium	200
Silver	5.0
Sodium	2000
Strontium	50
Thallium	200
Tin	50
Titanium	50
Vanadium	50
Zinc	50
Sulfur	400

Matrix spike sample concentration: Dry weight correction is made at final calculation

Attachment 2

ICPMS Matrix Spike Concentration Method 6020	
Element	**Matrix Spike Conc. (mg/Kg)**
Aluminum (Al)	500
Antimony (Sb)	5
Arsenic (As)	10
Barium (Ba)	10
Beryllium (Be)	5
Boron (B)	100
Cadmium (Cd)	5
Calcium (Ca)	500
Chromium (Cr)	10
Cobalt (Co)	5
Copper (Cu)	10
Iron (Fe)	500
Lead (Pb)	5
Magnesium(Mg)	500
Manganese (Mn)	50
Molybdenum (Mo)	10
Nickel (Ni)	10
Potassium (K)	500
Selenium (Se)	10
Silver (Ag)	5
Sodium (Na)	500
Strontium (Sr)	10
Thallium (Tl)	4
Tin (Sn)	10
Titanium (Ti)	10
Vanadium (V)	10
Zinc (Zn)	50

Note: For Matrix spike sample concentration, dry weight correction is made at final calculation.

Attachment 3

ERA
A Waters Company

Certificate of Analysis

Lot No. D075-540

Metals in Soil

Catalog No. 540
Issue Date: October 11, 2011
Revision Date: Original

Certification

Parameter	Total Concentration [1] (mg/kg)	Certified Value [2] (mg/kg)	Uncertainty [3]	QC PALs™ [4] (mg/kg)	PT PALs™ [5] (mg/kg)
aluminum	68100*	10100	0.8%	5110 - 15100	4560 - 15600
antimony	228	113	0.8%	DL - 252	22.7 - 286
arsenic	266	237	2.9%	197 - 278	169 - 306
barium	678	252	2.4%	212 - 292	186 - 318
beryllium	105	93.3	4.1%	77.7 - 109	69.4 - 117
boron	135	118	1.3%	87.3 - 149	71.9 - 164
cadmium	215	191	4.5%	159 - 223	140 - 242
calcium	25400*	6840	5.3%	5640 - 8040	5080 - 8600
chromium	364	128	3.8%	104 - 151	89.3 - 166
cobalt	208	178	3.5%	149 - 207	132 - 223
copper	145	123	9.0%	103 - 143	92.3 - 154
iron	42900*	13100	4.8%	6650 - 19600	4290 - 22000
lead	105	103	6.7%	85.6 - 120	73.0 - 132
magnesium	9060	2990	4.4%	2280 - 3710	1980 - 4010
manganese	918	333	5.5%	274 - 391	250 - 415
mercury	12.8	12.4	10.1%	8.88 - 15.9	6.36 - 18.4
molybdenum	113	91.1	4.8%	74.2 - 108	63.3 - 122
nickel	152	118	6.0%	96.8 - 139	85.8 - 150
potassium	19700*	2870	4.0%	1950 - 3780	1780 - 3950
selenium	123	110	1.6%	86.6 - 134	72.6 - 148
silver	51.6	47.3	3.8%	31.3 - 63.2	31.4 - 63.2
sodium	17400*	550	3.8%	405 - 694	289 - 811
strontium	252	128	4.0%	104 - 153	90.6 - 166
thallium	177	158	3.7%	128 - 188	108 - 208
tin	121	107	0.8%	84.5 - 130	61.7 - 153
titanium	3280*	282	4.8%	65.4 - 498	0.00 - 606
vanadium	205	119	4.0%	94.9 - 143	81.2 - 157
zinc	197	183	6.9%	150 - 216	127 - 239

Please see footnotes on back

DL = Detection Limit

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SOLN. A
DE
4-4-11

Expiry: 21-Sep-12

Certificate of Analysis

Part Number: **4400-100419DD01**
Lot Number: **11C157**
Shelf Life: **18 Months**

Date Recd
03/22/11 MP

TestAmerica/Edison
Custom Standard
5% HNO3

Concentrations in ug/mL ± 0.5%

Fe	1000	Zn	500
Se	2000	Mn	500
TL	2000	Ni	500
Be	50		
Cd	50		
Cr	200		
Co	500		
Cu	250		
Pb	500		
Ag	50		
Sr	500		
V	500		

This standard solution was prepared using high-purity starting materials, high-purity acid (if required) and 18-megaohm de-ionized water. The starting materials were weighed to five significant figures and diluted in volumetric glassware calibrated to five significant figures.

Starting materials were analyzed at 1000µg/mL by ICP-MS for trace impurities. The standard solution concentrations were certified instrumentally against the National Institute of Standards and Technology's SRM 3100 series, NIST approved second source and/or gravimetrically.

Accuracy and stability are guaranteed to within plus or minus 0.5% of the certified value for the stated shelf life from the date of shipment. The solution should be kept tightly capped and stored under normal laboratory conditions. See attached MSDS for proper handling information.

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Expiry: 21-Sep-12

Certificate of Analysis

Part Number: **4400-100419DD01** **Solution B**
Lot Number: **11C157**
Shelf Life: **18 Months**

TestAmerica/Edison
Custom Standard
10% HNO3

Date Recd
03/22/11 MP

Concentrations in ug/mL ± 0.5%

Al	2000
Mg	20000
K	20000
Ca	20000
Na	20000

This standard solution was prepared using high-purity starting materials, high-purity acid (if required) and 18-megaohm de-ionized water. The starting materials were weighed to five significant figures and diluted in volumetric glassware calibrated to five significant figures.

Starting materials were analyzed at 1000µg/mL by ICP-MS for trace impurities. The standard solution concentrations were certified instrumentally against the National Institute of Standards and Technology's SRM 3100 series, NIST approved second source and/or gravimetrically.

Accuracy and stability are guaranteed to within plus or minus 0.5% of the certified value for the stated shelf life from the date of shipment. The solution should be kept tightly capped and stored under normal laboratory conditions. See attached MSDS for proper handling information.

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Expiry: 21-Sep-12

Certificate of Analysis

Part Number: **4400-100419DD01** **Solution C**
Lot Number: **11C157**
Shelf Life: **18 Months**

Date Rec'd
03/22/11 MP

TestAmerica/Edison
Custom Standard
5% HNO3 + 2% HF

Concentrations in ug/mL ± 0.5%

Sb	500
Mo	500
Sn	500
Ti	500

This standard solution was prepared using high-purity starting materials, high-purity acid (if required) and 18-megaohm de-ionized water. The starting materials were weighed to five significant figures and diluted in volumetric glassware calibrated to five significant figures.

Starting materials were analyzed at 1000µg/mL by ICP-MS for trace impurities. The standard solution concentrations were certified instrumentally against the National Institute of Standards and Technology's SRM 3100 series, NIST approved second source and/or gravimetrically.

Accuracy and stability are guaranteed to within plus or minus 0.5% of the certified value for the stated shelf life from the date of shipment. The solution should be kept tightly capped and stored under normal laboratory conditions. See attached MSDS for proper handling information.

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Expiry: 21-Sep-12

Certificate of Analysis

Part Number: **4400-100419DD01** **Solution D**
Lot Number: **11C157**
Shelf Life: **18 Months**

Date Rec'd
05/22/11 MP

TestAmerica/Edison
Custom Standard
2% HNO3

Concentrations in ug/mL ± 0.5%

As	2000
Ba	2000
B	500

This standard solution was prepared using high-purity starting materials, high-purity acid (if required) and 18-megaohm de-ionized water. The starting materials were weighed to five significant figures and diluted in volumetric glassware calibrated to five significant figures.

Starting materials were analyzed at 1000µg/mL by ICP-MS for trace impurities. The standard solution concentrations were certified instrumentally against the National Institute of Standards and Technology's SRM 3100 series, NIST approved second source and/or gravimetrically.

Accuracy and stability are guaranteed to within plus or minus 0.5% of the certified value for the stated shelf life from the date of shipment. The solution should be kept tightly capped and stored under normal laboratory conditions. See attached MSDS for proper handling information.

SM-606-111
(ICPMS LCS/SPK)
Element List
(µg/mL)

Aluminum	500
Antimony	5
Arsenic	10
Barium	10
Beryllium	5
Boron	100
Cadmium	5
Calcium	500
Chromium	10
Cobalt	5
Copper	10
Iron	500
Lead	5
Magnesium	500
Manganese	50
Molybdenum	10
Nickel	10
Potassium	500
Selenium	10
Silver	5
Sodium	500
Strontium	10
Thallium	4
Tin	10
Titanium	10
Vanadium	10
Zinc	50

Title: Extraction of Semi-Volatile Organic Compounds in Aqueous Samples and Leachates - Separatory Funnel, SW846 Method 3510C

Once printed, this is considered an uncontrolled document

Approvals (Signature/Date):

Sylvanus Klusey Organic Operations Manager	7/2/24 Date	Dan Helfrich Health & Safety Manager	7/2/24 Date
Carl Armbruster Quality Assurance Manager	7/2/24 Date	Mark Acierno Laboratory Director	7/2/24 Date

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1.0 Scope and Application

1.1. **Analytes, Matrix(s), and Reporting Limits** SW846 Method 3510C describes a procedure for isolating semivolatile organic compounds from aqueous samples and leachates, including concentration techniques suitable for preparing the extract for GC/MS analysis. This SOP is applicable to the isolation and concentration of water-soluble and slightly water-soluble semivolatile organics in preparation for analysis by SW846 Method 8270E.

1.2. For a complete discussion of analytes and reporting limits (RLs) please refer to Eurofins Edison SOP No. ED-MSS-009, *Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS) SW846 Method 8270E*, current revision

1.3. On occasion clients may request modifications to this SOP. These modifications are handled following the procedures outlined in Section 7 (*Review of Work Request*) and 19 (*Test Methods and Method Validation*) of Eurofins Edison's Quality Assurance Manual (ED-QA-LQM).

2.0 Summary of Method

2.1. A measured volume of sample (~250 mL) is serially extracted with methylene chloride at a pH less than 2 and again at a pH greater than 11 using separatory funnel extraction. The methylene chloride extract is dried and concentrated to a volume of approximately 2 mL. Nitrogen blowdown is employed as the final concentration step. The extract is subsequently analyzed by SW846 Method 8270E (GC/MS) by a large volume injection (LVI) technique. This procedure is referred to throughout as Reduced Volume Extraction (RVE) and Large Volume Injection (LVI).

2.2. An option for preparing aqueous samples using a larger initial volume (~1000 ml) is also described. This procedure is referred to as 'large volume' throughout the document.

3.0 Definitions

For a complete list of definitions refer to Appendix 5 in the most current revision of Eurofins Edison's Quality Assurance Manual (ED-QA-LQM).

4.0 Interferences

4.1. Solvents, reagents, glassware, and other sample hardware may yield artifacts and/or interferences to sample analysis. All these materials must be demonstrated to be free from interferences under the conditions of the analysis by analyzing method blanks.

4.2. Phthalate esters contaminate many products commonly found in the laboratory. Plastics, in particular, must be avoided, because phthalates are often used as plasticizers and are easily extracted from plastic material. Phthalate contamination may result at any time if consistent quality control is not practiced.

4.3. The decomposition of some analytes has been demonstrated under basic extraction conditions. Phthalate esters may exchange and phenols may react to form tannates. These reactions increase with increasing pH, and are decreased by shorter reaction times. Performing the initial extraction at an acid pH will optimize the recovery of phenols

5.0 Safety

Employees must abide by the policies and procedures in the Corporate Environmental Health and Safety Manual (CW-E-M-001) and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum.

5.1. Specific Safety Concerns or Requirements

During Kuderna-Danish (KD) concentration, do not allow the extract to boil to dryness. The solvent vapors remaining in the KD apparatus may superheat and create an explosion or fire hazard.

The following analytes have been tentatively classified as known or suspected, human or mammalian carcinogens: benzo(a)anthracene, benzidine, 3,3'dichlorobenzindine, benzo(a)pyrene, alpha-BHC, beta-BHC, gamma-BHC, delta-BHC, dibenz(a,h)anthracene, N-nitrosodimethylamine, 4,4'-DDT, and polychlorinated biphenyl compounds. Primary standards of these toxic compounds should be prepared in hood.

The use of Kevlar gloves is required for the assembly/disassembly of ground glass joints in addition to those tasks that present the potential risk for injury.

The use of separatory funnels to extract aqueous samples with Methylene Chloride creates excessive pressure very rapidly. Initial venting should be done immediately after the sample container has been sealed and inverted, periodic venting may be necessary during the extraction. Vent the funnel into the hood away from people and other samples. This is considered a high-risk activity, the use of a face shield over safety glasses or goggles is recommended. Keep the sash on the fume hood as low as reasonably possible.

5.2. Primary Materials Used

The following is a list of the materials used in this method, which have a serious or significant hazard rating. **Note: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the MSDS for each of the materials listed in the table.** A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the MSDS for each material before using it for the first time or when there are major changes to the MSDS.

Material (1)	Hazards	Exposure Limit (2)	Signs and symptoms of exposure
Methylene Chloride	Carcinogen Irritant	25 ppm-TWA 125 ppm-STEL	Causes irritation to respiratory tract. Has a strong narcotic effect with symptoms of mental confusion, light-headedness, fatigue, nausea, vomiting and headache. Causes irritation, redness and pain to the skin and eyes. Prolonged contact can cause burns. Liquid degreases the skin. May be absorbed through skin.
Sulfuric Acid	Corrosive Oxidizer Dehydra-dator	1 mg/m^3	This material will cause burns if comes into contact with the skin or eyes. Inhalation of vapors will cause irritation of the nasal and respiratory system.
Sodium Hydroxide	Corrosive Poison	2 ppm, 5 mg/m^3	This material will cause burns if comes into contact with the skin or eyes. Inhalation of Sodium Hydroxide dust will cause irritation of the nasal and respiratory system.
Methanol (MeOH)	Flammable Poison Irritant	200 ppm-TWA	A slight irritant to the mucous membranes. Toxic effects exerted upon nervous system, particularly the optic nerve. Symptoms of overexposure may include headache, drowsiness and dizziness. Methyl alcohol is a defatting agent and may cause skin to become dry and cracked. Skin absorption can occur; symptoms may parallel inhalation exposure. Irritant to the eyes.
1 – Always add acid to water to prevent violent reactions.			
2 – Exposure limit refers to the OSHA regulatory exposure limit.			

6.0 Equipment and Supplies

6.1. Instrumentation

- Separatory funnel rotator, APR Machine or equivalent
- Analytical Evaporator (N-Evap) Organomation
- Centrifuge, Varifuge F; Hereaus Sepatech
- Six Position Steam Bath, Fisher 15-496 or equivalent

6.2. Supplies

- 250 ml Erlenmeyer Flask, AMK Glass ERL-0252 or equivalent
- 2000 ml or 500 ml Separatory Funnel, AMK Glass SFC or equivalent
- 100 mm o. d. glass funnels, Fisher or equivalent
- 10 ml jacketed, graduated Concentrator Tubes, AMK Glass KD-0018 or equivalent
- 19/22 Ground Glass Stoppers
- 3 Ball Snyder Columns, TEC Glass TG6-03 or equivalent

- 1 ml Gastight Syringe, Hamilton 81317 or equivalent
- 150 ml Centrifuge Tube
- 100 ml Graduated Cylinder
- Pasteur 5 ¾" Disposable Pipets, Fisher 13-678-20B or equivalent
- Kuderna Danish Flask (500 ml), TEC Glass TG7-01 or equivalent
- Vials, 2ml amber screw cap with Teflon liner
- Glass Wool
- Dessicator
- Standard Taper Clamps (Size 19, blue)
- Boiling Stones, Troemner P/N 133-B or equivalent, rinsed with Methylene Chloride
- pH Paper
- Watch Glass
- Wax Pencil
- 1 Liter Graduated Cylinder
- Marking Tags

7.0 Reagents and Standards

7.1 Reagents

Note: Each lot of Methylene Chloride, Acetone, Methanol and Sulfuric Acid is screened for contaminants before being used for analysis as detailed in Eurofins Corporate Quality SOP No. CA-Q-S-001 (*Solvent & Acid Lot Testing & Approval*) and Eurofins Edison SOP No. ED-GEN-023 (*Bulk Solvent Testing and Approval*).

7.1.1 Methylene Chloride – JT Baker Ultra-Resi 9254-03 or equivalent

7.1.2 Acetone, J.T. Baker Ultra-Resi 9264-03 or equivalent

7.1.3 Methanol, J.T. Baker, Pesticide Grade, 9077-02 or equivalent

7.1.4 Concentrated Sulfuric Acid - Baxter 2876-9 or equivalent

7.1.5 Sodium Hydroxide Pellets – Baxter 7708-500NY or equivalent

7.1.6 Sodium Sulfate Crystals – Mallinckrodt MA8024-06 or equivalent (Must be baked in the muffle furnace for four hours at 400°C and serially rinsed with Methylene Chloride prior to use.)

7.1.7 Sodium Hydroxide (10 N) - Fill a precleaned 1000 ml volumetric flask with 500 mls deionized water. Weigh out 400 g NaOH pellets and dispense slowly into the flask. Stir slowly until the pellets dissolve, then add more deionized water until the 1000 ml level is reached. Be careful as this procedure generates heat. Never add water to the reagent that is to be dissolved.

7.2 Standards

7.2.1 Most stock target analyte standard solutions are purchased as prepared solutions; other standards are prepared in the laboratory using neat compounds (see table below). Most stock solutions are diluted (in volumetric glassware) to working concentration using methylene chloride as the diluent as described below. Stock standards of similar quality from other suppliers may be substituted as required.

NOTE: The standards listed here are used as calibration standards and spiking standards. Separate source calibration verification standards are addressed in the analytical SOPs.

Standard Name	Concentration	Vendor	Catalog #
8270 List 1/ Std#1 MegaMix	500/1000/2000pmm	RESTEK	570666
8270 List 1/ Std#10Benzoic Acid	2000ppm	RESTEK	569731
8270 List 1/ Std#9	2000ppm	RESTEK	569730
Custom SVO Mix	2000ppm	SPEX	SVO-TANJ-16-5
Bisphenol A	1000ppm	SPEX	S-509-MC
8270 List 1/ Std#11	2000ppm	RESTEK	569732
8270 Surrogate Standard	5000 ppm	RESTEK	567685
Aromatic Amines Custom Mix	2000 ppm	Supelco	21467482

7.2.1.1. **Spiking Standard:** For use in spiking aqueous samples including TCLP/SPLP leach being prepared for BNA analysis by SW846 Method 8270. Prepare the second source spiking solution for MS/MSD/Blank Spike (LCS) as detailed in the following table using the applicable standards listed in 7.2.1. Use volumetric glassware. Dilute to the volume marker with methanol.

Standard Name	Concentration	Volume of Standard added to final volume of 200ml (solvent)	Final Concentration
8270 List 1/ Std#1 MegaMix	500/1000/2000pmm	20 ml (methanol)	50/100/200 ppm
8270 List 1/ Std#10	2000ppm	10 ml (methanol)	100 ppm
8270 List 1/ Std#9	2000ppm	10 ml (methanol)	100 ppm
Custom SVO Mix-SPEX	2000ppm	10 ml (methanol)	100 ppm
Bisphenol A-SPEX	1000ppm	10ml (methanol)	50ppm

Standard Name	Concentration	Volume of Standard added to final volume of 200ml (solvent)	Final Concentration
8270 List 1/ Std#11	2000ppm	20ul (methanol) 100ul(methanol)	Used neat for LVI Used neat for non-LVI
Aromatic Amines Custom Mix**	2000ppm	10 ml (methylene chloride)	100 ppm

** *As needed based on clients requirement.*

Note: Neat spiking/surrogate standards are stored per vendor requirements (either room temp or 4 deg C, as appropriate). All prepared standard solutions are refrigerated at 4 deg C.

7.2.2 **8270 Surrogate Standard Spiking Solution**: For use in spiking all blanks, samples and associated QC prior to extraction. Prepare as detailed in the following table using the applicable standards listed in 7.2.1. Use volumetric glassware. Dilute to the volume marker with methanol.

Standard Name	Concentration	Volume of Standard added to final volume of 1000 ml methanol	Final Concentration
8270 Surrogate Standard	5000 ppm	20 ml	100 ppm

7.2.3 Internal standard is prepared added by the analytical department. For details see analytical SOP No.. ED-MSS-009 (SW846 8270E).

7.2.4 The preparation of all standards must be documented in Eurofins LIMS (TALS) or a standard preparation logbook. Information such as standard supplier, lot number, original concentration, and a description of how standard was prepared are required along with a laboratory lot number, analyst's initials, date prepared and verification signature. Standards must be made every 6 months or sooner if signs of degradation appear.

8.0 Sample Collection, Preservation, Shipment and Storage

Sample container, preservation techniques and holding times may vary and are dependent on sample matrix, method of choice, regulatory compliance, and/or specific contract or client requests. Listed below are the holding times and the references that include preservation requirements.

8.1 All samples must be stored at 4ºC (± 2ºC) upon receipt.

8.2 Sample Extract Storage. Samples extracts must be protected from light and refrigerated at 4ºC (± 2ºC) from time of extraction until analysis.

8.3 Sample Extract Holding Time. All sample extracts must be analyzed within 40 days of extraction.

Matrix	Sample Container	Min. Sample Size	Preservation	Holding Time	Reference
Water or Leachate	250ml Amber (RVE)/ Amber glass, 1L	250ml-RVE/ 1000 ml	Cool 4 ± 2ºC	7 days to extraction; Analyze within 40 days of extraction	EPA Method SW846 8270C

9.0 Quality Control

9.1. **Sample QC** - The following quality control samples are prepared with each batch of samples. Refer to Eurofins Edison analytical SOP No. ED-MSS-009 (SW846 8270E) for details on analysis and evaluation of these QC elements:

Quality Controls	Frequency	Control Limit
Method Blank (MB)	1 in 20 or fewer samples	< Rpt. Limit
Laboratory Control Sample (LCS)[1]	1 in 20 or fewer samples	Statistical Limits [4]
Matrix Spike (MS)[2]	1 in 20 or fewer samples	Statistical Limits [4]
MS Duplicate (MSD)[2]	1 in 20 or fewer samples	Statistical Limits [4]
Surrogates	every sample[3]	Statistical Limits [4]

[1] LCS Duplicate (LCD) is performed only when insufficient sample is available for the MS/MSD or when requested by the client/project/contract.
[2] The sample selection for MS/MSD are randomly selected, unless specifically requested by a client….predetermined by the extraction lab.
[3] Analytical and QC samples (MB, LCS, MS/MSD, Method Blank)
[4] Statistical control limits are updated annually and are updated into lab reporting software.

9.1.1. **Method blanks** are extracted with every sample batch on each day that samples are extracted.

9.1.2. **Matrix Spike (MS)/Matrix Spike Duplicate (MSD):** A Matrix Spike/Matrix Spike Duplicate (MS/MSD) pair is extracted and analyzed with every batch of 20 environmental samples. (Note: an LCS/LCSD may be substituted for the MS/MSD if insufficient client environmental sample volume is available).

9.1.3. **Laboratory Control Sample (LCS)/Laboratory Control Sample Duplicate (LCSD):** A Laboratory Control Sample (LCS) (aka blank spike) must be extracted and analyzed with each batch of 20 environmental samples.

9.1.3.1 A Laboratory Control Sample Duplicate (LCSD) is extracted and analyzed only when insufficient client

sample is available for preparation of an MS/MSD pair. The LCS/LSCD is evaluated in the same manner as the MS/MSD (see Section 9.1.2)

9.1.4. Surrogate Standards: All samples, blanks and QC samples are spiked with a six (6) component surrogate standard mix (see Section 7.2.2).

10.0 Procedure

NOTE: The sample preparation procedure for aqueous samples (Section 10.1) contains two options: reduced volume extraction (RVE) (250ml) for large volume injection (LVI) analysis and large volume extraction (1000ml),

10.1. Sample Preparation for Aqueous/ Leachates Samples

10.1.1. Rinse the required number of 500-ml separatory funnels (when RVE is required) or 2000-ml separatory funnels (when large volume extraction is required) and 250-ml Erlenmeyer flasks twice with a 1:1 mixture of Methylene Chloride:Acetone and once with Methylene Chloride.

10.1.2. Place a small amount of glass wool into a 100-mm funnel and fill with pre-baked sodium sulfate crystals. Rinse three (3) times with Methylene Chloride. Also rinse the outside of the funnel stem three (3) times with Methylene Chloride (since the stem is likely to come into contact with the extract). Allow time for all of the rinsate to drain out of the funnel into a waste container.

10.1.3. Record the lab sample numbers on the separatory funnels with red wax pencil.

10.1.4. Make up tags with the following information and place on a 250ml Erlenmeyer flask:

BNAs		**BNs**	**AEs**
Acid Fraction	BN Fraction		
Sample Number	Sample Number	Sample Number	Sample Number
Fraction-Matrix	Fraction-Matrix	Fraction-Matrix	Fraction-Matrix
Date of Extraction	Date of Extraction	Date of Extraction	Date of Extraction

10.1.5. Place the 100ml funnel containing rinsed sodium sulfate crystals onto the flask.

10.1.6. Mark the fluid level on the sample bottles with a black Sharpie. Pour each sample into its corresponding separatory funnel. Fill each sample bottle to the black line with tap water. Pour this into the graduated cylinder used for measuring sample volumes. Note the volume for each sample on the Organic Extraction Data Sheet.

10.1.7. Rinse out a graduated cylinder with lab reagent water two to three times. Using the graduated cylinder obtain 250 ml when RVE is used (or 1000-ml when large volume is required) of lab reagent water from the Millipore filtering apparatus located in the Wet Chemistry laboratory for each of the method blank and the laboratory control sample (LCS) (aka blank spike).

10.1.8. Pour each the reagent water for the method blank and LCS into the corresponding separatory funnels.

10.1.9. Rinse syringes eight (8) to ten (10) times with Methylene Chloride.

10.1.10. If you are performing BNAs add 0.2 ml when RVE is used (or 1.0 ml when large volume is required) of Surrogate Standard Spiking Solution (see Section 7.2.2) to each sample/QC sample and proceed to Section 10.1.11. If you are performing *BN only* extraction, add 0.2 ml when RVE is used (or 1.0 ml when large volume is required) of Surrogate Standard Spiking Solution (see Section 7.2.2) to each sample/QC sample and proceed to Section 10.1.20. If you are performing *AE only* extraction add 0.2 ml when RVE is used (or 1.0 ml when large volume is required) of Surrogate Standard Spiking Solution (see Section 7.2.2) to each sample/QC sample and proceed to Section 10.1.11.

10.1.10.1. If extracting QC samples (MS, MSD, LCS or LCSD), add 0.2 ml when RVE is used (or 1.0 ml when large volume is required of the Spiking (see Section 7.2.1.1) to the appropriate separatory funnel. Note: When spiking the samples, make sure to get all bubbles out of the syringe. In addition, hold the syringe just above the level of the liquid when adding the spike. Do not touch the tip of the syringe to the liquid or the side of the separatory funnel.

10.1.11. Add concentrated sulfuric acid to each sample to adjust the pH to <2. (Usually you only need to add 1ml using small disposable Pasteur pipette). Note: pH adjustments must be documented in the extraction log.

10.1.12. Shake each sample for a short time and check pH using pH paper. The pH must be 2 or less. If the pH has not been lowered sufficiently, add more acid.

10.1.13. Add 15 ml of Methylene Chloride when RVE is used (or 60 ml when large volume is required) to each sample bottle.

10.1.14. Swirl the bottle and add 15 ml of Methylene Chloride when RVE is used (or 60 ml when large volume is required) to its corresponding separatory funnel.

10.1.15. After making sure the funnels are properly secured, start the rotators. Stop the rotator and vent the funnels after about 10 seconds. Resume rotating for 2 minutes.

10.1.16. Stop the rotation and allow the sample to settle.

10.1.17. Drain the bottom (organic) layer from the separatory funnel into the funnel/Erlenmeyer apparatus.

10.1.18. Repeat steps 10.1.13 through 10.1.17 twice, adding the Methylene Chloride directly to separatory, rather than rinsing the sample container as in 10.1.15.

10.1.18.1. If an emulsion forms during extraction, rinse a centrifuge tube well with methylene chloride and then drain the lower layer from the separatory funnel into the tube. Centrifuge for 3 to 5 minutes at 2000 rpm. Make sure the levels (and weights) of the samples directly opposite one another in the centrifuge are approximately equal. After the centrifuging process is finished, there will be two layers: water on top and the methylene chloride on the bottom. A 1 ml disposable pipette should be used to transfer the methylene chloride (bottom) layer from the centrifuge tube to the appropriate Erlenmeyer flask. With this method, care must be taken not to transfer the water (top) layer. The top layer that remains is poured back into the separatory funnel with the rest of the original sample.

10.1.19. If you are preparing the sample for acid extractables analysis only, you are finished and you can now discard the remaining liquid in each separatory funnel and proceed to Section 10.1.27. If you are required to extract base/neutrals, proceed with Section 10.1.20.

10.1.20. Adjust the pH of the sample to >11 by adding 10N sodium hydroxide (NaOH) to the sample in each separatory funnel. NOTE: pH adjustment must be documented in the extraction logbook.

10.1.21. Shake each separatory funnel for a short time and check pH. It should be basic, >pH 11. If the pH is not as high as it should be, add more 10N sodium hydroxide (NaOH).

10.1.22. Add 15 ml of Methylene Chloride when RVE is used (or 60 ml when large volume is required)

10.1.23. After making sure the funnels are properly secured, start the rotators. Stop the rotator and vent the funnels after about 10 seconds. Resume rotating for 2 minutes.

10.1.24. Stop the rotation and allow the sample to settle.

10.1.25. Drain the bottom (organic) layer from the separatory funnel into the funnel/Erlenmeyer apparatus.

10.1.26. Repeat steps 10.1.22 through 10.1.25 twice.

10.1.26.1. If an emulsion forms during extraction, rinse a centrifuge tube well with methylene chloride and then drain the lower layer from the separatory funnel into the tube. Centrifuge for 3 to 5 minutes at 2000 rpm. Make sure the levels (and weights) of the samples directly opposite one another in the centrifuge are approximately equal. After the centrifuging process is finished, there will be two layers: water on top and the methylene chloride on the bottom. A 1 ml disposable pipette should be used to transfer the methylene chloride (bottom) layer from the centrifuge tube to the appropriate Erlenmeyer flask. With this method, care must be taken not to transfer the water (top) layer. The top layer that remains is poured back into the separatory funnel with the rest of the original sample.

10.1.27. Pour the entire methylene chloride extract from the Erlenmeyer flask into a KD concentration tube apparatus (pre-rinsed three times with acetone). Rinse the Erlenmeyer flask from which the sample came twice with methylene chloride and pour both rinsates into the KD apparatus.

10.1.28. Attach Snyder column (pre-rinsed three times with acetone) to the top of the KD apparatus.

10.1.29. For RVE extractions blow the extract directly down to a final volume of 2-ml on the N-Evap. Remove the Snyder column from the top of the KD flask. Remove the blue taper clamp from the ground glass joint and dry the exterior with a Kimwipe. Transfer the concentrator tube with the 5ml extract to the N-Evap and “blow down” the extract until the volume is 2.0 ml.

10.1.30. For large volume (1000 ml) extractions concentrate the extract to approximately 5-ml in Steam Bath Remove the Snyder column from the top of the KD flask. Remove the blue taper clamp from the ground glass joint and dry the exterior with a Kimwipe. Transfer the concentrator tube with the 5ml extract to the N-Evap and “blow down” the extract until the volume is 1.0 ml. Bring the volume of each extract up to 2ml with methylene chloride

10.1.31. Split each extract into two (2) -1ml aliquots and transfer each aliquot to a separate 2ml amber screw cap vial with Teflon liner. Label one vial as ‘SIM” and the second vial as ‘Total’. Transfer custody of the vials to the Semivolatile GC/MS laboratory for analysis (see Eurofins Edison analytical SOP ED-MSS-009 (SW846 8270E).

10.2. Required Documentation:

The organic prep technician is responsible for completing the following items.

10.2.1. The Standards Prep Logbook or TALS Reagent Database must be completed in full with the required information whenever standards are logged and/or prepared.

10.2.2. Each time an extraction is performed, the applicable TALS data record must be completed and reviewed the Organic Prep Supervisor or designee. Lot numbers of all reagents and solvents used or added to samples during preparation must be documented in the database.

10.2.3. Each sample extracted must be included in a batch and be recorded in the TALS database.

10.2.4. Following the extraction procedure, the technician must complete all TALS data fields pertaining to the samples extracted.

11.0. Calculations/Data Reduction

n/a

12.0. Method Performance

12.1. Method Detection Limit Study (MDL)

The method detection limit (MDL) is the lowest concentration that can be detected for a given analytical method and sample matrix with 99% confidence that the analyte is present. The MDL is determined according to the laboratory's MDL procedure in Section 19 (Test Methods and Method Validation) of Eurofins Edison's Quality Assurance Manual (ED-QA-LQM). MDLs reflect a calculated (statistical) value determined under ideal laboratory conditions in a clean matrix, and may not be achievable in all environmental matrices. The laboratory maintains MDL studies for analyses performed; these are verified at least annually unless method requirements require a greater frequency.

12.2. Demonstration of Capabilities

For demonstration of capability procedure refer to Section 19 in the most current revision of Eurofins Edison's Quality Assurance Manual (ED-QA-LQM).

12.3. Training Requirements

Refer to Eurofins SOP No. ED-GEN-022, *Training*, for the laboratory's training program.

13.0. Pollution Control

13.1 It is Eurofins's policy to evaluate each method and look for opportunities to minimize waste generated (i.e., examine recycling options, ordering chemicals based on quantity needed, preparation of reagents based on anticipated usage and reagent stability). Employees must abide by the policies in Section 13 of the Corporate Environmental Health and Safety Manual (CW-E-M-001) for "Waste Management and Pollution Prevention."

14.0. Waste Management

14.1 Waste management practices are conducted consistent with all applicable rules and regulations. Excess reagents, samples and method process wastes are disposed of in an accepted manner. Waste description rules and land disposal restrictions are followed. Waste disposal procedures are incorporated by reference to Eurofins Edison SOPs Nos. ED-SPM-007 (*Disposal of Samples and Associated Laboratory Waste, current revision)* and ED-SPM-008 (*Laboratory Waste Disposal Procedures, current revision).* The following waste streams are produced when this method is carried out:

- Extractions Waste water. This material is created when 50% Acetone and 50% Methylene Chloride are added to 1 liter of sample water. The water is shaken with the solvent. The solvent is collected with the compounds of interest and the water is discarded into the Extractions Waste Water drum. This drum is removed to the walk-in hood in the waste room. A ½ inch PVC pipe is inserted into the bung hole of the drum and air is passed through the solution over night. The solution is then transferred into the first drum of the neutralization system and neutralized to a pH of 6 – 9. This solution is discharged into the municipal sewer system.

- Mixed Solvent Waste. This material is collected from rinsing and other processes into 5 gallon solvent cans as satellite accumulation. These cans are emptied every 24 hours into a steel drum in the waste room. This drum is kept in the walk in hood until it is full. The full drum is then removed from the hood and placed on secondary containment in the waste room.
  Teris Profile Number: 50016624
  Onyx Profile WIP Number: 545240

- Waste sodium sulfate. This material is collected from various methods which require the removal of water from solvent which carries the analyte (s) of interest. The solvent is passed through the sodium sulfate and the sodium sulfate plus the water is disposed of. The sodium sulfate is collected in buckets inside the hoods. The material is air dried and disposed of in the municipal waste dumpster.

- Waste sulfuric acid. This material is generated from clean up of PCB extracts for sulfur compounds. The acid is collected in satellite accumulation in the hood. The container is removed to the waste room for

neutralization with 50 % sodium hydroxide (Siedler Chemical SC-1824-03), water and sodium bicarbonate (Siedler Chemical SC-0219-25). Ice is used to control temperature in the plastic drums of the neutralization system. When neutralization is complete (pH 6 -9) the material is transferred to the municipal sewer system.

15.0. References / Cross-References

15.1 United States Environmental Protection Agency, "Method SW3510C, Separatory Funnel Extraction", Test Methods for Evaluating Solid Wastes, SW846 Third Edition, Volume 1B: Laboratory Manual, Physical/Chemical Methods, Revision 3, December 1996.

15.2 Eurofins Edison SOP No. ED-MSS-009, *Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS) SW846 Method 8270E*, current revision

15.3 Eurofins Edison Document No. ED-QA-LQM, *Laboratory Quality Manual*, current revision.

15.4 Eurofins Environmental Health and Safety Manual, CW-E-M-001.

15.5 Eurofins Corporate Quality SOP No. CA-Q-S-001 (*Solvent & Acid Lot Testing & Approval*), current revision.

15.6 Eurofins Edison SOP No. ED-GEN-023 (*Bulk Solvent Testing and Approval*), current revision.

15.7 Eurofins Edison SOP No. ED-GEN-022, *Training,* current revision

15.8 Eurofins Edison SOPs Nos. ED-SPM-007 (*Disposal of Samples and Associated Laboratory Waste, current revision)*

15.9 Eurofins Edison SOP No. ED-SPM-008 (*Laboratory Waste Disposal Procedures, current revision).*

16.0. Method Modifications:

N/A

17.0. Attachments

N/A

18.0. Revision History

Revision 12, effective 07/02/2024
- Updated throughout Eurofins branding.
- Updated references to remove obsolete methods 8270C and 8270D.

Revision 11, effective 03/26/2018
- Updated throughout to clarify that the lab's standard procdure is to use Reduced Volume Extraction (~250 ml initial volume) with an option to use large volume extraction (~1000 ml initial volume).

Revision 10, effective 11/29/2016:
- Sections 7.2.1 and 7.2.1.1 : updated current sources of standards.
- Section 7.2.1.1: added standards storage information as note at end of section.
- Section 8.0: added option for 250 ml amber sample containers (LVI option)

Revision 9, effective 11/21/2014:
- Section 7.2: updated current sources of all standards.
- Throughout document as required: added option for preparation of leachates by LVI.
- Section 10.1.29 through 10.1.31: clarified the concentration techniques for both full volume and LVI extracts.

Revision 8, effective 11/28/2012
- Throughout document: updated references to Lab Quality Manual section numbers.
- Added references as necessary throughout to Eurofins Edison SOP No. ED-MSS-009 (*Semivolatile Organic Compounds by GC/MS, SW846 Method 8270C*D, current revision.
- Section 2.2 added describing option for analysis of lower initial volume for subsequent analysis using large volume injection (LVI) technique.
- Section 6.2: added 500 ml separatory funnel.
- Sections 7.2.1 and 7.2.1.1: added '5 Compound BNA Custom Mix' and 'Aromatic Amine Custom Mix' to list of standards and prep instructions table.
- Section 10.1 (Sample Prep for Aqueous Samples): revised throughout to include option for extraction of reduced aqueous volume (250ml) for subsequent analysis by LVI technique. Added note as preface to Section 10.1 alerting analyst to the two available extraction volume options (1000ml and 250ml).

Revision 7, effective 12/6/10
- Section 3: revised to reference new location for definitions
- Sections 7.2.1 and 7.2.1.1: Added 4 compounds and additional details to the description of standard preparation of the Spiking Standard.
- Section 7.2.4: added option to document standards preparation within TALS rather than a laboratory notebook.
- Section 10.3: revised to include TALS as the main repository for raw data associated with sample prep.

Revision 6, effective November, 2008

- Revised SOP format in accordance with Eurofins Corporate Quality SOP No. CW-QS-002 (Rev 0) Writing a Standard Operating Procedure (SOP).
- Revised title to include 'Leachates'.
- Section 1.3: Added reference to Quality Assurance Manual for method modifications.
- Section 3: revised to reference new location for definitions.
- Section 5: Revised to include most up to date corporate health and safety references and information.
- Section 7: added details of the solvent testing and approval program.
- Section 7.2.1: Added additional details to the description of standards and the preparation of the Spiking Standards and Surrogate Standards. Removed references to the Internal Standard which is now added by the analytical group and is discussed in Eurofins Edison SOP No. ED-MSS-002, *Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS), SW846 Method 8270C*, current revision.
- Section 9: Quality Control: added additional details to the discussion of the various QC sample types
- Section 10: Revised and clarified to reflect current procedures. Removed reference to internal standard addition (now completed by analytical group).
- Section 11: Removed reference to Organic Calculation SOP.
- Section 12: updated and revised the MDL requirements to reflect text in the current revision of the Eurofins Edison Laboratory Quality Manual (LQM).
- Section 15: References: Expanded to include more specific SOP references
- Section 16: Added Section 16 (Method Modifications).
- Section 18: Added this Revision History section

Title: Extraction of Pesticides and PCBs in Water by Separatory Funnel using SW846 Method 3510C

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Approvals (Signature/Date):

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1.0 Scope and Application

1.1. **Analytes, Matrix(s), and Reporting Limits:** SW846 Method 3510C describes a procedure for isolating organic compounds from aqueous samples, including concentration techniques suitable for preparing the extract for GC and/or GC/MS analysis. This SOP is specifically applicable to the isolation and concentration of water-soluble and slightly water-soluble Pesticides and PCBs using Method 3510C in preparation for analysis GC methods SW846 8081B, 8082A and GC/MS method EPA 680.

1.2. For a complete discussion of analytes and reporting limits (RLs) refer to the SOP for the applicable analytical method:.

- TestAmerica Edison SOP No. ED-GCS-016, *Analysis of Organochlorine Pesticides by SW846 Method 8081B,* current revision.
- TestAmerica Edison SOP No. ED-GCS-017, *Analysis of Polychlorinated Biphenyls by SW846 Method 8082A,* current revision.
- TestAmerica Edison SOP No. ED-MSS-010, *Determination of PCBs in Water and Soil/Sediment by GC/MS, EPA Method 680*, current revision.

1.3. On occasion clients may request modifications to this SOP. These modifications are handled following the procedures outlined in Section 7 (*Review of Work Request*) and 19 (*Test Methods and Method Validation*) of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

2.0 Summary of Method

2.1 A measured volume of aqueous sample is spiked with surrogates and serially extracted with methylene chloride using a separatory funnel. The extract is dried by passing it through activated sodium sulfate, concentrated using a nitrogen blowdown technique and exchanged into hexane prior to analysis by Methods 8081B, 8082A or 680. Cleanup of extracts may be required prior to analysis.

2.2 The preferred option for preparing aqueous samples for analysis by SW8081B/8082A includes use of a reduced initial volume (~250ml) for analysis by a large volume injection (LVI). A technique for extraction of a larger volume (1000 ml) is also described.

3.0 Definitions

For a complete list of definitions refer to Appendix 2 in the most current revision of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

4.0 Interferences

Phthalate esters contaminate many products commonly found in the laboratory. Plastics, in particular, must be avoided, because phthalates are often used as

plasticizers and are easily extracted from plastic material. Phthalate contamination may result at any time if consistent quality control is not practiced.

Method interference may be caused by contaminants in solvents, reagents, glassware and other sample processing hardware that lead to discrete artifacts or elevated baselines in gas chromatograms. All these materials must be routinely demonstrated to be free from interference under the conditions of the analysis, by analyzing method and reagent blanks.

5.0 Safety

Employees must abide by the policies and procedures in the Corporate Environmental Health and Safety Manual (CW-E-M-001) and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum.

5.1. Specific Safety Concerns or Requirements

Nitrile gloves should be used when performing this extraction. Latex and vinyl gloves provide no significant protection against the organic solvents used in this SOP, and should not be used.

The use of separatory funnels to extract aqueous samples with methylene chloride creates excessive pressure very rapidly. Initial venting should be done immediately after the sample container has been sealed and inverted. Vent the funnel into the hood away from people and other samples. This is considered a high-risk activity, and a face shield must be worn over safety glasses or goggle when it is performed.

The use of Kevlar gloves is required for the assembly/disassembly of ground glass joints in addition to those tasks that present the potential risk for injury.

5.2. Primary Materials Used

The following is a list of the materials used in this method, which have a serious or significant hazard rating. **Note: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the MSDS for each of the materials listed in the table.** A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the MSDS for each material before using it for the first time or when there are major changes to the MSDS.

Material (1)	Hazards	Exposure Limit (2)	Signs and symptoms of exposure
Methylene Chloride	Carcinogen Irritant	25 ppm-TWA 125 ppm-STEL	Causes irritation to respiratory tract. Has a strong narcotic effect with symptoms of mental confusion, light-headedness, fatigue, nausea, vomiting and headache. Causes irritation, redness and pain to the skin and eyes. Prolonged contact can cause burns. Liquid degreases the skin. May be absorbed through skin.
Acetone	Flammable	1000 ppm-TWA	Inhalation of vapors irritates the respiratory tract. May cause coughing, dizziness, dullness, and headache.
Hexane	Flammable Irritant	500 ppm-TWA	Inhalation of vapors irritates the respiratory tract. Overexposure may cause lightheadedness, nausea, headache, and blurred vision. Vapors may cause irritation to the skin and eyes.
1 – Always add acid to water to prevent violent reactions (if applicable).			
2 – Exposure limit refers to the OSHA regulatory exposure limit.			

6.0 Equipment and Supplies

6.1. Equipment

- Steam Bath - Fisher Scientific 66738 or equivalent.
- Muffle Furnace - Thermolyne Type 6000 or equivalent.
- N-Evap - Meyer Analytical Evaporator Model No. 112 or equivalent
- Separatory Funnel Rotator, APR Machine or equivalent
- Centrifuge, Varifuge F; Hereaus Sepatech

6.2. Supplies

- 400 ml Clear Glass Jar
- 500 ml Separatory Funnel, AMK Glass SFC-0095 or equivalent
- 100 mm o. d. glass funnels, Fisher or equivalent
- 10 ml jacketed, graduated Concentrator Tubes, AMK Glass KD-0018 or equivalent
- 19/22 Ground Glass Stoppers

- 50 ul Gastight Syringe, Hamilton 80900 or equivalent
- 100 ul Gastight Syringe, Hamilton 81000 or equivalent
- 150 ml Centrifuge Tube
- 100 ml Graduated Cylinder
- Pasteur 5¾" Disposable Pipettes, Fisher 13-678-20B or equivalent
- Glass Wool
- Desiccators
- Standard Taper Clamps (Size 19, blue)
- Wax Pencil
- 1 Liter Graduated Cylinder
- Marking Tags
- pH paper

7.0 Reagents and Standards

7.1 Reagents

Note: Each lot of Methylene Chloride and Acetone, is screened for contaminants before being used for analysis as detailed in TestAmerica Corporate Quality SOP No. CA-Q-S-001 (*Solvent & Acid Lot Testing & Approval*) and TestAmerica Edison SOP No. ED-GEN-023 (*Bulk Solvent Testing and Approval*).

- Methylene Chloride - JT Baker Ultra-Resi 9254-03 or equivalent
- Sodium Sulfate Crystals – Mallinckrodt MA8024-06 or equivalent
- Acetone, J. T. Baker Ultra-Resi 9264-03 or equivalent
- Hexane, Pesticide Grade, Baxter 217-4or equivalent
- Organic free reagent water - Reagent water is defined as a water in which an interference is not observed at the MDL of each parameter of interest (ASTM Specification D1193, Type ii). At TestAmerica Edison this water is generated by the Barnstead/Thermolyne Water System (Model # D11991 Serial # 1191020210415).

7.1.1 Reagent preparation

7.1.1.1 Anhydrous sodium sulfate crystals (Mallinckrodt MA8024-06 or equivalent) must be baked in the muffle furnace for four hours at 400^{o}C and serially rinsed with methylene chloride prior to use.

7.2 Standards

7.2.1 Standards are purchased as concentrated solutions (see Section 7.2.2). Most stock solutions are diluted (in volumetric glassware) to working concentration using acetone as the diluent as described in Section 7.3.

7.2.2 **Standard mixes and sources:** Table 1 lists the standard concentrate mix sources. Table 2 details the individual components of these mixes.

Table 1a:
Pesticide/PCB Standard Mixes and Sources (8081/8082)*

Standard Name ("Lab Name")	Concentration in ug/ml (each component)	Source - Catalog #
Pesticide Surrogate Spike Mix	200	RESTEK-32000
Aroclor Spike Mix (1660 Aroclor)	1000	RESTEK-32039
Organochlorine Pesticides Mix ("Pest Spike")	2000	RESTEK-32415
Chlordane (technical) ("Technical Chlordane Spike")	5000	RESTEK-32072
Toxaphene	5000	RESTEK-32071

*May be substituted with equivalent standards from alternate sources.

Table 1b:
PCB Homologue Standard Mixes and Sources (EPA 680)*

Standard Name ("Lab Name")	Concentration in ug/ml (each component)	Source - Catalog #
Retention Time Calibration Standard Mixture	Varies	Ultra-CB682-MN
Concentration Calibration Standard Mix	Varies	Ultra-CB681-MN
$^{13}C_{12}$-Decachlorobiphenyl Surrogate	40	Cambridge-EC1410-3
Lindane13C6	100	Cambridge-CL1282-S

Table 2a:
Components of Pesticide/PCB Standard Mixes (8081/8082)

Parameter	Catalog Nos.	Lab Standard Name	Conc (ug/ml)
Decachlorobiphenyl (DCB)	Pesticide Surrogate Spike Mix	RESTEK-32000	200
2,4,5,6-Tetrachloro-m-xylene (TCMX)	Pesticide Surrogate Spike Mix	RESTEK-32000	200
Aroclor 1016	Aroclor Spike Mix	RESTEK-32039	1000
Aroclor 1260	Aroclor Spike Mix	RESTEK-32039	1000
Aldrin	Organochlorine Pesticides Mix	RESTEK-32415	2000
alpha-BHC	Organochlorine Pesticides Mix	RESTEK-32415	2000
beta-BHC	Organochlorine Pesticides Mix	RESTEK-32415	2000
Lindane	Organochlorine Pesticides Mix	RESTEK-32415	2000
g-BHC	Organochlorine Pesticides Mix	RESTEK-32415	2000
DDD	Organochlorine Pesticides Mix	RESTEK-32415	2000
4,4'-DDE	Organochlorine Pesticides Mix	RESTEK-32415	2000

Table 2a: Components of Pesticide/PCB Standard Mixes (8081/8082)			
Parameter	**Catalog Nos.**	**Lab Standard Name**	**Conc (ug/ml)**
4,4'-DDT	Organochlorine Pesticides Mix	RESTEK-32415	2000
Dieldrin	Organochlorine Pesticides Mix	RESTEK-32415	2000
alpha-Endosulfan	Organochlorine Pesticides Mix	RESTEK-32415	2000
beta-Endosulfan	Organochlorine Pesticides Mix	RESTEK-32415	2000
Endosulfan Sulfate	Organochlorine Pesticides Mix	RESTEK-32415	2000
Endrin	Organochlorine Pesticides Mix	RESTEK-32415	2000
Endrin aldehylde	Organochlorine Pesticides Mix	RESTEK-32415	2000
Endrin ketone	Organochlorine Pesticides Mix	RESTEK-32415	2000
Heptachlor	Organochlorine Pesticides Mix	RESTEK-32415	2000
Hetptachlor epoxide	Organochlorine Pesticides Mix	RESTEK-32415	2000
Methoxychlor	Organochlorine Pesticides Mix	RESTEK-32415	2000
Chlordane (technical)	Technical Chlordane Spike	RESTEK-32072	5000
Toxaphene	Toxaphene Spike	RESTEK-32071	5000

Table 2b: Components of PCB Homologue Standard Mixes (680)			
Parameter	**Catalog Nos.**	**Lab Standard Name**	**Conc (ug/ml)**
PCB-104	Ultra-CB682-MN	Retention Time Calibration Standard Mix	100
PCB-208	Ultra-CB682-MN	Retention Time Calibration Standard Mix	200
PCB-77	Ultra-CB682-MN	Retention Time Calibration Standard Mix	100
Total Nonachlorobiphenyls	Ultra-CB682-MN	Retention Time Calibration Standard Mix	200
DCB Decachlorobiphenyl	Ultra-CB681-MN	Concentration Calibration Standard Mix	250
Total Dichlorobiphenyls	Ultra-CB681-MN	Concentration Calibration Standard Mix	50
Total Heptachlorobiphenyls	Ultra-CB681-MN	Concentration Calibration Standard Mix	150
Total Hexachlorobiphenyls	Ultra-CB681-MN	Concentration Calibration Standard Mix	100
Total Monochlorobiphenyls	Ultra-CB681-MN	Concentration Calibration Standard Mix	50
Total Octachlorobiphenyls	Ultra-CB681-MN	Concentration Calibration Standard Mix	150
Total Pentachlorobiphenyls	Ultra-CB681-MN	Concentration Calibration Standard Mix	100
Total Tetrachlorobiphenyls	Ultra-CB681-MN	Concentration Calibration Standard Mix	100
Total Trichlorobiphenyls	Ultra-CB681-MN	Concentration Calibration Standard Mix	50
Decachlorobiphenyl-13C12	Cambridge-EC1410-3	$^{13}C_{12}$-Decachlorobiphenyl Surrogate	40
Lindane13C6	Cambridge-CL1282-S	Lindane13C6	100

7. 3. Standards Preparation

7.3.1. All standard stock solutions are diluted to the working concentrations with hexane or acetone (as indicated) using Class A volumetric glassware. **Note:** septa on all surrogate and spike vials are to be replaced immediately after use. Additionally, all surrogate and spike vials are to be returned to the standards refrigerator immediately after use.

7.3.2. **Pesticide Spiking Standard (LCS/MS/MSD): For the reduced volume extraction option:** prepare a 4 ug/ml spiking solution by diluting 10 ml of the 20ug/ml standard prepared above to a final volume of 50ml in acetone. For spiking instructions refer to Section 10.

7.3.3. **8082 PCB Spiking Standard (LCS/MS/MSD):**. **For the reduced volume extraction option:** prepare a 20 ug/ml spiking solution by diluting 10 ml of the 100 ug/ml stock standard prepared above to a final volume of 50ml in acetone. For spiking instructions refer to Section 10.

7.3.4. **680 PCB Homologue Spiking Standard (LCS/MS/MSD):** The EPA Method 680 PCB homologue spiking standard is prepared by diluting 1.0 ml of the Retention Time Calibration Standard Mix (Ultra-CB682-MN) and 1.0 ml of the Concentration Calibration Standard Mix (Ultra-CB681-MN) to 100mL of hexane using volumetric glassware. For spiking instructions refer to Section 10.

7.3.5. **Technical Chlordane Spiking Standard (LCS/MS/MSD):** The technical Chlordane spiking solution is prepared at a final concentration of 100 ug/ml by diluting 0.2 ml of the 5000 ug/ml Technical Chlordane Spike solution (RESTEK-32072, see Tables 1 and 2) to a 10 ml final volume using acetone. For spiking instructions refer to Section 10.

7.3.6. **Toxaphene Spiking Standard (LCS/MS/MSD):** A Toxaphene spiking solution is prepared at a final concentration of 100 ug/ml by diluting 0.2 ml of the 5000 ug/ml Toxaphene Spiking Standard (RESTEK-32071, see Tables 1 and 2) to a 10 ml final volume with acetone. For spiking instructions refer to Section 10.

7.3.7. **Pesticide Surrogate Spiking Standard: For the reduced volume extraction option:** prepare a 2 ug/ml spiking solution by diluting 10 ml of the 10 ug/ml stock standard described above to a final volume of 50ml in acetone. For spiking instructions refer to Section 10.

7.3.8. **680 PCB Homologue Surrogate Spiking Standard:** The EPA Method 680 surrogate spiking standard is prepared by diluting 3.125 ml of Decachlorobiphenyl-13C12 Surrogate (Cambridge-EC1410-3) and 1.0 ml of Lindane13C6 (Cambridge-CL1282-S) to 50.0 ml hexane using volumetric glassware. For spiking instructions refer to Section 10.

8.0 Sample Collection, Preservation, Shipment and Storage

Sample container, preservation techniques and holding times may vary and are dependent on sample matrix, method of choice, regulatory compliance, and/or specific contract or client requests. Listed below are the holding times and the references that include preservation requirements.

Matrix	Sample Container	Min. Sample Size	Preservation	Holding Time	Reference
Water	Amber Glass	250 ml (8 oz)	Cool 4 ± 2°C	7 days to extraction; 40 days to analysis	USEPA SW846
Water	Amber glass	1000 ml	Cool 4 ± 2°C	7 days to extraction; 40 days to analysis	USEPA Method 680

8.1. Extracts must be stored under refrigeration (Cool 4 ± 2°C) in the dark and analyzed within 40 days of extraction.

9.0 Quality Control

9.1 Sample QC - The following quality control samples are prepared with each batch of samples.

Quality Controls	Frequency	Control Limit
Method Blank (MB)	1 in 20 or fewer samples	< Rpt. Limit
Laboratory Control Sample (LCS)[1]	1 in 20 or fewer samples	Statistical Limits [4]
Matrix Spike (MS)[2]	1 in 20 or fewer samples	Statistical Limits [4]
MS Duplicate (MSD)[2]	1 in 20 or fewer samples	Statistical Limits [4]
Surrogates	every sample[3]	Statistical Limits [4]

[1] LCS Duplicate (LCD) is performed only when insufficient sample is available for the MS/MSD or when requested by the client/project/contract.
[2] The sample used for MS/MSD is randomly selected by the organic prep lab, unless specifically requested by a client.
[3] Analytical and QC samples (MB, LCS, MS/MSD)
[4] Statistical control limits are updated annually and are updated into TALS (LIMS).

9.1.1. Method Blanks are extracted with each sample batch on each day that samples are extracted. The analytical results for the method blank must fall below the reporting limit for each compound of interest. If a target compound is detected in the blank at a concentration higher than the reporting limit, first the extract is reanalyzed for confirmation. If results are still outside of limits the entire batch of samples extracted with the affected blank must be re-extracted and reanalyzed.

9.1.2. Laboratory Control Sample (LCS): A Laboratory Control Sample (LCS) or blank spike must be extracted and analyzed for with each batch of 20 environmental samples. The LCS data is used to ensure that the analytical system is in control. It is also used to assess performance if the MS/MSD recoveries fall outside of established limits. The recoveries of the LCS must fall within lab generated acceptance criteria. If the spiked sample recovery results fall outside the laboratory generated limits (refer to the current active TALS

method limit group database), the LCS recovery is evaluated. If LCS recovery is within limits the poor sample recovery results are attributed to matrix interference. If the LCS recovery results are outside QC limits, first the extract is reanalyzed and if it is still outside the limits the entire QC batch must be re-extracted and reanalyzed.

9.1.3. Matrix Spike/Matrix Spike Duplicate (MS/MSD): A Matrix Spike/Matrix Spike Duplicate (MS/MSD) pair is extracted and analyzed with every batch of 20 environmental samples. MS/MSD recoveries are evaluated against lab generated limits (refer to refer to the current active TALS method limit group database). If the MS/MSD recovery limits fall outside of lab limits the LCS recovery is evaluated and corrective action is taken as described in the applicable analytical SOP (see Section 15.0, References).

9.1.4. Surrogate Standards: All samples, blanks and QC samples are spiked with surrogate standard solution containing DCB and TCMS (see Section 7.3.6). The percent recovery of the surrogate standards is calculated and compared to lab generated limits (refer to refer to the current active TALS method limit group database). If the surrogate recovery limits are outside of acceptance limits the sample extract is reanalyzed to confirm. If the recoveries are still outside of limits the sample must be re-extracted and reanalyzed or the data flagged as “estimated concentration”.

10.0. Procedure

10.1. Rinse a 500 ml separatory funnels twice each with a 1:1 methylene chloride/acetone mix and once with methylene chloride. Drain the solvents before adding sample to the funnels.

10.2. Place a small amount of glass wool into a 100-mm funnel and fill with pre-baked sodium sulfate crystals. Rinse three times with methylene chloride. Also rinse the outside of the funnel stem three times with methylene chloride, as it is likely to come into contact with the extract. Allow time for all of the rinsate to drain out of the funnel into a waste container.

10.3. Write the lab sample id number for each sample on the separatory funnels using a red wax pencil.

10.4. Make up hangtags for each sample as follows and hang on the corresponding

PCBs	PST
Sample Number: xxx	Sample Number: xxx
Fraction-Matrix:xxx	Fraction-Matrix:xxx
Date of Extraction:xx/xx/xx	Date of Extraction:xx/xx/xx

10.5. Place a 100 ml funnel containing rinsed sodium sulfate crystals onto each flasks

10.6. Mark the fluid level on each sample bottle with a black magic marker.

10.7. Rinse out a 1000ml graduated cylinder two to three times with organic free reagent water (for TCLP/SPLP leachates or reduced volume extraction use a 250 ml graduated cylinder). Obtain 1000ml of organic free reagent water (100 ml for TCLP/SPLP leachates or 250ml for reduced volume extraction) from the Millipore filtering apparatus for each of the method blank and the LCS.

10.8. Measure the initial pH of each sample with wide range pH paper and record the observed value in TALS prep batch as 'Received/initial pH'. If the initial pH of the sample is not between 5-9 adjust the pH to within 5-9 using 1:1(v/v) sulfuric acid or 10N Sodium hydroxide, as appropriate. Record the final adjusted pH value in the TALS batch comment section. Lesser strengths of acid or base solution may be employed, provided that they do not results in a significant change (<1%) in the volume of sample.

10.9. Pour each sample (including the method blank and LCS water) into its corresponding separatory funnel.

10.10. Rinse the spiking syringes 8 to 10 times with Acetone.

10.11. **For methods 8081/8081**: Add 50 ul of Pesticide Surrogate Spike Mix (see Section 7.2) to each sample and QC sample. When spiking the samples, make sure to get all bubbles out of the syringe. In addition, hold the syringe just above the level of the liquid when adding the spike. Don't touch the tip of the syringe to the liquid or the side of the separatory funnel

10.12. **For method 680**: add 1.0 ml of the PCB Homologue Surrogate Spiking Standard (see Section 7.3.8) to each sample and QC sample. When spiking the samples, make sure to get all bubbles out of the syringe. In addition, hold the syringe just above the level of the liquid when adding the spike. Don't touch the tip of the syringe to the liquid or the side of the separatory funnel

10.13. Depending upon the fraction and requested target analytes (Refer to Section 7.3 for information of spiking solutions).

- **PCBs by 8082**: add 50 ul of the 20ug/ml PCB Spike solution (see Section 7.3.3) to each LCS and designated MS/MSD
- **Pesticides (total) and TCLP/SPLP Pesticides by 8081**: 50 ul of the 4 ug/ml Pest Spike solution (see Section 7.3.2) to each LCS and designated MS/MSD
- **Technical Chlordane by 8081:** 20 ul of the 100 ug/ml Technical Chlordane Spike mix (see Section 7.3.5) to each LCS and designated MS/MSD.
- **Toxaphene by 8081:** 20 ul of the 100 ug/ml Toxaphene Spike mix (see Section 7.3.6) to each LCS and designated MS/MSD.

- **PCB Homologues by 680:** 1ml of the 680 PCB Homologue Spiking Standard (see Section 7.3.4) to each LSC and designated MS/MSD).

When spiking the samples, make sure to get all bubbles out of the syringe. In addition, hold the syringe just above the level of the liquid when adding the spike. Don't touch the tip of the syringe to the liquid or the side of the separatory funnel. Add 15 ml of methylene chloride for the reduced volume extraction option.

10.14. Add 15 ml of methylene chloride to each sample bottle. Swirl the solvent in the bottle and add the 15 ml for of methylene chloride to its corresponding separatory funnel.

10.15. Secure the separatory funnels to the rotators. Start the rotators.

10.16. Stop the rotator and vent the funnels after about 10 seconds. Resume rotating for 2 minutes.

10.17. After the rotator stops let the sample settle.

10.18. Drain bottom layer (organic layer) of the sample into the funnel/Concentrator apparatus.

10.19. Repeat steps 10.12 through 10.16 twice, now adding the methylene chloride directly to separatory funnel, rather than rinsing the sample container as in 10.12.

10.20. If an emulsion forms during the extraction, rinse a centrifuge tube well with methylene chloride and then drain the lower layer from the large separatory funnel into the tube. Centrifuge for 3 to 5 minutes at 2000 rpm. Make sure the levels (and weights) of the samples directly opposite one another in the centrifuge are approximately equal. After the centrifuging process is finished, there will be two layers: water on top and the methylene chloride with the desired sample extract on the bottom. A 1-ml disposable pipette should be used to transfer the bottom layer from the centrifuge tube to the appropriate concentration tube. With this method, care must be taken not to transfer any of the top layer. The top layer that remains is poured back into the separatory funnel with the rest of the original sample.

10.21. Find the empty sample bottles previously marked with a black marker with tap water up to the black line. Pour this into the graduated cylinder used for measuring sample volumes. Record each sample volume into the TALs extraction batch database.

10.22. Rinse funnel/sodium sulfate attached to concentration tube, twice with about 20ml of methylene chloride.

10.23. Sample can be concentrated between 30^{o}C-40^{o}C in the N-Vap to 2 ml final volume in the methylene chloride

10.24. Add about 10ml of Hexane to extract to exchange

10.25. Concentrate the hexane extract to 1 ml on the steam bath (temperature set between 30°C-40°C) using the N-EVAP apparatus.

10.26. The extract is now ready for the appropriate clean up.

10.27. If an emulsion forms during extraction, rinse a centrifuge tube well with Methylene Chloride and then drain the lower layer from the large separatory funnel into the tube. Centrifuge for 3 to 5 minutes at 2000 rpm. Make sure the levels (and weights) of the samples directly opposite one another in the centrifuge are approximately equal. After the centrifuging process is finished, there will be two layers: water on top and the Methylene Chloride with the desired sample extract on the bottom. A 1-ml disposable pipette should be used to transfer the bottom layer from the centrifuge tube to the appropriate concentration tube. With this method, care must be taken not to transfer any of the top layer. The top layer that remains is poured back into the 2000-ml separatory funnel with the rest of the original sample.

10.28. Required Documentation:

The organic prep technician is responsible for completing the following items.

10.28.1. The TALS reagent database must be completed in full with all required information whenever standards are logged and/or prepared.

10.28.2. All required data types (sample volumes, reagent and standard volumes, reagent and standard lots, spike witness, etc…) must be entered into the TALS batch database each time an extraction is performed. The department manager is responsible for ensuring that the data is reviewed for completeness and accuracy.

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11.0. Calculations / Data Reduction

None

12.0. Method Performance

12.1. Method Detection Limit Study (MDL)

The method detection limit (MDL) is the lowest concentration that can be detected for a given analytical method and sample matrix with 99% confidence that the analyte is present. The MDL is determined according to the laboratory's MDL procedure in Section 20 (Test Methods and Method Validation) of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM). MDLs reflect a

calculated (statistical) value determined under ideal laboratory conditions in a clean matrix, and may not be achievable in all environmental matrices. The laboratory maintains MDL studies for analyses performed; these are verified at least annually unless method requirements require a greater frequency.

12.2. Demonstration of Capabilities

For DOC procedure refer to Section 19 in the most current revision of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

12.3. Training Requirements

Refer to the current revision of TestAmerica Edison SOP No. ED-GEN-022, *Training*, for the laboratory's training program.

13.0. Pollution Control

13.1. Pollution prevention encompasses any technique that reduces or eliminates the quantity or toxicity of waste at the point of generation. Numerous opportunities for pollution prevention exist in laboratory operation. The USEPA has established a prevention hierarchy of environmental management techniques that places pollution prevention as the management option of first choice. Whenever feasible, laboratory personnel should use pollution prevention techniques to address their waste generation. When wastes cannot be feasibly reduced at the source, the agency recommends recycling as the next best option.

13.2. The quantity of chemical purchased should be based on expected usage during its shelf life and disposal cost of unused material. Actual reagent preparation volumes should reflect anticipated usage

14.0. Waste Management

14.1. The U.S. Environmental Protection Agency requires that laboratory waste management practices conducted be consistent with all applicable rules and regulations. All waste will be disposed of in accordance with Federal, State and Local regulations. Where reasonably feasible, technological changes have been implemented to minimize the potential for pollution of the environment. Employees will abide by this method and the policies in section 13 of the Corporate Safety Manual for "Waste Management and Pollution Prevention."

14.2. The following waste streams are generated as a result of this analysis:

- Extractions Waste water. This material is created when 50% Acetone and 50% Methylene Chloride are added to 1 liter of sample water. The water is shaken with the solvent. The solvent is collected with the compounds of interest and the water is discarded into the Extractions Waste Water drum. This drum is removed to the walk-in hood in the waste room. A ½

inch PVC pipe is inserted into the bung hole of the drum and air is passed through the solution over night. The solution is then transferred into the first drum of the neutralization system and neutralized to a pH of 6 – 9. This solution is discharged into the municipal sewer system.

- Mixed Solvent Waste. This material is collected from rinsing and other processes into 5 gallon solvent cans as satellite accumulation. These cans are emptied every 24 hours into a steel drum in the waste room. This drum is kept in the walk in hood until it is full. The full drum is then removed from the hood and placed on secondary containment in the waste room.
  Teris Profile Number: 50016624
  Onyx Profile WIP Number: 545240

- Waste sodium sulfate. This material is collected from various methods which require the removal of water from solvent which carries the analyte (s) of interest. The solvent is passed through the sodium sulfate and the sodium sulfate plus the water is disposed of. The sodium sulfate is collected in buckets inside the hoods. The material is air dried and disposed of in the municipal waste dumpster.

- Waste sulfuric acid. This material is generated from clean up of PCB extracts for sulfur compounds. The acid is collected in satellite accumulation in the hood. The container is removed to the waste room for neutralization with 50 % sodium hydroxide (Siedler Chemical SC-1824-03), water and sodium bicarbonate (Siedler Chemical SC-0219-25). Ice is used to control temperature in the plastic drums of the neutralization system. When neutralization is complete (pH 6 -9) the material is transferred to the municipal sewer system.

15.0. References / Cross-References

15.1. United States Environmental Protection Agency, “Method 3510C: Separatory Funnel Liquid-Liquid Extraction”, Test Methods for Evaluating Solid Wastes, SW846 Third Edition, Volume 1B: Laboratory Manual, Physical/Chemical Methods, Revision 3, December 1996.

15.2. *EPA Method 680: Determination of Pesticides and PCBs in Water and Soils/Sediment by Gas Chromatography/Mass Spectrometry*. Physical and Chemical Methods Branch, Environmental Monitoring and Support Laboratory, Office of Research and Development, USEPA, Cincinnati, OH, November 1985.

15.3. TestAmerica Edison SOP No. ED-GCS-016, *Analysis of Organochlorine Pesticides by SW846 Method 8081B,* current revision.

15.4. TestAmerica Edison SOP No. ED-GCS-017, *Analysis of Polychlorinated Biphenyls by SW846 Method 8082A,* current revision.

15.5. TestAmerica Edison SOP No. ED-MSS-010, *Determination of PCBs in Water and Soil/Sediment by GC/MS ,EPA Method 680*, current revision.

15.6. TestAmerica Edison Document No. ED-QA-LQM, *Laboratory Quality Manual*, current revision.

15.7. TestAmerica Corporate Document No. CW-E-M-001, *Environmental Health and Safety Manual,* current revision.

15.8. TestAmerica Corporate Quality SOP No. CA-Q-S-001, *Solvent & Acid Lot Testing & Approval*, current revision.

15.9. TestAmerica Edison SOP No. ED-GEN-023, *Bulk Solvent Testing and Approval*, current revision.

15.10. TestAmerica Edison SOP No. ED-GEN-013, *Glassware Cleaning*, most current revision

15.11. TestAmerica Edison SOP No. ED-GEN-022, *Training,* current revision.

16.0. Method Modifications:

NONE

17.0. Attachments

NONE

18.0. Revision History

- Revison 13, dated Jun 27, 2019:
    - Sections 1 and 15 (and throughout document as applicable): Deleted references to obsolete methods SW8082 and SW8081A as well as references to associated SOPs.
    - Section 2.2: revised wording to clarify that the RVE/LVI technique is the standard procedure.
    - Throughout document: removed references to equipment no longer used in the procedure: Synder columns, Kuderna-Danish concentrators, Erlenmyer flasks.

- Revision 12, dated May 16, 2017:
    - Updated throughout to include aqueous preps for EPA method 680.
- Revision 11, dated Dec 13, 2016:
    - Section 6.2: added pH paper to list of supplies.
    - Section 10.8: added instruction for measuring, adjusting and documenting sample pH values.
- Revison 10, dated Jun 15, 2015:
    - Section 2.1 and throughout document: Revised standard initial volume for Reduced Volume Extraction (RVE) to 250 ml.
    - Section 7.2: Tables 1 and 2 updated with new Restek standards.
    - Sections 7.3: updated spiking standards preparation instructions as necessitated by switch to Restek standards.
    - Section 8.0: updated minimum volume to 250ml.
- Revison 9, dated May 3, 2013:
    - Section 7.2.2, Table 1: corrected concentration of the Chlordane (technical) standard solution to 1000 ug/ml. Deleted 'TCLP Pest Mix 1' and 'TCLP Pest Mix 2'. Added Toxaphene (Supleco 48103-U).
    - Section 7.2.2, Table 2: corrected concentration of the Chlordane (technical) standard solution to 1000 ug/ml. Deleted all TCLP Pest Spike standards. Added Toxaphene (Supleco 48103-U).
    - Deleted Section 7.3.4, TCLP Pesticide Spiking Standard (LSC/MS/MSD). Remaining sections renumbered accordingly.
    - Section 10.11. Deleted last bullet (TCLP Pesticides). Added '…and TCLP/SPLP Pesticides' to the second bullet (Pesticides). Added '(or 20 ul of the 100ug/ml mix for reduced volume extraction)' to the Toxaphene bullet.
- Revision 8, dated February 26, 2013:
    - Throughout document: updated Lab Quality Manual section number references as required.
    - Section 1.2: added references to all applicable analytical SOPs.
    - Section 2.0: added Section 2.1 which describes option for Reduced Volume Extraction.
    - Section 6.2: added a 500 ml separatory funnel.
    - Section 7.0: updated throughout to include additional standards preps for reduced volume extraction.
    - Section 8.0: updated to include smaller sample container for the reduced volume extraction option.
    - Section 10.0: updated to include spiking and concentration instructions for the reduced volume extraction option.

- Revision 7, dated October 31, 2011

    - Section 7.0: added 'Reagent Water' and details concerning it's preparation to the list of reagents.

- Revision 6, dated October 30, 2009

    - Revised SOP format in accordance with TestAmerica Corporate Quality SOP No. CW-QS-002 (Rev 0) Writing a Standard Operating Procedure (SOP).
    - Section 1.1 Added reference to Quality Assurance Manual for method modifications.
    - Section 1.1: Expanded to include references to applicable analytical SOPs.
    - Section 3: revised to reference new location for definitions.
    - Section 5: Revised to include most up to date corporate health and safety references and information.
    - Section 7.2.2: Added tables detailing components found in the various spiking standards mixes.
    - Section 7.3: Updated the instructions for preparation of spiking standards.
    - Section 7.3: Added tables with spiking standards prep details.
    - Section 8: Updated with additional details including a table outlining containers, preservation and holding times.
    - Section 9.1: Expanded QC sample preparation details.
    - References: Expanded to include more specific SOP references
    - Section 18: Added this Revision History section
    - Throughout document: added references to TestAmerica LIMS (TALS).
    - Throughout document: deleted references to organophosphorus pesticides as the Edison lab no longer analyzes for these.

Title: Extraction of Organochlorine Herbicides in Water by SW846 Method 8151A

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Approvals (Signature/Date):

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Date

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1.0 Scope and Application

1.1. **Analytes, Matrix(s), and Reporting Limits:** SW846 Method 8151A provides extraction and derivatization procedures for the gas chromatographic analysis of chlorinated acid herbicides in water, soil, and waste samples. An option for the hydrolysis of esters is also described. This SOP details the extraction of water samples with diethyl ether followed by esterification with trimethylsilyl diazomethane (an option for the use of diazald is also included). The derivatives are determined by gas chromatography with an electron capture detector (GC/ECD). The results are reported as acid equivalents.

1.2. For a complete discussion of analytes and reporting limits (RLs) please refer to Eurofins Edison SOP No. ED-GCS-005, *Analysis of Organochlorine Herbicides by SW846 Method 8151A,* current revision.

1.3. On occasion clients may request modifications to this SOP. These modifications are handled following the procedures outlined in Section 7 (*Review of Work*) and 19 (*Test Methods and Method Validation*) of Eurofins Edison's Quality Assurance Manual (ED-QA-LQM).

2.0 Summary of Method

This SOP provides extraction and derivatization procedures for the determination of Chlorinated acid herbicides and their esters in water and aqueous waste samples.

Water samples are hydrolyzed, cleaned with methylene chloride, acidified, extracted with diethyl ether and then esterified with TMSD (trimethylsilyl diazomethane). And optional esterification using diazald is also described. The derivatives are determined by gas chromatography with an electron capture detector (GC/ECD).

The sensitivity of Method 8151A depends on the level of interferences in addition to Instrumental limitations.

3.0 Definitions

For a complete list of definitions refer to Appendix 5 in the most current revision of Eurofins Edison's Quality Assurance Manual (ED-QA-LQM).

4.0 Interferences

Method interference may be caused by contaminants in solvents, reagents, glassware and other sample processing hardware that lead to discrete artifacts or elevated baselines in gas chromatograms. All these materials must be routinely demonstrated to be free from interference under the conditions of the analysis, by analyzing reagent blanks.

Matrix interference may be caused by contaminants that are co-extracted from the sample. Organic acids, especially chlorinated acids, cause the most direct

interference with the determination by methylation. Phenols, including chlorophenols, may also interfere with this procedure.

The acid forms of the analytes are strong organic acids that react readily with alkaline substances and can be lost during sample preparation. Glassware and glass wool must be acid-rinsed with 1 N hydrochloric acid and the sodium sulfate must be acidified with sulfuric acid prior to use to avoid analyte losses due to adsorption.

Sample extracts must be dry prior to methylation or else poor recoveries will result.

5.0 Safety

Employees must abide by the policies and procedures in the Corporate Environmental Health and Safety Manual (CW-E-M-001) and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum.

5.1. Specific Safety Concerns or Requirements

Ethyl Ether is an extremely flammable solvent. If a mechanical device is used for sample extraction, the device should be equipped with an explosion proof motor and placed in a hood.

Ethyl Ether must be free of peroxides as determined by use of EM Quant Peroxide Test Strips as described in Sections 6 and 7 below.

Diazomethane can explode under certain conditions therefore take the following precautions:

- Use a well-ventilated hood.
- Use a safety screen.
- Do not heat above 90°C.
- Avoid grinding surfaces, ground glass joints, sleeve bearings, and glass stoppers.
- Store away from alkali metals.
- Solutions of diazomethane decompose rapidly in the presence of solid materials such as copper powder, calcium chloride, and boiling chips.

The use of Kevlar gloves is required for the assembly/disassembly of ground glass joints in addition to those tasks that present the potential risk for injury.

Ether creates excessive pressure very rapidly. Therefore, initial venting should be done immediately after the separatory funnel has been sealed and inverted. Vent into hood away from analysts and other samples.

5.2. Primary Materials Used

The following is a list of the materials used in this method, which have a serious or significant hazard rating. **Note: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the MSDS for each of the materials listed in the table.** A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the MSDS for each material before using it for the first time or when there are major changes to the MSDS.

Material (1)	Hazards	Exposure Limit (2)	Signs and symptoms of exposure
Methylene Chloride	Carcinogen Irritant	25 ppm-TWA 125 ppm-STEL	Causes irritation to respiratory tract. Has a strong narcotic effect with symptoms of mental confusion, light-headedness, fatigue, nausea, vomiting and headache. Causes irritation, redness and pain to the skin and eyes. Prolonged contact can cause burns. Liquid degreases the skin. May be absorbed through skin.
Sodium Hydroxide	Corrosive Poison	2 ppm, 5 mg/m^3	This material will cause burns if comes into contact with the skin or eyes. Inhalation of Sodium Hydroxide dust will cause irritation of the nasal and respiratory system.
Sulfuric Acid	Corrosive Oxidizer Dehydrator Poison Carcinogen	1 Mg/M3-TWA	Inhalation produces damaging effects on the mucous membranes and upper respiratory tract. Symptoms may include irritation of the nose and throat, and labored breathing. Symptoms of redness, pain, and severe burn can occur. Contact can cause blurred vision, redness, pain and severe tissue burns. Can cause blindness.
Acetone	Flammable	1000 ppm-TWA	Inhalation of vapors irritates the respiratory tract. May cause coughing, dizziness, dullness, and headache.
Ethyl Ether	Flammable Irritant Peroxide Former	400 ppm-TWA	General anesthesia by inhalation can occur. Continued exposure may lead to respiratory failure or death. Early symptoms include irritation of nose and throat, vomiting, and irregular respiration, followed by dizziness, drowsiness, and unconsciousness. May cause irritation, redness and pain to the eyes. Irritating to the skin and mucous membranes by drying effect. Can cause dermatitis on prolonged exposure. May be absorbed through skin. **May form explosive peroxides on long standing or after exposure to air or light. This material must be disposed of within six months.**

Material (1)	Hazards	Exposure Limit (2)	Signs and symptoms of exposure
Hexane	Flammable Irritant	500 ppm-TWA	Inhalation of vapors irritates the respiratory tract. Overexposure may cause lightheadedness, nausea, headache, and blurred vision. Vapors may cause irritation to the skin and eyes.
1 – Always add acid to water to prevent violent reactions.			
2 – Exposure limit refers to the OSHA regulatory exposure limit.			

6.0 Equipment and Supplies

6.1. Equipment

- Top loading Balance - Sargent Welch S2642-25 or equivalent
- Automatic separatory funnel rotator
- Furnace - Thermolyne Type 6000 or equivalent.
- Vacuum Pump - General Electric Model No. 0322-V48-G180X or equivalent.
- N-Evap - Meyer Analytical Evaporator Model No. 112 or equivalent

6.2. Supplies

- 400 ml Clear Glass Jar
- 1 L Erlenmeyer Flask
- 500 ml Erlenmeyer Flask
- 2 L Separatory Funnel
- 500 ml Separatory Funnel
- 500 ml Centrifuge Bottle - Pyrex 1260 or equivalent.
- 10 ml graduated Concentrator Tube - Kontes K570050-1025 or equivalent.
- 10 ml glass vials with Teflon lined screw caps.
- 20 ml glass vials with Teflon lined screw caps.
- 5 ml to 1000 ml Class A Volumetric flasks
- Funnel - 75 mm diameter
- 1 L Graduated Cylinder

- 50 ul Gastight Syringe - VWR 60376-241 or equivalent.
- 100 ul Gastight Syringe - Baxter S9662-5 or equivalent.
- 100 ml Graduated Cylinder
- 1 ml Pasteur Disposable Pipet
- 10 ml Disposable Pipette
- Glass stopper - size 24/40
- Teflon stopper - size 19/22
- Filter paper - 15-cm diameter, Whatman No. 1 or equivalent.
- Phosphoric Acid Washed Glass Wool - Supelco 2-0383 or equivalent.
- Desiccator - Baxter D1420-2 or equivalent.
- Septa, 12 mm - Supelco 2-3273 or equivalent.
- Septa, 8 mm - Supelco 2-3272 or equivalent.
- Standard Taper Clamp (size 19, blue) - Wheaton 297749 or equivalent.
- Silicon Carbide Boiling Stones - Thomas 1590-D33 or equivalent.
- pH paper, Fisher 9590
- EM Quant Peroxide Test Strips, EMD No. 10011-1 or equivalent

Note: All glassware must be pre-rinsed with a 25% Sulfuric Acid: reagent water solution.

7.0 Reagents and Standards

7.1 Reagents

Note: Each lot of Methylene Chloride, Acetone, Methanol and Sulfuric Acid is screened for contaminants before being used for analysis as detailed in Eurofins Corporate Quality SOP No. CA-Q-S-001 (*Solvent & Acid Lot Testing & Approval*) and Eurofins Edison SOP No. ED-GEN-023 (*Bulk Solvent Testing and Approval*).

- Organic-free reagent water.
- Trimethylsilyldiazomethane (TMSD) , 2.0 molar solution in hexane, Acros 429211000 or equivalent

- Diethyl Ether (Residue Analysis Grade with 2% Ethanol preservative) - Baker 9259-03 or equivalent (tested for peroxide formation upon opening and monthly thereafter by use of EM Quant Peroxide Test Strips)
- Methylene Chloride (High Purity Grade) - Baker 9266 or equivalent.
- Acetone (High Purity Grade) – Baker 9254 or equivalent.
- Sodium Sulfate Anhydrous Crystals (Reagent Grade) – Malinckrodt 8024 or equivalent. (Baked at 400°C for 4 hours)
- Hexane (High Purity Grade) – Baker 9262 or equivalent.
- Carbitol (diethylene glycol monoethyl ether)
- Potassium Hydroxide (Analytical Reagent Grade) – Aldrich 306568 or equivalent
- Sulfuric Acid (Analytical Reagent Grade) - Mallinckrodt 2876 or equivalent.
- Silicic Acid, Aldrich 30, 636-3 or equivalent

7.1.1 Reagent preparation

7.1.1.1 Anhydrous sodium sulfate crystals must be baked in the muffle furnace at 400° C for 4 hours prior to use. After baking, the sodium sulfate must be acidified. Place 500 grams of anhydrous sodium sulfate into a 500 ml wide mouth Erlenmeyer flask. Add enough diethyl ether to cover the sodium sulfate. Add 0.5 ml concentrated sulfuric acid. Shake vigorously for 1 minute. Evaporate the ether by placing the flask on steam bath. Mix 1 g of the resulting solid with 5 ml of organic-free reagent water and measure the pH of the mixture. It must be below a pH of 4. Prepare fresh daily.

7.1.1.2 6N NaOH Solution: Rinse a 1 liter Pyrex flask three times with organic free reagent water. Weigh 240 g NaOH into flask and add 400 ml organic free reagent water. Mix until the NaOH is completely dissolved and the flask has cooled to room temperature. Transfer the NaOH solution to a clean 1 L bottle and fill up to 1 L with DI water.

7.1.1.3 12N H_2SO_4 : Rinse a 1 liter Pyrex flask three times with organic free reagent water. Add 200 ml organic free reagent water to the flask. Slowly, and while mixing, add 100-ml concentrated H_2SO_4 to flask. Continue mixing until flask has cooled to room temperature. Transfer the H_2SO_4 solution to a clean 500-ml amber bottle and label.

7.1.1.4 1:1 H_2SO_4: Rinse a 1 liter Pyrex flask three times with organic free reagent water. Add 100 ml organic free reagent water to the flask. Slowly, and while mixing, add 100-ml concentrated H_2SO_4 to flask. Continue mixing

until flask has cooled to room temperature. Transfer the H2SO4 solution to a clean 500-ml amber bottle and label.

7.1.1.5 25% H2SO4 solution (1:3 H2SO4 solution): 25 ml Acid and 75 ml reagent water. Add 75 ml organic free reagent water to a graduated cylinder. Slowly, and while mixing, add 25-ml concentrated H2SO4 to cylinder. Continue mixing until cylinder has cooled to room temperature. Transfer the H2SO4 solution to a clean amber bottle and label.

7.2 Standards

7.2.1 Standards are purchased as concentrated solutions (see Section 7.2.2). The surrogate stock solution is diluted (in volumetric glassware) to working concentration using acetone as the diluent as described in Section 7.3.

7.2.2 **Standard mixes and sources:** Table 1 lists the standard concentrate mix sources. Attachment 1 details the individual components of these mixes.

Table 1:
Herbicide Standard Mixes and Sources*

Standard Name ("Lab Name")	Concentration (ug/ml)	Source
Acid Herbicide LCS RTS ("Spiking Mix")	varies (in Methanol)	Restek Catalog # 567950
DCAA standard (Surrogate Spiking Solution)	1000 (in methanol)	Restek Catalog #567804

*May be substituted with equivalent standards from alternate sources.

Table 2:
Components of Herbicide Standard Mixes

Parameter	Catalog Nos.	Lab Standard Name	Concentration (ug/ml)
2,4-dichlorophenoxyacetic acid (2,4-D)	Restek Catalog # 567950	Spiking Mix	20
2-(2,4,5-Trichlorophenoxy)propionic acid (2,4,5-TP aka Silvex)	Restek Catalog # 567950	Spiking Mix	5
2,4,5-T	Restek Catalog # 567950	Spiking Mix	5
2,4-DB	Restek Catalog # 567950	Spiking Mix	20
Dalapon	Restek Catalog # 567950	Spiking Mix	20
Dicamba	Restek Catalog # 567950	Spiking Mix	10
Dichloroprop	Restek Catalog # 567950	Spiking Mix	20
Dinoseb	Restek Catalog #	Spiking Mix	20

Table 2: Components of Herbicide Standard Mixes			
Parameter	**Catalog Nos.**	**Lab Standard Name**	**Concentration (ug/ml)**
	567950		
MCPA acid	Restek Catalog # 567950	Spiking Mix	2000
MCPP acid	Restek Catalog # 567950	Spiking Mix	2000
Pentachlorophenol	Restek Catalog # 567950	Spiking Mix	5
Picloram (4-amino-3,5,6-trichloropicolinic acid)	Restek Catalog # 567950	Spiking Mix	20
2,4-Dichlorophenylacetic Acid	Restek Catalog # 567804	Surrogate Spiking Solution	1000

7. 3. Standards Preparation

7.3.1. The surrogate stock solutions are diluted to the working concentrations with acetone as indicated in Attachment1 and 2.

7.3.2. Herbicide Spiking Standard (LCS/MS/MSD):

7.3.2.1 Herbicide QC Spiking Standard Mix (12 compound analysis): The 12 compound spiking standard is ready to spike and used when analyzing for the standard list of herbicides The spiking standard mix is a 25 ml solution (Restek Catalog # 567950; see Tables 1 and 2) of the 12 compounds at the specified concentrations as free acids. The concentrate is used without further dilution prior to the spiking of the following quality control sample types: MS, MSD, and LCS. Spiking instructions are found in Section 10.

7.3.3. Herbicide Surrogate Spiking Standard (2, 4-DCAA Acid Spike Mix**):** The herbicide surrogate spiking standard is prepared as detailed in Attachment 1 using volumetric glassware and the concentrated free acid herbicide standards listed in Table 1 above.

8.0 Sample Collection, Preservation, Shipment and Storage

Sample container, preservation techniques and holding times may vary and are dependent on sample matrix, method of choice, regulatory compliance, and/or specific

contract or client requests. Listed below are the holding times and the references that include preservation requirements.

Matrix	Sample Container	Min. Sample Size	Preservation	Holding Time	Reference
Waters	Glass	1L amber/ 8oz amber	Cool 4 ± 2ºC	7 days to extraction; 40 days to analysis	USEPA SW846

8.1. Extracts must be stored under refrigeration (Cool 4 ± 2ºC) in the dark and analyzed within 40 days of extraction.

9.0 Quality Control

9.1 Sample QC - The following quality control samples are prepared with each batch of samples.

Quality Controls	Frequency	Control Limit
Method Blank (MB)	1 in 20 or fewer samples	< Rpt. Limit
Laboratory Control Sample (LCS)[1]	1 in 20 or fewer samples	Statistical Limits [4]
Matrix Spike (MS)[2]	1 in 20 or fewer samples	Statistical Limits [4]
MS Duplicate (MSD)[2]	1 in 20 or fewer samples	Statistical Limits [4]
Surrogates	every sample[3]	Statistical Limits [4]

[1] LCS Duplicate (LCD) is performed only when insufficient sample is available for the MS/MSD or when requested by the client/project/contract.
[2] The sample selection for MS/MSD is randomly selected by the organic prep lab, unless specifically requested by a client.
[3] Analytical and QC samples (MB, LCS, MS/MSD)
[4] Statistical control limits are updated annually and are updated into TALS (LIMS).

9.1.1. Method Blanks are extracted with each sample batch on each day that samples are extracted. The analytical results for the method blank must fall below the reporting limit for each compound of interest. If a target compound is detected in the blank at a concentration higher than the reporting limit, first the extract is reanalyzed for confirmation. If results are still outside of limits the entire batch of samples extracted with the affected blank must be re-extracted and reanalyzed.

9.1.2. Laboratory Control Sample (LCS): A Laboratory Control Sample (LCS) or blank spike must be extracted and analyzed for with each batch of 20 environmental samples. The LCS data is used to ensure that the analytical system is in control. It is also used to assess performance if the MS/MSD recoveries fall outside of established limits. The recoveries of the LCS must fall within lab generated acceptance criteria. If the spiked sample recovery results fall outside the laboratory generated limits (refer to the current active TALS method limit group database), the LCS recovery is evaluated. If LCS recovery is within limits the poor sample recovery results are

attributed to matrix interference. If the LCS recovery results are outside QC limits, first the extract is reanalyzed and if it is still outside the limits the entire QC batch must be re-extracted and reanalyzed.

9.1.3. Matrix Spike/Matrix Spike Duplicate (MS/MSD): A Matrix Spike/Matrix Spike Duplicate (MS/MSD) pair is extracted and analyzed with every batch of 20 environmental samples. MS/MSD recoveries are evaluated against lab generated limits (refer to refer to the current active TALS method limit group database). If the MS/MSD recovery limits fall outside of lab limits the LCS recovery is evaluated and corrective action is taken as described in Eurofins Edison SOP No. ED-GCS-00, *Analysis of Organochlorine Herbicides by SW846 Method 8151A,* current revision.

9.1.4. Surrogate Standards: All samples, blanks and QC samples are spiked with surrogate standard solution containing 2,4-DCAA (see Section 7.3.3). The percent recovery of the surrogate standards is calculated and compared to lab generated limits (refer to refer to the current active TALS method limit group database). If the surrogate recovery limits are outside of acceptance limits the sample extract is reanalyzed to confirm. If the recoveries are still outside of limits the sample must be re-extracted and reanalyzed or the data flagged as "estimated concentration".

10.0. Procedure

10.1. Sample Extraction (Aqueous Samples)

Note: For TCLP or SPLP leachate extraction procedure proceed to Section 10.6

10.1.1. Using a graduated cylinder, transfer a 250 ml sample aliquot to a 500 ml separatory funnel. Spike the sample with surrogate compound(s).

10.1.2. Add 50 ul of 100 ppm 2, 4-Dichlorophenylacetic Acid (DCAA) Surrogate Spiking Solution (see Attachment 2) to each sample and QC sample. NOTE: when spiking the samples with either surrogates or target spiking compounds, ensure that there are no bubbles in the syringe. In addition, hold the syringe just above the level of the water when adding the spike. Do not touch the tip of the syringe to the water or to the side of the separatory funnel. Swirl the separatory funnel after adding surrogate spike. All spikes must be witnessed.

10.1.3. When preparing QC spike samples (MS/MSD/LCS), spike 100ul of 12 compound mix (see Tables 1 and 2).

10.1.4. Add 20 g of NaCl to the sample, seal, and shake to dissolve the salt.

10.1.5. Use this step only if herbicide esters, in addition to herbicide acids, are to be determined.

10.1.6. Add 5 mL of 6 N NaOH to the sample, seal, and shake. Check the pH of the sample with pH paper. If the sample does not have a pH greater than or equal to 12, adjust the pH by adding more 6 N NaOH. Let the sample sit at room temperature until the hydrolysis step is completed (usually 1 - 2 hours), shaking the separatory funnel and contents periodically.

10.1.7. Add 15 mL of methylene chloride to the sample bottle and rinse both the bottle and the graduated cylinder. Transfer the methylene chloride to the separatory funnel and extract the sample by vigorously shaking the funnel for 2 minutes, with periodic venting to release excess pressure. Allow the organic layer to separate from the water phase for a minimum of 10 minutes. If the emulsion interface between the layers is more than one-third the volume of the solvent layer, the analyst must employ mechanical techniques to complete the phase separation. The optimum technique depends upon the sample, but may include stirring, filtration through glass wool, centrifugation, or other physical methods. Discard the methylene chloride phase.

10.1.8. Add a second 30-mL volume of methylene chloride to the separatory funnel and repeat the extraction procedure a second time, discarding the methylene chloride layer. Perform a third extraction in the same manner.

10.1.9. Add 5 mL of 12 N sulfuric acid to the sample, and shake to mix. Check the pH of the sample with pH paper. If the sample does not have a pH less than or equal to 2, adjust the pH by adding more acid.

10.1.10. Add 30 mL diethyl ether to the sample, seal, and extract the sample by vigorously shaking the funnel for 2 min with periodic venting to release excess pressure. Allow the organic layer to separate from the water phase for a minimum of 10 min. If the emulsion interface between layers is more than one third the volume of the solvent layer, the analyst must employ mechanical techniques to complete the phase separation. The optimum techniques to complete the phase separation depends upon the sample, but may include stirring, filtration through glass wool, centrifugation, or other physical methods. Remove the aqueous phase to a 1-L Erlenmeyer flask and collect the ether phase in a 100-mL Erlenmeyer flask containing approximately 10 g of acidified anhydrous sodium sulfate. Periodically, vigorously shake the extract and drying agent.

10.1.11. Return the aqueous phase to the separatory funnel, add 15 mL of diethyl ether to the sample, and repeat the extraction procedure a second time, combining the extracts in the 100-mL Erlenmeyer

flask. Perform a third extraction with 15 mL diethyl ether in the same manner. Allow the extract to remain in contact with the sodium sulfate for approximately 2 hours.

10.1.12. NOTE: The drying step is very critical to ensuring complete esterification. Any moisture remaining in the ether will result in low herbicide recoveries. The amount of sodium sulfate is adequate if some free flowing crystals are visible when swirling the flask. If all of the sodium sulfate solidifies in a cake, add a few additional grams of acidified sodium sulfate and again test by swirling. The 2 hour drying time is a minimum, however, the extracts may be held in contact with the sodium sulfate overnight.

10.2. Esterification

Esterification By TMSD

10.2.1. Add approximately 200uL of methanol to the extract followed by approximately 200uL of 2.0M Trimethylsilyldiazomethane (TMSD) solution. The extract will turn a yellow color. If this does not occur, add additional (approximately) 200uL aliquots of 2.0M Trimethylsilyldiazomethane (TMSD) solution until the yellow color persists. Check the sample every 15 minutes for yellow color. If the yellow disappears in this time frame, continue adding an additional aliquot of 2.0M Trimethylsilyldiazomethane (TMSD) solution until the yellow color persists.

10.2.2. Allow the extract to stand for at least one hour at room temperature to allow the methylation reaction to occur. The reaction is halted with the addition of approximately 0.05g (one scoop using a disposable spatula) of silica gel. The extract is then brought up to a final volume of 10 mL with hexane by visually comparing it to a calibrated collection tube.

10.2.3. Adjust the final extract volumes to 10ml with hexane. The extracts ready to be analyzed by GC. Transfer some volume to GC autosampler vials.

10.2.4. Samples must be analyzed as soon as possible (less than 24 hrs. preferably) after esterification. This is to minimize the trans-esterification and other potential reactions that may occur.

10.2.5. Store refrigerated if further processing will not be performed immediately. Extracts should be stored at 4°C away from light.

10.3. Esterification By Diazald

10.3.1. Add 10 ml of DI water and 15 ml of Carbitol (diethylene glycol monoethyel ether) to a 250-ml Erlenmeyer flask. Dissolve in 6 g of KOH

10.3.2. Prepare a 2-hole rubber stopper holding a 60 ml separatory funnel in one hole, and a length of U-shaped tubing in the other hole. Attach the 2-hole rubber stopper to the Erlenmeyer flask.

10.3.3. Prepare a diazald solution by adding 10 ml of ether to the 60 ml separatory funnel and dissolving in 2 g of diazald.

10.3.4. Place the Erlenmeyer flask/separatory funnel apparatus on a stirring hot plate. Allow the diazald to slowly drip into the Erlenmeyer. (The hot plate setting should never exceed setting of 2.)

10.3.5. Rinse the end of the U-shaped tubing 3 times with hexane, then place into extract allowing the diazomethane gas to bubble through the extract. The extract should turn a yellow color signaling that esterification is complete.

10.3.6. After esterification, remove excess diazomethane gas by adding a few grams of silicic acid to the extract and bubbling nitrogen gas through the extract on the N-Evap for several minutes.

10.3.7. Adjust the final extract volume of 10 ml with Hexane (5 ml for TCLP). The extracts ready to be analyzed by GC.

10.3.8. Samples must be analyzed as soon as possible (less than 24 hrs. preferably) after esterification. This is to minimize the trans-esterification and other potential reactions that may occur.

10.3.9. Store refrigerated if further processing will not be performed immediately.

10.3.10. Extracts should be stored at 4°C away from light.

10.4. Extract Concentration

10.4.1. Concentrate samples in an N-Evap apparatus making sure the control the temperature below 40°C such that the concentrator tube is partially immersed in the hot water and the entire lower surface of the tube is bathed with hot water.

10.4.2. Adjust the vertical position of the apparatus and the water temperature, as required, to complete the concentration in 10-20 minutes.

10.4.3. Evaporate samples until the sample volume is approximately 2 ml.

10.4.4. Add 15 ml of hexane and concentrate further to a final volume of approximately 3 ml.

10.4.5. Remove the sample from the Evaporator and cool for about 5 minutes.

10.5. Sample Extraction (Leachate Samples)

10.5.1. Rinse enough 60-ml separatory funnels and 500-ml Erlenmeyer flasks to accommodate the number of samples to be prepped. Each funnel and flask must be rinsed three times: once with a 50:50 mixture of methylene chloride: acetone, once with methylene chloride and once with a 25% sulfuric acid: reagent water solution.

10.5.2. Label the sample on the corresponding separatory funnels and the corresponding 500 ml Erlenmeyer flasks.

10.5.3. Pipette 15 ml of each sample into its corresponding separatory funnel.

10.5.4. Rinse a 100 ml graduated cylinder once with methylene chloride and two to three times with lab reagent water. Using the graduated cylinder obtain 15 ml of lab reagent water from the Millipore filtering apparatus for each of the method blank and the laboratory control sample (LCS) (aka blank spike).

10.5.5. Rinse each syringe to be used for adding surrogates and spikes, two to three times with acetone.

10.5.6. Add 50 ul of 100 ppm 2, 4-Dichlorophenylacetic Acid (DCAA) Surrogate Spiking Solution (see Attachment 1) to each sample and QC sample. NOTE: when spiking the samples with either surrogates or target spiking compounds, ensure that there are no bubbles in the syringe. In addition, hold the syringe just above the level of the water when adding the spike. Do not touch the tip of the syringe to the water or to the side of the separatory funnel. Swirl the separatory funnel after adding surrogate spike. All spikes must be witnessed.

10.5.7. When preparing QC spike samples (MS/MSD/LCS), spike 100uL of 12 compound mix (see Tables1 and 2). .Swirl the separatory funnel after adding the spike solution(s).

10.5.8. Add 2 ml of 6N NaOH solution to each sample.

10.5.9. Add 20 ml of diethyl ether.

10.5.10. Extract the samples by vigorously shaking the separatory funnels for 2 minutes, with periodic venting to release excess pressure.

10.5.11. Allow the organic layer to separate from the water phase for a minimum of 10 minutes.

10.5.12. If the emulsion interface between the layers is more than one-third the volume of the solvent layer, the analyst must employ mechanical techniques to complete the phase separation. The optimum technique depends upon the sample, but may include stirring, filtration through glass wool, centrifugation or other physical methods.

10.5.13. Collect the diethyl ether layer for each sample into the corresponding 250-ml Erlenmeyer flask.

10.5.14. Repeat steps 10.6.10 through 10.14 twice, using 10-ml aliquots of diethyl ether each time.

10.5.15. Discard the ether phase after each extraction.

10.5.16. Adjust the pH to $\leq$ 2 by adding approximately 2 ml of 1:3 Sulfuric Acid/Water to the samples. Check pH with pH paper.

10.5.17. Extract three times for two minutes each with ether, using 20 ml the first time, and 10 ml each the second and third times.

10.5.18. Collect all three ether phases into a screw top 125-ml glass jar containing acidified sodium sulfate. Let the sample dry for 2 hours.

10.5.19. Pour the dried extract through a funnel plugged with acid washed glass wool, and collect the extract into the N-Evap tubes.

10.5.20. Rinse the Erlenmeyer flask and funnel with 20 to 30 ml of diethyl ether to complete the quantitative transfer.

10.5.21. Proceed to Section 10.2.1.

10.6. Required Documentation:

The organic prep technician is responsible for completing the following items.

10.6.1. The TALS reagent database must be completed in full with the required information whenever standards are logged and/or prepared.

10.6.2. All required data types (sample volumes, reagent and standard volumes, reagent and standard lots, etc…) must be entered into the TALS batch database each time an extraction is performed.

.

11.0. Calculations / Data Reduction

None

12.0. Method Performance

12.1. Method Detection Limit Study (MDL)

A Method Detection Limit (MDL) study, as described in the Eurofins corporate Detection and Quantitation Limits SOP, CA-Q-S-006, must be performed initially and whenever a significant change affecting sensitivity is made to the analytical system. The MDL must be re-evaluated from quarterly MDL points at least every 12 months..

12.2. Demonstration of Capabilities

For DOC procedure refer to Section 19 in the most current revision of Eurofins Edison's Quality Assurance Manual (ED-QA-LQM).

12.3. Training Requirements

Refer to the current revision of Eurofins Edison SOP No. ED-GEN-022, *Training*, for the laboratory's training program.

13.0. Pollution Control

13.1. Pollution prevention encompasses any technique that reduces or eliminates the quantity or toxicity of waste at the point of generation. Numerous opportunities for pollution prevention exist in laboratory operation. The USEPA has established a prevention hierarchy of environmental management techniques that places pollution prevention as the management option of first choice. Whenever feasible, laboratory personnel should use pollution prevention techniques to address their waste generation. When wastes cannot be feasibly reduced at the source, the agency recommends recycling as the next best option.

13.2. The quantity of chemical purchased should be based on expected usage during its shelf life and disposal cost of unused material. Actual reagent preparation volumes should reflect anticipated usage

14.0. Waste Management

14.1. The U.S. Environmental Protection Agency requires that laboratory waste management practices conducted be consistent with all applicable rules and regulations. All waste will be disposed of in accordance with Federal, State and Local regulations. Where reasonably feasible, technological changes have been implemented to minimize the potential for pollution of the environment. Employees will abide by this method and the policies in section

13 of the Corporate Safety Manual for "Waste Management and Pollution Prevention."

14.2. The following waste streams are generated as a result of this analysis:

- Extractions Waste water. This material is created when 50% Acetone and 50% Methylene Chloride are added to 1 liter of sample water. The water is shaken with the solvent. The solvent is collected with the compounds of interest and the water is discarded into the Extractions Waste Water drum. This drum is removed to the walk-in hood in the waste room. A ½ inch PVC pipe is inserted into the bung hole of the drum and air is passed through the solution over night. The solution is then transferred into the first drum of the neutralization system and neutralized to a pH of 6 – 9. This solution is discharged into the municipal sewer system.

- Mixed Solvent Waste. This material is collected from rinsing and other processes into 5 gallon solvent cans as satellite accumulation. These cans are emptied every 24 hours into a steel drum in the waste room. This drum is kept in the walk in hood until it is full. The full drum is then removed from the hood and placed on secondary containment in the waste room.
  Teris Profile Number: 50016624
  Onyx Profile WIP Number: 545240

- Waste sodium sulfate. This material is collected from various methods which require the removal of water from solvent which carries the analyte (s) of interest. The solvent is passed through the sodium sulfate and the sodium sulfate plus the water is disposed of. The sodium sulfate is collected in buckets inside the hoods. The material is air dried and disposed of in the municipal waste dumpster.

- Waste sulfuric acid. This material is generated from clean up of PCB extracts for sulfur compounds. The acid is collected in satellite accumulation in the hood. The container is removed to the waste room for neutralization with 50 % sodium hydroxide (Siedler Chemical SC-1824-03), water and sodium bicarbonate (Siedler Chemical SC-0219-25). Ice is used to control temperature in the plastic drums of the neutralization system. When neutralization is complete (pH 6 -9) the material is transferred to the municipal sewer system.

15.0. References / Cross-References

15.1. United States Environmental Protection Agency, "Method 8151A: Organochlorine Herbicides by Gas Chromatography", Test Methods for Evaluating Solid Wastes, SW846 Third Edition, Volume 1B: Laboratory Manual, Physical/Chemical Methods, Revision 3, December 1996.

15.2. Eurofins Edison SOP No. ED- ORP-023, *Extraction of Organochlorine Herbicides in Soil by SW846 Method 8151A,* current revision.

15.3. Eurofins Edison Document No. ED-QA-LQM, *Laboratory Quality Manual*, current revision.

15.4. Eurofins Corporate Document No. CW-E-M-001, *Environmental Health and Safety Manual,* current revision.

15.5. Eurofins Corporate Quality SOP No. CA-Q-S-001, *Solvent & Acid Lot Testing & Approval*, current revision.

15.6. Eurofins Edison SOP No. ED-GEN-023, *Bulk Solvent Testing and Approval*, current revision.

15.7. Eurofins Edison SOP No. ED-GEN-013, *Glassware Cleaning*, most current revision

15.8. Eurofins Edison SOP No. ED-GEN-022, *Training,* current revision.

16.0. Method Modifications:

NONE

17.0. Attachments

Attachment 1 – Surrogate Solution Prep

18.0. Revision History

Revision 16, 09/11/2024

- Updated to Eurofins branding throughout.
- Updated sec. 10.0 Procedure to help with better the herbicide recoveries.
- Added section 10.3 the use of Diazald esterification in case of TMSD shortage.
- Updated equipment with the use of N-Evap in place of the Kuderna Danish apparatus.

Revision 15, 10/5/2021

- Updated Lab Quality Manual section references as needed throughout document.
- Updated throughout to reflect used of TMSD for esterification (replacing diazald)
- Section 12: updated to reflect current MDL procedures.

Revision 14, April 26, 2019

- Section 10.4.11: methanol was added to extract to help with better herbicide recoveries.

- Revision 13, dated February 22, 2016:

  - Updated Table 2 with the corrected spelling of Picloram(4-amino-3,5,6-trichloropicolinic acid.
  - Section 7.1.1.3: corrected the preparation instructions for 12N sulfuric acid. The correct volume of water is 200ml (was 300 ml). 100ml concentrated sulfuric diluted into 200 ml water is 12N.
  - Section 7.1.1.5: clarified to indicate that a 25% H2SO4 solution is a 1:3 solution.

- Revision 12, dated January 28, 2016:

  - Sections 7.2.1 and 7.3.1: updated info to reflect prep using new standard solutions.
  - Tables 1 and 2 updated with new standard mixes and sources.
  - Attachment 1: deleted. Attachment 2 now becomes Attachment 1.
  - Section 7.3.2.1: revised to reflect new standards and procedures.
  - Section 7.3.3: updated to revise from Attachment 2 to Attachment 1.
  - Section 8.0: added 8 oz amber glass container as option.
  - Section 10.1.1: added 500 ml separatory funnel as option.
  - Section 10.1.9 and 10.6.8: updated spiking instructions.
  - Section 10.4.11: updated and clarified final extract volumes.

- Revision 11, dated January 27, 2014::

  - Minor editorial changes throughout document.
  - Section 7.2.2: Update standard sources and mixes (Table 1).
  - Section 7.3.2 and 7.3.3: Updated standards prep information.
  - Section 10.1.9: updated QC spiking procedures (LCS/MS/MSD).
  - Section 10.6.8: updated leachate QC spiking procedures.
  - Added Attachment 1 which details the individual target compounds and their concentrations in the new standards.
  - Added Attachment 2 which details the individual surrogate compounds and their concentrations in the new standards.

- Revision 10, dated January 6, 2012:

  - Section 7.2.2, Table 2: updated concentration of MCPP spiking mix.
  - Section 7.2.2, Tables 1 and 2: Updated source of Picloram spiking standard.
  - Section 7.3.2.4: revised instructions for preparation of Picloram spiking solution.
  - Corrected number of Sections 7.3.2.1 thru 7.3.2.4.
  - Revised Section 10.6.8: corrected typos and added detailed procedures dependent upon spiking scenarios.

- Revision 9, dated December 21 2011:

    - Revised the following sections to reflect the requirement that all glassware must be rinsed with sulfuric acid prior to use in the extraction of herbicides: Section 6.2, Section 10.1.1 and Section 10.6.1.
    - Added Section 7.1.1.5 which describes the preparation of a 25% sulfuric acid: reagent water solution for use in acid-rinsing glassware.
    - Throughout document: updated LQM section references as appropriate as some have changed with the latest LQM revision

- Revision 8, dated August 26 2011:

    - Section 5.1: revised to include following statement: “Ethyl Ether must be free of peroxides as determined by use of EM Quant Peroxide Test Strips as described in Sections 6 and 7 below.”
    - Section 6.2: added EM Quant Peroxide Test Strips to supplies list.
    - Section 7.1: added requirement to test Ether for peroxide formation.
    - Revised Section 10.3.4 to include a requirement to pour extract through a funnel plugged with acid washed glass wool. Also revised collection container (was Erlenmeyer flask; now K-D concentrator).
    - Section 10.3.9 was revised to clarify that the ether extracts from each sample are collected into a single container (not multiple separate containers).
    - Section 10.6.8: corrected the spike volume used for the 10 Compound Spike mix. Reworded the section to make the instructions clearer.

- Revision 7, dated October 30, 2009
    - Revised SOP format in accordance with Eurofins Corporate Quality SOP No. CW-QS-002 (Rev 0) Writing a Standard Operating Procedure (SOP).
    - Section 1.1 Added reference to Quality Assurance Manual for method modifications.
    - Section 1.1: Expanded to include references to applicable prep and cleanup SOPs.
    - Section 3: revised to reference new location for definitions.
    - Section 5: Revised to include most up to date corporate health and safety references and information.
    - Section 7.2.2: Added tables detailing components found in the various standards mixes.
    - Section 7.3: Updated the instructions for preparation of standards.
    - Section 7.3: Added tables with calibration standards prep details.
    - Section 8: Updated with additional details including a table outlining containers, preservation and holding times for waters and soils.
    - Section 9.1: Expanded QC sample preparation details.
    - References: Expanded to include more specific SOP references
    - Section 18: Added this Revision History section
    - Throughout document: added references to Eurofins LIMS (TALS).

Attachment 1 – Surrogate Standards Preparation

TestAmerica
THE LEADER IN ENVIRONMENTAL TESTING

Reagent ID: OP_HERB_SU_00020

		Expiration Date:	06/10/2014
Description:	HERBICIDE Surrogate	Laboratory:	TestAmerica Edison
No. of Bottles:	10	Prepared By:	Patel, Hemex
Storage Location:	ORP-STDS & SPIKES	Solvent:	Acetone
Reagent Volume:	100.000 mL	Solvent Lot:	33214
Creation Date:	12/10/2013		
Container(s):	2644797, 2644798, 2644799, 2644800, 2644801, 2644802, 2644803, 2644804, 2644805, 2644806		
Comment:			

Reagent Analyte Information

Analyte	Source ID	Source Exp. Date	Source Conc.	Source Conc. Units	Final Conc.	Final Conc. Units
2,4-Dichlorophenylacetic acid	OP_2,4DCAA_00016	09/30/2014	1000.00000	ug/mL	100.00000	ug/mL

Source Reagents

Reagent	Description	Type	Expiration	Vendor	Vendor Lot #	Vendor Cat Lot #	Volume Used	Volume Units
OP_2,4DCAA_00016	2,4 - DCAA Acid Spike Mix	ASTD	09/30/14	RESTEK	A093820	567804	10.00000	mL

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Title: Extraction of Organochlorine Herbicides in Soil by SW846 Method 8151A

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Approvals (Signature/Date):

06/05/2024		06/05/2024	
Mamdou Leye	Date	Dan Helfrich	Date
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06/05/2024		06/05/2024	
Carl Armbruster	Date	Mark Acierno	Date
Quality Assurance Manager		Laboratory Director	

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1.0 Scope and Application

1.1. Analytes, Matrix(s), and Reporting Limits: SW846 Method 8151A provides extraction and derivatization procedures for the gas chromatographic analysis of chlorinated acid herbicides in water, soil, and waste samples. An option for the hydrolysis of esters is also described. This SOP details the extraction of soil samples with diethyl ether follower by esterification with diazomethane (or diazald) The derivatives are determined by gas chromatography with an electron capture detector (GC/ECD). The results are reported as acid equivalents.

1.2. For a complete discussion of analytes and reporting limits (RLs) please refer to Eurofins Edison SOP No. ED-GCS-005, Analysis of Organochlorine Herbicides by SW846 Method 8151A, current revision.

1.3. On occasion clients may request modifications to this SOP. These modifications are handled following the procedures outlined in Section 9 (Service to the Client) and 19 (Test Methods and Method Validation) of Eurofins Edison's Quality Assurance Manual (ED-QA-LQM).

2.0 Summary of Method

This SOP provides extraction and derivatization procedures for the determination of chlorinated acid herbicides and their esters in solid samples. Soil samples are serially extracted with diethyl ether. The extracts are hydrolyzed, dried and concentrated and then esterified with Trimethylsilyl diazomethane. The derivatives are determined by gas chromatography with an electron capture detector (GC/ECD). The sensitivity of Method 8151 depends on the level of interferences in addition to instrumental limitations.

3.0 Definitions

For a complete list of definitions refer to Appendix 5 in the most current revision of Eurofins Edison's Quality Assurance Manual (ED-QA-LQM).

4.0 Interferences

Method interference may be caused by contaminants in solvents, reagents, glassware and other sample processing hardware that lead to discrete artifacts or elevated baselines in gas chromatograms. All these materials must be routinely demonstrated to be free from interference under the conditions of the analysis, by analyzing reagent blanks.

Glassware must be scrupulously cleaned. Clean each piece of glassware as soon as possible after use by rinsing it with the last solvent used in it. This should be followed by detergent washing with hot water and rinses with tap water, then with organic-free reagent water. Glassware should be solvent-rinsed with acetone and pesticide-quality hexane. After rinsing and drying, glassware should be sealed and stored in a clean environment to prevent any accumulation of dust or other contaminants. Store glassware inverted or capped with aluminum foil. Immediately prior to use, glassware should be rinsed with the next solvent to be used.

Matrix interference may be caused by contaminants that are co-extracted from the sample. Organic acids, especially chlorinated acids, cause the most direct interference with the determination by methylation. Phenols, including chlorophenols, may also interfere with this procedure.

The acid forms of the analytes are strong organic acids that react readily with alkaline substances and can be lost during sample preparation. Glassware and glass wool must be acid-rinsed with 1 N hydrochloric acid and the sodium sulfate must be acidified with sulfuric acid prior to use to avoid analyte losses due to adsorption.

Sample extracts must be dry prior to methylation or else poor recoveries will result.

5.0 Safety

Employees must abide by the policies and procedures in the Corporate Environmental Health and Safety Manual (CW-E-M-001) and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum.

5.1. Specific Safety Concerns or Requirements

Ethyl Ether is an extremely flammable solvent. If a mechanical device is used for sample extraction, the device should be equipped with an explosion proof motor and placed in a hood.

Ethyl Ether must be free of peroxides as determined by use of EM Quant Peroxide Test Strips as described in Sections 6 and 7 below.

Diazomethane can explode under certain conditions therefore take the following precautions:

- Use a well-ventilated hood.
- Use a safety screen.
- Do not heat above 90 degree Celsius.
- Store away from alkali metals.
- Solutions of diazomethane decompose rapidly in the presence of solid materials such as copper powder, calcium chloride, and boiling chips.

The use of Kevlar gloves is required for the assembly/disassembly of ground glass joints in addition to those tasks that present the potential risk for injury.

Ether creates excessive pressure very rapidly. Therefore, initial venting should be done immediately after the separatory funnel has been sealed and inverted. Vent into hood away from analysts and other samples.

5.2. Primary Materials Used

The following is a list of the materials used in this method, which have a serious or significant hazard rating. Note: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the MSDS for each of the materials listed in the table. A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the MSDS for each material before using it for the first time or when there are major changes to the MSDS.

Material (1)	Hazards	Exposure Limit (2)	Signs and symptoms of exposure
Methylene Chloride	Carcinogen Irritant	25 ppm-TWA 125 ppm-STEL	Causes irritation to respiratory tract. Has a strong narcotic effect with symptoms of mental confusion, light-headedness, fatigue, nausea, vomiting and headache. Causes irritation, redness and pain to the skin and eyes. Prolonged contact can cause burns. Liquid degreases the skin. May be absorbed through skin.
Sodium Hydroxide	Corrosive Poison	2 ppm, 5 mg/m^3	This material will cause burns if comes into contact with the skin or eyes. Inhalation of Sodium Hydroxide dust will cause irritation of the nasal and respiratory system.
Sulfuric Acid	Corrosive Oxidizer Dehydrator Poison Carcinogen	1 Mg/M3-TWA	Inhalation produces damaging effects on the mucous membranes and upper respiratory tract. Symptoms may include irritation of the nose and throat, and labored breathing. Symptoms of redness, pain, and severe burn can occur. Contact can cause blurred vision, redness, pain and severe tissue burns. Can cause blindness.
Acetone	Flammable	1000 ppm-TWA	Inhalation of vapors irritates the respiratory tract. May cause coughing, dizziness, dullness, and headache.

Material (1)	Hazards	Exposure Limit (2)	Signs and symptoms of exposure
Ethyl Ether	Flammable Irritant Peroxide Former	400 ppm TWA	General anesthesia by inhalation can occur. Continued exposure may lead to respiratory failure or death. Early symptoms include irritation of nose and throat, vomiting, and irregular respiration, followed by dizziness, drowsiness, and unconsciousness. May cause irritation, redness and pain to the eyes. Irritating to the skin and mucous membranes by drying effect. Can cause dermatitis on prolonged exposure. May be absorbed through skin. May form explosive peroxides on long standing or after exposure to air or light. This material must be disposed of within six months.
Hexane	Flammable Irritant	500 ppm-TWA	Inhalation of vapors irritates the respiratory tract. Overexposure may cause lightheadedness, nausea, headache, and blurred vision. Vapors may cause irritation to the skin and eyes.
1 – Always add acid to water to prevent violent reactions.			
2 – Exposure limit refers to the OSHA regulatory exposure limit.			

6.0 Equipment and Supplies

6.1. Equipment

- Top loading Balance - Sargent Welch S2642-25 or equivalent
- N-Evap - Meyer Analytical Evaporator Model No. 112 or equivalent
- Explosion Proof Hood

6.2. Supplies

- 250 ml Clear Glass Jar
- 500 ml Erlenmeyer Flask
- 125 ml Erlenmeyer Flask
- 125 ml Separatory Funnel
- 10 ml graduated Concentrator Tube - Kontes K570050-1025 or equivalent.
- 10 ml glass vials with Teflon lined screw caps.

- 20 ml glass vials with Teflon lined screw caps.
- 5 ml to 1000 ml Class A Volumetric flasks
- Funnel - 75 mm diameter
- 50 ul Gastight Syringe - VWR 60376-241 or equivalent.
- 100 ul Gastight Syringe - Baxter S9662-5 or equivalent.
- 100 ml Graduated Cylinder
- 1 ml Pasteur Disposable Pipette
- 10 ml Disposable Pipette
- Acid Washed Glass Wool – Fisher cat # B0773KMDPK or equivalent.
- pH Paper
- Tongue Depressors
- EM Quant Peroxide Test Strips, EMD No. 10011-1 or equivalent

7.0 Reagents and Standards

7.1 Reagents

Note: Each lot of Methylene Chloride, Acetone, Methanol and Sulfuric Acid is screened for contaminants before being used for analysis as detailed in Eurofins Quality SOP No. CA-Q-S-001 (Solvent & Acid Lot Testing & Approval) and Eurofins Edison SOP No. ED-GEN-023 (Bulk Solvent Testing and Approval).

- Trimethylsilyl diazomethane (TMSD), 2.0 molar solution in hexane, Acros 429211000 or equivalent.
- Diethyl Ether (Residue Analysis Grade with 2% Ethanol preservative) - Baker 9259-03 or equivalent (tested for peroxide formation upon opening and monthly thereafter by use of EM Quant Peroxide Test Strips)
- Methylene Chloride (High Purity Grade) - Baker 9266 or equivalent.
- Acetone (High Purity Grade) – Baker 9254 or equivalent.

- Sodium Sulfate Anhydrous Crystals (Reagent Grade) – Fisher or equivalent. (Baked at 400□C for 4 hours)
- Hexane (High Purity Grade) – Baker 9262 or equivalent.
- Potassium Hydroxide (Analytical Reagent Grade) – Aldrich 306568 or equivalent
- Sulfuric Acid (Analytical Reagent Grade) – FisherA300S212 or equivalent.
- Peroxide Test Strips - Aldrich Z10, 168-0 or equivalent
- Organic free reagent water - Reagent water is defined as a water in which an interference is not observed at the MDL of each parameter of interest (ASTM Specification D1193, Type ii). At Eurofins Edison this water is generated by the Barnstead/Thermolyne Water System (Model # D11991 Serial # 1191020210415).
- Diazald - Aldrich D2, 800-0 or equivalent.

7.1.1 Reagent preparation

7.1.1.1 Anhydrous sodium sulfate crystals must be baked in the muffle furnace at 400 degrees C for 4 hours prior to use. After baking, the sodium sulfate must be acidified. Place 500 grams of anhydrous sodium sulfate into a 500 ml wide mouth Erlenmeyer flask. Add enough diethyl ether to cover the sodium sulfate. Add 0.5 ml concentrated sulfuric acid. Shake vigorously for 1 minute. Evaporate the ether by placing the flask on steam bath. Mix 1 g of the resulting solid with 5 ml of organic-free reagent water and measure the pH of the mixture. It must be below a pH of 4. Prepare fresh daily.

7.1.1.2 37% KOH Solution: Rinse a 1 liter Pyrex flask three times with organic free reagent water. Weigh 148 g KOH into flask and add 400 ml organic free reagent water. Mix until the KOH is completely dissolved and the flask has cooled to room temperature. Transfer the KOH solution to a clean 500-ml amber bottle and label.

7.1.1.3 12N H2SO4: Rinse a 1 liter Pyrex flask three times with organic free reagent water. Add 200 ml organic free

reagent water to the flask. Slowly, and while mixing, add 100-ml concentrated H2SO4 to flask. Continue mixing until flask has cooled to room temperature. Transfer the H2SO4 solution to a clean 500-ml amber bottle and label.

7.1.1.4 25% H2SO4 solution: 25 ml Acid and 75 ml reagent water. Add 75 ml organic free reagent water to a graduated cylinder. Slowly, and while mixing, add 25-ml concentrated H2SO4 to cylinder. Continue mixing until cylinder has cooled to room temperature. Transfer the H2SO4 solution to a clean amber bottle and label.

7.2 Standards

7.2.1 Standards are purchased as concentrated solutions (see Section 7.2.2). Most stock solutions are diluted (in volumetric glassware) to working concentration using hexane as the diluent as described in Section 7.3.

7.2.2 Standard mixes and sources: Table 1 lists the standard concentrate mix sources. Table 2 details the individual components of these mixes.

Table 1:
Herbicide Standard Mixes and Sources*

Standard Name ("Lab Name")	Concentration (ug/ml)	Source
Acid Herbicide LCS RTS ("Spiking Mix")	varies (in Methanol)	Restek Catalog # 567950
DCAA standard	1000 (in methanol)	Restek Catalog #567804

*May be substituted with equivalent standards from alternate sources.

Table 2:
Components of Herbicide Standard Mixes

Parameter	Catalog Nos.	Lab Standard Name	Concentration (ug/ml)
2,4-dichlorophenoxyacetic acid (2,4-D)	Restek Catalog # 567950	Spiking Mix	20
2-(2,4,5-Trichlorophenoxy)propionic acid (2,4,5-TP aka Silvex)	Restek Catalog # 567950	Spiking Mix	5
2,4,5-T	Restek Catalog # 567950	Spiking Mix	5
2,4-DB	Restek Catalog # 567950	Spiking Mix	20
Dalapon	Restek Catalog # 567950	Spiking Mix	20

Table 2: Components of Herbicide Standard Mixes			
Parameter	Catalog Nos.	Lab Standard Name	Concentration (ug/ml)
Dicamba	Restek Catalog # 567950	Spiking Mix	10
Dichloroprop	Restek Catalog # 567950	Spiking Mix	20
Dinoseb	Restek Catalog # 567950	Spiking Mix – 10 compound	20
MCPA acid	Restek Catalog # 567950	Spiking Mix – 10 compound	2000
MCPP acid	Restek Catalog # 567950	Spiking Mix – 10 compound	2000
Pentachlorophenol	Restek Catalog # 567950	Pentachlorophenol spike	5
Picloram (4-amino-3,5,6trichloropicolinic acid)	Restek Catalog # 567950	Picloram Acid Spiking Standard	20
2,4-Dichlorophenylacetic Acid	Restek Catalog # 567804	Surrogate Spiking Solution	1000

7. 3. Standards Preparation

7.3.1. All standard stock solutions are diluted to the working concentrations as required with acetone (as indicated) using Class A volumetric glassware.

7.3.2. Herbicide Spiking Standard (LCS/MS/MSD):

7.3.3.1 Herbicide QC Spiking Standard Mix (12 compound analysis): The (12) compound spiking standard is ready to spike and used when analyzing for the standard list of herbicides The spiking standard mix is a 25 ml solution (Restek Catalog # 567950; see Tables 1 and 2) of the 12 compounds at the specified concentrations as free acids (see Table 2). The concentrate is used without further dilution prior to the spiking of the following quality control sample types: MS, MSD, and LCS. Spiking instructions are found in Section 10.

7.3.3. Herbicide Surrogate Spiking Standard (2,4-DCAA Acid Spike Mix): The herbicide surrogate spiking solution is a 1 ml solution of 2,4-DCAA at a concentration of 1000 ug/ml. (Restek Catalog # 867804,

see Tables 1 and 2). The concentrate is used after 10X dilution in acetone prior to the spiking of samples (final concentration of spiking standard is 100 ug/ml).

8.0 Sample Collection, Preservation, Shipment and Storage

Sample container, preservation techniques and holding times may vary and are dependent on sample matrix, method of choice, regulatory compliance, and/or specific contract or client requests. Listed below are the holding times and the references that include preservation requirements.

Matrix	Sample Container	Min. Sample Size	Preservation	Holding Time	Reference
Soil	Glass	8oz clear glass	Cool 4 ± 2°C	14 days to extraction; 40 days to analysis	USEPA SW846

8.1. Extracts must be stored under refrigeration (Cool 4 ± 2°C) in the dark and analyzed within 40 days of extraction.

9.0 Quality Control

9.1 Sample QC - The following quality control samples are prepared with each batch of samples.

Quality Controls	Frequency	Control Limit
Method Blank (MB)	1 in 20 or fewer samples	< Rpt. Limit
Laboratory Control Sample (LCS) [1]	1 in 20 or fewer samples	Statistical Limits [4]
Matrix Spike (MS) [2]	1 in 20 or fewer samples	Statistical Limits [4]
MS Duplicate (MSD) [2]	1 in 20 or fewer samples	Statistical Limits [4]
Surrogates	every sample[3]	Statistical Limits [4]

[1] LCS Duplicate (LCSD) is performed only when insufficient sample is available for the MS/MSD or when requested by the client/project/contract.
[2] The sample selection for MS/MSD is randomly selected by the organic prep lab, unless specifically requested by a client.
[3] Analytical and QC samples (MB, LCS, MS/MSD)
[4] Statistical control limits are updated annually and are updated into TALS (LIMS).

9.1.1. Method Blanks are extracted with each sample batch on each day that samples are extracted. The analytical results for the method blank

must fall below the reporting limit for each compound of interest. If a target compound is detected in the blank at a concentration higher than the reporting limit, first the extract is reanalyzed for confirmation. If results are still outside of limits the entire batch of samples extracted with the affected blank must be re-extracted and reanalyzed.

9.1.2. Laboratory Control Sample (LCS): A Laboratory Control Sample (LCS) or blank spike must be extracted and analyzed for with each batch of 20 environmental samples. The LCS data is used to ensure that the analytical system is in control. It is also used to assess the performance if the MS/MSD recoveries fall outside of established limits. The recoveries of the LCS must fall within lab generated acceptance criteria. If the spiked sample recovery results (MS/MSD) fall outside the laboratory generated limits (refer to the current active TALS method limit group database), the LCS recovery is evaluated. If LCS recovery is within limits the poor sample recovery results are attributed to matrix interference. If the LCS recovery results are outside QC limits, first the extract is reanalyzed and if it is still outside the limits the entire QC batch must be re-extracted and reanalyzed.

9.1.3. Matrix Spike/Matrix Spike Duplicate (MS/MSD): A Matrix Spike/Matrix Spike Duplicate (MS/MSD) pair is extracted and analyzed with every batch of 20 environmental samples. MS/MSD recoveries are evaluated against lab generated limits (refer to refer to the current active TALS method limit group database). If the MS/MSD recovery limits fall outside of lab limits the LCS recovery is evaluated and corrective action is taken as described in Eurofins Edison SOP No. ED-GCS-005, Analysis of Organochlorine Herbicides by SW846 Method 8151A, current revision.

9.1.4. Surrogate Standards: All samples, blanks and QC samples are spiked with surrogate standard solution containing 2,4-DCAA (see Section 7.3.3). The percent recovery of the surrogate standards is calculated and compared to lab generated limits (refer to refer to the current active TALS method limit group database). If the surrogate recovery limits are outside of acceptance limits the sample extract is reanalyzed to confirm. If the recoveries are still outside of limits the sample must be re-extracted and reanalyzed or the data flagged as “estimated concentration”.

10.0. Procedure

10.1. Sample Extraction and hydrolysis (Soil Samples)

10.1.1. Rinse enough graduated cylinders and flasks once with acetone, twice with diethyl ether and once with 25% sulfuric acid: reagent water.

10.1.2. Weigh out 30g (+/- 0.1g) of soil sample into a clean clear glass 8oz sample container. Mark the lab sample identification numbers on the corresponding sample containers with red wax pencil.

10.1.3. Make up labels for each sample with the following information and place on the corresponding 500 ml Erlenmeyer flasks.

10.1.4. Weigh out approximately 30 g of sodium sulfate into two clean glass jars. These will serve as the blank and LCS samples respectively.

10.1.5. Rinse each syringe to be used for adding surrogates and spikes with acetone.

10.1.6. Add 50 ul of 100 ppm 2,4-Dichlorophenylacetic Acid (DCAA) Surrogate Spiking Solution (see Table 1) to each sample and QC sample. NOTE: Hold the syringe just above the level of the soil when adding the spike. Do not touch the tip of the syringe to the soil or to the side of the glass jar. Swirl the separatory funnel after adding surrogate spike. All spikes must be witnessed.

10.1.7. When preparing QC spike samples (MS/MSD/LCS/LCSD), spike with 250ul of the Herbicide QC Spiking Standard Mix (Restek 569750, see Section 7.3.3.1). Swirl the glass jar after adding the spike. All spikes must be witnessed.

10.1.8. Adjust the pH of each sample and QC sample to 2 with concentrated HCl (about 5ml) and monitor the pH for 15 minutes with occasional stirring. If necessary, add additional HCl until the pH remains at 2.

10.1.9. Add 20 ml of acetone to each sample. Mix each sample with the wrist shaker for 20 minutes.

10.1.10. Add 60 ml of diethyl ether to the each sample and shake again for 20 minutes. Decant the extract and measure the volume of solvent recovered.

10.1.11. Extract the sample twice more using 20 ml of acetone followed by 60 ml of diethyl ether. After addition of each solvent, the mixture should be shaken with the wrist shaker for 10 minutes and the acetone-ether extract decanted.

10.1.12. After the third extraction, the volume of extract recovered should be at least 75% of the total volume of solvent added. If solvent recovery is less than 75%, extract once more with 20 ml of diethyl ether.

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10.1.13. Check the pH of the extract. If it is not at or below pH 2, add more concentrated HCl until stabilized at pH of 2.

10.1.14. Into a pre-rinsed 500ml separatory funnel add 250ml of organic free reagent water.

10.1.15. Add 5ml of H2SO4 to the reagent water and check with pH paper to insure pH is <2.

10.1.16. Add the solvent extract to separatory funnel and gently mix the contents of the separatory funnel for 1 minute and allow the layers to separate.

10.2. Partitioning

10.2.1. Add 2.0 ml of the 37% KOH solution, 15 ml of reagent water.

10.2.1. Allow it to cool for 5-10 minutes.

10.2.2. Pour the extract into a 500-ml separatory funnel pre-rinsed with diethyl ether.

10.2.3. Add 40 ml of diethyl ether to the separatory funnel and shake for two minutes.

10.2.4. Pour the dried diethyl ether extract through a funnel plugged with acid washed glass wool, collecting the extract in the K-D concentrator. Use a glass rod to crush any caked sodium sulfate during the transfer.

10.2.5. Repeat twice using 20-ml aliquots of diethyl ether.

10.2.6. Discard the ether phase.

10.2.7. Adjust the pH of the extract remaining in the 500-ml separatory funnel by adding 5 ml of 12N Sulfuric Acid. Check pH with pH paper.

10.2.8. Add 40 ml of diethyl ether to the separatory funnel and shake for 2 minutes with periodic venting to release pressure.

10.2.9. Collect each diethyl ether phase into one pre-cleaned screw top glass jars containing approximately 10 g of acidified sodium sulfate crystals and mix well.

10.2.10. Repeat sections10.2.8 and 10.2.9 twice using 20-ml aliquots of diethyl ether.

10.2.11. Allow the diethyl ether extract to remain in contact with the sodium sulfate for approximately 2 hours.

10.2.12. Pour the dried diethyl ether extract through a funnel plugged with acid washed glass wool, collecting the extract in the Evaporator concentrator. Use a glass rod to crush any caked sodium sulfate during the transfer.

10.2.13. Place the white identification tag on the Evaporator apparatus.

10.2.14. Rinse the Erlenmeyer flask and funnel with 20 to 30 ml of diethyl ether to complete the quantitative transfer.

10.4. Extract Concentration

10.4.1. Blow down the sample in the concentrator until the sample volume is approximately 1 ml.

10.4.2. Add 30 ml of hexane and concentrate further on the evaporator to a final volume of approximately 10 ml.

10.4.3. Remove the samples from the evaporator and allow it to drain and cool for at least 10 minutes.

10.4.4 Extracts will be esterified either by TMSD or by Diazald

10.5. Esterification by TMSD

10.5.1. Add approximately 200 uL of methanol to the extract followed by approximately 200 uL of 2.0M Trimethylsilyl diazomethane (TMSD) solution. The extract will turn a yellow color. If this does not occur, add additional (approximately) 200 uL aliquots of 2.0M Trimethylsilyl diazomethane (TMSD) solution until the yellow color persists. Check the sample every 15 minutes for yellow color. If the yellow disappears in this time frame, continue adding an additional aliquot of 2.0M Trimethylsilyldiazomethane (TMSD) solution until the yellow color persists.

10.5.2. Allow the extract to stand for at least one hour at room temperature to allow the methylation reaction to occur. The reaction is halted with the addition of approximately 0.05g (one scoop using a disposable spatula) of silica gel. The extract is then brought up to a final volume of 10 mL with hexane by visually comparing it to a calibrated collection tube.

10.5.3. Adjust the final extract volumes to 10ml with hexane. The extracts ready to be analyzed by GC. Transfer some volume to GC autosampler vials.

10.5.4. Samples must be analyzed as soon as possible (less than 24 hrs. preferably) after esterification. This is to minimize the transesterification and other potential reactions that may occur.

10.5.5. Store refrigerated if further processing will not be performed immediately.

10.5.6. Extracts should be stored at 4 deg C away from light.

10.6 Esterification by Diazald

10.6.1 Add 10 ml of DI water and 15 ml of Carbitol (diethylene glycol monoethyel ether) to a 250-ml Erlenmeyer flask. Dissolve in 6 g of KOH

10.6.2 Prepare a 2-hole rubber stopper holding a 60 ml separatory funnel in one hole, and a length of U-shaped tubing in the other hole. Attach the 2-hole rubber stopper to the Erlenmeyer flask.

10.6.3 Prepare a diazald solution by adding 10 ml of ether to the 60 ml separatory funnel and dissolving in 2 g of diazald.

10.6.4 Place the Erlenmeyer flask/separatory funnel apparatus on a stirring hot plate. Allow the diazald to slowly drip into the Erlenmeyer. The hot plate setting should never exceed 2.

10.6.5 Rinse the end of the U-shaped tubing 3 times with hexane, then place into extract allowing the diazomethane gas to bubble through the extract. The extract should turn a yellow color signaling that esterification is complete.

10.6.6 After esterification, remove excess diazomethane gas by adding a few grams of silicic acid to the extract and bubbling nitrogen gas through the extract on the N-Evap for several minutes'

10.6.7 Adjust the final extract volume of 10 ml with Hexane (5 ml for TCLP). The extracts are ready to be analyzed by GC.

10.6.8 Samples must be analyzed as soon as possible (less than 24 hrs. preferably) after esterification. This is to minimize the trans-esterification and other potential reactions that may occur.

10.6.9 Store refrigerated if further processing will not be performed immediately.

10.6.10 Extracts should be stored at 4 deg C away from light.

10.7. Required Documentation:

The organic prep technician is responsible for completing the following items.

10.7.1. The TALS reagent database must be completed in full with the required information whenever standards are logged and/or prepared.

10.7.2. All required data types (sample volumes, reagent and standard volumes, reagent and standard lots, etc…) must be entered into the TALS batch database each time an extraction is performed.

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11.0. Calculations / Data Reduction

None

12.0. Method Performance

12.1. Method Detection Limit Study (MDL)

The MDL is the minimum measured concentration of a substance that can be reported with 99% confidence that the measured concentration or amount is distinguishable from method blank results. The MDL is determined according to the laboratory's MDL procedure in Section 19 (Test Methods and Method Validation) of Eurofins Edison's Quality Assurance Manual (ED-QA-LQM) consistent with 40CFR Part 136 Appendix B, August, 2017. MDLs reflect a calculated (statistical) value determined under ideal laboratory conditions in a clean matrix, and may not be achievable in all environmental matrices. The laboratory maintains MDL studies for analyses performed; these are verified at least annually unless method requirements require a greater frequency.

12.2. Demonstration of Capabilities

For DOC procedure refer to Section 19 in the most current revision of Eurofins Edison's Quality Assurance Manual (ED-QA-LQM).

12.3. Training Requirements

Refer to the current revision of Eurofins Edison SOP No. ED-GEN-022, Training, for the laboratory's training program.

13.0. Pollution Control

13.1. Pollution prevention encompasses any technique that reduces or eliminates the quantity or toxicity of waste at the point of generation. Numerous opportunities for pollution prevention exist in laboratory operation. The USEPA has established a prevention hierarchy of environmental

management techniques that places pollution prevention as the management option of first choice. Whenever feasible, laboratory personnel should use pollution prevention techniques to address their waste generation. When wastes cannot be feasibly reduced at the source, the agency recommends recycling as the next best option.

13.2. The quantity of chemical purchased should be based on expected usage during its shelf life and disposal cost of unused material. Actual reagent preparation volumes should reflect anticipated usage

14.0. Waste Management

14.1. The U.S. Environmental Protection Agency requires that laboratory waste management practices conducted be consistent with all applicable rules and regulations. All waste will be disposed of in accordance with Federal, State and Local regulations. Where reasonably feasible, technological changes have been implemented to minimize the potential for pollution of the environment. Employees will abide by this method and the policies in section 13 of the Corporate Safety Manual for "Waste Management and Pollution Prevention."

14.2. The following waste streams are generated as a result of this analysis:

- Extractions Waste water. This material is created when 50% Acetone and 50% Methylene Chloride are added to 1 liter of sample water. The water is shaken with the solvent. The solvent is collected with the compounds of interest and the water is discarded into the Extractions Waste Water drum. This drum is removed to the walk-in hood in the waste room. A ½ inch PVC pipe is inserted into the bung hole of the drum and air is passed through the solution over night. The solution is then transferred into the first drum of the neutralization system and neutralized to a pH of 6 – 9. This solution is discharged into the municipal sewer system.

- Mixed Solvent Waste. This material is collected from rinsing and other processes into 5 gallon solvent cans as satellite accumulation. These cans are emptied every 24 hours into a steel drum in the waste room. This drum is kept in the walk in hood until it is full. The full drum is then removed from the hood and placed on secondary containment in the waste room.
  Teris Profile Number: 50016624
  Onyx Profile WIP Number: 545240

- Waste sodium sulfate. This material is collected from various methods which require the removal of water from solvent which carries the analyte (s) of interest. The solvent is passed through the sodium sulfate and the sodium sulfate plus the water is disposed of. The sodium sulfate is collected in buckets inside the hoods. The material is air dried and disposed of in the municipal waste dumpster.

- Waste sulfuric acid. This material is generated from clean up of PCB extracts for sulfur compounds. The acid is collected in satellite accumulation in the hood. The container is removed to the waste room for neutralization with 50 % sodium hydroxide (Siedler Chemical SC-182403), water and sodium bicarbonate (Siedler Chemical SC-0219-25). Ice is used to control temperature in the plastic drums of the neutralization system. When neutralization is complete (pH 6 -9) the material is transferred to the municipal sewer system.

15.0. References / Cross-References

15.1. United States Environmental Protection Agency, “Method 8151A: Organochlorine Herbicides by Gas Chromatography”, Test Methods for Evaluating Solid Wastes, SW846 Third Edition, Volume 1B: Laboratory Manual, Physical/Chemical Methods, Revision 3, December 1996.

15.2. Eurofins Edison SOP No. ED- ORP-015, Extraction of Organochlorine Herbicides in Water by SW846 Method 8151A, current revision.

15.3. Eurofins Edison Document No. ED-QA-LQM, Laboratory Quality Manual, current revision.

15.4. Eurofins Corporate Document No. CW-E-M-001, Environmental Health and Safety Manual, current revision.

15.5. Eurofins Corporate Quality SOP No. CA-Q-S-001, Solvent & Acid Lot Testing & Approval, current revision.

15.6. Eurofins Edison SOP No. ED-GEN-023, Bulk Solvent Testing and Approval, current revision.

15.7. Eurofins Edison SOP No. ED-GEN-013, Glassware Cleaning, most current revision

15.8. Eurofins Edison SOP No. ED-GEN-022, Training, current revision.

16.0. Method Modifications:

NONE

17.0. Attachments

NONE

18.0. Revision History

- Revision 13, dated 05 Jun 2024:
  - Removed all KD apparatus no longer used
  - Added the Diazald esterification procedure in case we run out of TMSD.
  - Removed all equipment, reagents, supplies and glassware no longer used.
  - Updated throughout to reflect Eurofins branding.

- Revision 12, dated Oct 08 2020:
  - Section 7.1: added Trimethylsilyldiazomethane (TMSD) , 2.0 molar solution in hexane, Acros 429211000 or equivalent. Removed Diazald..
  - Section 10.5.1: replaced the Diazald esterification procedure with the TMSD procedure.

- Revision 11, dated April 26, 2019
  - Section 10.4.11: methanol was added to extract to help with better herbicide recoveries.

- Revision 10, dated February 22, 2016:

  - Revised throughout to correct the spelling of Picloram (4-amino-3,5,6trichloropicolinic acid
  - Section 7.1.1.3: corrected the preparation instructions for 12N sulfuric acid. The correct volume of water is 200ml (was 300 ml). 100ml concentrated sulfuric diluted into 200 ml water is 12N.

- Revision 9, dated January 06, 2016:

  - Tables 1 and 2: updated sources and concentrations of standards.
  - Section 7.3.1 revised to specify acetone as the diluent.
  - Section 7.3.3.1 (spiking solution prep): updated to reflect current standards and procedures. Sections 7.3.3.2, 7.3.3.3 and 7.3.3.4 deleted (obsolete).
  - Section 7.3.3 (surrogate spiking standard prep): updated to reflect current standards and procedures.
  - Section 8.0: updated minimum sample size (8 oz. glass container).
  - Section 10.1.7 (spiking procedures): updated to reflect current practice and new standard mixes.

- Revision 8, dated December 21, 2011

- Revised the following sections to reflect the requirement that all glassware must be rinsed with sulfuric acid prior to use in the extraction of herbicides: Section 6.2 and Section 10.1.1.
- Added Section 7.1.1.4 which describes the preparation of a 25% sulfuric acid: reagent water solution for use in acid-rinsing glassware.
- Throughout document: updated LQM section references as appropriate as some have changed with the latest LQM revision

- Revision 7, dated August 26, 2011

  - Section 5.1: revised to include following statement: “Ethyl Ether must be free of peroxides as determined by use of EM Quant Peroxide Test Strips as described in Sections 6 and 7 below.”
  - Section 6.2: added EM Quant Peroxide Test Strips to supplies list.
  - Section 7.1: definition and source of Organic-Free Water added.
  - Section 7.1: added requirement to test Ether for peroxide formation.
  - Section 10.1.2: added detail regarding the initial weight of sample to be measured (i.e. ‘Weigh out 30g +/- 0.1g)
  - Revised Section 10.3.4 to include a requirement to pour extract through a funnel plugged with acid washed glass wool. Also revised collection container (was Erlenmeyer flask; now K-D concentrator).
  - Revised Section 10.3.9 to include a procedure for mixing well after adding ethyl ether phase to sodium sulfate.
  - Section 10.6 deleted. Section 10.6 was essentially a duplicate of Section 10.5 that had mistakenly been incorporated into the SOP text.

- Revision 6, dated October 30, 2009

  - Revised SOP format in accordance with Eurofins Corporate Quality SOP No.CW-QS-002 (Rev 0) Writing a Standard Operating Procedure (SOP).
  - Section 1.1 Added reference to Quality Assurance Manual for method modifications.
  - Section 1.1: Expanded to include references to applicable prep and cleanup SOPs.
  - Section 3: revised to reference new location for definitions.
    Section 5: Revised to include most up to date corporate health and safety references and information.
  - Section 7.2.2: Added tables detailing components found in the various standards mixes.
  - Section 7.3: Updated the instructions for preparation of standards.
    Section 7.3: Added tables with calibration standards prep details.
  - Section 8: Updated with additional details including a table outlining containers, preservation and holding times for waters and soils.

- Section 9.1: Expanded QC sample preparation details.
- References: Expanded to include more specific SOP references
  Section 18: Added this Revision History section
- Throughout document: added references to Eurofins LIMS (TALS).

Title: Procedure for the Microwave Extraction of Solids, SW846 3546

Once printed, this is considered an uncontrolled document

Approvals (Signature/Date):

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1.0 Scope and Application

The procedure uses microwave energy to produce elevated temperature and pressure conditions (i.e., 100° -115°C and 50 - 175 psi) in a closed vessel containing the sample (soil, sediment and sludge) and organic solvent(s) to achieve analyte recoveries equivalent to those from Automated Soxhlet extraction (Method 3541), using less solvent and taking significantly less time than the Automated Soxhlet procedure.

This method is applicable to the extraction of semi-volatile petroleum products in soil, sediment and sludge which may then be analyzed by a variety of chromatographic procedures. The method may also be applicable for the extraction of additional target analytes, provided that the analyst demonstrates adequate performance for the intended application as further described in Eurofins Edison's Quality Assurance Manual (ED-QA-LQM).

This method only is applicable to solid samples with small particle sizes. If practical the sample may be air dried and ground to a fine powder prior to extraction.

1.1 **Analytes, Matrix(s), and Reporting Limits:** This standard operating procedure details the procedures used by Eurofins Edison for the microwave extraction of soils, sediments, sludges, and waste solids for semivolatile organic compounds by SW846 Method 3546 for subsequent analysis of:

- Diesel Range Organics (C10-C28 & C8-C44) by SW846 Method 8015D (see Eurofins Edison SOP No. ED-GCS-020);
- Organochlorine Pesticides and PCBs by SW846 8081B and 8082A (see Eurofins Edison SOPs No. ED-GCS-016 and ED-GCS-017)
- Semivolatile Organic Compounds by Gas Chromatography/ Mass Spectrometry (GC/MS) by SW846 8270E (Eurofins Edison SOP No. ED-MSS-009)
- PCBs by GC/MS using EPA Method 680 (Eurofins Edison SOP ED-MSS-010)

1.2 The microwave prep for NJDEP Extractable Petroleum Hydrocarbons (EPH) (10/08), current revision, is addressed separately in Eurofins Edison SOP ED-GCS-012 (current revision).

1.3 For a complete discussion of analytes and reporting limits (RLs) please refer to the applicable Eurofins Edison analytical SOPs referenced in Section 1.1 and in References (Section 14.0).

1.4 On occasion clients may request modifications to this SOP. These modifications are handled following the procedures outlined in Section 9 (*Review of Work Request*) and 19 (*Test Methods and Method Validation*) of Eurofins Edison's Quality Assurance Manual.

2.0 Summary of Method

A representative soil, clay, sediment, sludge, solid or waste sample is weighed and placed into a 75mL Teflon vessel and extracted using an appropriate solvent in a microwave extractor. The extraction vessel containing the sample and solvent system is heated to the extraction

temperature and extracted for 10 minutes. The mixture is allowed to cool. The vessel is opened and the contents are filtered. The solid material is rinsed and the various solvent fractions are combined. The extract is then dried, concentrated using a nitrogen blow down device, and as necessary, solvent exchanged for use in clean up, fractionation, or determinative methods.

3.0 Definitions

For a complete list of definitions refer to Appendix 5 in the most current revision of Eurofins Edison's Quality Assurance Manual (ED-QA-LQM).

4.0 Interferences

4.1 Solvents, reagents, glassware, and other sample processing hardware may contribute to interferences with sample analysis. All materials must be demonstrated to be free from interferences under the conditions of the analysis by analyzing a method blanks.

4.2 Phthalate esters are commonly extracted from laboratory items. Plastics in particular, must be avoided because phthalates are easily extracted from these materials. The presence of these contaminants in extracts is problematic because it will give false positive results for the methods that list phthalates as target compounds or it will interfere with the target compounds of other methods that are co-extracted with them.

4.3 All glassware used must be scrupulously cleaned before use in trace analysis. Refer to Eurofins Edison SOP No. ED-GEN-013 (*Glassware Cleaning*), current revision.

4.4 Use caution if sodium sulfate is used for this method. Salts are known to super heat when used in microwave. Typically samples are analyzed with the addition of 5.0 grams sodium sulfate.

5.0 Safety

Employees must abide by the policies and procedures in the Corporate Safety Manual, Radiation Safety Manual and this document.

This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum.

5.1 Specific Safety Concerns or Requirements

Nitrile gloves should be used when performing this extraction. Latex and vinyl gloves provide no significant protection against the organic solvents used in this SOP, and should not be used. During Kuderna-Danish (KD) concentration, do not allow the extract to boil to dryness. The solvent vapors remaining in the KD apparatus may superheat and create an explosion or fire hazard.

The use of the microwave to extract samples creates excessive pressure and temperature within the digestion vessels very rapidly. Cooling the sample after digestion is extremely important.

5.2 Primary Materials Used

The following is a list of the materials used in this method, which have a serious or significant hazard rating. NOTE: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the MSDS for each of the materials listed in the table. A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the MSDS for each material before using it for the first time or when there are major changes to the MSDS.

Material	Hazards	Exposure Limit (2)	Signs and symptoms of exposure
Acetone	Flammable	1000 ppm-TWA	Inhalation of vapors irritates the respiratory tract. May cause coughing, dizziness, dullness, and headache.
Hexane	Flammable Irritant	500 ppm-TWA	Inhalation of vapors irritates the respiratory tract. Overexposure may cause lightheadedness, nausea, headache, and blurred vision. Vapors may cause irritation to the skin and eyes.
Methylene Chloride	Carcinogen Irritant	25 ppm-TWA 125 ppm-STEL	Causes irritation to respiratory tract. Has a strong narcotic effect with symptoms of mental confusion, light-headedness, fatigue, nausea, vomiting and headache. Causes irritation, redness and pain to the skin and eyes. Prolonged contact can cause burns. Liquid degreases the skin. May be absorbed through skin.
1 – Always add acid to water to prevent violent reactions.			
2 – Exposure limit refers to the OSHA regulatory exposure limit.			

6.0 Equipment and Supplies

6.1 Instrumentation

- Zymark Turbovap II concentrator
- Electronic Balance, capable of weighing to 0.01g.
- N-Evap Analytical Evaporator
- Fisher 8 Position Steam Bath
- MARS 5 microwave oven with temperature sensor (CEM Corp) capable of sensing temperature within 2.5°C and adjusting microwave field output within 2 sec of sensing.
- MARS 40 position carousel (CEM Corp)
- Visiprep DL column holder

6.2 Supplies

- 10, 50 and 200 mL Concentrator tubes.
- Vials, - 1ml, 4ml, and 10ml with PTFE lined snapcaps.

- Glass syringes, 25ul, 50ul, 100ul, 500ul, 1000ul
- Pastuer pipets
- Glass Buchner funnels (stainless steel funnels may be substituted) – Fisher Scientific.
- 500 ml Kuderna-Danish (KD) flask
- Stainless steal spatulas
- Glass wool- Contaminant-free (silane treated or oven baked at 400^{O}C)
- 75mL Teflon Express vessels with stopper and cap (CEM Corp.)
- Glass fiber filter paper - #1 185mm (Whatman)
- Weigh boats
- Tongue depressors, wood

7.0 Reagents and Standards

Note: Each solvent lot is screened for contaminants before being used for analysis as detailed in Eurofins Corporate Quality SOP No. CA-Q-S-001 (*Solvent & Acid Lot Testing & Approval*) and Eurofins Edison SOP No. ED-GEN-023 (*Bulk Solvent Testing and Approval*).

7.1. Reagents

7.1.1 Organic free reagent water - Reagent water is defined as a water in which an interference is not observed at the MDL of each parameter of interest (ASTM Specification D1193, Type ii). At Eurofins Edison this water is generated by the Barnstead/Thermolyne Water System (Model # D11991 Serial # 1191020210415).

7.1.2 Methylene Chloride, JT Baker Resi-analyzed, P/N 9254-03 (or equivalent)

7.1.3 Hexane – JT Baker Ultra-Resi 73513-42-5 or equivalent

7.1.4 Acetone, J.T. Baker Ultra- ResiAnalyzed, Catalog No. 9264-03 (or equivalent)

7.1.5 Nitrogen, high-purity

7.1.6 Construction Sand (Home Depot or Lowes), free from organic compounds. (Baked in the muffle furnace for four hours at 400^{O}C and stored in a desiccator prior to use.)

7.1.7 Sodium Sulfate Anhydrous Powder, Mallinckrodt MA8020-06 or equivalent (Must be baked in the muffle furnace for four hours at 400^{O}C and stored in a dessicator prior to use.)

7.2. Standards

7.2.1 Stock target analyte standard spiking solutions are purchased as prepared solutions (see table below). Stock solutions are diluted (in volumetric glassware) to a working concentration using methylene chloride ($MeCl_2$) hexane or Acetone as the diluent as indicated below

below. Stock standards of similar quality from other suppliers may be substituted as required.

NOTE: Second sources (from separate lots) are used for quanitation standards and spiking.

Stock Standards (Methods 8015D DRO)				
Standard Mix	**Concentration**	**Source**	**Catalog #**	**Used in method(s):**
o-Terphenyl	10000 ppm	Sigma Aldrich	47580U	*SW846 8015D DRO
Custom TPH Mixed	1000 ppm	Agilent	CUS-3860	*SW846 8015D DRO
Diesel Fuel #2	50000 ppm	Restek	31259	*SW846 8015D

Stock Standards - Pesticides/PCBs* (Methods SW846 8081B and 8082A)				
Standard Mix	**Concentration**	**Source**	**Catalog #**	**Used in method(s):**
Pesticide Surrogate Spike Mix ("Pest/PCB Surrogate")	10 ug/ml	Supelco	861275	SW846 8081B/8082A
Aroclor Spike Mix ("PCB Spike")	100 ug/ml	Supelco	861274	SW846 8082A
SS CLP Organochlorine Pesticides Mix ("Pest Spike")	2000 ug/ml	Supelco	4S7426-U	SW846 8081B
Chlordane (technical) ("Technical Chlordane Spike")	1000 ug/ml	Supelco	48065-U	SW846 8081B
Toxaphene	1000 ug/ml	Supelco	48065-U	SW846 8081B

*May be substituted with equivalent standards from alternate sources.

Components of Pesticide/PCB Standard Mixes (Methods SW846 8081B and 8082A)			
Parameter	**Catalog Nos.**	**Lab Standard Name**	**Concentration (ug/ml)**
Decachlorobiphenyl (DCB)	Supelco – 4S8913	Pest/PCB Surrogate	10.0
2,4,5,6-Tetrachloro-m-xylene (TCMX)	Supelco – 4S8913	Pest/PCB Surrogate	10.0
Aroclor 1016	Supelco - 861274	PCB Spike	100
Aroclor 1260	Supelco - 861274	PCB Spike	100
Aldrin	Supelco - 4S7426-U	Pest Spike	2000
Alpha-BHC	Supelco - 4S7426-U	Pest Spike	2000
Alpha-Chlordane	Supelco - 4S7426-U	Pest Spike	2000
Beta-BHC	Supelco - 4S7426-U	Pest Spike	2000
Delta-BHC	Supelco - 4S7426-U	Pest Spike	2000
Dieldrin	Supelco - 4S7426-U	Pest Spike	2000
Endosulfan I (Alpha)	Supelco - 4S7426-U	Pest Spike	2000
Endosulfan II (Beta)	Supelco - 4S7426-U	Pest Spike	2000

Components of Pesticide/PCB Standard Mixes (Methods SW846 8081B and 8082A)			
Parameter	**Catalog Nos.**	**Lab Standard Name**	**Concentration (ug/ml)**
Endosulfan Sulfate	Supelco - 4S7426-U	Pest Spike	2000
Endrin Aldehyde	Supelco - 4S7426-U	Pest Spike	2000
Endrin Ketone	Supelco - 4S7426-U	Pest Spike	2000
Endrin	Supelco - 4S7426-U	Pest Spike	2000
Gamma-BHC (Lindane)	Supelco - 4S7426-U	Pest Spike	2000
Gamma-Chlordane	Supelco - 4S7426-U	Pest Spike	2000
Heptachlor	Supelco - 4S7426-U	Pest Spike	2000
Heptachlor Epoxide (Isomer B)	Supelco - 4S7426-U	Pest Spike	2000
Methoxychlor	Supelco - 4S7426-U	Pest Spike	2000
4,4'-DDD	Supelco - 4S7426-U	Pest Spike	2000
4,4'DDE	Supelco - 4S7426-U	Pest Spike	2000
4,4'-DDT	Supelco - 4S7426-U	Pest Spike	2000
Chlordane (technical)	Supelco – 48065-U	Technical Chlordane Spike	1000
Toxaphene	Supelco 48103	Toxaphene Spike	1000

Stock Standards – BNAs (Method 8270E)			
Standard Mix	**Concentration (ug/ml)**	**Lab Vendor**	**Catalog #**
8270 List 1/ Std#1 MegaMix	500/1000/2000	RESTEK	567672
8270 List 1/ Std#5 N-Nitrosodiphenylamine	2000	RESTEK	567676
8270 List 1/ Std#2 Amines	2000	RESTEK	567673
8270 List 1/ Std#3 Benzoic Acid	2000	RESTEK	567674
Custom SVO Mix	2000	SPEX	SVO-TANJ-16-5
Bisphenol A	1000	SPEX	S-509-MC
8270 List 1/ Std#8	2000	RESTEK	568724
8270 Surrogate Standard	5000	RESTEK	567685
Aromatic Amines Custom Mix	2000	Supelco	21467482

Stock Standards – PCB Homologues (Method 680)			
Standard Mix	**Concentration (ug/ml)**	**Lab Vendor**	**Catalog #**
Retention Time Calibration Standard Mixture	Varies by component (100 to 200)	Ultra	CB-682MN
Concentration Calibration Standard Mix	Varies by component (50 to 250)	Ultra	CB-681MN
13C12-Decachlorobiphenyl Surrogate	40	Cambridge	EC-1410-3
Lindane13C6	100	Cambridge	CLM-1282-S

Components of PCB Homologue Mixes (Methods 680)			
Parameter	**Catalog Nos.**	**Lab Standard Name**	**Concentration (ug/ml)**
PCB-104	Ultra CB-682MN	Retention Time Calibration Standard Mixture	100
PCB-208	Ultra CB-682MN	Retention Time Calibration Standard Mixture	200
PCB-77	Ultra CB-682MN	Retention Time Calibration Standard Mixture	100
Total Nonachlorobiphenyls	Ultra CB-682MN	Retention Time Calibration Standard Mixture	200
DCB Decachlorobiphenyl	Ultra CB-681MN	Concentration Calibration Standard Mix	250
Total Dichlorobiphenyls	Ultra CB-681MN	Concentration Calibration Standard Mix	50
Total Heptachlorobiphenyls	Ultra CB-681MN	Concentration Calibration Standard Mix	150
Total Hexachlorobiphenyls	Ultra CB-681MN	Concentration Calibration Standard Mix	100
Total Monochlorobiphenyls	Ultra CB-681MN	Concentration Calibration Standard Mix	50
Total Octachlorobiphenyls	Ultra CB-681MN	Concentration Calibration Standard Mix	150
Total Pentachlorobiphenyls	Ultra CB-681MN	Concentration Calibration Standard Mix	100
Total Tetrachlorobiphenyls	Ultra CB-681MN	Concentration Calibration Standard Mix	100
Total Trichlorobiphenyls	Ultra CB-681MN	Concentration Calibration Standard Mix	50

7.2.2 Spiking Standards Prep for GC FID (DRO): The table below provides instruction in preparation of the various working spiking standards for use in this preparation method using the applicable standards listed in 7.2.1. Use volumetric glassware. Dilute to the volume marker with the indicated solvent.

Working Spiking Standards Preparation					
Standard Name	**Vendor/ Cat #**	**Initial Conc. (ug/ml)**	**Vol. of Standard (ml)**	**Vol. of solvent ml (solvent)**	**Final Conc. (ug/ml)**
QAM-025 LCS Spike Diesel Fuel #2	Restek/31259	50000	4	100 ($MeCl_2$)	2000

Working Spiking Standards Preparation					
Standard Name	**Vendor/ Cat #**	**Initial Conc. (ug/ml)**	**Vol. of Standard (ml)**	**Vol. of solvent ml (solvent)**	**Final Conc. (ug/ml)**
DRO Surrogate -o-terphenyl	Supelco/47580U	10000	1.0	500 (Acetone)	20
QAM-025 MS/MSD Spike TPH Mix 3	Sigma/861394-U	1000	1.47	10 ($MeCl_2$)	147

7.2.3 Spiking Standards Prep for GC ECD(8081/8082):

7.2.3.1 All standard stock solutions are diluted to the working concentrations with hexane or acetone (as indicated) using Class A volumetric glassware. **Note:** septa on all surrogate and spike vials are to be replaced immediately after use. Additionally, all surrogate and spike vials are to be returned to the standards refrigerator immediately after use.

7.2.3.2 Pesticide Spiking Standard (LCS/MS/MSD): The Pesticide Mix BS/MS/MSD solution with 20 single component pesticides is prepared at a final concentration of 20 ug/ml by diluting 500 ul (0.50 ml) of the 2000 ppm Pest Spike stock solution (Supelco 4S7426-U, see tables in Section 7.2.1) to a 50 ml final volume with acetone. For spiking instructions refer to Section 10.

7.2.3.3 PCB Spiking Standard (LCS/MS/MSD): The PCB spiking solution (Supelco – 861274, see Tables 1 and 2) is a custom mix received from the vendor at its working concentration of 100 ug/ml in Acetone. For spiking instructions refer to Section 10.

7.2.3.4 Technical Chlordane Spiking Standard (LCS/MS/MSD): A technical Chlordane spiking solution is prepared at a final concentration of 100 ug/ml by diluting 1 ml of the 1000 ug/ml Technical Chlordane Spike solution (Supelco 48065-U, see tables in Section 7.2.1) to a 10 ml final volume using acetone. For spiking instructions refer to Section 10.

7.2.3.5 Toxaphene Spiking Standard (LCS/MS/MSD): A Toxaphene spiking solution is prepared at a final concentration of 100 ug/ml by diluting 1 ml of the 1000 ug/ml Toxaphene Spike solution (Supelco 48103, see tables in Section 7.2.1) to a final volume 10 ml. using acetone. For spiking instructions refer to Section 10.

7.2.3.6 Pesticide/PCB Surrogate Spiking Standard: The Pesticide/PCB surrogate spiking solution is a concentrated 10 ml solution of DCB/TCMX at a concentration of 10 ug/ml. (Supelco Catalog # 861275, see tables in Section 7.2.1). The concentrate is used without further dilution prior to the spiking of samples.

7.2.4 Spiking Standard for BNA: For use in spiking Soils samples prepared for BNA analysis by SW846 Method 8270. Prepare the spiking solution for MS/MSD/Blank Spike (LCS) as detailed in the following table using the applicable standards listed in 7.2.1. Use volumetric glassware. Dilute to the volume marker with methanol

Standard Name	Concentration	Volume of Standard added to final volume of 200ml (solvent)	Final Concentration
8270 List 1/ Std#1 MegaMix	500/1000/2000pmm	20 ml (methanol)	50/100/200 ppm
8270 List 1/ Std#5 N-Nitrosodiphenylamine	2000ppm	10 ml (methanol)	100 ppm
8270 List 1/ Std#2 Amines	2000ppm	10 ml (methanol)	100 ppm
8270 List 1/ Std#3 Benzoic Acid	2000ppm	10 ml (methanol)	100 ppm
Custom SVO Mix	2000ppm	10 ml (methanol)	100 ppm
Bisphenol A	1000ppm	10ml (methanol)	50ppm
8270 List 1/ Std#8	2000ppm	20ul (methanol) 100ul(methanol)	Used neat for LVI Used neat for non-LVI
Aromatic Amines Custom Mix**	2000ppm	10 ml (methylene chloride)	100 ppm

*** As needed based on clients requirement.*

7.2.4.1 BNA Surrogate Standard Spiking Solution: For use in spiking all blanks, samples and associated QC prior to extraction. Prepare as detailed in the following table using the applicable standards listed in 7.2.1. Use volumetric glassware. Dilute to the volume marker with methanol.

Standard Name	Concentration	Volume of Standard added to final volume of 1000 ml methanol	Final Concentration
8270 Surrogate Standard	5000 ppm	20 ml	100 m

7.2.5 Spiking Standard for PCB Homologues (EPA 680): For use in spiking LCS and MS/MSD prior to extraction. Prepare by adding 1.0ml of the Retention Time Calibration Standard and 1.0ml of the Concentration Calibration Standard Mix to hexane in volumetric glassware and dilute to final volume of 100ml. 1.0mL of this solution is spiked into LCS/MS/MSD prior to extraction.

7.2.5.1 PCB Homologue Surrogate Standard Spiking Solution (EPA 680): (2.0ug/mL and 2.5ug/mL) – Add 3.125mL of $^{13}C_{12}$-Decachlorobiphenyl

and 1.0mL of Lindane13C6 and dilute to a final volume of 50mL in hexane in volumetric glassware. 1.0mL of this solution is spiked into all blanks, samples and QC items prior to extraction.

7.2.6 The preparation of all standards must be documented in a standard preparation logbook or in the TALS reagent module. Information such as standard supplier, lot number, original concentration, and a description of how standard was prepared are required along with a laboratory lot number, analyst's initials, date prepared and verification signature. Standards must be made every 6 months or sooner if signs of degradation appear.

8.0 Sample Collection, Preservation, Shipment and Storage

Sample container, preservation techniques and holding times may vary and are dependent on sample matrix, method of choice, regulatory compliance, and/or specific contract or client requests. Listed below are the holding times and the references that include preservation requirements.

Matrix	Sample Container	Min. Sample Size	Preservation	Holding Time [1]	Reference
Soils	Glass	4 oz	Cool 4 ± 2°C	14 Days	SW846 Method 8000

Samples are collected in amber jars with Teflon lined caps.
[1]All sample extracts must be analyzed within forty (40) days of extraction.

9.0 Quality Control

9.1. Sample QC – The following quality control samples are prepared with each batch of samples.

QC Analysis	Frequency	Acceptance Criteria	Corrective Action
Laboratory Control Sample (LCS/LCSD)[1]	1 in 20 or fewer samples	See applicable analytical SOPs	See applicable analytical SOPs for control criteria
Method Blank (MB)	1 in 20 or fewer samples	See applicable analytical SOPs	See applicable analytical SOPs for control criteria
MS\MSD[2] (Client specified)	1 in 20 or fewer samples	See applicable analytical SOPs	See applicable analytical SOPs for control criteria
Surrogates[3]	All Samples including QC	See applicable analytical SOPs	See applicable analytical SOPs for control criteria

[1] LCS Duplicate (LCSD) is performed only when insufficient sample is available for the MS/MSD or when requested by the client/project/contract except for NJDEP EPH 10/09 where LCS/LCSD is required.
[2] The sample selections for MS/MSD are randomly selected, unless specifically requested by a client. For NJDEP EPH 10/09, only MS is required (MSD for NJDEP EPH 10/09 is by client request only).
[3] Analytical and QC samples (MB, LCS, MS/MSD)
[4] Statistical control limits are updated annually and are updated into LIMS.

9.2. Instrument QC

N/A

10.0 Procedure

10.1. Sample Preparation

10.1.1 Decant and discard any water layer on a sediment sample. Discard any foreign objects such as rocks, leaves and sticks. Mix sample thoroughly with wooden tongue depressor prior to subsampling

10.1.2 The initial amount and treatment of soil samples is method dependent:

- For DRO (8015): 15 grams of soil is weighed into a 75mL Teflon microwave vessel (the weight is recorded to two significant figures). Where practical samples should be air dried and ground prior to extraction. Drying should be performed in a hood to avoid contamination.
- For 8270: 15 grams of soil is weighed into an aluminum weighing dish (the weight is recorded to two significant figures). 15 ml of acetone is added to the dish and the soil/acetone mixture is stirred well with a wooden tongue depressor to create a slurry. The soil/acetone slurry is transferred to a 75 ml Teflon microwave vessel. The dish is then rinsed with 15 ml of methylene chloride which is also added to the microwave vessel.
- For 8081/8082: 15 grams of Soil is weighed into an aluminum dish. 15 ml of Acetone is added to the dish and the soil / acetone mixture is stirred well with a wooden tongue depressor to create a slurry. Then, the mixture is transferred into a 75ml Teflon vessel. The dish is then rinsed with 15 ml of Hexane which is also added to the microwave vessel.
- For EPA 680: 30 grams of soil is weighed into a 75mL Teflon microwave vessel (the weight is recorded to two significant figures).

10.1.3 For laboratory blanks and control spikes, an equal portion of clean sand is prepped along with samples.

10.1.4 All samples, blanks, and spikes are fortified with an appropriate amount of the applicable method surrogates. All matrix spikes and lab control spikes are fortified with an appropriate amount of the applicable method spiking solution. See Attachment 1 for general spiking instructions. (Refer to Section 7.2 for information on preparation of spiking solutions):

- PCBs (8082): add 50 ul of the PCB Spike solution to each LCS and designated MS/MSD;

- Pesticides (total, 8081): 100 ul of the Pest Spike solution to each LCS and designated MS/MSD;
- Technical Chlordane: 100 ul of the Technical Chlordane Spike mix to each LCS and designated MS/MDS;
- Toxaphene: 100 ul of the Toxaphene Spike mix to each LCS and designated MS/MSD;
- BNA (8270): 500ul of spike/Surrogate solution to each LCS and designated MS/MSD);
- PCB Homologues (EPA 680): 1.0 ml each of Spiking solution (see Sec.7.2.5) and Surrogate solution (see Sec. 7.2.5.1) to each LCS and designated MS/MSD.

  NOTE: When spiking the samples, it is critical to remove all bubbles from the syringe.

10.1.5 Add the following solvent to each sample vessel depending upon the fraction (**note**: for Pesticides and PCBs by methods 8081 and 8082 the solvent addition is addressed in Section 10.1.2 above)

- 30mL of methylene chloride for DRO (8015);
- 30 mL of Methylene Chloride/Acetone blend (50:50) for BNA (8270)

30 mL of Hexane for PCB homologues by EPA 680

10.1.6 A stopper is placed over the opening along with the vessel cap. The vessel is then tightened using the MARS capping wrench. This capping wrench tightens the cap to the appropriate torque.

10.1.7 The sample vessels are placed into the 40-position carousel. Each position has an insulator sleeve that the vessel slides into – slide the vessel into the appropriate sleeve – and press firmly down to ensure a complete connection.

10.1.8 Place the carousel (with samples and vessels) into the microwave unit.

Start Run: (load method – using key pad on face of unit)
Press: Home
Press Select: load method
Press Select: from user directory
Press Select: 3546 Microwave – Xpress method
Press Start.

Microwave Operating Parameters				
Power Max	**Power %**	**Oven Ramp**	**Degrees Celsius**	**Hold Time**
1200W	100	10.0 minutes	110	10.0 minutes
1600W[1]	100	20.0 minutes	115	10.0 minutes

[1] For pesticide/PCB and BNA samples only

10.1.9 A 5-minute cool down will close out the run.

10.1.10 Remove vessels from carousel and allow cooling (either at room temperature or in a cold water bath).

10.1.11 When cool down is complete, remove carousel from microwave.

10.1.12 Pre-wash a funnel filled with sodium sulfate with three successive washings of 30 ml acetone. Pour the extract carefully through the sodium sulfate funnel (to remove any moisture) into the 200mL concentrator tube. Rinse the 75mL vessel with 10 mL methylene chloride three times to ensure quantitative transfer.

10.1.13 Set the water temperature in the concentrator to 35°C and adjust the pressure to around 5psi of nitrogen.

10.1.14 Place the tube into the apparatus and slowly raise the pressure to 20psi. If splashing occurs, start with a lower pressure and raise it when the solvent gets lower.

10.1.15 Concentrate to just under the 1mL mark on the nipple of the tube. Remove from the bath and transfer to an auto sampler vial with a glass Pasteur pipette..

10.1.16 Add a few drops of clean methylene chloride to the tube, rinsing the narrow part and add to the vial to adjust to 1mL or other method specific final volume. If solvent exchange to hexane is required, add approximately 30mL (mix well) and return to concentrator set at 35°C. See Attachment 2.

10.1.17 Total concentration time should be approximately 20 minutes for methylene chloride. If a sample takes a longer than usual amount of time to concentrate or if the extract becomes viscous the final volume should be adjusted to a larger volume and documented.

10.1.18 The extract is now ready for the appropriate clean up and or analysis.

10.2. Calibration

10.2.1 The balance calibration is checked daily prior to use. Refer to Eurofins Edison SOPs ED-GEN-010, *Calibration of Analytical Balances*, current revision and ED-GEN-006, *Standard Operating Procedure for Preventive Maintenance and Calibration Procedures for All Analytical Instruments and Ancillary Equipment*, current revision.

11.0 Calculations / Data Reduction

N/A

12.0 Method Performance

12.1. Method Detection Limit Study (MDL)

The method detection limit (MDL) is the lowest concentration that can be detected for a given analytical method and sample matrix with 99% confidence that the analyte is present. The MDL is determined according to the laboratory's MDL procedure in Section 19 (Test Methods and Method Validation) of Eurofins Edison's Quality Assurance Manual (ED-QA-LQM). MDLs reflect a calculated (statistical) value determined under ideal laboratory conditions in a clean matrix, and may not be achievable in all environmental matrices. The laboratory maintains MDL studies for analyses performed; these are verified at least annually unless method requirements require a greater frequency.

12.2. Demonstration of Capabilities

For demonstration of capability procedure refer to Section 19 in the most current revision of Eurofins Edison's Quality Assurance Manual (ED-QA-LQM).

12.3. Training Requirements

Refer to Eurofins SOP No. ED-GEN-022, *Training*, for the laboratory's training program.

13.0 Pollution Control

13.1. It is Eurofins's policy to evaluate each method and look for opportunities to minimize waste generated (i.e., examine recycling options, ordering chemicals based on quantity needed, preparation of reagents based on anticipated usage and reagent stability). Employees must abide by the policies in Section 13 of the Corporate Environmental Health and Safety Manual (CW-E-M-001) for "Waste Management and Pollution Prevention."

14.0 Waste Management

14.1 Waste management practices are conducted consistent with all applicable rules and regulations. Excess reagents, samples and method process wastes are

disposed of in an accepted manner. Waste description rules and land disposal restrictions are followed. Waste disposal procedures are incorporated by reference to Eurofins Edison SOPs No. ED-SPM-008 (*Laboratory Waste Disposal Procedures, current revision).* The following waste streams are produced when this method is carried out:

- *Mixed Solvent Waste*: Mixed solvent waste is collected in a small beaker inside the bench top hood. This waste is then transferred into the satellite accumulation container in the Organic Prep. Lab. on a daily basis. This material is transferred into 5 gallon solvent cans as satellite accumulation. These cans are emptied every 24 hours into a steel drum in the waste room. This drum is kept in the walk in hood until it is full. The full drum is then removed from the hood and placed on secondary containment in the waste room.

  Teris Profile Number: 50016624
  Onyx Profile WIP Number: 545240

- *Auto sampler vials and expired standards*: These vials are collected in satellite accumulation within the instrument laboratory. The vials are then placed into a 55 steel open top drum in the waste room. When the drums are full, the drum will be collected by the waste vendor for disposal. This waste is treated for incineration.

  Teris Profile Number: 50016652
  Onyx Profile WIP Number: 282493

15.0 References / Cross-References

15.1 United States Environmental Protection Agency, “Method SW3546, Microwave Extraction”, Test Methods for Evaluating Solid Wastes, SW846 Laboratory Manual, Physical/Chemical Methods, February 2007.

15.2 United States Environmental Protection Agency, Method SW8015D, Test Methods for Evaluating Solid Wastes, SW846 Third Edition, Volume 1B: Laboratory Manual, Physical/Chemical Methods, Revision 4, June 2003.

15.3 United States Environmental Protection Agency, “Method 8081B, Organochlorine Pesticide by Gas Chromatography”, Test Methods for Evaluating Solid Wastes, SW846 Third Edition, Volume 1B: Laboratory Manual, Physical/Chemical Methods, Revision 2, February 2007.

15.4 United States Environmental Protection Agency, “Method 8082A, Organochlorine Pesticide by Gas Chromatography”, Test Methods for Evaluating Solid Wastes, SW846 Third Edition, Volume 1B: Laboratory Manual, Physical/Chemical Methods, Revision 1, February 2007.

15.5 United States Environmental Protection Agency, “Method SW8270E, Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry”, Test Methods for Evaluating Solid Wastes, SW846 Update VI, Revision 6, June 2018.

15.6 Eurofins Edison SOP No. ED-GCS-020, *Preparation of Water Samples by SW846 Methods 3510C (Separatory Funnel) and Analysis of Diesel Range Organics in Soil and Water Samples by SW846 Method 8015D (GC/FID)*current revision.

15.7 Eurofins Edison SOP No. ED-GCS-016, *Analysis of Organochlorine Pesticides by Gas Chromatograph, SW846 Method 8081B*, current revision.

15.8 Eurofins Edison SOP No. ED-GCS-017, *Analysis of Polychlorinated Biphenyls by Gas Chromatograph, SW846 Method 8082A*, current revision

15.9 Eurofins Edison SOP No. ED-MSS-010, *Determination of PCBs in Water and Soil/Sediment by GC/MS, EPA Method 680,* current revision.

15.10 Eurofins Edison Document No. ED-QA-LQM, *Laboratory Quality Manual*, current revision.

15.11 Eurofins Environmental Health and Safety Manual, CW-E-M-001.

15.12 Eurofins Corporate Quality SOP No. CA-Q-S-001, *Solvent & Acid Lot Testing& Approval*, current revision.

15.13 Eurofins Edison SOP No. ED-GEN-023, *Bulk Solvent Testing and Approval*, current revision.

15.14 Eurofins Edison SOP No. ED-GEN-013, *Glassware Cleaning,* current revision

15.15 Eurofins Edison SOP No. ED-GEN-022, *Training,* current revision

15.16 Eurofins Edison SOP No. ED-SPM-008, *Laboratory Waste Disposal Procedures,* current revision.

15.17 Eurofins Edison SOP No. ED-GEN-006, *Standard Operating Procedure for Preventive Maintenance and Calibration Procedures for All Analytical Instruments and Ancillary Equipment,* current revision.

15.18 Eurofins Edison SOP No. ED-GEN-010, *Calibration of Analytical Balances,* current revision.

15.19 Eurofins Edison SOP No. ED-GEN-007, *Subsampling*, current revision.

15.20 Operation Manuals for the Zymark Turbo Vap II Concentrator.

15.21 Operating manual for the MARS 5 Microwave unit.

16.0 Method Modifications:

N/A

17.0 Attachments

Attachment 1: Spiking information
Attachment 2: Specific Extraction Conditions

18.0 Revision History

Rev 12, July 2, 2024

- Updated to reflect Eurofins branding and formatting.
- Section 1.1: updated method/SOP references as needed.
- Throughout document: updated Lab Quality Manual section references as needed.
- Section 14 (References): updated to reflect current documents.
- Section 7.2.1: updated DRO spiking solution.
- Section 10.1.2: updated procedure for 8081/8082 such that acetone: hexane is now the extraction solvent (methylene chloride eliminated).

Rev 11, March 12, 2018

- Updated Section 10.1 to revise procedures for the microwave extraction of solids for subsequent analysis by EPA methods 8081, 8082 and 8270.
- Updated to remove all references to addition of sodium sulfate to samples prior to microwave extraction.
- Fixed section numbering and formatting errors.

Rev 10, May 16, 2017

- Updated throughout to add procedures for microwave extractions of solids for subsequent analysis by EPA Method 680 (PCBs by GC/MS).

Rev 9, Dec 15, 2016

- Updated throughout to remove procedures for microwave extraction of solids for NJ EPH method. Those procedures are fully covered in Eurofins Edison SOP ED-GCS-012, Preparation and Analysis of Extractable Petroleum Hydrocarbons (EPH) in Solid and Water Samples using NJDEP EPH Method 10/08, August 2010 (Rev. 3): Analysis of Extractable Petroleum Hydrocarbon Compounds (EPH) in Aqueous and Soil/Sediment/Sludge Matrices (current revision)
- Added following text to Section 1.2: The microwave prep for NJDEP Extractable Petroleum Hydrocarbons (EPH) (10/08), current revision, is addressed separately in Eurofins Edison SOP ED-GCS-012 (current revision).
- All references to NJDEP EPH methodology removed.

Rev 8, Jan 22, 2015

- Updated to include procedures for microwave extraction of solids for analysis my SW846 Methods 8270C and 8270D (Semivolatile Organic Compounds by Gas Chromatography/ Mass Spectrometry (GC/MS). Specifically
- Added 8270 method references and SOP numbers to Sections 1.1 and 15.0
- Added a table to Section 7.2.1 detailing the BNA standard mixes.
- Added new Section 7.2.4 detailing the preparation of BNA spiking standards
- Added Section 7.2.4.1 detailing the preparation of BNA surrogate spiking standards.
- Added details of 8270 spiking and extraction to Section 10.0 as appropriate.
- Added BNA Spiking details to Attachments 1 and 2. COAs for BNA spiking not included in SOP but are on-file in the department.

Rev 7, June 14, 2013

- Section 1.1: updated the DRO method references to include SW8015C and SW8015D. Also update the SOP references for the DRO analytical methods.
- Section 7.2.1: updated stock standards table to include SW8015C and 8015D. Revised source for o-Terphenyl stock. Removed TPH Mix 1 from list. Removed 8015x DRO from the list of methods for which TPH Mix 3 is used. Added 8015x DRO to the list of methods for which Diesel Fuel #2 is used.
- Section 7.2.2.1: Revised DRO surrogate spike source and prep instructions. Revised DRO and QAM-025 spiking standard source and prep instructions.
- Section 15.0: References: added references for methods SW8015C and 8015D.
- Attachment 1: updated spiking information for DRO.

Rev 6, October 10, 2012

- Throughout document:: Revised LQM reference sections to reflect the most current revision
- Throughout document: updated as detailed below to include prep instructions for solid samples undergoing analysis by SW846 8081A/B and 8082/A.
- Section 1.1: added references to the 8081/8082 SOPs: Eurofins Edison SOPs No.ED-GCS-003, ED-GCS-004, ED-GCS-016 and ED-GCS-017.
- Section 6.2: added weigh boats and wooden tongue depressors.
- Section 7.2.1: added acetone as a diluent and added tables detailing the Pestcide and PCB standards.
- Section 7.2.2: added “GCFID (DRO/EPH/QAM)” to section header.
- Section 7.2.3: added instructions for prep of Pest/PCB spiking standards.
- Section10.1.4: Added Pest/PCB spiking instructions.

- Section 10.1.5: added instructions for addition of extraction solvent (Methylene Chloride:Acetone for Pest/PCB).
- Section 10.1.8: updated table to include Microwave Parameters for Pest/PCB prep.
- Section 10.1.12: added a methylene chloride rinse.
- Section 15: added method and SOP references for SW846 8081A/8081B and SW846 8082/8082A.
- Attachments: updated to include Pest/PCB information.

Rev 5, August 26, 2011

- Section .6.2: added vendor and part number details for silica gel columns (Phenomenex Part No:8L-S012-JCH)
- Section 10.1.2: Added details for the pre-washing of sodium sulfate funnels with three successive 30 ml volumes of acetone. Added details for the rinsing of the 75 ml vessel with three successive volumes of methylene chloride.

Rev 4, April 21, 2010

- Section 7.2.1: Corrected the footnotes in the tables 'Stock Standards – Aliphatics (Method NJDEP EPH 10/08)' and 'Stock Standards-Aromatics (Method NDJEP EPH 10.08)'.
- Attachment 3: Added this attachment which consists of select certificates of analysis for Method NJDEP EPH 10/08.
- Section 7.2.2.1: Table 'Working Spiking Standards Preparation'" replaced asterisks (*) with dashes (-) in order to clarify that these are simply bullets rather than referencing footnotes.

Rev 3, April 19, 2010

- Section 7.2.2.1: added procedure for preparation of a 500 ppm Aliphatic Neat Spike Mix.
- Section 7.2.2: Spiking Standards Prep: revised the procedure for prep of the EPH Aliphatic Spike in the 'Working Spiking Standards Preparation' table as follows:
    - Replaced 'MA EPH-n-Hydrocarbons (Absolute/91488) with the 'Florida TRPH Standard (Restek/31266)'
    - Included used of the intermediate 500 Aliphatic Neat Spike Mix.

Rev 2, February 9, 2009

- Section 3.0, Definitions – updated to reflect current location of definitions (Appendix 2 of Lab Quality Manual
- Section 5.2, Primary Materials Used – added 'hexane' to table (used in the NJDEP EPH method).
- Section 7.2.1: added stock standards associated with NJDEP EPH 10/08 method.
- Section 7.2.2: Spiking Standards Prep: updated 'Working Spike Standards' table to include revised NJDEP EPH 10/09 spiking standards; revised other as required.
- Section 9.1, Sample QC: updated with revise NJDEP EPH 10/09 QC requirements.

- Section 10.1, Sample Preparation: revised initial sample weight to 15 grams.
- Section 10.1.8: added Microwave Operating Parameters for the NJDEP EPH 10/09 method.
- Section 10.2.1: changed the specifications of the silica column.
- Section 10.2.5: changed the volume of the hexane rinsate.
- Section 10.2.7: changed the volume of the methylene chloride rinsate.
- Section 10.2.11: Added text describing procedures for NJDEP EPH 10/09 Demonstration of Fractionation Capability.
- Section 14.1 and Section 15.0 : Removed reference to Eurofins Edison SOP No. ED-SPM-007 (*Disposal of Samples and Associated Laboratory Waste, current revision)* (SOP is now retired).
- Section 15.0: updated references to NJDEP EPH method as well as Eurofins Edison SOP for NJDEP EPH analysis.
- Section 17.0, Attachments: corrected descriptions of attachments.

Rev 1, June 29, 2009

- Section 1.0, Scope and Application – corrected typo in the temperature range 100 – 115°C
- Section 5.2, Primary Materials Used – removed ‘sodium hydroxide’ and ‘sulfuric acid’ from table as they are not used in this method.
- Section 6.1, Instrumentation – added Visiprep DL column holder to the instrumentation list
- Section 6.2, Supplies – added 5 g silica gel column (20 ml capacity)
- Sections 7.2.1, 7.2.2, Attachment 1 and Attachment 2: corrected a typo in the abbreviation for Methylene Chloride ($MeCl_2$).
- Section 10.1.1.2 - sentence correction to show actual process and typo error correction. Phrase ‘may also’ changed to ‘shall’.
- Section 10.1.12 – replaced the word ‘salt’ with ‘Sodium Sulfate’ to show actual reagent being used.
- Section 10.1.17 – typo error correction to ’20 minutes’
- Section 10.2.5 – Added the following text to the end of the section: “The amount on hexane will need to be adjusted with every lot of silica columns. The Hexane amount should never exceed 20 mls.”
- Corrected carbon ranges for the reference DRO SOPs throughout the document.

Rev 0, March 27, 2009: New

Attachment 1

Spiking Information – Microwave Extraction

Method	Surrogate Amount (all samples and QC)	Spike Amount (LCS/MS/ MSD)	Final volume	Initial Solvent	Final Solvent
DRO (8015)	1 mL	1 mL	1 mL	$MeCl_2$	$MeCl_2$
Pest/PCB (8081/8082)	0.05 mL	0.1/0.05 mL	10 mL	MeCl2/Acetone (50:50)	Hexane Exchange from MeCl2/Acetone
BNA (8270)	500uL	500uL	1 mL	MeCl2/Acetone (50:50)	$MeCl_2$
PCB Homologues (EPA 680)	1.0	1.0	1 mL	Hexane	Hexane

Attachment 2

Specific Extraction Conditions

Method	Initial extraction pH	Secondary extraction pH	Final Solvent	Volume of extract required for cleanup(mL)	Final extract volume for analysis (mL)
DRO (8015)	as received	NA	$MeCL_2$	NA	1.0
Pest/PCB (8081/8082)	as received	NA	Hexane	3	10.0
BNA (8270)	as received	NA	$MeCL_2$	NA	1.0
PCBs (EPA 680)	as received	NA	Hexane	NA	1.0

Title: SW846 Method SW8081B, Analysis of Organochlorine Pesticides by Gas Chromatography

Approvals (Signature/Date):

Catalina Dalangin SVOA GC Manager	06/12/2024 Date	Dan Helfrich Health & Safety Manager	06/12/2024 Date
Carl Armbruster Quality Assurance Manager	06/12/2024 Date	Mark Acierno Laboratory Director	06/12/2024 Date
Sylvanus Klusey Operations Manager - Organics	06/12/2024 Date		

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1.0 Scope and Application

1.1 Analytes, Matrix(s), and Reporting Limits

Method 8081B is used to determine the concentrations of various organochlorine pesticides in extracts from solid and liquid matrices, using dual fused-silica, open-tubular, capillary columns with electron capture detectors (ECD). The list of analytes and their corresponding reporting limits are as follows:

Parameter		Soil	Water	Leachate
	CAS Registry No.	Reporting Limits (ug/Kg)	Reporting Limits (ug/L)	Reporting Limits (mg/L)
Aldrin	309-00-2	6.7	0.02	---
Alpha-BHC	319-84-6	2.0	0.02	---
Beta-BHC	319-85-7	2.0	0.02	---
Delta-BHC	319-86-8	2.0	0.02	---
Gamma-BHC (Lindane)	58-89-9	6.7	0.02	0.00050
Chlordane	57-74-9	67	0.50	0.0050
4,4' –DDD	72-54-8	6.7	0.02	---
4,4' –DDE	72-55-9	6.7	0.02	---
4.4' –DDT	50-29-3	6.7	0.02	---
Dieldrin	60-57-1	2.0	0.02	---
Endosulfan I	959-98-8	6.7	0.02	---
Endosulfan II	33213-65-9	6.7	0.02	---
Endosulfan sulfate	1031-07-8	6.7	0.02	---
Endrin	72-20-8	6.7	0.02	0.00050
Endrin aldehyde	7421-93-4	6.7	0.02	---
Endrin ketone	53494-70-5	6.7	0.02	---
Heptachlor	76-44-8	6.7	0.02	0.00050
Heptachlor epoxide	1024-57-3	6.7	0.02	0.00050
Methoxychlor	72-42-5	6.7	0.02	0.00050
Toxaphene	8001-35-2	67	.50	0.0050
Gamma- Chlordane	5103-74-2	6.7	0.02	---
Alpha-Chlordane	5103-71-9	6.7	0.02	---
Mirex	2385-85-5	6.7	0.010	---

The most current MDLs and RLs for this method can be found in the active Eurofins LIMS (TALS) SW846 8081B Method Limit Group (MLG) database.

1.2 On occasion clients may request modifications to this SOP. These modifications are handled following the procedures outlined in Section 7 (*Review of Work Request*) and Section 19 (*Test Methods and Method Validation)* of Eurofins Edison's Quality Assurance Manual (ED-QA-LQM).

2.0 Summary of Method

2.1. Samples undergo a preparation step prior to analysis by SW846 Method 8081B. A measured volume or weight of sample is extracted using the appropriate matrix-specific sample extraction technique. (Reference the applicable Organic Sample Prep SOPs listed below). The effective final volume is usually between 5 and 20 ml in hexane.

2.1.1. Aqueous samples are extracted using either SW846 Method 3510C (SOP No. ED-ORP-014: *Extraction of Pesticides and PCBs in Water by Separatory Funnel*) or SW846 Method 3511 (SOP No. ED-ORP-051: *Extraction of Semivolatile Organic Compounds in Water by Microextraction using SW846 Method 3511*)

2.1.2. Solid samples are extracted using SW846 Method 3550B: Sonication (*SOP No. ED-ORP-018: Extraction of Pesticides/PCBs in Soil Using Low-Level Extraction*) or SW846 Method 3546: Microwave (SOP No. ED-ORP-044: *Procedure for the Microwave Extraction of Solids,SW846 3546).*

2.1.3. Organic liquids are prepared using SW846 Method 3580A (*SOP No. ED-ORP-019: Waste Dilution for Pesticides and PCBs*).

2.1.4. Extract cleanup steps are employed depending on the nature of the matrix interferences. Suggested cleanups include SW846 Method 3620B (*SOP No. ED-ORP-020: Florisil Cleanup for Pesticide/PCB Sample Extracts*) and SW846 Method 3660B (*SOP No. ED-ORP-021: The Removal of Elemental Sulfur from Pesticide/PCB Sample Extracts*).

2.2. After cleanup, a small aliquot of the extract is injected into a gas chromatograph (GC) equipped with a capillary column. The GC is temperature programmed to separate the compounds which were recovered during the extraction step by boiling point. The effluent of the gas chromatograph is interfaced to an Electron Capture Detector (ECD) which is used to detect the compounds eluting from the GC.. Quantitation is accomplished by comparing the area response of each target analyte relative to an internal standard established through a five-point calibration (six points for second order regression). Specific calibration and quality control steps are included in the method that must be performed and must meet the specifications of SW846 Method 8081B.

2.3. For pesticide analysis a system performance check (DDT/Endrin breakdown) and a calibration verification standard must be run prior to analysis. Failure of either will generally indicate the need for injection port/column maintenance and/or recalibration.

2.4. Samples are analyzed after all the necessary checks have been performed. Samples analyzed for pesticides require an additional post analysis Quant Report to be printed and attached to the chromatographic report.

2.5. All samples are then manually reviewed. Secondary column confirmation of target compounds and quantitation are conducted by the analyst as required.

3.0 Definitions

For a complete list of definitions refer to Appendix 5 in the most current revision of Eurofins Edison's Quality Assurance Manual (ED-QA-LQM).

4.0 Interferences

4.1. Interferences by phthalate esters introduced during sample preparation can pose a major problem in pesticide determinations.

4.1.1. Interferences from phthalate esters can be minimized by avoiding contact with any plastic materials and checking all solvents and reagents for phthalate contamination. Exhaustive cleanup of solvents, reagents and glassware may be required to eliminate background phthalate ester contamination.

4.2. The presence of elemental sulfur will result in broad peaks that interfere with the detection of early-eluting organochlorine pesticides. Sulfur contamination should be expected with sediment samples. If sulfur is encountered, employ the sulfur removal procedures detailed in SW846 Method 3660B (*SOP No. ED-ORP-021: The Removal of Elemental Sulfur from Pesticide/PCB Sample Extracts*). Note that the recover of Endrin Aldehyde is adversely affected by the TBA cleanup procedure detailed in this method. Accordingly, this compound must be determined prior to sulfur cleanup.

4.3. Co-eluting chlorophenols are eliminated by using SW846 Method 3620B (*SOP No. ED-ORP-020: Florisil Cleanup for Pesticide/PCB Sample Extracts*).

4.3.1. Check Florisil prior to use to assure quantitative recovery of targeted analytes. Duplicate checks are required for each new lot or every three hundred samples whichever is more frequent.

4.3.2. Check Florisil by spiking 1ml of the Pest Std Mix A midpoint (Supelco Catalog No. 47977) and 0.5 ml of trichlorophenol (Absolute Standardsl Catalog No. 20024) onto the cartridge and concentrating to final volume of 1 ml. Inject 1 ul onto a capillary column, conducting the elution and analyzing the extract. Recovery is acceptable if all pesticides are recovered at 80 - 110% and the recovery of trichlorophenol is <5% and co-eluting interfering peaks are absent from the extract.

5.0 Safety

Employees must abide by the policies and procedures in the Corporate Environmental Health and Safety Manual (CW-E-M-001) and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum.

5.1. Specific Safety Concerns or Requirements

The gas chromatograph contains zones that have elevated temperatures. The analyst needs to be aware of the locations of those zones, and must cool them to room temperature prior to working on them.

There are areas of high voltage in the gas chromatograph. Depending on the type of work involved, either turn the power to the instrument off, or disconnect it from its source of power.

5.2. Primary Materials Used

The following is a list of the materials used in this method, which have a serious or significant hazard rating. **Note: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the MSDS for each of the materials listed in the table.** A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the MSDS for each material before using it for the first time or when there are major changes to the MSDS.

Material (1)	Hazards	Exposure Limit (2)	Signs and symptoms of exposure
Acetone	Flammable	1000 ppm-TWA	Inhalation of vapors irritates the respiratory tract. May cause coughing, dizziness, dullness, and headache.
Hexane	Flammable Irritant	500 ppm-TWA	Inhalation of vapors irritates the respiratory tract. Overexposure may cause lightheadedness, nausea, headache, and blurred vision. Vapors may cause irritation to the skin and eyes.
Methanol	Flammable Poison Irritant	200 ppm-TWA	A slight irritant to the mucous membranes. Toxic effects exerted upon nervous system, particularly the optic nerve. Symptoms of overexposure may include headache, drowsiness and dizziness. Methyl alcohol is a defatting agent and may cause skin to become dry and cracked. Skin absorption can occur; symptoms may parallel inhalation exposure. Irritant to the eyes.
Methylene Chloride	Carcinogen Irritant	25 ppm-TWA 125 ppm-STEL	Causes irritation to respiratory tract. Has a strong narcotic effect with symptoms of mental confusion, light-headedness, fatigue, nausea, vomiting and headache. Causes irritation, redness and pain to the skin and eyes. Prolonged contact can cause burns. Liquid degreases the skin. May be absorbed through skin.
1 – Always add acid to water to prevent violent reactions.			
2 – Exposure limit refers to the OSHA regulatory exposure limit.			

6.0 Equipment and Supplies

6.1. Instrumentation:

6.1.1. Gas Chromatograph: The system used is an HP and an Agilent Technologies (Avondale, PA) model 5890/6890 Gas Chromatograph (GC). Each GC is equipped for simultaneous quantitation and confirmation columns using two separate detector channels on dual megabore capillary columns that are suitable for the analysis of organochlorine pesticides. All operations are as automated as possible with the equipment utilized.

6.1.2. Injection system: Sample injection is accomplished by a single auto injector. The auto injector is serviced by a robot arm that shuttles samples between the sample tray and the injector turret.

6.1.2.1. The samples are injected into a split/splitless injection port equipped with electronic pressure control (EPC). The injection port is normally operated in splitless mode during injection. The EPC is operated in the ramp pressure mode.

6.1.2.2. Liners: The injection port is each fitted with replaceable, heavy-walled siltek-coated glass double gooseneck liner. The liner contains a plug of silanized glass wool approximately 1 cm in length. The glass wool is positioned in the liner between the double gooseneck. The liner is replaced on a regular maintenance schedule.

6.1.2.3. Oven and Columns: Temperature programmable gas chromatograph ovens are required, capable of integrated temperature control between 35^{O}C and 350^{O}C.

6.1.2.3.1. Two dissimilar columns are used for analysis. A Restek RtxCLPesticides, 30m x 0.53mm ID x 0.5um film thickness column is used for sample quantitation. The secondary confirmation column is a Restek RtxCLPesticides II, 30m x 0.53mm ID x 0.42um film thickness column.

6.1.2.4. Detectors: Sample detection is by electron capture. The GC is equipped with dual Electron Capture Detectors (ECD), one for each column.

6.1.2.4.1. Each detector is supplemented with make-up gas to provide sufficient detector flow for maintaining the electron plasma. This is in addition to the gas exiting the column. The make-up gas (P-5 & Nitrogen) is fed from a supply other than the injection port.

7. Reagents and Standards

7.1. Reagents

7.1.1. Gases: Hydrogen is used as the carrier and injection port purge gas. It is introduced to the GC at the injection port. P-5 and Nitrogen) is used as make-up gas. It is introduced to the GC via the make-up gas adapter at the end of the capillary column. Hydrogen is supplied via a Parker Balston H2 Generator. Nitrogen & P-5 is supplied by Air Gas

7.1.1.1. The gas streams are polished using three traps or filters before introduction to the GC The traps are as follows:

7.1.1.1.1. Hydrocarbon trap
7.1.1.1.2. H_2O trap
7.1.1.1.3. O_2 scrubber

7.1.1.2. Both the moisture trap and the Oxygen scrubber are of the indicating type. They require either replacement or reconditioning upon color change of the active agents. Refer to the instructions for the individual traps to determine if it is still active. The hydrocarbon trap is a simple activated carbon trap. With high quality gas, it should last for an extended period of time (1-yr. minimum).

7.1.2. Solvents used in the extraction and cleanup procedures include n-hexane, methylene chloride, and acetone that are exchanged to n-hexane prior to analysis.

7.1.3. Hexane is required in this procedure. All solvents must be pesticide quality or equivalent. Each lot of solvent is screened for contaminants before being used for analysis as detailed in Eurofins Corporate Quality SOP No. CA-Q-S-001 (*Solvent & Acid Lot Testing & Approval*) and Eurofins Edison SOP No. ED-GEN-023 (*Bulk Solvent Testing and Approval*).

7.2. Standards

7.2.1. Standards are purchased as concentrated solutions (see Section 7.2.2).

NOTE: Independent sources are used for quantitation standards and spiking standards

7.2.1.1. Most stock solutions are diluted (in volumetric glassware) to working concentration using hexane as the diluent as described in Section 7.2.2.1.

7.2.2. Standard mixes and sources *.

Standard Name	Source
Organochlorine Pesticide Mix AB #3	Restek Catalog No. 32415
Organochlorine Pesticide Mix AB #3.sec	Restek Catalog No. 32415.sec (second source)
Pesticide Surrogate Mix	Restek Catalog No. 32000
Endrin/DDT	Supelco Catalog No 48282
Chlordane	Restek Catalog No. 32021
Toxaphene	Restek Catalog No. 32005
Toxaphene (different pattern)	Restek Catalog No. 32071
Mirex	Accustandard Cat. No. P-066S-10X
1-Bromo-2-nitrobenzene (internal standard)	Restek Cat. No. 32279

*Suppliers with equivalent standards may be substituted..

The components of each standard mix are as follows (note: 'sec' indicates second source):

Parameter	Supplier	Catalog No.	Concentration of Standard (ug/ml)
Aldrin	Restek	32415 & 32415.sec	2000
Alpha-BHC	Restek	32415 & 32415.sec	2000
Beta-BHC	Restek	32415 & 32415.sec	2000
Delta-BHC	Restek	32415 & 32415.sec	2000
Gamma-BHC (Lindane)	Restek	32415 & 32415.sec	2000
Alpha -Chlordane	Restek	32415 & 32415.sec	2000
Gamma -Chlordane	Restek	32415 & 32415.sec	2000
Technical Chlordane	Restek	32021	1000
4,4' –DDD	Restek	32415 & 32415.sec	2000
4,4' –DDE	Restek	32415 & 32415.sec	2000
4.4' –DDT	Restek	32415 & 32415.sec	2000
Dieldrin	Restek	32415 & 32415.sec	2000
Endosulfan I	Restek	32415 & 32415.sec	2000
Endosulfan II	Restek	32415 & 32415.sec	2000
Endosulfan sulfate	Restek	32415 & 32415.sec	2000
Endrin	Restek	32415 & 32415.sec	2000
Endrin aldehyde	Restek	32415 & 32415.sec	2000
Endrin ketone	Restek	32415 & 32415.sec	2000
Heptachlor	Restek	32415 & 32415.sec	2000
Heptachlor epoxide	Restek	32415 & 32415.sec	2000
Methoxychlor	Restek	32415 & 32415.sec	2000
Toxaphene	Restek	32005	1000
Toxaphene	Restek	32071	5000
Mirex	Accustandard	861428-U	1000
4,4-DDT	Supelco	18282	500
Endrin	Supelco	48282	500
Decachlorobiphenyl (DCB)	Restek	32000	200
Tetrachloro-m-xylene (TCmX)	Restek	32000	200

Parameter	Supplier	Catalog No.	Concentration of Standard (ug/ml)
1-Bromo-2-nitrobenzene (internal standard)	Restek	32279	1000

7.2.2.1. Standards Preparation

7.2.2.1.1. Calibration Mix (Organochlorine Pesticide Mix)

The 5 point calibration standards are prepared as detailed in the following table using volumetric glassware and hexane as the diluent:

Initial Calibration Standards Prep (Organochlorine Pesticide Mix)					
Stock Std	**2.5 ppb**	**50 ppb**	**100 ppb**	**250 ppb**	**500 ppb**
Organochlorine Mix AB#3 *(2000 ug/ml)* *Restek (Cat No..32415)in Hexane:Toluene*	Volume brought up to 200 ml hexane: *0.25 ul*	Volume brought up to 200 ml hexane: *5.0 ul*	Volume brought up to 500 ml hexane: *25 ul*	Volume brought up to 200 ml hexane: *25 ul*	Volume brought up to 200 ml hexane: *50 ul*
Initial Calibration Standards Prep (TCMX/DCB Surrogate Mix)					
Stock Std	**25 ppb***	**50 ppb**	**100 ppb**	**150 ppb**	**200 ppb**
Tetrachloro-m-xylene/ Decachlorobiphenyl Surrogates Mix (200 ug/ml) *Restek (Cat, No, 32000) in Acetone*	Volume brought up to 200 ml hexane: *6.25 ul*	Volume brought up to 200 ml hexane: *50 ul*	Volume brought up to 500 ml hexane: *250 ul*	Volume brought up to 200 ml hexane: *150 ul*	Volume brought up to 200 ml hexane: *200 ul*
Initial Calibration Standards Prep (Mirex)					
Stock Std	**2.5 ppb**	**50 ppb**	**100 ppb**	**250 ppb**	**500 ppb**
Mirex *(1000 ug/ml)* *Accustandard (Cat. No. P-066S-10x) in Methanol*	20x dilution of 50 ppb	10x dilution of 500 ppb	5x dilution of 500 ppb	2x dilution of 500 ppb	Volume brought up to 100 ml hexane: *50 ul*

Note: 20 ul of 5 ug/ml Internal Standard solution is added to all calibration standards prior to analysis.

7.2.2.2. **Pesticide Surrogate Spike Mix (10 ug/ml**) : The Pesticide 10ug/ml surrogate spiking solution is prepared by diluting 10 ml of 200 ug/ml of the Pesticide Surrogate Mix (Restek-32000) in to 200 ml of Acetone. For spiking instructions refer to the applicable prep SOP.

7.2.2.3. **Pesticide Surrogate Spike Mix (2 ug/ml) for the reduced volume extraction option:** prepare a 2 ug/ml spiking solution by diluting 10 ml of the 10 ug/ml stock standard described in

7.2.2.2 to a final volume of 50ml in acetone. For spiking instructions refer to the applicable prep SOP.

7.2.2.4. **Pesticide Internal Standard Spike Mix (5 ug/ml):** The Pesticide 5 ug/ml internal standard spike mix is prepared by dilution 1 ml of 1000 ug/ml of the 1-Bromo-2-Nitrobenzene standard (Restek 32279) in to 200 ml of Hexane. 20 ul of this solution is added to all standards, QC samples and field sample extracts prior to analysis.

7.2.2.5. **Pesticide Spiking Standard (20 ug/ml):** The Pesticide Spiking Mix containing the single component pesticides is prepared at a final concentration of 20 ug/ml by diluting 500 ul of the Organochlorine Pesticide Mix AB#3 (Restek 32415 to a 50 ml final volume with acetone. For spiking instructions refer to the applicable prep SOP.

7.2.2.6. **Pesticide Spiking Standard (4 ug/ml) for the reduced volume extraction option**: prepare a 4 ug/ml spiking solution by diluting 10 ml of the 20ug/ml standard prepared in Section 7.2.2.4 above to a final volume of 50ml in acetone. For spiking instructions refer to the applicable prep SOP.

7.2.2.7. **System Performance Solution (Breakdown Check)** 3,3-DDT and Endrin at 0.25 ug/ml): The breakdown check is prepared by taking 250 ul of 500 ug/ml DDT/Endrin Mix (Supelco Catalog No 48282) and bringing it up to a volume of 500 ml with hexane

7.2.2.8. **Technical Chlordane Calibration Solution** (1.0 ug/ml solution w/ surrogates TCMX & DCB at 0.10 ug/ml): 100 ul of 1000 ug/ml Technical Chlordane Standard (Restek Catalog No 32021) and 50 ul of 200 ug/ml Surrogate Mix (Restek Catalog No. 32000). Dilute to 100 ml in Hexane. ***NOTE:*** ICAL consists of single midpoint calibration standard for multiple responders Technical Chlordane and Toxaphene.

7.2.2.9. **Toxaphene Calibration Solution** (1.0 ug/ml solution w/surrogates TCMX & DCB at 0.1 ug/ml) : 20 ul of 5000 ug/ml Toxaphene stock (Restek Catalog No 32071) and 50 ul of 200 ug/ml Surrogate Mix (Restek Catalog No. 32000). Dilute to 100 ml in Hexane. ***NOTE:*** ICAL consists of single midpoint calibration standard for multiple responders Technical Chlordane and Toxaphene.

7.2.2.10. **Initial Calibration Verification (ICV)** Preparation: follow the instructions above for midpoint standards substituting the second source standard (catalog no. suffix = sec) for the primary standards.

8. Sample Collection, Preservation, Shipment and Storage

8.1. Extracts must be stored under refrigeration in the dark and analyzed within 40 days of extraction.

8.2. Samples from chlorinated water sources must be treated with sodium thiosulfate (0.008% solution) at the time of collection to remove chlorine. NOTE: containers pre-preserved with sodium thiosulfate must be requested in bottle orders for samples from chlorinated water sources.

Matrix	Sample Container	Min. Sample Size	Preservation	Holding Time	Reference
Waters	Amber glass, 250 ml, 40 ml or 60 ml	250 ml (3510C prep)	Cool 4 ± 2ºC	7 days to extraction; Analyze within 40 days of extraction	SW846
Soils	Glass, 2 or 4 oz	100 g	Cool 4 ± 2ºC	14 days to extraction; Analyze within 40 days of extraction	SW846

Sample container, preservation techniques and holding times may vary and are dependent on sample matrix, method of choice, regulatory compliance, and/or specific contract or client requests. Listed below are the holding times and the references that include preservation requirements.

9. Quality Control

9.1. **Sample QC** - The following quality control samples are prepared with each batch of samples.

Quality Controls	Frequency	Control Limit
Method Blank (MB)	1 in 20 or fewer samples	< Rpt. Limit
Laboratory Control Sample (LCS)[1]	1 in 20 or fewer samples	Statistical Limits [4]
Matrix Spike (MS)[2]	1 in 20 or fewer samples	Statistical Limits [4]
MS Duplicate (MSD)[2]	1 in 20 or fewer samples	Statistical Limits [4]
Surrogates	every sample[3]	Statistical Limits [4]
Internal Standard [1]	Every sample[3]	Response within -50% to +100% of most recent cal standard

LCS Duplicate (LCSD) is performed only when insufficient sample is available for the MS/MSD or when requested by the client/project/contract.

[2] The sample selection for MS/MSD are randomly selected, unless specifically requested by a client….predetermined by the extraction lab.

[3] Analytical and QC samples (MB, LCS, MS/MSD)

[4] Statistical control limits are updated annually and are updated into LIMS.

9.1.1. Method Blanks are extracted with each sample batch on each day that samples are extracted. The analytical results for the method blank must fall below the reporting limit for each compound of interest. If a target compound is detected in the blank at a concentration higher than the reporting limit, first the extract is reanalyzed for confirmation. If results are still outside of limits the entire batch of samples extracted with the affected blank must be re-extracted and reanalyzed.

9.1.2. Laboratory Control Sample (LCS): A Laboratory Control Sample (LCS) or blank spike must be extracted and analyzed for with each batch of 20 environmental samples. The recoveries of the LCS must fall within lab generated acceptance criteria (refer to the current TALS Method Limit Group database). If the LCS recovery results are outside of these limits, the extract is reanalyzed. If LCS recoveries are still outside of QC limits after extract reanalysis but recoveries for the Matrix Spike/ Matrix spike Duplicate (MS/MSD) are within QC limits, the data is reported and a Non Conformance Memo (NCM) is written.

9.1.3. Matrix Spike/Matrix Spike Duplicate (MS/MSD): A Matrix Spike/Matrix Spike Duplicate (MS/MSD) pair is extracted and analyzed with every batch of 20 environmental samples. MS/MSD recoveries are evaluated against lab generated limits (refer to the current TALS Method Limit Group database). If the MS/MSD recovery limits fall outside of lab limits the LCS recovery is evaluated. If the LCS recoveries meet criteria the data is reported and a Non-Conformance Memo (NCM) is written.

9.1.4. Surrogate Standards: All samples, blanks and QC samples are spiked with a 2 component surrogate standard mix containing TCMX & DCB (see Section 7.2). The percent recovery of the surrogate standards is calculated and compared to lab generated limits (refer to the current TALS Method Limit Group database). Minimum requirements for surrogate evaluation:

- Both surrogates must have reportable results that meet the acceptance criteria;
- Reported surrogates must be from a column with a passing CCV;
- At least one surrogate must pass on any column from which target analytes are identified and reported.

If both TCMX and DCB recovery are outside of acceptance limits the sample extract is reanalyzed to confirm. If the recoveries are still outside of limits the sample must be re-extracted and reanalyzed or the data flagged as “estimated concentration”.

9.1.5. Internal Standard: The internal standard (1-bromo-2-nitrobenzene) must elute within 30 seconds of and have an area response of 50 to 100% as compared to the most recent preceding calibration standard.

9.1.6. Lower Limit of Quantitation (LLOQ) (aka Reporting Limit) Verification: The LLOQ is the lowest concentration at which the laboratory has

demonstrated target analytes can be reliably measured and reported with a certain degree of confidence, which must be ≥ the lowest point in the calibration curve. The lab verifies the LLOQ annually to demonstrate the capability of quantiation at lower analyte concentrations. The verification is performed by the extraction and analysis of an MDL spike at a concentration of 0.5-2 times the established LLOQ. Recovery of target analytes in the LLOQ verification should be within established in-house limits or within other such project-specific acceptance limits to demonstrate acceptable method performance at the LLOQ. Until the laboratory has sufficient data to determine acceptance limits, the LCS criteria ± 20% (i.e., lower limit minus 20% and upper limit plus 20%) will be used for the LLOQ acceptance criteria. The annual LLOQ verification is completed and documented with the required annual MDL evaluation.

9.2. Instrument QC

9.2.1. GC System Performance Check

9.2.1.1. **Endrin/4,4'-DDT Breakdown:** Prior to performing any standards or sample analysis, a daily check is made on the chromatographic performance of the system. This performance check is made by injecting a standard of Endrin and DDT, each at a 250-ppb level (see Section 7.2), and calculating the percentage breakdown for each compound.

9.2.1.2. Ideally, only two peaks will be seen (one for Endrin and one for DDT). As a rule, this is not the case. It is normal to observe up to six peaks. Three peaks are attributable to Endrin and its degradation products: Endrin Aldehyde (EA) and Endrin Ketone (EK). Three peaks are attributable to DDT and its degradation products: DDE and DDD. Calculate the percentage breakdown as follows:

Endrin:

$$\frac{\text{(Areas of EA + EK)}}{\text{(Areas of EA + EK + Endrin)}} \times 100 = \%\ \text{breakdown Endrin}$$

DDT:

$$\frac{\text{(Areas of DDE + DDD)}}{\text{(Areas of DDE + DDD + DDT)}} \times 100 = \%\ \text{breakdown DDT}$$

9.2.1.3. If the percentage breakdown for either Endrin or DDT is greater than 15%, the system CANNOT be used for pesticide analysis. If the Endrin/DDT performance check fails, injection port/column maintenance must be performed. Usually, changing the glass wool/liner will cure most breakdown problems in the injection port.

Depending upon the nature of the samples, the entire injection port will occasionally need to be cleaned. This cleaning is best done with 1:1 Acetone: Hexane. Another routine maintenance operation to improve column performance is the removal of the first 3 cm of the column. (Note: the septa should be changed each time the injection port is opened).

9.2.1.4. After injection port/column maintenance has been performed, and the columns have been given time to equilibrate (baseline back down to normal) the Endrin/DDT must be re-injected and the system performance re-evaluated.

9.2.2. Initial Calibration Range and Initial Calibration Verification (ICV)

9.2.2.1. ***Initial Calibration Range*:** Single component pesticides are calibrated using a five-point calibration range. Multi-component pesticides are calibrated using a single point calibration at the anticipated midpoint of the calibration range. Standards are prepared following the instructions in Section 7.2.

9.2.2.2. Single response Pesticide Calibration: All single component pesticides and two surrogates are calibrated with a minimum of 5 concentrations. Single component pesticides are analyzed at 10, (5 ppb for the 125 ml initial volume method) 5, 100, 250 and 500 ppb. Surrogate standards are analyzed at 25, 50, 100, 150 and 200 ppb. See Section 7.2 for details on standard prep.

9.2.2.3. Multi-response Pesticide Calibration: Chlordane (technical) and Toxaphene initial calibration is accomplished by analysis of a single point at 1000 ppb (see Section 7.2 for details on standard prep).

9.2.2.4. ***Initial Calibration Verification (ICV):*** An Initial Calibration Verification (ICV) standard is analyzed immediately after the Initial Calibration Range and before any samples are analyzed. The ICV is prepared as detailed in Section 7.2 and must be from a source separate from the standards used in the Initial Calibration Range.

9.2.3. Continuing Calibration Verification (CCV): For single component pesticides, a mid-point Continuing Calibration Verification (CCV) must be analyzed every 12-hours or 20 samples (whichever is more frequent). 'Samples' here are defined as field samples and batch QC (MB, LCS, MS, MSD) and do not include CCVs, PEMs, instrument blanks, etc… For multi-response pesticides a CCV must be analyzed within 12 hours of any multi-response pesticide detects.

9.2.3.1 Analysis of Replicate CCVs: Occasionally dual, sequential CCVs may (for a variety of reasons) be included in an analytical

sequence. When such replicate CCVs are injected both must be evaluated as detailed in the table below (reference Eurofins Document CA-Q-W-008, 'Technical Guidance on the Use and Evaluation of Replicate Continuing Calibration Verification (CCV)').

Dual CCV Evaluation Decision Tree		
Inejection	**QC Acceptance**	**Action**
CCV1 **CCV2**	**Pass** **Pass**	Continue analytical sequence. Data acceptable based on calibration.
CCV1 **CCV2**	**Pass** **Fail**	Analyses before CCV1 may be accepted. Re-analyze all samples that were analyzed after failed CCV2.
CCV1 **CCV2**	**Fail** **Pass**	Re-analyzed all samples that were analyzed before CCV1 and after the previous compliant CCV. Analyses after CCV2 may continue.
CCV1 **CCV2**	**Fail** **Fail**	Re-analyze all samples since the last acceptable CCV. Perform maintenance and/or recalibration prior to re-analysis.

9.2.3.2 In the event that replicate CCVs are included in a sample injection sequence, the acceptance of the associated sample analyses must be properly evaluated and the evaluation process must be documented. Under no circumstances is it allowable to accept sample data based on the evaluation of only 1 of the CCV replicates.

9.2.3.3 Clear documentation of the evaluation of the CCV must be included in the analytical sequence run log (i.e., 'Pass' or 'Fail' in the comment section for each CCV). Additionally, clear documentation of corrective action taken in the event of CCV failures must be included in the run log (see table above for actions that need documentation).

Note: It is acceptable to use the CCV solution as a primer at the beginning of an analytical sequence however the injection should be documented as a 'Primer' in the sequence rather than as a CCV.

9.2.4. Calibration Acceptance Summary

9.2.4.1. Retention Time Windows: Retention time windows must be established to compensate for minor shifts in absolute retention

times as a result of sample loading and normal chromatographic variability (for more detail on the following procedures refer to Eurofins Corporate Technical Services Policy No. CA-T-P-005, “Policy for Determining RT Windows for GC/ECD Tests” and Eurofins Corporate Technical Services Work Instruction No. CA-T-WI-010, “Further Guidance on the RT Window Policy No. CA-T-P-005”).

9.2.4.1.1. Initial determination of RT windows.

9.2.4.1.1.1. The center of the retention time (RT) window shall be updated based on the middle level in the initial calibration of the first CCV in the daily sequence, whichever is most recent.

9.2.4.1.1.2. Use a default RT window of 0.01 minutes. At the end of the batch evaluate all CCVs and LCSs in the batch. If necessary, widen the window such that all analytes fall within the RT window. Reprocess the batch using the new RT windows.

9.2.4.1.1.3. Multiply the maximum deviation by 1.5. This is the retention time window, unless the result is less than 0.01 minutes, in which case the window is set at 0.01 minutes. For example, if the maximum RT deviation for a specific analyte is 0.008 minutes, then the RT window is set at ±0.012 minutes.

NOTE: For the multi-component analytes, for example Aroclors, Toxaphene and Technical Chlordane, the maximum deviation must be evaluated for each of the 3 to 6 major peaks used for sample calculations.

9.2.4.1.1.4. Retention time windows for analytes of interest must not overlap for GC analysis.

9.2.4.1.2. Ongoing evaluation of retention time windows

9.2.4.1.2.1. Evaluate the retention time windows on an ongoing basis. The center of the RT window is updated on the first CCV of the day. All analytes for all subsequent CCVs, LCS and matrix spikes must fall within the retention time window (except as discussed below).

9.2.4.1.2.2. Matrix spike analytes may fall outside of the retention time window if there is a large non-

target peak coeluting with the analyte in the matrix spike.

9.2.4.1.2.3. If any analytes fall outside of the retention time window in CCVs, LCS or matrix spikes (except as discussed above for matrix spikes) then the RT windows for those analytes shall be widened to the minimum degree required for the analyte to fall within the RT window. All samples in the batch shall be reprocessed with the new RT window, and the wider RT window shall remain in place for subsequent batches.

9.2.4.1.2.4. Retention time windows should be reliably narrower than ±0.03 minutes. If RT windows wider that this are necessary, the instrument should be evaluated and maintenance performed as needed. Subsequent to maintenance, RT windows shall be narrowed to the extent that is consistent with the data obtained.

9.2.4.2. **Initial Calibration Range:** Internal standard calibration is employed for this method. A response factor is calculated for each analyte at each calibration concentration.

Response factor = $((A_x)\ (C_{is}))/((A_{is})\ (C_x))$

Where:
A_x = area of the compound
C_x = Concentration of the compound
A_{is} = area of the internal standard
C_{is} = Concentration of the internal standard

9.2.4.2.1. Calculate the percent Relative Standard Deviation of the response factors for each compound at each level:

% RSD = (RF Standard Deviation/RF Mean) X 100

Where:
RF = Response Factor

9.2.4.2.2. If the % RSD across the 5 point range is <20% for any given compound the calibration can be assumed to be linear and the average response factor can be used to calculate concentrations of target compounds in samples.

9.2.4.2.3. If the % RSD is >20% for any given compound, a first order linear regression may be applied to the data to calculate the calibration curve and determine sample

concentration. If this method is employed, the r^1 (Correlation Coefficient) value must be $\geq$ 0.990 for the calibration to be acceptable. Calibration is checked every 12 hours or after every twenty (20) samples, whichever comes first, by injecting a calibration verification standard for all single component pesticide standards.

9.2.4.2.4. Chlordane and Toxaphene Calibration: Chlordane and Toxaphene are multiple response pesticides and are calibrated with a minimum of 5 points as required (i.e, within 12 hours of either analyte being detected in a sample). Three to eight peaks are used for calculation of response factors and the same criteria detailed above is applied to determine acceptability of calibration.

9.2.4.2.5. Resolution: All single component analyte peaks must exhibit at least 80% chromatographic resolution. The analyst performs a visual check of the mid-level initial calibration standard and all subsequent calibration checks (ICV/CCV). If the resolution requirement is not met instrument maintenance should be performed followed by re-calibration. Percent resolution can be calculated when necessary as follows:

$$\% \text{ Resolution} = V/H \times 100$$

Where:

V= Depth of the valley between two peaks. The depth of the valley is measured along a vertical line from the level of the apex of the shorter peak to the floor of the valley between the two peaks

H = Height of the shorter of the adjacent peaks

9.2.4.3. **Relative Standard Error:** The percent relative standard error (% RSE) from the calibration curve is used to evaluate the initial calibration. This provides a measure of how much error is associated with using the calibration curve for quantitation. The average Relative Standard Error (RSD for average response factors) of the calibration points from the curve used must be ≤ 20%.

Some data systems will not measure the %RSE from a linear or quadratic fit. For the linear case, the correlation coefficient may be used as an alternative to the %RSE, and must be greater than or equal to 0.990. For the quadratic case the Coefficient of Determination may be used, and must be greater or equal to 0.990.

Note: The Relative Standard Error (RSE) is superior to the Correlation Coefficient (*r*) and Coefficient of Determination (r_2) for testing the fit of a set of calibration points to a line. The lower points on a curve have little effect on *r.* As a result, a curve may have a very good correlation coefficient (>0.990) while also having > 100% error at the low point

9.2.4.4. Initial Calibration Verification (ICV): An ICV will consist of a second source standard at or near the midpoint of the Initial Calibration Range analyzed at the frequency specified in Section 9.2.2.4. The calculated concentration of the ICV must be within ±20%D of the expected concentration. Should the %D exceed 20% the analyst should take corrective action (check standard solution, perform instrument maintenance, etc.) and re-inject the ICV. If the %D still exceeds 20% after a single ICV reinjection, a new Initial Calibration Range must be analyzed. All single component analyte peaks must exhibit 80% resolution (see Section 9.2.4.2.5)

9.2.4.5. Continuing Calibration Verification (CCV): A CCV will consist of a second source standard at or near the midpoint of the Initial Calibration Range analyzed at the frequency specified in Section 9.2.3.. The calculated concentration of the CCV must be within ±20%D of the expected concentration. Should the %D exceed 20% the analyst should take corrective action (check standard solution, perform instrument maintenance, etc.) and re-inject the CCV. If the %D still exceeds 20% after a single CCV reinjection, a new Initial Calibration Range must be analyzed. All single component analyte peaks must exhibit 80% resolution (see Section 9.2.4.2.5).

Step	***Standards***	***Type***	***Control Limit***	***Frequency***
Method # 8081B				
GC System Performance Check	*Endrin/DDT, 250 ppb*	*Performance check*	*15% breakdown*	*At beginning of 12 hour clock and after system maintenance*
*Initial Calibration**	2.5, 50, 100, 250 and 500 ppb for single response, 1000 ppb for multi response	*Average response factor or 1st order linear regression*	*For average RF: <20%RSD all analytes. For linear regression: r ≥0.990 or <20%RSE*	*As required when ICV or CCV do not meet requirements*
ICV	*100 ppb*	*Average*	*± 20%D*	*Once after each initial calibration*
CCV	*100 ppb*	*Average*	*± 20%D*	*Every 12 hrs or 20 samples, whichever is more frequent*

10. Procedure

10.1. Gas Chromatograph Operation

10.1.1. The sequence of events for GC analysis involves many steps. First the injection system and column performance and calibration must be verified. Maintenance operations are performed as needed. Then samples must be run on the instrument. Chromatograms and reports must be evaluated for content, integration and concentration. Re-runs and dilutions must be made based on the calibrations that were in effect at the time the sample was run. Lastly, a detailed analysis and calculations must be performed to determine the concentration of all the parameters for which the sample was analyzed.

10.1.2. General Operating Conditions

10.1.2.1. Injection System: A split/splitless injection port with electronic pressure control (EPC) is used. Thirty seconds after sample injection, the purge valve is turned on to facilitate the sweeping of any remaining residual solvent/sample from the injection port.

10.1.2.2. The EPC is used in the ramp pressure mode. The ramp pressure program is as follows:

Initial Pressure	InitialTime	Rate	Final Pressure	Hold
12 psi	2.5 min	7 psi/min	4 psi	1.50 min
		5 psi/min	9 psi	1.40 min
		9 psi/min	13 psi	2.00 min

10.1.2.3. For pesticide analysis the normal operating conditions of the injection port are as follows:

Injection port Temperature:	250^{o}C
Column flow:	12.3 ml/minute
Split vent flow:	5 ml/minute
EPC:	Pressure Ramp
Detector temperature	330C

10.1.2.4. In addition to the EPC, the injection port is also equipped with a siltek-coated glass double goose neck liner that contains a 1 cm glass wool plug. The plug of glass wool is located in the liner between the double goose neck.

10.1.2.5. This liner/glass wool combination provides many functions. The glass wool serves as a heat sink rapidly vaporizing solvent and samples resulting in higher response factors. The liner also protects the column head from accumulation of high boiling residuals and particulates.

10.1.2.6. The glass wool will be changed when changing the liner. The changing of the glass wool/liner is based upon the breakdown of an Endrin/DDT standard. This is covered in further detail in section 10.2.1.

10.1.2.7. Regular maintenance is performed on the injection port. When the glass wool/liner is changed, the septa also must be changed. Injection port, oven and detector temperatures are lowered to ambient prior to "cracking" the system. This is so as to introduce a minimum of damaging oxygen molecules into the system.

10.1.2.8. After the system has cooled, the old liner is removed. The injection port should be checked for particulate residues and cleaned as needed. A flashlight is usually required for this. After a new liner has been prepared it is placed into the injection port. A graphite seal is placed around the liner. The edges of the seal must be flat, not knife-edged, and free of nicks or burrs. If any of these conditions are not met, the graphite seal must be replaced as well. The graphite seal is critical to proper operation of the injection port. If in doubt, replace it.

10.1.2.9. The locking ring on the top of the injection port should be turned, with the wrench, about 1/8 turn past finger tight. The septum nut should never be tightened more than finger tight. After the injection port is reassembled, all column nuts inside the oven should be checked for leaks using Snoop (Supelco) or another suitable leak tester.

10.1.2.10. Once the signal from both detectors has stabilized, it is time to re-heat the zones. The zones should be heated in the order of detectors, oven and then injectors. This is to ensure that volatilized contaminants do not condense on the column or detector.

10.1.2.11. Oven: With the megabore columns installed, temperature programming is employed to achieve higher resolution of compounds and shorter run times than could be accomplished using isothermal methods.

10.1.2.11.1. A standard oven program for pesticide analysis is employed for all columns as follows:

Initial Temp	**Hold Time1**	**Rate1**	**Temp1**
160ºC	0.62 min	30º/min	244ºC
Hold Time2	**Rate 2**	**Final Temp**	**Final Time**
2.5min	21º/min	315ºC	3.0min

10.1.2.12. Detectors: Detectors operate at 330^{O}C and need to be supplied with 60 ml/min total flow. They are essentially maintenance free on a day-to-day basis. They are routinely baked out at 330^{O}C to remove persistent contaminants. On occasion the detectors may be baked out at a higher temperature to remove contaminants with an extremely high boiling point (CAUTION: Do not exceed the maximum detector temperature of 380^{O}C).

10.1.2.12.1. If the detectors are particularly contaminated, they must be sent to Agilent Technologies in Avondale, Pennsylvania for reconditioning. This should occur if the detector baseline is greater than 100 Hz. Detector reconditioning should be required at a maximum of biannually.

10.1.2.13. Chemstation: HP Chemstation software is used for automation of runs and data acquisition. The system is dedicated to a single GC and does not multitask. Therefore, data manipulation cannot be done while sample analysis is in progress. The data system acquires and stores all chromatographic data.

10.1.2.14. Eurofins Chrom data processing software is used for the processing of the chromatography data files. Calibrations, verification standards and samples are processed and reviewed using this database. Chrom is integral to Eurofins LIMS (TALS) which is used to generate all reports..

10.2. Analytical Sequence

10.2.1. The analytical sequence for performance checks, initial calibration, calibration verifications and sample analysis is described in the following sections.

10.2.2. Before calibration standards are analyzed the GC Performance Check Standard (see Section 9.2.2.1) must first be analyzed and evaluated to check the performance of the injection port and column with regard to catalytic active sites. The breakdown for both Endrin and DDT in the Performance Check Standard must be less than 15%. If the performance check fails this criteria system maintenance must be performed and the check successfully reanalyzed before proceeding with calibration.

10.2.3. A five point initial calibration (ICAL) is analyzed and evaluated for each of the 21 single response pesticides plus surrogates as described in Section 9.2.4.2. When needed a 5 point ICAL is also analyzed for Mirex.

10.2.4. Calibration for Technical Chlordane and Toxaphene: Chlordane and Toxaphene are multiple response pesticides containing at least 3-8 primary peaks each. A single point calibration check standard at a concentration of 1000ug/l is analyzed for Chlordane and Toxaphene. A full 5 point calibration range is analyzed for these compounds should they be detected in client samples..

10.2.5. A second source initial calibration verification (ICV) is analyzed and evaluated for each of the 21 single response pesticides as described in Section 9.2.4.3. When needed an ICV is also analyzed for Mirex. **NOTE**: The 12 hour time clock for Pesticides commences with the injection of the first Pesticide Calibration Standard or Verification.

10.2.6. GC Performance Check Standard is analyzed and the breakdown of Endrin/DDT is measured again before samples are analyzed and at the beginning of each subsequent 12 hour shift. If the breakdown check fails, then injection port/column maintenance is required

10.2.7. Client samples and QC samples may be analyzed after the analysis of the performance check. Sample analysis may proceed for up to 20 samples or 12 hours prior to analysis of another calibration verification (whichever is more frequent).

10.2.8. A Continuing Calibration Verification (CCV) for the 21 single response pesticides plus surrogates must be analyzed and evaluated every 12 hours or 20 samples (whichever is more frequent) as described in Section 9.2.4.4.. This is accomplished by running the midpoint calibration standard as a CCV (Pest Mix 100 ppb check standard and Mirex 100 ppb check standard; see Section 7.2.2.1). The calculated concentration for each compound in the CCV must be +/- 20 % of the expected concentration. Any samples analyzed after a failing CCV must be reanalyzed under a passing CCV. If, after performing instrument maintenance, the reanalysis of a CCV fails criteria, a new initial calibration range must be analyzed (see Section 9.2.4.2). Any data reported against a failing CCV must have a Non-Conformance Memo detailing the issue.

10.2.9. Analytical Sequence: The automation of GC runs is accomplished via the "SEQUENCE" macro of the Chemstation. The sequence file contains the name of Method file corresponding to the type of analysis to be performed, the range of samples to be run, and the number of injections per bottle. It is common practice to run the check standards, evaluate the instrument status, and then complete the Sample Table and Sequence File. If everything else is complete, the run is initiated using the START SEQUENCE soft-key of the SEQUENCE macro.

Example Analytical Sequence	
1. Hexane 2. Instrument Blank	12. Mirex 1 (10 ppb) (if needed) 13. Mirex 2 (20 ppb) (if needed)

Example Analytical Sequence	
3. Endrin/DDT Breakdown 4. Pesticide Mix 1 (2.5 ppb) 5. Pesticide Mix 2 (50 ppb) 6. Pesticide Mix 3 (100 ppb) 7. Pesticide Mix 4 (250 ppb) 8. Pesticide Mix 5 (500 ppb) 9. Chlordane (1000 ppb) 10. Toxaphene (1000 ppb) 11. Pesticide ICV (100 ppb)	14. Mirex 3 (100 ppb) (if needed) 15. Mirex 4 (250 ppb) (if needed) 16. Mirex 5 (500 ppb) (if needed) 17. Mirex ICV (100 ppb) (if needed) 18. Instrument Blank 19. Endrin/DDT Breakdown 20. Pest Mix 3 (100 ppb)…CCV 21. Mirex 3 (100 ppb) …CCV (if needed) 22. 20 or fewer samples or 12 hours 23. Instrument Blank 24. Endrin/DDT Breakdown 25. Pest Mix 3 (100 ppb)…CCV 26. Mirex 3 (100 ppb) …CCV (if needed) 27.20 or fewer samples or 12 hours

10.3. Dual Column Approach

10.3.1. The laboratory designates the rear column as the primary column and the front column as the secondary column. If the difference between the dual columns results in ≤40% RPD report the higher concentration.

10.3.2. The values are calculated from the chromatographic peaks that fall within the daily retention time windows. Retention times are updated using the retention times found in opening CCV for the most recent 12 hour period.

10.3.3. If the calculated values are greater than 40% RPD of each other, report the lower concentration regardless of whether that result is from the primary or secondary column. Report the result with a flag of P*. **Exception:** NJDEP DKQP protocols require reporting the higher concentration in all instances.

10.3.4. If the surrogates on one column are >40% RPD compared to the other column, this may be indicative of a bad injection or columnar blockage. The sample should be reanalyzed. If similar results are obtained following reanalysis, report the lower of the two numbers and describe the circumstances in the job summary and report case narrative.

10.3.5. If one of the columns fails CCV criteria (but the CCV is between 15%-40% greater than expected value), the sample results shall be reported from the compliant column. If the falls outside of acceptance criteria on the low side, reanalysis shall be performed.

10.3.6. If the CCV on one of the columns is more than 40% different from the correct value, it can be assumed that there has been significant drift on that column. The sample shall be reanalyzed against an acceptable calibration.

10.3.6.1. An exception to this requirement would be if the CCV recovery on one column fails on the high side and >40% RPD but the associated samples were non-detect for all target analytes on both columns. In this case the non-detect results may be reported from the compliant column.

10.3.7. In some cases where the sample chromatography is complex and has largely varying peaks concentrations, the chromatographic separation may not be sufficient on the 0.53mm ID columns. In this case a confirmatory analysis on an instrument with 0.32 ID columns may be required. The supplemental data produced using analysis on the 0.32mm ID 'microbore' column may minimize overlapping and baseline interference difficulties, and better resolves potential positive identifications. Use of this alternative chromatographic technique shall be noted in the job summary and report case narrative.

10.3.8. In summary, the flow chart in Attachment 1 presents a recommended rational approach to selecting the better number to report for dual column data. It shall be noted that these recommendations may be overridden by project specific requirements and that they cannot cover all eventualities. The complexity of some data set will require the final decision to be made utilizing the judgment of experienced analysts. In some cases further cleanup steps to remove interferences may be appropriate.

10.4. Extract Cleanups

10.4.1. Cleanup methods are dictated by the original sample matrix and the parameters being determined.

10.4.2. Cleanup of all water samples, if needed, is performed using Florisil (Eurofins Edison SOP No. ED-ORP-020*: Florisil Cleanup for Pesticide/PCB Sample Extracts*, SW846 Method 3620B, most current revision) and TBA sulfite (Eurofins Edison SOP No. ED-ORP-021: *The Removal of Elemental Sulfur from Pesticide/PCB Sample Extracts, SW846 Method 3660B,* most current revision). Blanks must also undergo cleanup following the same procedures as samples.

10.4.3. Cleanup of all soil samples is conducted using Florisil (Eurofins Edison SOP No. ED-ORP-020*: Florisil Cleanup for Pesticide/PCB Sample Extracts*, SW846 Method 3620B, most current revision) and, if needed, TBA sulfite (Eurofins Edison SOP No. ED-ORP-021: *The Removal of Elemental Sulfur from Pesticide/PCB Sample Extracts, SW846 Method 3660B,* most current revision). Blanks must also undergo cleanup following the same procedures as samples.

10.4.4. Check Florisil prior to use to assure quantitative recovery of target analytes. (see Section 4.3.2 above and Eurofins Edison SOP No. ED-ORP-020*: Florisil Cleanup for Pesticide/PCB Sample Extracts*, SW846 Method 3620B,

10.5. Data Processing and Documentation

10.5.1. Before the analysis sequence is initiated the GC Maintenance logbook must be filled out. It should contain the following information: date, injector temp, oven temp, detector temp, injector flow, signal A, signal B, analysts initials, and notes for any necessary repairs.

10.5.2. After samples have been run, each standard and sample must be entered into the Instrument Run Log. The Instrument Run Log should contain the following information: run date, data file name, vial position, sample number, initial volume/weight, final volume, dilution factor, method, job number, QA number, extraction date, lab prep batch, Chrom batch signature of analyst at the bottom of each page, lot numbers for standards used, and result of run (O.K., dilution, non-inject, etc.).

10.5.3. The reporting limit is based on the concentration of the lowest standard in the initial calibration, adjusted for the sample wt/vol, final volume, dilution factor and %moisture (No unqualified analytical results or non detects may be reported which correspond to an extract concentration less than the lowest standard in the calibration range).

10.5.4. Any compound concentration that exceeds the concentration of the calibration range must be diluted and re-analyzed.

11.0. Calculations / Data Reduction

11.1. Accuracy:

$$\text{ICV / CCV, LCS \% Recovery} = \frac{\text{observed concentration}}{\text{known concentration}} \times 100$$

$$\text{MS \% Recovery} = \frac{\text{(spiked sample) - (unspiked sample)}}{\text{spiked concentration}} \times 100$$

11.2. Precision (RPD):

$$\text{Matrix Duplicate (MD)} = \frac{|\text{orig. sample value - dup. sample value}|}{[(\text{orig. sample value + dup. sample value})/2]} \times 100$$

11.3. Calculation of Sample Amounts (Internal Standard Procedure)

11.3.1.1 Aqueous Samples

$$\text{Concentration } (\mu g/L) = \frac{(As)(Cis)(D)}{(Ais)(RF)(Vs)\ (Vi)\ (1000)}$$

Where:

As	=	Area of the target analyte peak in the sample
Cis	=	Concentration of the internal standard (ug/L)
D	=	Dilution factor, if the sample or extract was diluted prior to analysis. If no dilution is performed, D = 1.
Vi	=	Volume of the extract injected (ul)
Ais	=	Area of the internal standard peak
RF	=	Average response factor from the initial calibration.
Vs	=	Volume of sample extracted (ml)

The 1000 in the denominator represents the number of ul in 1 ml.

11.3.1.2 Solid Samples

$$\text{Concentration } (\mu g/kg) = \frac{(As)(Cis)(D)(Vt)}{(Ais)(RF)(Ws)\ (Vi)\ (1000)}$$

Where:

As	=	Area of the target analyte peak in the sample
Cis	=	Concentration of the internal standard (ug/L)
D	=	Dilution factor, if the sample or extract was diluted prior to analysis. If no dilution is performed, D = 1.
Vi	=	Volume of the extract injected (ul)
Ais	=	Area of the internal standard peak
RF	=	Average response factor from the initial calibration.
Vt	=	Volume of concentrated extract (ul)
Ws	=	Weight of sample (g)

The 1000 in the denominator represents the number of ul in 1 ml.

11.4. Relative Response Factors

$$RRF = \frac{A_x}{A_{is}} \times \frac{C_{is}}{C_x}$$

Where:

A_x = Area of target analyte peak
Ais = Area of internal standard peak
Cis = Concentration of internal standard
Cx = Concentration of compound in standard

11.5. Percent Relative Standard Deviation (% RSD):

$$\% \text{ RSD} = \frac{\text{Standard Deviation of RRFs}}{\text{Mean RRF}}$$

11.6. Relative Standard Error (RSE)

$$\% RSE = 100\% \times \sqrt{\frac{\sum_{i=1}^{N}\left[\frac{C_i - PC_i}{C_i}\right]^2}{(N-P)}}$$

Where:

N = Number of points in the curve
P = Number of parameters in the curve (= 1 for average response factor, 2 for linear, 3 for quadratic)
CI = True concentration for level i
PCi = Predicted concentration for level i

11.7. Percent Difference (% D):

$$\% \text{ D} = \frac{RRF_c - \overline{RRF_i}}{\overline{RRF_i}} \times 100$$

Where: RRFc = RRF from continuing calibration

$\overline{RRF_i}$ = Mean RRF from current initial calibration

11.8. Percent Recovery (% R): Surrogates and Spikes

$$\text{Recovery (\%)} = \frac{\text{Concentration (or amount) found}}{\text{Concentration (or amount) added}} \times 100$$

11.9. Dry Weight Correction: All solid samples must be corrected for dry weight using the following formula for dry weight determination.

$$DW = \frac{Gd}{Gw} \times 100$$

Where:

DW	=	Percent % Dry Weight
Gd	=	Dry weight of selected sample aliquot
Gw	=	Wet weight of selected sample aliquot

Multiply the DW value times the wet weight of the sample extracted.

NOTE: All dry weight corrections are made in TALS at the time the final report is prepared.

12.0. Method Performance

12.1. Method Detection Limit Study (MDL)

The method detection limit (MDL) is the lowest concentration that can be detected for a given analytical method and sample matrix with 99% confidence that the analyte is present. The MDL is determined according to the laboratory's MDL procedure in Section 20 (Test Methods and Method Validation) of Eurofins Edison's Quality Assurance Manual (ED-QA-LQM). MDLs reflect a calculated (statistical) value determined under ideal laboratory conditions in a clean matrix, and may not be achievable in all environmental matrices. The laboratory maintains MDL studies for analyses performed; these are verified at least annually unless method requirements require a greater frequency.

12.2. Lower Limit of Quantitation (LLOQ) (aka Reporting Limit) Verification:

The LLOQ is the lowest concentration at which the laboratory has demonstrated target analytes can be reliably measured and reported with a certain degree of confidence, which must be ≥ the lowest point in the calibration curve. The lab verifies the LLOQ annually to demonstrate the capability of quantiation at lower analyte concentrations. The verification is performed by the extraction and analysis of an MDL spike at a concentration of 0.5-2 times the established LLOQ. Recovery of target analytes in the LLOQ verification should be within established in-house limits or within other such project-specific acceptance limits to demonstrate acceptable method performance at the LLOQ. Until the laboratory has sufficient data to determine acceptance limits, the LCS criteria ± 20% (i.e., lower limit minus 20% and upper limit plus 20%) will be used for the LLOQ acceptance criteria. The annual LLOQ verification is completed and documented with the required annual MDL evaluation.

12.3. Demonstration of Capabilities

For DOC procedure refer to Section 19 in the most current revision of Eurofins Edison's Quality Assurance Manual (ED-QA-LQM).

12.4. Training Requirements

Refer to Eurofins SOP No. ED-GEN-022, *Training*, for the laboratory's training program.

13.0. Pollution Control

13.1. Pollution prevention encompasses any technique that reduces or eliminates the quantity or toxicity of waste at the point of generation. Numerous opportunities for pollution prevention exist in laboratory operation. The USEPA has established a prevention hierarchy of environmental management techniques that places pollution prevention as the management option of first choice. Whenever feasible, laboratory personnel should use pollution prevention techniques to address their waste generation. When wastes cannot be feasibly reduced at the source, the agency recommends recycling as the next best option.

13.2. The quantity of chemical purchased should be based on expected usage during its shelf life and disposal cost of unused material. Actual reagent preparation volumes should reflect anticipated usage.

14.0. Waste Management

14.1. The U.S. Environmental Protection Agency requires that laboratory waste management practices conducted be consistent with all applicable rules and regulations. All waste will be disposed of in accordance with Federal, State and Local regulations. Where reasonably feasible, technological changes have been implemented to minimize the potential for pollution of the environment. Employees will abide by this method and the policies in section 13 of the Corporate Safety Manual for “Waste Management and Pollution Prevention.”

14.2. The following waste streams are generated as a result of this analysis:

- Expired Standards – The vials are collected in a 1 gallon polyethylene bucket. These vials are then transferred to an open top 55 gallon steel or polyethylene waste drum. These drums are transported to a waste facility for proper disposal.

- Auto sampler vials and expired standards: These vials are collected in satellite accumulation within the instrument laboratory. The vials are then placed into a 55 steel open top drum in the waste room. When the drums are full, the drum will be collected by the waste vendor for disposal. This waste is treated for incineration.

  Teris Profile Number: 50016652
  Onyx Profile WIP Number: 282493

- Mixed Solvent Waste: Mixed solvent waste is collected in a small beaker inside the bench top hood. This waste is then transferred into the satellite accumulation container in the Organic Prep. Lab. on a daily basis. This material is transferred into 5 gallon solvent cans as satellite accumulation. These cans are emptied every 24 hours into a steel drum in the waste room. This drum is kept in the walk in hood until it is full. The full drum is then removed from the hood and placed on secondary containment in the waste room.

  Teris Profile Number: 50016624
  Onyx Profile WIP Number: 545240

- Soil Retain Samples - These samples if not flagged in the system for any hazardous constituents are transferred to poly-lined cubic yard boxes. These boxes when full are sent to stabilization or incineration. These materials are sent out as hazardous for lead and chromium

  Teris Profile Number (incineration): 50016710
  Onyx Profile Number: (stabilization) 402535

15.0. References / Cross-References

15.1. United States Environmental Protection Agency, "Method SW8000C: Determinative Chromatographic Separations,", Test Methods for Evaluating Solid Wastes, SW846, Revision 3, March 2003.

15.2. United States Environmental Protection Agency, "Method 8081B, Organochlorine Pesticide by Gas Chromatography", Test Methods for Evaluating Solid Wastes, SW846 Third Edition, Volume 1B: Laboratory Manual, Physical/Chemical Methods, Revision 2, February 2007.

15.3. Eurofins Edison Document No. ED-QA-LQM, *Laboratory Quality Manual*, most current revision.

15.4. Eurofins Edison SOP No. ED-ORP-014: *Extraction of Pesticides and PCBs in Water by Separatory Funnel, SW846 Method 3510C,* most current revision.

15.5. Eurofins Edison SOP No. ED-ORP-018*: Extraction of Pesticides/PCBs in Soil Using Low-Level Extraction, SW846 Method 3550B,* most current revision.

15.6. Eurofins Edison SOP ED-ORP-044, *Procedure for the Microwave Extraction of Solids, SW846 3546*

15.7. Eurofins Edison SOP No. ED-ORP-019*: Waste Dilution for Pesticides and PCBs, SW846 Method 3580A,* most current revision

15.8. Eurofins Edison SOP No. ED-ORP-051: *Extraction of Semivolatile Organic Compounds in Water by Microextraction using SW846 Method 3511*

15.9. Eurofins Edison SOP No. ED-ORP-020*: Florisil Cleanup for Pesticide/PCB Sample Extracts*, SW846 Method 3620B, most current revision.

15.10. Eurofins Edison SOP No. ED-ORP-021: *The Removal of Elemental Sulfur from Pesticide/PCB Sample Extracts, SW846 Method 3660B,* most current revision.

15.11. Eurofins Edison SOP No. ED-GEN-022, *Training,* most current revision.

15.12. Eurofins Corporate Quality SOP No. CA-Q-S-001 (*Solvent & Acid Lot Testing & Approval*), most current revision.

15.13. Eurofins Edison SOP No. ED-GEN-023 (*Bulk Solvent Testing and Approval*), most current revision.

15.14. Eurofins Document CA-Q-W-008, 'Technical Guidance on the Use and Evaluation of Replicate Continuing Calibration Verification (CCV), most current version.

15.15. Eurofins Corporate Quality SOP No. CA-Q-P-004, "Reporting Results for Methods that Require Second-Column Confirmation", most current revision.

15.16. Eurofins Corporate Work Instruction No. CA-T-WI-008, "Minimum Requirements for Pesticide Analysis by SW846 Method 8081B", most current revision.

15.17. Eurofins Corporate Policy CA-T-P-004, "Policy for Determining RT Windows for GC/ECD Tests", most current revision.

15.18. Eurofins Corporate Technical Services Work Instruction No. CA-T-WI-010, "Further Guidance on the RT Window Policy No. CA-T-P-005", most current revision.

16.0. Method Modifications:

None

17.0. Attachments

Attachment 1: Dual Column Reporting Flowchart

18.0. Revision History

Revision 8, dated 06/12/2024

- Updated to include SW846 3511 as aqueous prep method.

Revision 7, dated 10/17/2022:

- Updated to Eurofins branding throughout document.
- Revised Section 8 to include requirement to treat samples from chlorinated sources with sodium thiosulfate
- Section 9.2.4.3: Included details of evaluation of initial calibration for Relative Standard Error (RSE).
- Section 11.6: added formula for calculation of RSE.
- Section 12.2 added: details the annual LLOQ verification requirement.

Revision 6, dated 03/25/2021:

- Added Section 10.5.3 which details how the reporting limit is established.
- Added Section 10.5.4 which discusses requirement to dilute analytes into range of calibration.

Revision 5, dated 10/12/2020:

- Edited throughout to reflect Eurofins branding and policy.
- Updated Lab Quality Manual section references as needed.

Revision 4, dated 09/13/2016:

- Section 9.2.4.1: completely rewrote this section to reflect requirements of Eurofins Corporate Technical Services Policy No. CA-T-P-005, “Policy for Determining RT Windows for GC/ECD Tests” and TestAmerica Corporate Technical Services Work Instruction No. CA-T-WI-010
- Section 15 (References): added references to TestAmerica Corporate Technical Services Policy No. CA-T-P-005, “Policy for Determining RT Windows for GC/ECD Tests” and TestAmerica Corporate Technical Services Work Instruction No. CA-T-WI-010, “Further Guidance on the RT Window Policy No. CA-T-P-005”.
- Attachment 1: RT Windows for Single Analytes/Surrogates: DELETED and renamed subsequent attachments.

Revision 3, dated 01/05/2016:

- Section 2.2: expanded to include summary of internal standard calibration.
- Section 7.2.2: added 1-Bromo-2-nitrobenzene (internal standard) to the list of standards (Restek 32279). Components and concentration added to table.
- Added Section 7.2.2.4 which describes the preparation of the internal standard solution. All subsequent sections renumbered accordingly.
- Section 7.2.2.1.1: added footnote to ICAL standard prep table detailing requirement to spike each standard with internal standard solution.
- Section 7.2.2.4: describe internal standard spiking protocol (20 ul of 5.0 ug/ml solution into all standards, QC extracts and field sample extracts.
- Section 9.1: added internal standard to ‘Sample QC’ table.
- Section 9.1.4: added following minimum requirements for surrogate evaluation and reporting: a) Both surrogates must have reportable results that meet the acceptance criteria; b)reported surrogates must be from a column with a passing CCV; c)At least one surrogate must pass on any column from which target analytes are identified and reported. (per corp “Minimum Requirements” document).
- Section 9.1.5: added this section which describes acceptance criteria for internal standards (retention time and response).
- Section 9.2.3: Added the following sentence: “‘Samples’ here are defined as field samples and batch QC (MB, LCS, MS, MSD) and do not include CCVs, PEMs, instrument blanks, etc… “. Deleted the phrase ‘and at the end of every sequence’. (both changes reflect ‘Minimum Requirements for Pesticide Analysis’ document).
- Added Section 9.2.4.1.3: “Updating absolute retention times: Update retention times with the retention times found in the opening CCV for that 12 hour period.”
- Section 9.2.4.2: replaced ‘external standard’ with ‘internal standard’. Added formula for calculation of response factors by internal standard method. Deleted text regarding calibration acceptance criteria from this section as it is duplicated in subsequent sections.
- Section 9.2.4.2.2: added phrase ‘for any given compound.’
- Added section 9.2.4.2.5: describes resolution check.

- Sections 9.2.4.3 and 9.2.4.4: added statement concerning 80% resolution requirement.
- Section 9.2.4.4: changed 'ICV' to 'CCV' in last sentence.
- Section 10.1.2.13: Revised first sentence to read: ": HP Chemstation software is used for automation of runs and data acquisition."
- Section 10.2.2: corrected reference to Section 9.2.2.1 (was incorrectly listed as 7.2.2.1).
- Section 10.2.8: revised to clarify that CCV bracketing is not required and that only samples analyzed after a failing CCV must be reanalyzed (i.e., samples analyzed immediately prior to a failing CCV need not be reanalyzed).
- Section 10.3.2: added the following regarding updating retention times: "Retention times are updated using the retention times found in opening CCV for the most recent 12 hour period."
- Section 11: added formulas for calculation of sample concentrations as well as %RSD, %D, % Recovery, RRF and dry weight correction.
- Section 15: removed reference to SOP No. ED-ORP-016*: Automated Soxhlet Extraction of Solid Samples – Pesticides/PCBs, SW846 Method 3541* as it is no longer is use.
- Section 15: added reference to TestAmerica Corporate Quality SOP No. CA-Q-P-004, "Reporting Results for Methods that Require Second-Column Confirmation"
- Section 15: added reference to TestAmerica Corporate Work Instruction No. CA-T-WI-008, "Minimum Requirements for Pesticide Analysis by SW846 Method 8081B".
- Section 15: added reference to TestAmerica Corporate Policy Memorandum No. CA-Q-QM-006, "Technical Guidelines for Analysis of Complex GC/ECD Chromatograms".

- Revision 2, dated 13 May 2015:
  - Section 1.1: updated RLs to reflect current lab practice.
  - Section 2.1 and throughout: revised initial aqueous/TCLP sample volumes to reflect current lab practice
  - Section 2.1.1: removed note describing option for Reduced Volume Extraction (RVE) as this is now standard lab practice.
  - Section 2.1.2 and throughout document: removed reference to prep by SW3541 as this method is no longer in use at Edison lab.
  - Section 4.3.2 and throughout: updated source of standards used for Florisil check.
  - Section 6.1.2.3.1: updated name of analytical GC columns currently in use.
  - Section 6.1.2.4.1: updated make-up gas to P-5 & Nitrogen.
  - Section 7.1.1: updated carrier gas to Hydrogen and make-up gas to P-5&Nitrogen.
  - Section 7.2.2 and throughout document: updated source and catalog numbers for analytical standards (Restek is now primary source of standards).
  - Section 7.2.2.1: updated standards prep instructions. Removed outdated references to standards and spiking mixes. Removed notes pertaining to RVE since this procedure is now standard and incorporated into instructions.
  - Section 7.2.2.10: added instructions for preparation of ICVs.
  - Section 8.1: adjusted water sample container from 1000ml to 250ml.
  - Section 9.2.2: removed references and instructions pertaining to the Pesticide Resolution Check (a CLP requirement we no longer perform).
  - Section 9.2.3.1: Added extensive discussion regarding the analysis of replicated CCVs.

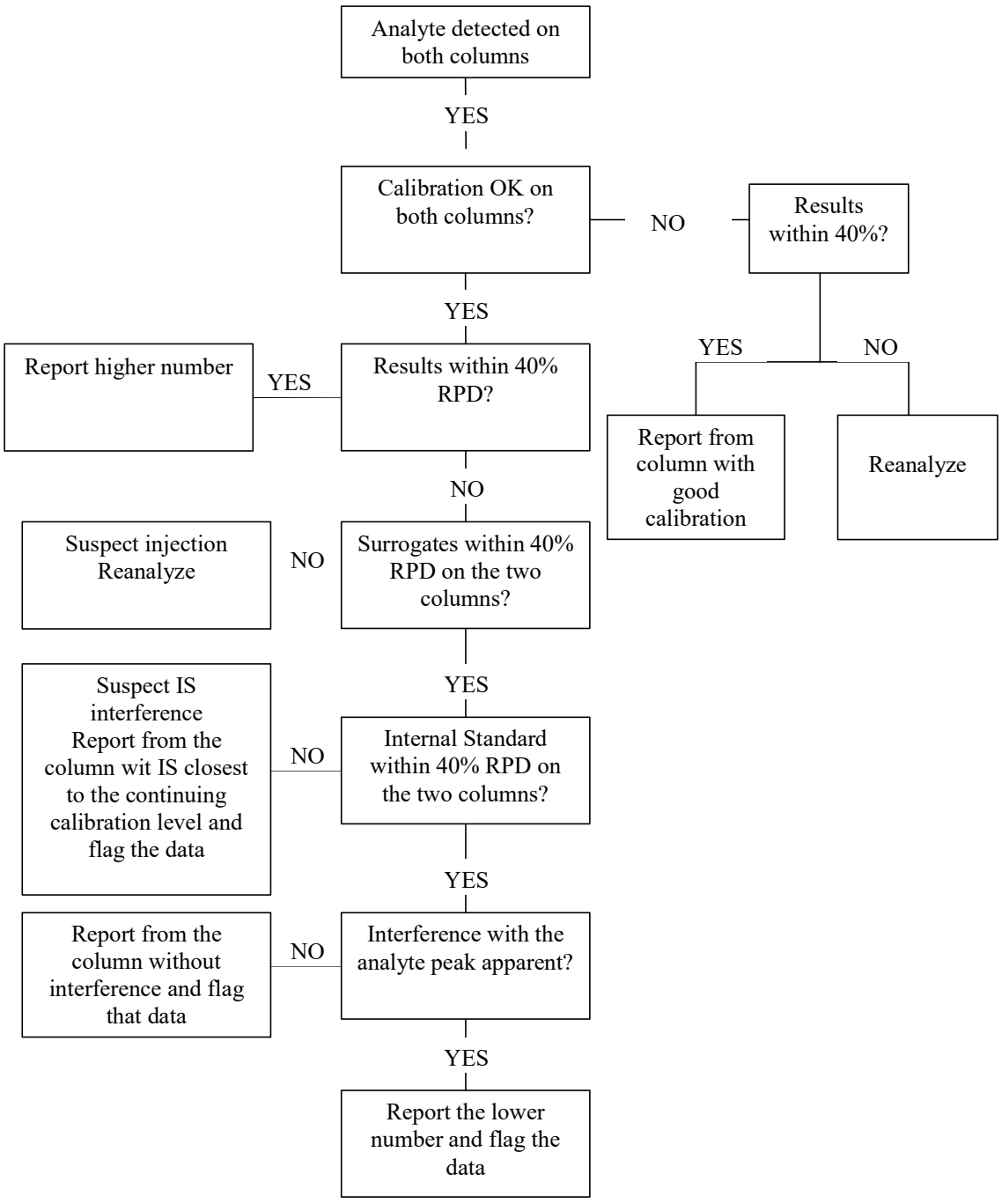
- Section 9.2.4.4: updated table to include new concentration for low standard (2.5 ppb).
- Section 10.1.2.14 and throughout document: replaced references to Target with TestAmerica Chrom.
- Section 10.2: made extensive revisions to discussion of the analytical sequence (removing duplicate entries and adjusting to reflect current procedures).
- Section 10.3: added note concerning NJ DKQP requirements for reporting highest concentration of dual columns.
- Section 15 (References): updated to include "Technical Guidance on the Use and Evaluation of Replicate Continuing Calibration Verification (CCV), most current version."
- Added Sections 7.2.2.11 and 7.2.2.12 reflecting the addition and preparation of Internal standard

- Revision 1, dated 09 October 2012
  - Throughout: Revised LQM section number references to reflect the most current LQM revision.
  - Section 2.1.1: added description of reduced initial volume (125ml)/final volume (1ml) option.
  - Section 2.1.2: Added reference to TestAmerica Edison SOP ED-ORP-044, *Procedure for the Microwave Extraction of Solids, SW846 3546.*
  - Section 7.2.2.1.1 added preparation of 5ppb standard for the reduced volume method.
  - Section 9.2.2.2 Added 5ppb standard for the reduced volume method
  - Section 9.2.4.4 Added 5 ppb standard to the initial calibration for the reduced volume method
  - Section 10.2.6 Added 5 ppb to the Analytical sequence for the low level method Section 15.0: Removed reference to TestAmerica Edison SOP EDS-GEN-019, *Organic Calculations,* most current revision.
  - Section 15.0: Added reference to TestAmerica Edison SOP ED-ORP-044, *Procedure for the Microwave Extraction of Solids, SW846 3546*

- Revision 0, dated 02/17/2011: New

ATTACHMENT 1

Dual Column Reporting Flowchart
(Note: NJDEP DKQP requires reporting the higher concentration in all instances)



Title: Analysis of Total and Amenable Cyanide in Water, Drinking water, Wastewater and Soil- Automated by Method EPA SW846 9012B; 335.4 and Standard Method 4500 CN^-C, G

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Approvals (Signature/Date):

Jasmine Parillo 11/6/23	Dan Helfrich 11/6/23
Jasmine Parillo Date	Dan Helfrich Date
Department Manager	Health & Safety Manager /Coordinator
11/7/23	11/6/23
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1.0 Scope and Application

1.1 Analytes, Matrix(s), and Reporting Limits

1.1.1 Methods EPA 335.4, SW846 9012B, Lachat 10-204-00-1-A and SM 4500 CN^-C, G are described in this SOP. The SOP is applicable to water, drinking water, wastewater, soil and waste samples requiring cyanide determination. The method detects inorganic cyanides that are present as either soluble salts or complexes. It is used to determine values for both total cyanide, free cyanide and cyanide amenable to chlorination.

1.1.2 The automated method has a detector that is sensitive to approximately to 0.005 mg CN-/L. The laboratory's reporting limit are as follows:

Analyte	Water Reporting Limit (mg/L)	Soil Reporting Limit (mg/Kg) Micro Distillation
Cyanide	**0.01**	**0.24**

1.1.3 On occasion clients may request modifications to this SOP. These modifications are handled following the procedures outlined in Sections 7 (Review of Work Request) and 19 (Test Methods and Method Validation) of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

2.0 Summary of Method

Cyanide is extracted by means of reflux distillation (MICRO DIST apparatus). Sample is distilled in a strongly acidic solution which breaks down cyanide complexes and converts the cyanide to hydrocyanic acid (HCN). HCN is absorbed into a sodium hydroxide absorber solution and the cyanide ion in the absorbing solution is determined by automated UV colorimetry at 570nm.

3.0 Definitions

For a complete list of definitions refer to Appendix 5 in the most current revision of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

4.0 Interferences

4.1 Interferences can be reduced or eliminated by using the distillation procedure.

4.2 The presence of sulfide in the sample matrix adversely effects the determination of total cyanide. Samples that contain hydrogen sulfide, metals sulfides or other compounds that may produce hydrogen sulfide during distillation should be treated.

4.2.1 Place a drop of the sample on lead acetate test paper (which has been pre-moistened with pH 4 acetate buffer solution) to detect the presence of sulfides. If sulfides are present (test strip turns black), the sample volume

required for the cyanide determination should be increased by 25 milliliters (ml).

4.2.2 The total volume of sample should be treated with powdered cadmium carbonate or lead carbonate. Yellow cadmium sulfide precipitates if the sample contains sulfide.

4.2.3 Repeat this operation until a drop of the treated sample solution does not darken the lead acetate test paper

4.2.4 Filter the solution through a dry filter paper into a dry beaker, and from the filtrate measure the sample to be used for analysis.

NOTE: Avoid a large excess of cadmium carbonate and a long contact time in order to minimize a loss of cyanide on the precipitated material.

4.3 Oxidizing agents such as chlorine decompose most cyanides.

4.3.1 To determine if oxidizing agents are present test a drop of sample with potassium iodine-starch paper. If a blue color appears that indicates the need for treatment. Add ascorbic acid, a few crystals at a time, to the sample until a drop of sample produces no blue color on the indicator paper. Add an additional 0.6g of ascorbic acid for each liter of sample volume.

4.4 Nitrates and nitrites may give high biased results. During distillation they form nitrous acid, which will react with some organic compounds to form oximes. These compounds once formed will decompose to generate HCN. They are interferences when present above 10 mg/L with other specific organic compounds.

4.4.1 Nitrate and nitrite interferences are eliminated by treatment with sulfamic acid just before distillation.

4.5 Thiocyanate is reported to be an interference when present at very high levels. Levels of 10 mg/L were not found to interfere.

4.6 Fatty acids, detergents, surfactants may cause foaming during the distillation process, making the endpoint difficult to detect. If this occurs, samples can be acidified with acetic acid (1.6M) to pH 6.0-7.0.

5.0 Safety

Employees must abide by the policies and procedures in the Corporate Environmental Health and Safety Manual (CW-E-M-001) and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum.

5.1. Specific Safety Concerns or Requirements

Ensure cooling water is turned on to the distillation unit. Otherwise the samples may boil over and come into contact with the heating plates. Potassium Cyanide will give off Hydrogen Cyanide (HCN) gas if combined with strong acids. Inhalation of CN gas can cause irritation, dizziness, nausea, unconsciousness and potentially death.

5.2. Primary Materials Used

The following is a list of the materials used in this method, which have a serious or significant hazard rating. **Note: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the MSDS for each of the materials listed in the table.** A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the MSDS for each material before using it for the first time or when there are major changes to the MSDS.

Material (1)	Hazards	Exposure Limit (2)	Signs and symptoms of exposure
Phosphoric Acid	Corrosive	1 Mg/M3 TWA	Inhalation is not an expected hazard unless misted or heated to high temperatures. May cause redness, pain, and severe skin burns. May cause redness, pain, blurred vision, eye burns, and permanent eye damage.
Sodium Hydroxide	Corrosive	2 Mg/M3-Ceiling	Severe irritant. Effects from inhalation of dust or mist vary from mild irritation to serious damage of the upper respiratory tract, depending on severity of exposure. Symptoms may include sneezing, sore throat or runny nose. Contact with skin can cause irritation or severe burns and scarring with greater exposures. Causes irritation of eyes, and with greater exposures it can cause burns that may result in permanent impairment of vision, even blindness.
Pyridine	Flammable Irritant	5 ppm-TWA	Inhalation causes severe irritation to the respiratory tract. Symptoms of overexposure include headache, dizziness, nausea, and shortness of breath. Causes severe irritation possibly burns, to the skin. Symptoms include redness and severe pain. Absorption through the skin may occur, resulting in toxic effects similar to inhalation. May act as a photosensitizer. Vapors cause eye irritation. Splashes cause severe irritation, possible corneal burns and eye damage.
Barbituric Acid	Irritant	Not established	Limited information. Inhalation may irritate respiratory tract. Causes skin and eye irritation. Should be treated as potential health hazard; do not ingest.
Hydrochloric Acid	Corrosive Poison	5 ppm – Ceiling	Inhalation of vapors can cause coughing, choking, inflammation of the nose, throat, and upper respiratory tract, and in severe cases, pulmonary edema, circulatory failure, and death. Can cause redness, pain, and severe skin burns. Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.

Material (1)	Hazards	Exposure Limit (2)	Signs and symptoms of exposure
Potassium Hydroxide	Poison Corrosive Reactive	2 mg/m3 – Ceiling	Inhalation symptoms may include coughing, sneezing, damage to the nasal or respiratory tract. High concentrations can cause lung damage. Swallowing may cause severe burns of mouth, throat and stomach. Other symptoms may include vomiting, diarrhea. Severe scarring of tissue and death may result. Contact with skin can cause irritation or severe burns and scarring. Causes irritation of eyes with tearing, redness, swelling. Greater exposures cause severe burns with possible blindness.
Potassium Cyanide	Poison Corrosive	5 Mg/M3 TWA as CN	This material will form Hydrogen Cyanide (HCN) gas when combined with strong acids. Breathing HCN gas may result in death. Corrosive to the respiratory tract. May cause headache, weakness, dizziness, labored breathing nausea and vomiting, which can be followed by weak and irregular heartbeat, unconsciousness, convulsions, coma and death. Solutions are corrosive to the skin and eyes, and may cause deep ulcers, which heal slowly. May be absorbed through the skin, with symptoms similar to those noted for inhalation. Symptoms may include redness, pain, blurred vision, and eye damage.
Sodium Cyanide	Poison Corrosive	5 mg/m3 TWA as CN (skin)	This material will form Hydrogen Cyanide (HCN) gas when combined with strong acids. Breathing HCN gas may result in death. Corrosive to the respiratory tract. May cause headache, weakness, dizziness, labored breathing nausea and vomiting, which can be followed by weak and irregular heartbeat, unconsciousness, convulsions, coma and death. Solutions are corrosive to the skin and eyes, and may cause deep ulcers, which heal slowly. May be absorbed through the skin, with symptoms similar to those noted for inhalation. Symptoms may include redness, pain, blurred vision, and eye damage.
Silver Nitrate	Poison Corrosive Oxidizer	0.01mg/m3 (TWA) for silver metal dust and fume as Ag	Inhalation symptoms may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting. May be absorbed into the body following inhalation. Swallowing can cause severe burns of the mouth, throat and stomach. Can cause sore throat, vomiting, and diarrhea. Poison. Symptoms include pain and burning in the mouth, blackening of the skin and mucous membranes, throat, and abdomen, salivation, vomiting of black material, diarrhea, collapse, shock, coma and death. Skin contact can cause redness, pain and severe burns. Eye contact can cause blurred vision, redness, pain, severe tissue burns and eye damage.
1 – Always add acid to water to prevent violent reactions.			
2 – Exposure limit refers to the OSHA regulatory exposure limit.			

6.0 Equipment and Supplies

6.1. Instrumentation

- MICRO DIST distillation apparatus with sample distillation tube press (Hach).

- Lachat 8000 and 8500 series: Flow injection analysis equipment-designed to deliver and react sample and reagents in the required order and ratios. Lachat 8000 series

  - Multichannel proportioning pump
  - Reaction manifold
  - Colorimetric detector
  - Data system
  - Heating Unit

6.2. Supplies

- Lachat Micro Distillation Tubing, p/n A17117 (collector tubes, caps, membranes, and sample tubes) or equivalent, disposable
- Various Class A volumetric flask and pipettors
- pH-indicator strips (pH 0-14)
- Potassium Iodine-starch paper
- Lead-Acetate paper (pre-moistened with pH 4 acetate buffer solution)
- Analytical balance
- Vacuum pump
- Specimen cups
- Transfer pipettes
- Graduated cylinder (class A)
- Micro-buret

7. Reagents and Standards

7.1. Reagents

7.1.1. Deionized water-18 megohm reagent grade Type II water.

7.1.2. Acetone – store at room temperature; for stability information refer to manufacturer's instructions.

7.1.3. Rhodanine indicator - p-dimethyl-aminobenzalrhodanine: Place 20 mg of p-dimethyl-aminobenzalrhodanine in a 100ml volumetric flask and dilute to the

mark with acetone. Store at room temperature. Stable for six months.

7.1.4. Acetate Buffer - Dissolve 82.0 gram of $NaC_2H_3O_2$ x $3H_2O$ in 100ml DI water. Add sufficient glacial acetic acid and adjust pH to 4.5 (approx. 10 drops). This solution is stable for 6 months, store at 4ºC.

7.1.5. Cadmium Carbonate (powder) ACS reagent –store at room temperature; discard after 5 years from date receipt or earlier if necessary.

7.1.6. Reagents for cyanides amenable to chlorination.

7.1.6.1. Calcium hypochlorite solution, (0.35M), $Ca(OCl)_2$. Dissolve 5 g of calcium hypochlorite in 100 ml of deionized water. Prepare the solution fresh daily, store at room temperature. Solution is stable for 1 month, Note: store in an amber bottle if not used immediately.

7.1.6.2. 0.25 N NaOH. Dissolve 10.0 g NaOH into 1 L of deionized water. Dilute to mark with deionized water and invert to mix. Solution is stable for 6 months, store at room temperature.

7.1.6.3. Sodium Arsenite, NaAsO2. Dissolve 2g of Sodium Arsenite in 100ml of DI water. Prepare solution every month; store at room temperature.

7.1.7. Reagents for cyanide distillation.

7.1.7.1. 0.25 M NaOH. See section 7.1.6.2

7.1.7.2. Sulfamic Acid Solution: Dissolve 9.6 g. H_2NSO_3H into 100ml of deionized water. Solution is stable for 6 months, store at room temperature.

7.1.7.3. Micro Distillation Releasing Agent (7.11 M sulfuric acid/ 0.79M magnesium chloride): In a hood, place a 500ml beaker on a top-loading balance and tare. Then add 110.8g DI water. Then add and dissolve completely 32.2g magnesium chloride hexahydrate ($MgCl_2$ x $6H_2O$) in this water. Slowly add 139g concentrated sulfuric acid a little at a time, swirling and allowing to cool. Solution is stable for 6 months, store at room temperature.

7.1.7.4. Bismuth nitrate Solution: Dissolve 3 g of $Bi(NO)_3$•$5H_2O$ in 10 mls DEIONIZED WATER , add 25 mls glacial acetic acid while stirring and dilute to a 100 ml final volume.

7.1.8. Reagents for automated colorimetric determination.

7.1.8.1. Pyridine-Barbituric acid Reagent: In a fume hood, place 15.0 g barbituric acid in a 1 L beaker and add 100 ml DEIONIZED WATER, rinsing down the sides of the beaker to wet the barbituric. Add 75 ml pyridine (C_5H_5N) while stirring and mix until

barbituric acid dissolves. Add 15 ml conc. HCl (12 M HCl) and mix. Transfer to a 1 L volumetric flask, dilute to mark and invert to mix. Prepare weekly, store solution in amber bottle and at room temperature.

7.1.8.2. Chloramine-T: Dissolve 2.0g chloramine-T hydrate in 500 ml deionized water. Prepare fresh daily. Store at room temperature.

7.1.8.3. Phosphate buffer: In a 1 L volumetric flask, dissolve 97.0 g potassium phosphate, monobasic, anhydrous, (KH_2PO_4) in approximately 800 ml of DEIONIZED WATER. Dilute to mark and invert to mix. Solution is stable for one month. Store at room temperature.

7.1.8.4. 0.25 M NaOH (carrier) See section 7.1.6.2.

7.2. Standards

7.2.1. Standard 0.0192N Silver nitrate solution (1 ml = 1 mg CN): Prepared by weighing 3.2647 g of dried $AgNO_3$, dissolved in deionized water and dilute to 1000ml. Solution is stable for 6 months or when QC check is outside the acceptable limits, whichever comes first, store at 4ºC.

7.2.2. Primary (Simple) Cyanide stock solution, 1000 mg/L: This standard is used for the preparation of calibration standards (Sec 10.2). Purchased commercially from Accustandard (catalog number WC-CN-10X-5). Follow manufacturer's instructions for storage and stability. Standardize the solution against 0.0192N silver nitrate solution quarterly.

If prepared in house, prepare as follows: Primary Cyanide stock solution, 1000 mg/L: Dissolve 2.51 gm of KCN and 2.0 gm of KOH in 900 ml of deionized water. Standardize the solution against 0.0192N silver nitrate solution weekly and dilute to the appropriate concentration so that 1ml=1mg CN. Solution is stable for 6 months, store at 4ºC. Standardize the solution as follows::

- Take 5.0 ml of the primary stock cyanide solution (Sec. 7.2.2) and dilute it to 50ml using the 0.25 M NaOH. Add 10-12 drops of the rhodanine indicator (Sec. 7.1.3) to produce a bright yellow color.
- Using the 10 ml micro buret, titrate the stock cyanide solution from a bright yellow color to a salmon hue endpoint. Record the volume of silver nitrate solution used for the titration in the Standardization logbook.
- Titrate a blank using 50mls of 0.25N NaOH, 10-12 drops of rhodanine indicator. Record the volume of silver nitrate solution used for the titration in the Standardization logbook.
- Calculate CN concentration as follows:

Based on the following: $Ag^{+} + 2\ CN \rightarrow [Ag(CN)_2]^{-}$

$$CN^{-}(mg/L) = \frac{A-B}{C} \times N \times \frac{2\ mol\ CN}{1\ eq\ AgNO_3} \times \frac{26.02g\ CN}{1\ mol\ CN} \times \frac{1000mg}{1\ g}$$

Where:
A= ml $AgNO_3$ for titration of sample
B=ml $AgNO_3$ for titration of blank
C= ml or g of sample
N= normality of $AgNO_3$

- Record the preparation in the reagent TALS. Record final concentration in the Standardization logbook.

- **Note***:/standardizedconcentration* .

7.2.3. Secondary (Simple) Cyanide Stock Solution, 1000mg/L: The secondary cyanide stock solution must come from a source different from the primary cyanide stock solution (ERA, cat# 997 or Accustandard, cat# WC-CN-10X-5). Follow manufacturer's instructions for storage and stability. Standardize the solution against 0.0192N silver nitrate solution quarterly. This standard is used for the preparation of ICV and CCV standards (Sec 9.2.1 and 9.2.2).

If prepared in house, prepare as follows: Dissolve 2.51 gm of KCN and 2.0 gm of KOH in 900 ml of deionized water. Note: the secondary cyanide stock solution must be prepared from a different source than the primary cyanide stock solution. Standardize the solution with 0.0192N silver nitrate solution weekly and dilute to the appropriate concentration so that 1ml=1mg CN. The solution is stable for 6 months, store at 4ºC. Follow the standardization procedure in 7.2.2.

Note: */standardizedconcentration* .

7.2.4. Primary Working Solution, 6 mg/L: Take 0.6 mL of the Primary Cyanide Stock Solution (Sec. 7.2.2) and dilute to a final volume of 100ml with 0.25N NaOH. Prepare fresh daily.

7.2.5. Secondary Working Solution, 6 mg/L: Take 0.6 mL of the Secondary Cyanide Stock Solution (Sec. 7.2.3) and dilute to a final volume of 100ml with 0.25N NaOH. Prepare fresh daily.

7.2.5.1. Secondary Working Solution for Easy-Dist: 10mg/L: Take 1.0 mL of the Secondary Cyanide Stock Solution (Sec. 7.2.3) and dilute to a final volume of 100ml with 0.25N NaOH. Prepare fresh daily.

7.2.6. Complex Cyanide stock solution (Potassium Ferrocyanide Trihydrate in 0.5 NAOH), 1000 mg/L: Purchased commercially from ERA (catalog number 998). Follow manufacturer's instructions for storage and stability. This

standard is used for the preparation of QC samples which are distilled prior to analysis (LCS and MS/MSD).

7.2.7. Complex Cyanide Working solution, 6 mg/L: Take 0.6 mL of the Complex Cyanide stock solution (Sec 7.2.6) and dilute to a final volume of 100 ml with 0.25N NaOH. Prepare fresh daily.

7.2.7.1. Complex Cyanide Working solution for Easy-Dist, 10 mg/L: Take 1.0 mL of the Complex Cyanide stock solution (Sec 7.2.6) and dilute to a final volume of 100 ml with 0.25N NaOH. Prepare fresh daily.

7.2.8. Soil Standard Reference Materia (LCSSRM): Purchased commercially from ERA or Phenova. Follow manufacturer's instructions for storage and stability. This standard is used for the preparation of QC samples which are distilled prior to analysis.

8. Sample Collection, Preservation, Shipment and Storage

Sample container, preservation techniques and holding times may vary and are dependent on sample matrix, method of choice, regulatory compliance, and/or specific contract or client requests. Listed below are the holding times and the references that include preservation requirements.

Matrix	Sample Container	Min. Sample Size	Preservation	Holding Time [1]	Reference
Waters	Glass or plastic	200 ml	NaOH, pH > 12; Cool 4 ± 2°C	14 Days	Method 335.4; SW846 Method 9012B
Soils	Glass	5.0 grams	Cool 4 ± 2°C	14 Days	Method 335.4; SW846 Method 9012B

[1] Inclusive of digestion and analysis.

9. Quality Control

9.1. Sample QC: Waters and soils, are separated into different QC batches.

9.1.1. Method Blank (MB): 0.25N NaOH is used for the blank and is carried through the entire sample preparation and analytical process. Add 6ml of 0.25 N NaOH to a disposable distillation sample tube. Results must be less than the reporting limit, or the batch must be redistilled and reanalyzed. One method blank must be analyzed with each set up of samples or every 20 samples, whichever is more frequent.

9.1.2. Laboratory Control Sample (LCS) 0.10 mg/L: A LCS (aqueous batches) or LCSSRM (soil batches) must be analyzed with each distillation batch or every

20 samples, whichever is more frequent. Prepare the solution fresh daily by adding 0.1 mL of the 6 mg/L Complex CN working solution (Sec. 7.2.7) and 5mL of 0.25 NaOH. The results must be within the control limits; if not, the batch must be redistilled and reanalyzed. Control limits: for 9012B ±15% of the true value; for 335.4 ±10% of the true value; and for SM4500CN ±10% of the true value.

- *Soil - Laboratory Control Sample Standard Reference Material (LCSSRM),* weigh out 0.25g of the standard reference material, add 5.0 ml DI water to the disposable distillation tube. The results must be within vendor specified QC limits or the batch must be redistilled and reanalyzed.

9.1.3. Matrix Spike/Matrix Spike Duplicate (MS/MSD) One MS/MSD pair must be analyzed for every 10 samples.

- Aqueous samples (drinking water and wastewater): **MICRO DIST, 0.2 mg/L:** two portions of the same sample (matrix spike and matrix spike duplicate), each 6 ml, are added to separate disposable distillation tubes then add 0.2 mL of the 6 mg/L Complex CN primary working solution (Sec 7.2.7) into each sample. The results must be within 90-110 %..

- Soil samples: **MICRO DIST, 4.8 mg/Kg:** add 0.25g of the sample to two separate disposable distillation tubes (matrix spike and matrix spike duplicate) and add 5.0 ml of deionized water. Spike these samples with 0.2 mL of the 6 mg/L Complex CN primary working solution (Sec. 7.2.7). The results must be within laboratory generated limits.

- Amenable to chlorination: MS/MSD – For aqueous samples, measure 6 ml of sample for both the MS and MSD and add to a 40ml glass vial. Add 0.2 ml of the 6mg/L Complex CN primary working solution (Sec 7.2.7) into each sample; the spiking concentration is 0.20mg/L. For soils samples, weigh out 0.25g of sample and add 5.0ml of water then follow spiking procedure for aqueous samples. The spike must be added before the chlorination step begins. The form of cyanide used for spiking is completely amenable to decomposition with chlorine and therefore, the recovery of the spikes is expected to be 0%. If cyanide remains following the chlorination step, it is evident that the chlorination was not complete.

9.2. Instrument QC

9.2.1. Initial Calibration Verification (ICV), 0.20 ppm: The ICV must be analyzed immediately after an acceptable calibration and before any samples are analyzed. The ICV will be prepared from the secondary Simple CN source (Sec 7.2.3). See Sec 10.2.3.3 for the ICV preparation instructions by Micro Dist. The determined concentration must be within the ICV control limits; if not the analysis should be terminated until the source of the problem is identified and corrected. ICV control limits for 9012B is ±15% of the true

value; for 335.4 ±10% of the true value and for SM4500CN ±15% of the true value.

9.2.2. Continuing Calibration Verification (CCV), 0.20 ppm: A CCV is analyzed after every 10 samples and at the end of the sample run. The CCV will be prepared from the same source as the ICAL. CCV control limits for 9012B is ±15% of the true value; for 335.4 ±10% of the true value and for SM4500CN ±10% of the true value. If the result exceeds the limit, the analysis should be terminated until the source of the problem is identified and corrected and all samples following the last acceptable CCV must be reanalyzed.

9.2.3. Initial Calibration Blank (ICB): An ICB is analyzed immediately after the ICV to verify calibration and acceptable instrument performance. The results must be less than the reporting limit. Use 0.25N NaOH for the ICB.

9.2.4. Continuing Calibration Blank (CCB): A CCB must be analyzed after every 10 samples and at the end of the sample run. The results must be less than the reporting limit. If the CCB result exceeds the reporting limit, all samples following the last acceptable CCB must be reanalyzed. Use 0.25N NaOH for the CCB.

9.2.5. Minimum Reporting Level (MRL), 0.01 mg/L: The MRL is required for 335.4 Drinking water samples only. The MRL must be analyzed immediately after the ICV/ICB pair and before any samples are analyzed. The MRL is prepared in the same manner as the low level standard. Add 5ml of 0.25N NaOH solution to the sample tube, then add 0.01ml of 6ppm Primary Standard (Sec. 7.2.4). Follow procedure for sample prep in Sec. 10.1.3. The recovery for the MRL should be within 50-150% of the true value. If not, re-analyze the entire batch (see exception note below). If the MRL is biased high, non-detect (ND) samples can be reported with flags and add NCM in report.

Note: For Method 335.4, if MRL fails and samples are not drinking water samples, place an 'x' in front of the MRL when data is uploaded into TALS; the MRL will not be reported with the non-drinking water samples.

10. Procedure

10.1. Sample Preparation

10.1.1. Each sample matrix must be spot tested for the presence of interfering ions.

10.1.1.1. Check that pH of each sample is >12 using the pH indicator strip.

10.1.1.2. Check for the presence of chlorine using KI-Starch paper. See section 4.3.1.

10.1.1.3. Check for the presence of sulfide using lead acetate paper (pre-moistened with pH4 acetate buffer solution). See section 4.2.1. – 4.2.4. Method 9012B: If positive add bismuth nitrate to the sample. At the same time add bismuth nitrate to all standards before distillation, see Section 10.2.3.

10.1.2. Procedure for the pretreatment of cyanides amenable to chlorination. **Note**: If total cyanide is detected, the laboratory would need to analyze both the cyanide amenable to chlorination sample and to re-perform (repeat) the total cyanide sample that was originally analyzed through the entire procedure.

10.1.2.1. Divide the sample into two equal aliquots of 6 ml sample and chlorinate one for the determination of cyanide amenable to chlorination. For aqueous samples, measure the 6 ml of sample and add into a 40 ml glass vial. For soils samples, weigh out 0.25g of sample and add 5ml of water. Add calcium hypochlorite solution (Section 7.1.6.1) drop-wise while agitating the mixture using a magnetic stir plate and maintaining the pH at between 11 and 12 with sodium hydroxide solution (Section 7.1.6.2). Cover the vials with aluminum foil to protect the samples from the light.

Note: A MS/MSD must be performed for samples requiring cyanide amenable to chlorination as a negative quality control; see Sec 9.1.3.

CAUTION: Toxic cyanogen chloride is the initial reaction product during an alkaline chlorination. This reaction should take place in a fume hood.

10.1.2.2. Excess residual chlorine must be maintained in the solution for 1 hour while agitating. Monitor pH with pH test paper and chlorine with KI-starch paper. A distinct blue color on the paper indicates sufficient chlorine in solution. If necessary add more calcium hypochlorite and/or NaOH.

10.1.2.3. Following one hour, remove any residual chlorine by dropwise addition of NaAsO2 solution (Sec. 7.1.6.3). Test with KI starch paper to ensure that there is no residual chlorine present as a reducing agent..

10.1.2.4. Test for total cyanide in both the chlorinated and unchlorinated aliquot of the sample. Cyanide amenable to chlorination is determined by the difference between the total cyanide result of the un-chlorinated aliquot and the chlorinated aliquot.

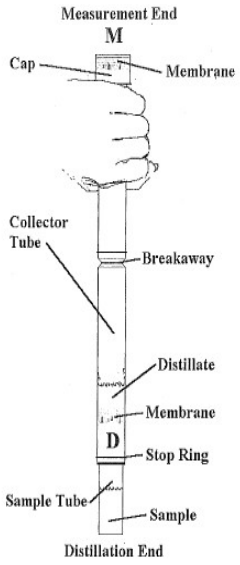
10.1.3. <u>MICRO DIST Distillation Procedure</u>

10.1.3.1. Set the controller to 120 deg C. Allow the block to warm up which takes approximately 40 minutes.

10.1.3.2. With the 'M' end or 'measuring end' up, place the collector tubes for the samples into the tube rack. Add 2 mL of 0.25N NaOH solution and add a membrane and cap. Label the top of the tube with the sample ID. Up to 21 samples tubes can fit on one block.

10.1.3.3. Pipet 6.0ml of aqueous sample into each sample tube or weigh out 0.25 to 0.30 grams of sample plus 5.0 ml of DI water for soil samples. Add 0.25ml of the sulfamic acid solution and 0.75ml of the releasing agent to all tubes. Label the tube with the sample ID.

***NOTE**: Homogenize soil samples properly prior to taking an aliquot for analysis.



10.1.3.4. Immediately push the 'D' end or 'distillation or discarded' end of the collector tube over the open end of each sample tube to start the seal.

10.1.3.5. Place the assembly into the press, putting the sample tube through the hole in the white base. Before pressing, the user should hold the collector tube firmly at the breakaway point to ensure the tube does not shift during the pressing procedure.

10.1.3.6. Press down on the press handle until the stop ring on the sample tube hits the 'D' end of the collector tube.

10.1.3.7. Put on heat resistant gloves and push the sample tube and 'D' end of each tube into the preheated block so that the collector tube stop ring touches the block.

10.1.3.8. Set timer for 30 minutes. Do not pull the tubes out before the 30 minutes to check them. This will cause the sample to suck-back.

10.1.3.9. After the 30 minutes have passed, put on heat resistant gloves. Remove the first tube from the block and immediately pull off its sample tube using a downward, twisting motion. Important: Remove the sample tube within 4 seconds of removing it from the block or suck-back of the sample will occur, which may cause low recoveries. Dispose of the sample tube and remaining hot solution by dropping it into the sink or waste bucket.

Note: Do not pull out all the samples at once. Each sample needs to be separated immediately upon removal from the block.

10.1.3.10. Place the tubes in the collector tube rack with the 'M' end up. Parafilm the 'D' end of the tube and allow the tubes to cool for at least 10 minutes.

10.1.3.11. For each collector tube, hold the tube horizontally and rinse the walls with the distillate in order to homogenize it. Slowly roll the distillate around the tube to gather any droplets clinging to the walls. Then slowly return the collector tube to an upright position with the 'D' end up.

10.1.3.12. With the 'D' end up, break the collector tube in half by pulling the 'D' end hard towards the user to break it and twisting and tearing off the 'D' end. Rinse the 'D' end with a small volume of DI water and pour into the 'M' end. The 'D' end can be discarded.

10.1.3.13. Do not invert the sample. With the 'M' end down, place the tube in the collector tube rack. Dilute to the mark with deionized water. Seal the open end with parafilm if the sample is not going to be analyzed immediately.

10.1.3.14. The solution is now ready for semi-automated colorimetry.

10.1.4. <u>MICRO DIST Distillation Procedure using reuse, preclean Microdistillation tube</u>

10.1.4.1. With the D end up, place the collector tubes in the tube rack.

10.1.4.2. In the sample tube, pipet 6.0ml of aqueous sample into each sample tube or weigh out 0.25 to 0.30 grams of sample plus 5.0 ml of DI water for soil samples. Add 0.25ml of the sulfamic acid solution and 0.75ml of the releasing agent to all tubes. Label the tube with the sample ID.

10.1.4.3. Place the sample tube into the press, putting the sample tube through the whole in the white base. Place the D end on top of the sample tube and press until the D end meets the ring around the sample tube.

10.1.4.4. Add 2 mL of 0.25N NaOH solution to the D end which is connected to the with sample tube.

10.1.4.5. Attach a silicone tubing about 1.5" long to the tube labeled M end (labeled with sample ID). Then connect the tube labeled M end to the tube labeled D end (which is connected to sample tube).

10.1.4.6. Put on heat resistant gloves and push the sample tube and 'D' end of each tube into the preheated block so that the collector tube stop ring touches the block.

10.1.4.7. Set timer for 30 minutes. Do not pull the tubes out before the 30 minutes to check them. This will cause the sample to suck-back.

10.1.4.8. After the 30 minutes have passed, put on heat resistant gloves. Remove the first tube from the block and immediately flip the tube upside down and gently tap the tube on the counter a couple times. Remove the D end connected to sample tube. Rinse the D end/sample tube with few drops of DI water and add to the M end tube. The D end/sample tube can now be placed in a bucket for cleaning, refer to SOP ED-GEN-013, Glassware cleaning, for the full procedure.

10.1.4.9. Place the tubes in the collector tube rack with the 'M' end up.

10.1.4.10. Dilute to the mark with deionized water. The solution is now ready for semi-automated colorimetry. Seal the open end with parafilm, if the sample is not going to be analyzed immediately.

10.2. Calibration

10.2.1. All standards (Calibration Standards, calibration blank, ICV/CCV) must be distilled in the same manner as samples. A calibration must be analyzed each day before sample analysis.

10.2.2. Preparation of Standards for samples without sulfide:

10.2.2.1. Use the primary working solution (Sec. 7.2.4) to prepare the calibration standards below.

10.2.2.2. Prepare calibration standards and CCV for Micro Distillation batch as follows; the final volume in collector tube is 6.0 ml.

Volume (mL) of 6 mg/L CN primary working solution	Volume (mL) of 0.25N NaOH added to each Distillation Sample Tube	Concentration CN-(mg/L)
0.40	5	0.40
0.20	5	0.20
0.10	5	0.10
0.05	5	0.05
0.025	5	0.025
0.010	5	0.010
0	5	0.0
CCV	5	0.20

Note: [1] Add a calibration standard of 0.005 CN mg/l as directed on special projects.
[2] Prepare CCV with each distillation batch.
[3] Due to limited volume of the distillate, it may be necessary to prepare and distill two or three CCVs in the batch.

10.2.2.3. Prepare ICV using a secondary Simple CN source (Sec 7.2.3) as follows:

Volume (mL) of 6 mg/L CN secondary working solution (ICV)	Volume (mL) of 0.25N NaOH added to each Distillation Sample Tube	Concentration CN-(mg/L)
0.20	5	0.20

10.2.2.4. Correlation coefficient of 0.995 or greater must be obtained.

10.2.2.5. After running the calibration, recalculate each of the standard's concentration. Review Table 1 of the instrument report specifically the *%Residual* and *Det. Conc. (mg N/L)* column for the resulting concentration. The % Residual of the calibration standards should be within 50% for the first calibration standard, 0.01 mg/L (1 to 2 times the RL), 20% for 0.025 mg/L and 0.050 mg/L standards (3 to 5 times the RL) and 10% the rest of the standards (greater than 5 times the RL). If this criteria is not met, re-analyze the calibration standards (in some cases, new calibration standards may need to be prepared).

10.2.3. Method 9012B: Preparation of Standards for samples with sulfide:

10.2.3.1. From the 6 mg/L primary working standard prepare five standards as above to be distilled in the same manner as the samples using the method of standard additions. Note: Bismuth Nitrate must also be added to the standards. Standards distilled in this way will give a linear curve at lower concentrations but as concentration increased the recovery decreases.

10.2.3.2. Correlation coefficient of 0.995 or greater must be obtained.

10.3. Sample Analysis

10.3.1. System startup:

10.3.1.1. Follow manifold scheme for this method.

10.3.1.2. Turn on heating unit at 60° C for 15 minutes before analysis.

10.3.1.3. Put all reagent lines into deionized water and turn pump on. Check for leaks and slow flow rate.

10.3.1.4. Switch over reagent lines to proper reagent. Let reagent run through manifold for 15 minutes before analysis to allow baseline to stabilize.

10.3.2. Set up tray table with all appropriate QC checks. CCV/CCB every 10 samples and at the end of the run. The following analytical sequence must be used:

Instrument Calibration
ICV (QCS)
ICB
MRL
CCV
CCB
MB
LCS or LCSSRM for soils
8 Samples with Analytical Spikes
CCV (IPC)
CCB
10 samples
CCV (IPC)
CCB
Repeat until run is complete
CCV (IPC)
CCB

10.3.3. Place standards and samples into autosampler cups.

10.3.4. Run tray.

10.3.5. Dilute and reanalyze samples that exceed the calibration curve using the distilled calibration blank or CCB.

11.0. Calculations / Data Reduction

11.1. Accuracy:

$$\text{ICV / CCV, LCS \% Recovery} = \frac{\text{observed concentration}}{\text{known concentration}} \times 100$$

$$\text{MS \% Recovery} = \frac{\text{(spiked sample) - (unspiked sample)}}{\text{spiked concentration}} \times 100$$

11.2. Precision (RPD):

$$\text{Matrix Duplicate (MD)} = \frac{|\text{orig. sample value - dup. sample value}|}{[(\text{orig. sample value + dup. sample value})/2]} \times 100$$

11.3. Final results calculation in aqueous samples:

Concentration = mg/L

Concentration (mg/L) from instrument is imported to TALS
Samples with dilution factor are calculated in TALS for final results

11.4. Final results calculation in solid samples:

$$\text{Concentration mg/kg} = \frac{C \times V \times D}{W}$$

Where:
C = sample concentration in extract (mg/L)
V = Volume of extract (mL)
D = Dilution Factor
W = Weight/Volume of sample aliquot extracted (grams)

NOTE: All dry weight corrections are made in TALS.

11.5. Final results calculation amenable to chlorination:

mg CN^- amenable to chlorination/L = A - B

where:
A: mg CN^-/L: found in unchlorinated portion of sample
B: mg CN^-/L: found in chlorinated portion of sample

11.6. Data Reduction

11.6.1. Cyanide soil and waters are batched separately in TALS Analyst Desktop. Update Cyanide prep batches as follows:.

11.6.1.1. For soils, enter in 0.25-0.30g under the ‘initial amount’ column and 6ml under the ‘final amount’ column for each sample including the MB and LCSSRM.

11.6.1.2. For waters, enter 6ml under the columns 'initial amount' and 'final amount' for each sample including the MB and LCS. Under the columns 'chlorinechk' and 'sulfidechk' record the results from the test strip paper. 'N' designates the interference was not present. Record 'pH>12' under the column 'DistillpHchk.'

11.6.1.3. Since the calibration standards are distilled, they will be recorded in the prep batch. Under the column 'Lab ID,' type in "IC' for 7 rows. Enter 6ml under the columns 'initial amount' and 'final amount' for each standard. Enter how many milliliters of the 6ppm primary working solution were used for each calibration standard following the chart in Sec. 10.2.2.1.

11.6.1.4. For both soil and water batches, record reagent information including reagent ID and expiration date on the batch information page. Record the actual time the samples were distilling under 'batch comments.' This should be designated as distillation start and end time.

11.6.2. Instrument data is imported to TALS by following these steps:

11.6.2.1. After the run has finished, click the data icon at the top of the screen. Choose the correct file. Go to 'File" and choose "Export Data' from the drop down menu. A screen will pop up, click 'ok' and then another screen will pop up, click 'ok.'

11.6.3. From the desktop, open the 'LIMSdata' icon on the Lachat 8000 and the 'Exports' icon on the Lachat 8500. Select the correct file, and then right click. Go to 'Send to-> LimsImport ->' Choose the correct method. The data has now been imported to TALS.

11.6.4. All reagent information is recorded in the "Batch Information" page. Use the 'Worksheet tab' if additional pages are necessary.

11.6.5. Record special notes and observations in the "worksheet" tab (i.e. sample appearance and notes on why samples were rejected or diluted).

11.6.6. All raw data is attached as a pdf file. The raw data includes the instrument report and calibration curve.

11.6.7. Complete the Data Review Checker (DRC) in TALS: Prior to data submission the analyst must execute the DRC (Data Review Checker) program in the applicable analytical batch (TALS Analyst Desktop II module).

11.6.7.1. Open the analytical batch and click on the Edit tab above to enter the Edit Mode.

11.6.7.2. Press F8 command key on the computer keyboard or right click anywhere on the batch worksheet then click on 'Run checklist.'

11.6.7.3. Acknowledge by filling in responses to all unacknowledged findings. Highlight the checklist with findings, then highlight the associated list of findings; right click and choose 'Acknowledge Item.'

11.6.7.4. Fill in appropriate comments in the response box, then hit 'OK.' 'The column labeled 'unacknowledged findings' should show '0' for all questions once completed; then batch is ready for 2nd level review.

12.0. Method Performance

12.1. Method Detection Limit Study (MDL)

The method detection limit (MDL) is the lowest concentration that can be detected for a given analytical method and sample matrix with 99% confidence that the analyte is present. The MDL is determined according to the laboratory's MDL procedure in Section 19 (Test Methods and Method Validation) of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM). MDLs reflect a calculated (statistical) value determined under ideal laboratory conditions in a clean matrix, and may not be achievable in all environmental matrices. The laboratory maintains MDL studies for analyses performed; these are verified at least annually unless method requirements require a greater frequency.

12.2. Demonstration of Capabilities

For DOC procedure refer to Section 19 in the most current revision of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

12.3. Training Requirements

Refer to TestAmerica SOP No. ED-GEN-022, Training, for the laboratory's training program.

13.0. Pollution Control

It is TestAmerica's policy to evaluate each method and look for opportunities to minimize waste generated (i.e., examine recycling options, ordering chemicals based on quantity needed, preparation of reagents based on anticipated usage and reagent stability). Employees must abide by the policies in Section 13 of the Corporate Environmental Health and Safety Manual (CW-E-M-001) for "Waste Management and Pollution Prevention."

14.0. Waste Management

14.1. Waste management practices are conducted consistent with all applicable rules and regulations. Excess reagents, samples and method process wastes are disposed of in an accepted manner. Waste description rules and land disposal

restrictions are followed. Waste disposal procedures are incorporated by reference to TestAmerica SOP No. ED-SPM-008 (Laboratory Waste Disposal Procedures).

14.2. The following waste streams are produced when this method is carried out:

- Pyridine/Hydroxide Solution: Hazardous Waste Liquid, n.o.s. This material is collected at satellite accumulation in 30 gallon Poly containers. When the container is full, the container is transferred to the waste room and held in secondary containment until a waste vendor is called for a pick up.

  Teris Profile Number: 50016717
  Onyx Profile WIP Number: 584650

15.0. References / Cross-References

15.1. Methods for the Determination of Inorganic Substances in Environmental Samples, EMSL-Cincinnati, EPA/600/R-93/100, August 1993, Method - 335.4 Determination of Total Cyanide by Semi-Automated Colorimetry

15.2. Standard Methods for the Examination of Water and Wastewater, American Public Health Association, Washington, DC, Method 4500 CN C, G-2016.

15.3. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, 3rd ed., U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. U.S. Government Printing Office: Washington, DC, 1995; SW846 Method 9012B.

15.4. QuikChem Method 10-204-00-1-A, Determination of Cyanide in Waters.

15.5. TestAmerica Edison Document No. ED-QA-LQM, *Laboratory Quality Manual*, most current revision.

15.6. TestAmerica Edison SOP ED-GEN-022, *Training*, most current revision.

15.7. TestAmerica Edison SOP No. ED-SPM-008, *Laboratory Waste Disposal Procedures*, current revision.

15.8. TestAmerica Corporate Environmental Health and Safety Manual, Document No. CW-E-M-001, most current revision.

15.9. TestAmerica Edison SOP No. ED-GEN-013, *Glassware cleaning*, current revision.

16.0. Method Modifications:

Item	Method no.	Modification
1	335.4	Sec 4.3.1: This SOP referenced method 335.4 (not SW846) when treating samples suspected to contain chlorine and nitrates/nitrites.

2	QuikChem Method 10-204-001-41-A	Sec 7.1.8.3: Preparation procedure for the Phosphate buffer follows Quikchem method 10-204-001-41-1 (not Method 335.4).
3	SM 4500 CN^- C	Sec 10.1.3.3: Sulfamic acid solution is added to all samples during distillation. Addition of Sulfamic acid is a procedure described in Standard methods 18th ed, Method 4500 CN^- C. Methods SW846 9012B and EPA 335.4 require the addition of Sulfamic acid for samples which are known to contain NO3 and/or NO2.
5	335.4; SW9012B	Sec 7.1.7.2-7.1.7.3; 10.1.4.2; 10.1.4.3- Modified procedure for reagent preparation and amount of reagent added in sample while keeping the reagent sample volume ratio and concentration the same.
6	335.4; SW9012B	*335.4 & 9012B: It is recommended that at least two standards (a high and a low) be distilled and compared to similar values on the curve to ensure that the distillation technique is reliable.* Sec 9.1.2: For Micro Distillation, one LCS (0.10 mg/L) will be prepared for each distillation batch; however calibration standards, ICV and CCV will be distilled in the same manner as the samples.
7	335.4; SW9012B	*Method 335.4; SW9012B: Distill standards for samples with Sulfide.* This SOP follows the procedure described in the Hach Micro Dist User Manual, Method Number 10-204-00-1-X when distilling samples by Micro Dist- *It is imperative that the standards be distilled with the samples.*
8	Micro Dist (Method No. 10-204-00-1-X)	Add between 0.50-1.0g of soil/sludge to 5 ml DI water. This SOP will use 0.25g of soil sample to 5 ml DI water. Improved accuracy with the soil LCS when using 0.25g rather than 0.50g sample weight.

17.0. Attachments

N/A

18.0. Revision History

- Revision 18, dated 08 November 2023
  - Sec. 10.1.3.12 & 10.1.4.8: Revised solution to use when rinsing the CN sample tube after distillation from 0.25N NaOH to DI water.
  - Sec. 10.2.2.5: Added criteria to use when evaluating the calibration curve.

- Revision 17, dated 23 February 2023
  - Sec. 9.2.5: Clarified the applicable matrix, procedure, and corrective action for the QC – MRL.

- Revision 16, dated 22 September 2022
  - Sec. 7.1.6.3 and 10.1.2.3: Replaced ascorbic acid with sodium arsenite to remove residual chlorine.
  - Sec. 9.2.5: Fixed MRL acceptance range to 50-150%.
  - Sec. 10.3.2: Revised instrument tray set up to reflect actual laboratory practices.
  - Sec 15: Revised Standard Method reference to Rev 2016.

- Revision 15, dated 06 January 2021
  - Sec 7.1.6.1: Clarified the stability information for the reagent $Ca(OCl)_2$.

- Revision 14, dated 16 December 2020
  - Sec 3: Revised the Definitions locations as per the most current LQM.
  - Deleted all reference to Easy-Dist (midi-dist) and wipes distillation, not applicable in this SOP.
  - Sec. 7.1.6.1: Revised Calcium Hypochlorite storage requirements and preparation frequency to daily.
  - Sec. 9.1.2: Clarified that only soil LCS should be designated LCSSRM in TALS sample worksheet.
  - 9.1.3: Clarified the MS/MSD procedure for the Cyanide amenable to chlorination.
  - Sec 9.2.5: Added MRL to the list of instrument QC.
  - Sec. 10.1.2: Added requirements that sample which is detected for total cyanide must be re-analyzed and prepared with the cyanide amenable to chlorination sample.
  - Sec 10.1.2.1 & 10.1.2.2: Revised to clarify the procedures for CN amenable to chlorination (i.e. taking identical samples for total and amenable samples; 'excess' added in Sec 10.1.2.2).
  - Sec 10.1.4: Added procedure for setting up distillation using the reuse, preclean distillation tubes.
  - Sec. 11.6.7: Replaced EDS-WI-008, Wetchem Data Review Checklist with TALS DRC; procedures added for DRC.
  - Sec 15.9: Deleted WI EDS-WI-008, not applicable; subsequent sections adjusted.
  - Sec 15.10: Added reference – SOP ED-GEN-013.

- Revision 13.1, dated 23 October 2017
  - Updated SOP header with Eurofins emblem.

- Revision 13, dated 23 October 2017
  - Sec. 9.1.2: Corrected preparation instructions for LCS from 0.20 mg/L to 0.10 mg/L. Updated control limits for Method 9012B to +/-15%.
  - Sec. 9.2.1: Updated the ICV control limits for Method 9012B.
  - Sec. 9.2.2: Updated the CCV control limits for Method 9012B; removed instructions to prepare a CCV with each Micro-Distillation batch.
  - Sec. 10.3.2: Updated the example analytical sequence for Micro Dist and Easy Dist.
  - Sec 16, Item 6 of Method Modification – Deleted text- CCV (0.20 mg/L) will be distilled with each distillation batch.

- Revision 12, dated 26 September 2017
  - Sec. 1.1.2: Updated the Soil RL to 0.24 mg/Kg to reflect the initial soil sample weight change from 0.5g to 0.25g.
  - Sec. 6.2: Added Lachat Micro Distillation tubes and pH test strips to list of supplies.
  - Sec. 7.1.7.2: Revised preparation instructions for sulfamic acid solution; revised to use a double strength concentration sulfamic acid solution, however the amount added in sample is reduced in half.
  - Sec. 7.1.7.3: Replaced 2.5M MgCl2 and 1:1 H2SO4 solution with Microdistillation releasing agent (7.11 M sulfuric acid/ 0.79M magnesium

chloride) to be used instead of the separate H2SO4 and MgCl2 solution; equivalent reagent concentration is added in sample.
  - Sec. 7.2.3: Added ERA cat# 997 as an alternative source for a Simple CN secondary standard.
  - Sec 7.2.4 & 7.2.5: Added preparation instructions for the Micro Dist Primary/Secondary Working standards.
  - Sec 7.2.6: Deleted LCSH
  - Sec 7.2.7: Updated preparation instructions for the Complex CN Working Solution (Micro Dist).
  - Sec 7.2.8: Added soil standard reference material.
  - Sec 9.1.1: Updated preparation instructions for MB from deionized water to 0.25 N NaOH to reflect actual laboratory practices.
  - Sec 9.1.2: Updated preparation instructions for LCS needed for Micro-Dist; removed LCSH prep for Micro Distillation. Revised the LCS sample weight to use from 0.5g to 0.25g. Added Easy Dist prep instructions for LCSSRM.
  - Sec 9.1.3: Updated the matrix spike preparation instructions for Micro Dist for soil and water.
  - Sec 9.2.1: Updated the ICV preparation instructions for Micro-Dist;
  - Sec 9.2.2: Revised the standard source used for preparing CCV; source will be the same source as the calibration standards and will be distilled with each Micro Dist distillation batch.
  - Sec 10.1.1.1: Added instructions to check pH of each sample.
  - Sec 10.1.4.2: Revised the volume to add in collector tube to 2.0ml of 0.25N NaOH.
  - Sec 10.1.4.3: Revised the reagents and amount of reagents added into the sample/distillation tube; Revised the initial weight used for solid samples from 0.5g to 0.25-0.30g. Added note to homogenize soil sample prior to taking aliquot.
  - Sec 10.1.4.12: Added instructions to rinse the D-end and add rinsate to the M-end.
  - Sec 10.2.2: Added instructions to distill all standards used for the analysis of CN by Micro Distillation.
  - Sec 10.2.3.2 & 10.2.3.3: Added preparation instructions for the calibration standards and check standards (ICV,CCV) by Micro Distillation. Added note that CCV must be distilled with each distillation batch.
  - Sec 10.3.2: Clarified analytical sequence for Micro Dist and Easy Dist.
  - Sec 10.3.5: Updated instructions for sample dilutions.
  - Sec 11.7.1: Added instructions for completing Batch information page in TALS.
  - Sec 16: Method modification items 5-8 added.

- Revision 11, dated 11 August 2014
  - Sec. 7.2.2 & 7.2.3: Clarified procedure as to when to apply the standardized value of the CN stock solution.
  - Sec. 9.1.2: LLCS and HLCS will be analyzed for both methods SW9012 and EPA335.4 Deleted text: *'Distillation of two LCSs (LLCS and HLCS) is not a method requirement for Method 335.4. Use HLCS as the QC sample for Method 335.4.*

- Revision 10, dated 12 March 2014
  - Deleted Method 9012A reference throughout the SOP; replaced SW method reference with 9012B.

- Sec 15.3 Added reference to Standard Methods Editorial revision 2011; subsequent sections adjusted accordingly.

- Revision 9, dated 12 November 2012
  - Sec 1.1.2: Revised RL for solids from 0.12 mg/kg to 0.10 mg/kg; sample final volume is 5 ml.
  - Sec 9.1.2 & 9.1.3: Deleted text: *After micro-distillation, volume is brought up to 6 ml with deionized water.* The final volume of the distillate is not adjusted.
  - Deleted Sec 10.1.4.13, final distillate will not to be diluted to 6 ml; subsequent sections adjusted accordingly.
  - Sec 10.1.4.13 (formerly Sec 10.1.4.14): deleted text: *Shake the tube with a gentle whipping motion to mix in diluent water.* Added text: *With the 'M' end down, place the tube in the collector tube rack.*

- Revision 8, dated 25 October 2012
  - Deleted Sec 7.2.4 (5 mg/L primary working solution), standard not applicable; subsequent sections adjusted accordingly.
  - Sec 7.2.2, 7.2.3 & 7.2.6: Clarified to include which QC samples these standards are applicable to.
  - Sec 7.2.6 & 7.2.7: Added complex cyanide standard, 1000 mg/L stock standard and 10 mg/L working solution to be used for distilled QC samples (LCS and MS/MSD).
  - Sec 9.1.2: Added note: *Distillaton of two LCSs (LLCS and HLCS) is not a method requirement for Method 335.4. Use HLCS as the QC sample for Method 335.4.*
  - Sec 9.1.2: Revised the LLCS concentration to 0.10 mg/L; revised to reflect the correct spiking amount (ml) and source standard (complex CN working solution) in the preparation procedure.
  - Sec 9.1.3: Revised the spiking solution from simple to complex CN.

- Revision 7, dated 13 September 2012
  - Sec 1: Revised to include the RL for microdistillation in soils.
  - Sec. 2.0: Revised to include 'MICRO DIST' as one of the ways to distill samples.
  - Sec. 6.0: Updated list of equipment (added MICRO DIST and Lachat 8000 and 8500 series).
  - Sec. 9.1.1: Changed the frequency for the Method Blank analysis from 1 per 10 samples to 1 per 20 samples.
  - Sec. 9.1.2: Changed the frequency for the LLCS/HLCS analysis from 1 per 10 samples to 1 per 20 samples. Also, included the micro distillation preparation procedure for LLCS/HLCS.
  - Sec. 9.1.3: Clarified the requirement of one MS/MSD per 10 samples. Also, included the micro distillation preparation procedure for MS/MSD.
  - Sec. 10.1.4: Added procedure for micro distillation of samples.

- Revision 6, dated 22 March 2012
  - Sec. 1.1.1: added method 4500 CN G to the list of methods.
  - Sec 1.1.3, 12.1 & 12.2: Revised QAM references to reflect the most recent QAM revision.
  - Sec. 7.2.2/7.2.3: Added information on commercially purchased CN stock standard.

- Sec 9.1.3: Added MS/MSD requirement for cyanide amenable to chlorination under sample QC.
- Sec. 10.1.2.1: Added prep for soil samples requiring cyanide amenable to chlorination.
- Sec 11.6: Added calculation formula for CN amenable to chlorination; subsequent sections adjusted accordingly.
- Sec 15.9: Added applicable reference.

- Revision 5, dated 22 November 2010
  - Sec. 1.1.1: Added wipes to list of applicable matrices.
  - Sec. 1.1.2: Added reporting limit for wipes.
  - Sec. 6.2: Added specimen cups, transfer pipettes, graduated cylinder and micro-burets to the list of supplies.
  - Sec. 7.1.4: Changed the amount of acetic acid added from “approximately 100 ml” to “approximately 10 drops” to reflect actual laboratory practices.
  - Sec. 7.1.6.2: Clarified reagent prep
  - Sec. 8.0: Added wipes to section.
  - Sec. 9.1: Added sample QC requirements for wipe batches.
  - Sec. 9.1.1: Included the prep of the method blank for wipe batches
  - Sec. 9.1.2: Revised the prep of the LLCS and HLCS to reflect actual laboratory practices. Also, included prep of the LCS/LCSD for wipe batches.
  - Sec. 9.1.3: Revised MS/MSD prep for aqueous and soil.
  - Sec. 9.2.2: Deleted text “If the CCV is not within the control limits, a second analysis should be performed.”
  - Sec 9.2.3 & 9.2.4: Clarified the type of solution utilized for the ICB and CCB.
  - Sec. 10.1.3.1: Revised step of the distillation procedure to reflect actual laboratory practices.
  - Sec. 10.2.2.1: Revised calibration standards prep Table.
  - Sec. 10.3.2: Added comment on how to set up the analytical sequence for wipe samples.
  - Sec. 11.5: Included calculation for wipe samples.
  - Sec. 11.6: Added steps to import data to TALS.
  - Section 16: Added method revision for addition of wipe matrix to SW846 9012A/9012B.

- Revision 4, dated 28 September 2009
  - Revised SOP format in accordance with TestAmerica Corporate Quality SOP No. CW-QS-002 (Rev 0) Writing a Standard Operating Procedure (SOP).
  - Incorporated SOP ED-WET-007 (Analysis of Total Cyanide in Drinking water-Automated, Method 335.4) into this SOP; retired SOP ED-WET-007 at the effective date of this SOP.
  - Sec. 7.2.2: Added information for the standardization of the Cyanide Stock. Replace frequency of the standardization from monthly to weekly to comply with Standard methods.
  - Sec 7.2.3 – 7.2.6: Added standards and preparation instructions.
  - Sec 9.1.3: Clarified % recovery limits for water and solid samples.
  - Sec 9.2.1 & 9.2.2: Clarified corrective actions to be taken if QCS/ICV and IPC/CCV results are outside the acceptable limits.
  - Sec 10.3.2: Revised sample analytical sequence to comply with method 335.4.
  - Sec. 11.5: Revised new data reduction procedures in accordance with new TALS.

- Sec. 15: Replace reference 335.2 and 335.3 with the EPA 335.4 reference; added applicable reference.
- Sec 16: Added Method modification to specify actual source of reagent information.

- Revision 3b, dated 13 July 2009
  - Sec 2.1: .For each batch of ten samples or less, a matrix spike and matrix spike duplicate will be distilled and analyzed. (Replaced 20 samples to 10 samples per batch).
  - Sec 9.5.1.3 & 9.5.2.2.: Revised Correlation coefficient from 0.997 to 0.995 as per corporate SOP on Calibration curves.
  - Sec 10.3: Up to 10 samples can be put in a batch. .Revised number of samples in a batch from 20 to 10 samples.

- Revision 3a, dated 13 March 2009
  - Sec 1.1: Delete Methods 335.1/.3; Add Method Lachat 10-204-00-1-A (Methods deleted in response to MUR).
  - Sec 3.6: Delete text: If this occurs, a Dow Corning 544 can be added to prevent the foam from collecting in the condenser. Replace the above procedure with: *If this occurs, samples can be acidified with acetic acid (1.6M) to pH 6.0-7.0.*
  - Sec 5.2: Add: Solution is stable for 6 months or when QC check is outside the acceptable limits, whichever comes first, store at 4ºC.
  - Sec 5.4: Acetate Buffer-Dissolve 82.0g of $NaC_2H_3O_2 \times 3 H_2O$ in 100ml DI water. Add glacial acetic acid drop by drop until the pH is 4.5. This solution is stable for 6 months, store at 4ºC. (Changed amount of acetic acid added to reflect actual laboratory practices).
  - Sec 5.6: Remove: Dow Corning 544 antifoam agent. Lab does not use this reagent , samples will be acidified with acetic acid.
  - Sec. 5.7.1, 5.8.2, 5.8.3, 5.8.4: Add: Solution is stable for 6 months, store at room temperature.
  - Sec 5.7.2: 0.25M NaOH. Add: Dissolve 10.0g NaOH into 1L deionized water. Solution is stable for 6 months, store at room temperature.
  - Sec. 5.9.1 & 5.9.2: Add: Store at room temperature.
  - Sec. 5.9.3: Phosphate buffer: In a 1L volumetric flask, dissolve 97g of potassium phosphate, monobasic, anhydrous (KH_2PO_4) in approximately 800ml of deionized water. Dilute to the mark. Solution is stable for one month. Store at room temperature. (Changed reagent preparation to comply with the Lachat method).
  - Sec 6.3: Add: Laboratory Control Sample (LCS): Prepare a 5ppm and 10ppm CN standard by diluting the 1000ppm Primary CN stock. Prepare fresh daily.
    - LLCS: Take 0.25ml of the 5ppm CN standard and bring up to a 50ml final volume with 0.25N NaOH. The true value is 0.025ppm.
    - HLCS: Take 1.0ml of the 10ppm CN standard and bring up to a 50ml final volume with 0.25N NaOH. The true value is 0.2ppm

  - Sec 9.10: Delete text: “Free Cyanide is estimated using the weak acid dissociable procedure following the colorimetric procedure without distillation. For reference refer to SM 4500-CN-A.” Revise the above text to: “*Free Cyanide will be treated following the procedure for the Cyanide Amenable to chlorination and therefore must be distilled.” See Section 9.2*

- Sec. 10.7: MS and MSD Recovery: Delete: The recovery must be within laboratory generated limits. Revise the above text to: *The recovery must be within 90-110% (*Revise MS/MSD recovery to comply with method 335.4).
- Sec. 15.1: References: Replace 335.2 & 335.3 reference with EPA 335.4 reference

Title: Method SW846 3060A, The Alkaline Digestion of Soil and Wipe Samples for the Analysis of Hexavalent Chromium

Once printed, this is considered an uncontrolled document

Approvals (Signature/Date):

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1.0 Scope and Application

1.1 Analytes, Matrix(s), and Reporting Limits

1.1.1 SW846 Method 3060A is an alkaline digestion procedure for extracting Hexavalent Chromium [Cr(VI)] from soluble, adsorbed, and precipitated forms of chromium compounds in soils, sludges, sediments, and similar waste materials. Materials applicable to this method include soil, sediment, debris, brick, concrete, sludge, and precipitate. TestAmerica Edison has modified the method to include digestion of surface wipe samples. To quantify total Cr(VI) in a solid matrix, three criteria must be satisfied: 1) the extracting solution must solubilize all forms of Cr(VI), 2) the conditions of the extraction must not induce reduction of native Cr(VI) to Cr(III), and 3) the method must not cause oxidation of native Cr(III) contained in the sample to Cr(VI). Method 3060A meets these criteria for a wide spectrum of solid matrices.

1.1.2 Method 3060A digestates can be analyzed for hexavalent chromium using Method 7196 (colorimetrically by UV-VIS spectrophotometry). Reference the applicable analytical method SOP for details on reporting limits.

1.1.3 On occasion clients may request modifications to this SOP. These modifications are handled following the procedures outlined in Sections 7 (Review of Work Request) and 19 (Test Methods and Method Validation) of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

2.0 Summary of Method

2.1. This method uses an alkaline digestion to solubilize both water-insoluble (with some exceptions) and water soluble Cr(VI) compounds in solid waste samples. The pH of the digestate must be carefully adjusted during the digestion procedure. The sample is digested using 0.28M Na_2CO_3/0.5M NaOH solution and heating at 90-95ºC for 60 minutes to dissolve the Cr(VI) and stabilize it against reduction to Cr(III).

2.2. Under the alkaline conditions of the extraction, minimal reduction of Cr (VI) or oxidation of native Cr(III) occurs. The addition of Mg^{+2} in a phosphate buffer to the alkaline solution has been shown to suppress oxidation, if observed. The accuracy of the extraction procedure is assessed using spike recovery data for soluble and insoluble forms of Cr(VI) (e.g. K_2Cr2O_7 and $PbCrO_4$), coupled with measurement of ancillary soil properties, indicative of the potential for the soil to maintain a Cr(VI) spike during digestion, such as oxidation reduction potential (ORP), pH, organic matter content, ferrous iron, and sulfides. Recovery of an insoluble Cr(VI) spike can be used to assess the first two criteria, and method-induced oxidation is usually not observed except in soils high in Mn and amended with soluble Cr(III) salts or freshly precipitated $Cr(OH)_3$.

3.0 Definitions

For a complete list of definitions refer to Appendix 5 in the most current revision of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

4.0 Interferences

4.1 When analyzing a sample digestate for total Cr (VI), the reducing/oxidizing tendency of each sample matrix can be determined at the client's request. Establishing the tendency of Cr(VI) to exist or not exist in the unspiked sample(s), assists in the interpretation of QC data for matrix spike recoveries outside conventionally accepted criteria for total metals.

4.1.1 This can be accomplished by characterization of each sample for additional analytical parameters such as pH, ferrous iron, sulfides, and Oxidation Reduction Potential. Other indirect indicators of reducing/oxidizing tendency include Total Organic Carbon (TOC), Chemical Oxygen Demand (COD), and Biological Oxygen Demand (BOD).

4.2 Certain substances, not typically found in the alkaline digests of soils, may interfere in the analytical methods for Cr(VI) following alkaline extraction if the concentrations of these interfering substances are high and the Cr(VI) concentration is low. Refer to the SOP for Method 7196A for the specific agents that may interfere with Cr(VI) quantification.

4.3 For waste materials or soils containing soluble Cr(III) concentrations greater than four times the laboratory Cr(VI) reporting limit, Cr(VI) results obtained using this method may be biased high due to method-induced oxidation. The addition of Mg^{2+} in a phosphate buffer to the alkaline extraction solution has been shown to suppress this oxidation

4.4 A sample containing a high buffering capacity may need to be digested using additional digestion solution.

4.5 It is very important to monitor the temperature of the digestion solution during the digestion to maintain a temperature of 90-95^{o}C during the entire time period.

4.6 Do not use Ghost wipe, Whatman, mixed cellulose ester (MCE) or glass fiber filters for sampling wipes because they convert Cr(VI) to Cr(III). Use either PVC filters or binderless quartz fiber filters.

5.0 Safety

Employees must abide by the policies and procedures in the Corporate Environmental Health and Safety Manual (CW-E-M-001) and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum.

5.1. Specific Safety Concerns or Requirements

Samples that contain high concentrations of carbonates or organic material or samples that are at elevated pH can react violently when acids are added.

5.2. Primary Materials Used

The following is a list of the materials used in this method, which have a serious or significant hazard rating. **Note: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the MSDS for each of the materials listed in the table.** A complete list of materials used in the method can be found in the reagents and materials Section. Employees must review the information in the MSDS for each material before using it for the first time or when there are major changes to the MSDS.

Material (1)	Hazards	Exposure Limit (2)	Signs and symptoms of exposure
Nitric Acid	Corrosive Oxidizer Poison	2 ppm-TWA 4 ppm-STEL	Nitric acid is extremely hazardous; it is corrosive, reactive, an oxidizer, and a poison. Inhalation of vapors can cause breathing difficulties and lead to pneumonia and pulmonary edema, which may be fatal. Other symptoms may include coughing, choking, and irritation of the nose, throat, and respiratory tract. Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and stain skin a yellow or yellow-brown color. Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
Potassium Dichromate	Oxidizer Corrosive Carcinogen	0.1 Mg/M3 TWA as CrO3	Extremely destructive to tissues of the mucous membranes and upper respiratory tract. May cause ulceration and perforation of the nasal septum. Symptoms of redness, pain, and severe burn can occur. Dusts and strong solutions may cause severe irritation. Contact can cause blurred vision, redness, pain and severe tissue burns. May cause corneal injury or blindness.

6.0 Equipment and Supplies

6.1. Equipment

- Digestion vessel: water bath equipped with shaker (Precision, Model 50)
- pH meter: Orion benchtop or equivalent
- Vacuum filtration apparatus
- Analytical balance capable of accurate weighings to 0.01 grams

6.2. Supplies

- Class A volumetric flasks with stoppers
- Filter paper 0.45 and 0.1 um size.
- Nalgene 115-ml filter disposable unit with 0.45um filter
- Binderless quartz fiber filter, 37 or 47 mm diameter, 0.45 mm thick (for wipe analysis)
- Digestion container: 125ml Nalgene small-mouth polypropylene bottles
- Certified thermometer (NIST traceable)-capable of reading 100ºC
- Finnpipet (1-5 ml) with tips
- Graduated cylinder (class A)
- Specimen cups
- Transfer pipettes
- Wood spatulas

7. Reagents and Standards

7.1. Reagents

7.1.1. The following Reagent grade chemicals are used for all solutions required in this test. For stability information, refer to manufacturer's instructions or 2 years from date opened if no instructions are available. All reagents are stored at room temperature:

7.1.1.1. Concentrated Nitric acid
7.1.1.2. Anhydrous Sodium Carbonate
7.1.1.3. Sodium Hydroxide
7.1.1.4. Potassium Dichromate
7.1.1.5. Magnesium Chloride-$MgCl_2$ (anhydrous)
7.1.1.6. Potassium Phosphate, Dibasic
7.1.1.7. Potassium Phosphate, Monobasic

7.1.2. Phosphate Buffer- 0.5M K_2HPO_4/0.5M KH_2PO_4 buffer at pH 7: Dissolve 87.09g K_2HPO_4 and 68.04g KH_2PO_4 into 700ml reagent water. Bring up to a final volume of 1 liter. Store at room temperature. Stable for 6 months.

7.1.3. Digestion Solution: Weigh 20g of NaOH and 30g of Na_2CO_3 and dissolve in a 1 liter volumetric flask using Type I water. Dilute to the mark and then transfer the solution to a tightly capped polyethylene bottle. Store at room temperature. Prepare fresh monthly. **Note**: Check the pH of the digestion solution to be certain it has a pH of greater than 11.5 before using it. If the pH drops below 11.5, a new solution must be prepared.

7.1.4. 1:1 HNO3: Add 500ml DI to a 1 Liter volumetric flask and then slowly add 500ml of concentrated HNO3. Solution is stable for 6 months. Store at room temperature.

7.2. Standards

7.2.1. Potassium Dichromate Primary Standard Solution (1000 mg/L Cr+6):

Weigh 0.2829 g of Potassium Dichromate ACS grade, J.T. Baker, cat# 3093-01 (dried for 1 hour at 105ºC) and dissolve in deionized water in a 100 ml flask. Dilute to the mark. Store at room temperature. Solution is stable for 6 months.

7.2.2. Potassium Dichromate Secondary Standard Solution (1000 mg/L Cr+6): Weigh 0.2829 g of Potassium Dichromate ACS grade, J.T. Baker, cat# 3090-04 (dried for 1 hour at 105ºC) and dissolve in deionized water in a 100 ml flask. Dilute to the mark. **Note**: Prepare the Secondary standard solution from a different source than what was used to prepare the primary standard solution. Stable for 6 months, store at room temperature.

7.2.3. Hexavalent Chromium Primary Spiking Solution (100 mg/L Cr+6) Prepare by adding 10 ml of 1000 mg/L Cr+6 primary standard (Section 7.2.1) to a 100 ml volumetric flask and dilute to volume with deionized water. Stable for 6 months, store at room temperature.

7.2.4. Hexavalent Chromium Secondary Spiking Solution (100 mg/L Cr+6) Prepare by adding 10 ml of 1000 mg/L Cr+6 Secondary standard (Section 7.2.2) to a 100 ml volumetric flask and dilute to volume with deionized water. Stable for 6 months, store at room temperature.

7.2.5. Lead Chromate-AR Grade; for storage and stability information, refer to manufacturer's instructions

8. Sample Collection, Preservation, Shipment and Storage

Sample container, preservation techniques and holding times may vary and are dependent on sample matrix, method of choice, regulatory compliance, and/or specific contract or client requests. Listed below are the holding times and the references that include preservation requirements.

Matrix	Sample Container[1]	Min. Sample Size	Preservation	Holding Time[3]	Reference
Soils	Glass or plastic	2.50g[2]	Cool 4 ±2ºC	30 Days	SW 846 Method 3060A
Wipes[4]	Glass or plastic	1 wipe	Cool 4 ±2ºC	30 Days	SW 846 Method 3060A

[1] Containers should not contain stainless steel
[2]Additional volume may be required if the sample is chosen for QC or if a re-prep is required.
[3]The alkaline digestate must be analyzed within 168 hours after extraction from the soil or wipe.
[4]In chrome plating environments, wipe samples taken on a PVC filter or an uncoated binderless quartz fiber filter, should be placed in a vial containing 5 mL of an aqueous solution containing 10% Na_2CO_3 with 2% $NaHCO_3$ immediately after sampling to eliminate the interference from the acid used in the chrome plating process. An alternate medium

which does not require extraction in the field is a binderless quartz fiber filter coated with 1% NaOH.

9. Quality Control

9.1. Sample QC - The following quality control samples are prepared daily with each batch of 20 samples or less, whichever is more frequent. Soil and wipe samples must be divided into separate QC batches.

9.1.1. Method Blank:

- *Soil Samples:* One method blank must be digested and analyzed per soil batch. A method blank consists of 50 ml digestion solution and is carried through the entire analytical procedure. The concentration of the method blank must be less than the reporting limit or the entire batch must be re-digested and re-analyzed.

- *Wipe Samples:* One method blank must be digested and analyzed per wipe batch. The method blank will consist of a blank wipe and 50 ml digestion solution and will be carried through the entire analytical procedure. The concentration of the method blank must be less than the reporting limit or the entire batch must be re-digested and re-analyzed.

9.1.2. Laboratory Control Sample (Soils and wipes): Laboratory control samples from Secondary sources, shall be digested and analyzed per batch as follows:

9.1.2.1 Soil LCS:

- **LCS Soluble (LCSSRM):** Obtained from an independent source (ERA). Prepare the LCS soluble solution by diluting the concentrated LCS solution as indicated in the manufacturer's instructions. If necessary, prepare a different dilution so that the concentration after analysis falls within the calibration curve. Add 5ml of the diluted LCS soluble solution into 50ml digestion solution. The results must be within vendor specified QC limits or the entire batch must be re-digested and re-analyzed. Document the preparation of the LCS soluble solution in the TALS reagent module.

- **LCS Insoluble (LCSI):** Prepared by adding 0.011g of PbCrO4 into 50ml digestion solution. The results must be within 80-120% of the true value or the entire batch must be re-digested and re-analyzed.

- **LCS matrix matched (LCSSRM):** Obtained from an independent source (ERA). Add 2.5g of the soil LCS into 50ml digestion solution. The results must be within vendor specified QC limits or the entire batch must be re-digested and re-analyzed. This LCSSRM is included in DKQP guidelines however it is not reported to clients.

9.1.2.2 Wipe LCS/LCSD:

For wipe sample batches, a Laboratory Control Sample (LCS)/Laboratory Control Sample Duplicate must be prepared using the LCS soluble solution. Add a blank wipe to the digestion bottles for each of the LCS and LCSD and follow the prep for LCS Soluble detailed in Section 9.1.2.1 above.

9.1.3. **Predigestion Matrix Spikes (Soils only):** Both the soluble and insoluble pre-digestion matrix spikes must be analyzed per batch of ≤ 20 soil samples.

9.1.3.1. **Soluble Matrix Spike (MSS):** spike the sample with 1.0 ml of the 100 ppm Cr (VI) primary spiking solution prepared in Section 7.2.3 (equivalent to 40mg/kg Cr (VI)).

9.1.3.2. **Insoluble Matrix Spike (MSI):** to a separate sample aliquot add 0.011g of $PbCrO_4$. It is used to evaluate the dissolution during the digestion process.

9.1.3.3. Both matrix spikes are then carried through the digestion process. The acceptance range for the matrix spike recoveries is 75-125%. If the matrix spike recoveries fall outside these recovery limits, the entire batch must be rehomogenized, redigested, and reanalyzed.

9.1.3.4. If either matrix spike recovery is outside of the acceptable range of 75-125% but, the LCS is within the criteria specified in Section 9.1.2, additional laboratory characterization of each sample in the batch for ORP and pH can be performed at the client's request to determine if the sample exhibits reducing conditions. Further characterization for total sulfides, total organic carbon, chemical oxygen demand, or biological oxygen demand may be required by the client.

9.1.4. **Duplicate (DU) (Soils only):** One duplicate laboratory sample must be analyzed per soil batch. The sample used for the predigestion spike should be used for this purpose. Duplicate samples must have a Relative Percent Difference (RPD) of ≤20%, if both the original and the duplicate are ≥ four times the laboratory reporting limit. A control limit of ± 2.0mg/kg (laboratory reporting limit) is used when either the original or the duplicate sample is < four times the laboratory reporting limit.

9.1.5. **Post Digestion Spike (PDS) (Soils only):** Following the analysis (colorimetric determination), a post-digestion spike must be analyzed per soil batch. The spike concentration must be equivalent to 40mg/kg or twice the sample concentration, whichever is greater. The post digestion spike must be performed on a field sample, not on a field blank or preparation blank. It would be helpful to perform this analysis on the sample used for the matrix spike. Recovery limits for the post-digestion spike are 85-115%. If the post digestion spike fails to meet the recovery limits, a new aliquot of the sample

must be re-spiked and re-analyzed as described in SOP ED-WET-011 (The Analysis of Digestates for Hexavalent Chromium by SW846 7196A).

9.2. Instrument QC

See applicable analytical SOP, ED-WET-011 (The Analysis of Digestates for Hexavalent Chromium by SW846 7196A).

10. Procedure

10.1. Sample Preparation

10.1.1. Homogenize soil samples following TestAmerica Edison SOP ED-GEN-007 (Subsampling).

10.1.2. Weigh 2.5g ± 0.10g of sample into a clean labeled 125ml nalgene bottle. Record weight up to two decimal places. For wipe samples, add 1 sample wipe into a clean labeled 125 ml nalgene bottle.

10.1.3. Add 50 +/- 1.0ml of digestion solution to each sample. Then add 400mg of MgCl2 and 0.5ml of 1.0M Phosphate Buffer.

10.1.4. Matrix spike preparation (soils only): Spike the samples designated MS soluble and MS insoluble as detailed in Section 9.1.3. Add 50 +/- 1.0ml of digestion solution to each sample followed by 400mg of MgCl2 and 0.5ml of 1.0M Phosphate Buffer.

10.1.5. LCS preparation: For soil samples, prepare as detailed in Section 9.1.2.1. For wipe samples, prepare as detailed in Section 9.1.2.2. Add 400mg of MgCl2 and 0.5ml of 1.0M Phosphate Buffer.

10.1.6. Place all samples in hot water bath at a temperature of 90-95ºC and begin shaking at 175rpm for 5 minutes. Then release pressure by venting the caps. After the caps are resealed tightly, begin heating and shaking for 60 minutes. Start timing after the water bath has returned to 90-95ºC and maintain this temperature throughout the 60 minute digestion.

10.1.7. Measure and record the digestion start time and temperature, time and temperature after 30 minutes, and the digestion end time and temperature. Use a calibrated thermometer to measure the temperature of one of the samples in the water bath.

10.1.8. Following the heated digestion, gradually cool the solution to room temperature and quantitatively transfer the contents of the bottle to the vacuum filtration apparatus with Type I water rinses. Filter the digestate through a 0.45um filter (commercially purchased filter). Transfer the rinsates and filtrate to a clean labeled 100ml plastic cup. (**Note**: Use a polyethylene bottle if the colorimetric analysis is not following immediately).

10.1.9. Determine the concentration of hexavalent chromium in the sample extract using Method 7196A USEPA SW846 3rd Edition, (TestAmerica Edison SOP ED-WET-011, The Analysis of Digestates for Hexavalent Chromium by SW846 7196A).

10.2. Calibration:

Refer to the applicable analytical SOPs: TestAmerica Edison SOP ED-WET-011, The Analysis of Digestates for Hexavalent Chromium by SW846 7196A.

10.3. Sample Analysis

Refer to the applicable analytical SOPs: TestAmerica Edison SOP ED-WET-011, The Analysis of Digestates for Hexavalent Chromium by SW846 7196A.

11.0. Calculations / Data Reduction

11.1. Calculations:

Refer to the applicable analytical SOP (ED-WET-011) for calculations.

11.2. Data Reduction:

11.2.1. All sample preparation information is recorded directly in the logbook and in TALS at the time of sample preparation.

11.2.2. Record reagent information in the prep batch information (this can be viewed in the “batch information” page).

11.2.3. Record special comments and observations in the ‘worksheet’ tab.

11.2.4. The logbook pages for the prep are attached to the analytical batch as pdf files.

11.2.5. Complete the Data Review Checker (DRC) in TALS: Prior to data submission the analyst must execute the DRC (Data Review Checker) program in the applicable analytical batch (TALS Analyst Desktop II module).

11.2.5.1. Open the analytical batch and click on the Edit tab above to enter the Edit Mode.

11.2.5.2. Press F8 command key on the computer keyboard or right click anywhere on the batch worksheet then click on ‘Run checklist.’

11.2.5.3. Acknowledge by filling in responses to all unacknowledged findings. Highlight the checklist with findings, then highlight the associated list of findings; right click and choose ‘Acknowledge Item.’

11.2.5.4. Fill in appropriate comments in the response box, then hit 'OK.' 'The column labeled 'unacknowledged findings' should show '0' for all questions once completed; then batch is ready for 2nd level review.

12.0. Method Performance

12.1. Method Detection Limit Study (MDL)

The method detection limit (MDL) is the lowest concentration that can be detected for a given analytical method and sample matrix with 99% confidence that the analyte is present. The MDL is determined according to the laboratory's MDL procedure in Section 19 (Test Methods and Method Validation) of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM). MDLs reflect a calculated (statistical) value determined under ideal laboratory conditions in a clean matrix, and may not be achievable in all environmental matrices. The laboratory maintains MDL studies for analyses performed; these are verified at least annually unless method requirements require a greater frequency.

12.2. Demonstration of Capabilities

For DOC procedure refer to Section 19 in the most current revision of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

12.3. Training Requirements

Refer to TestAmerica SOP No. ED-GEN-022, Training, for the laboratory's training program.

13.0. Pollution Control

It is TestAmerica's policy to evaluate each method and look for opportunities to minimize waste generated (i.e., examine recycling options, ordering chemicals based on quantity needed, preparation of reagents based on anticipated usage and reagent stability). Employees must abide by the policies in Section 13 of the Corporate Environmental Health and Safety Manual (CW-E-M-001) for "Waste Management and Pollution Prevention."

14.0. Waste Management

14.1. Waste management practices are conducted consistent with all applicable rules and regulations. Excess reagents, samples and method process wastes are disposed of in an accepted manner. Waste description rules and land disposal restrictions are followed. Waste disposal procedures are incorporated by reference to TestAmerica SOP No. ED-SPM-008 (Laboratory Waste Disposal Procedures).

14.2. The following waste streams are produced when this method is carried out:

- Soil Retain Samples - These samples if not flagged in the system for any hazardous constituents are transferred to poly-lined cubic yard boxes. These

boxes when full are sent to stabilization or incineration. These materials are sent out as hazardous for lead and chromium.

Teris Profile Number (incineration): 50016710
Onyx Profile Number: (stabilization) 402535

- Sample waste-After analysis, the samples and standards are collected in a polyethylene container labeled 'Cr (VI) waste.' Once the container is full, it is brought to the waste room for disposal.

15.0. References / Cross-References

15.1. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, 3rd ed., U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. U.S. Government Printing Office: Washington, DC, 1995; SW-846, Method 3060A.

15.2. Occupational Health and Safety Administration (OSHA) Method W4001, Hexavalent Chromium, Methods Development Team, OSHA Salt Lake Technical Center, Salt Lake City, UT, April 2001.

15.3. TestAmerica Edison Document No. ED-QA-LQM, *Laboratory Quality Manual*, most current revision.

15.4. TestAmerica Edison SOP ED-GEN-022, *Training*, most current revision.

15.5. TestAmerica Edison SOP No. ED-SPM-008, *Laboratory Waste Disposal Procedures*, current revision.

15.6. Test America Edison SOP ED-WET-011, The Analysis of Digestates for Hexavalent Chromium by SW846 7196A, most current revision.

16.0. Method Modifications:

The method has been modified to include procedures specific to the digestion of wipe samples.

17.0. Attachments

N/A

18.0. Revision History

- **Revision 13.1, dated 08 January 2021**
  - Updated SOP header with Eurofins emblem; no procedural change.
  - Sec 3: Revised the Definitions location as per the most current LQM.

- **Revision 13, dated 14 February 2019**

  - Sec. 9.1.2: Added matrix matched LCS applicable to DKQP projects.
  - Sec. 11.2.5: Revised the use of data review paper checklist to TALS DRC review, instructions added.
  - Deleted reference WI# EDS-WI-008 in Sec 15.7, not applicable.
  - Updated approval signatures to current.

- **Revision 12, dated 20 November 2014**

  - Removed references to SW846 7199 throughout the SOP; laboratory no longer perform this method.
  - Sec. 9.1.2: Revised the LCSS limits from +/-15% to vendor's certified limits to reflect actual laboratory practices.
  - Sec. 9.1.3.3: Removed notation that redigestion/reanalysis of batch is only for NJ sites or with PM/client's advice; Re-digestion and reanalysis is performed for all failed QC batch and is a method requirement.
  - Sec. 10.1.7: Revised procedures for checking sample temperature during sample digestion; temperature of the sample will be checked at start, middle and end of digestion.

- **Revision 11, dated 11 December 2012**

  - Sec 1 and 12: Updated LQM section references to reflect the most current LQM revision.
  - Sec 9.1.2 (LCSI) and 9.1.3.2 (MSI): Deleted 0.012g to reflect actual laboratory practices.

- **Revision 10, dated 18 November 2010**

  - Section 1.1: included statement regarding the modification of the method for preparation of wipe samples.
  - Section 1.1.2: removed soil RL details and included statement referring reader to the applicable method SOP for RL details.
  - Section 4.1: Oxidizing/reducing parameters will be analyzed if requested by the client.
  - Section 4.6: Added interferences for wipe samples.
  - Section 6.2: Removed bottle top dispenser from list of supplies. Added graduated cylinder, specimen cups, transfer pipettes, and binderless quartz fiber filters to the list of supplies.
  - Section 7.1: Reformatted Reagents Section. Added Potassium Phosphate, Dibasic and Potassium Phosphate, Monobasic to list of reagents.
  - Section 8.0: Added wipes to the sample collection, preservation, shipment, and storage Section.

- Section 9.1: Modified Sample QC Section to specify wipe criteria. Added Sections 9.1.2.1 and 9.1.2.2 to differentiate the LCS procedures for soils and wipes.
- Section 9.1.3.4: Section was revised to specify the additional laboratory characterization only when required by the client.
- Sections 9.1.3, 9.1.4 and 9.1.5: added language to clarify that these QC types apply only to soils (and not to wipes).
- Section 10.1.2: added procedures for wipe sample preparation.
- Section 10.1.5 and 10.1.6: added to detail the QC sample (LCS and matrix spike) prep procedures for soils and wipes.
- Section 11.0: Replaced all calculations with a reference to the applicable analytical method SOP. Add
- Section 15.0: Added reference for OSHA Method W4001, Hexavalent Chromium (wipe sample methodology).
- Section 16.0: added method modification language for addition of wipe samples.

- **Revision 9, dated 03 February 2010**
  - Section 9.1.3.1: Changed MS to MSS to be consistent with TALS naming convention.
  - Section 10.1.3: Added Section (previously part of Section 10.1.4) to clarify that spike should be added directly to the sample aliquot prior to the addition of the digestion solution, magnesium chloride, and phosphate buffer. Subsequent Sections adjusted.
  - Section 10.1.4: Section added to include LCS soluble and LCS insoluble. Subsequent Sections adjusted.

- **Revision 8, dated 25 August 2009**
  - Revised SOP format in accordance with TestAmerica Corporate Quality SOP No. CW-QS-002 (Rev 0) Writing a Standard Operating Procedure (SOP).
  - Section 1.1.2: Added reporting limit.
  - Section 7.1.8: Added prep information.
  - Removed midpoint calibration checks standard (CCS) and Calibration blank in the QC Section, both QC samples are not applicable to this SOP.
  - Deleted pH adjustment procedure, previously named Section 9.6; this procedure will be included in the analytical SOP.
  - Section 15: Added applicable references.

- **Revision 7b, dated 30 April 2009**
  - Section 5.6: Added stability and storage information.
  - Section 5.7: Added stability information
  - Section 5.8: Added stability information

- Section 10.8: Added information about the pH adjusted PS to conform to method requirements.
- Section 15: Added applicable references.

- **Revision 7a, dated 10 February 2009**

  - Section 4.4: Add filter size to Nalgene 115-ml disposable filter.
  - Section 4.10: Add Bottle top dispenser use for adding the digestion solution.
  - Section 4.11: Add Wood spatulas; Use wooden spatulas instead of the stainless steel spatulas.
  - Section 6.1: Delete pre-made standard purchased from Inorganic Ventures. Cr6+ Primary Standard will be prepared in the lab.
  - Section 6.2: Specified source of the 1000 ppm Cr6+
  - Section 6.3 and 6.6: Delete 10mg/l Cr6+ standards; Working standard 10mg/L Cr+6 is not utilize for soil analysis.
  - Section 10.3: expanded LCS information to include preparation information for both LCSs.
  - Section 10.4.2: Specified the exact amount of PbCrO4 added to the insoluble matrix spike.
  - Section 6.5: Added storage information.
  - Section 6.4: Added text: source must be different from the primary standard.
  - Section 9.3: Expanded Section to include the spiking of LCS and MS.
  - Section 9.4: Expanded Section to include recording specific information for the water bath.

- **Revision 7, dated March 2007**

  - Section 10.3: Revised to specify the types of LCS used including their source and acceptance limits.
  - Section 10.6: Deleted the requirement that ‘CCS is taken through the entire digestion process to reflect actual laboratory practices.

- **Revision 6, dated 30 October 2006**

  - Section 9.6.3: Corrected referenced SOP number from EDS-WET-010 to EDS-WET-011.
  - Section 10.5:Revised first sentence to read “One duplicate laboratory sample per batch *must* be analyzed.” (‘Must’ previously read ‘should’).
  - Section 10.4.3: The text in italics was added to the following sentence in Section 10.4.3:
    “NOTE: If the spiked sample concentration is greater than 4x the predigestion spike concentration, no redigestion/reanalysis is required unless the samples are from a NJ site in which case the lab project manager should be contacted for further guidance.”
  - Section 10.8: Added the following text:
    “If the Post Digestion Spike fails to meet recovery limits, a new aliquot of the sample must be re-spiked and re-analyzed.

Title: The Analysis of Digestates for Hexavalent Chromium by EPA SW846 7196A

Once printed, this is considered an uncontrolled document

Approvals (Signature/Date):

Jasmine Parillo Department Manager	9/23/2024 Date	Dan Helfrich Health and Safety Manager	9/20/2024 Date
Carl Armbruster Quality Assurance Manager	9/23/2024 Date	Mark Acierno Laboratory Director	9/21/2024 Date

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1.0 Scope and Application

1.1 Analytes, Matrix(s), and Reporting Limits

1.1.1 This SOP is applicable to the determination of hexavalent chromium digestates of solid samples using SW846 Method 7196A. Solid samples must be first digested according to Method 3060A USEPA SW846 3rd Edition, TestAmerica Edison SOP ED-WET-010 (The Alkaline Digestion of Soil Samples for the analysis of hexavalent chromium).

1.1.2 The laboratory's reporting limit for hexavalent chromium in soil is 2.0 mg/kg.

1.1.3 On occasion clients may request modifications to this SOP. These modifications are handled following the procedures outlined in Sections 7 (Review of Work Request) and 19 (Test Methods and Method Validation) of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

2.0 Summary of Method

Solid samples are digested utilizing SOP ED-WET-010, alkaline digestion of soil samples via Method 3060A. Following the sample preparation and digestion procedure, dissolved hexavalent chromium is determined spectrophotometrically at 540 nm by reaction with diphenylcarbazide in acid solution.

3.0 Definitions

For a complete list of definitions refer to Appendix 2 in the most current revision of TestAmerica Edison's Quality Assurance Manual (ED-QA-LQM).

4.0 Interferences

4.1 Molybdenum and Mercury react to form color with diphenylcarbazide, however the intensity of color is much lower than those for chromium at the specified pH. Concentrations up to 200 mg/L can be accepted.

4.2 Vanadium interferes strongly, but can be tolerated up to 10 times the concentration of Cr (VI) present.

4.3 Iron may cause a yellow color but should not affect the colorimetric measurement at 540 nm.

4.4 Reducing matter may reduce hexavalent Cr to trivalent Cr in varying amounts. No preventative measure is available at this time; however, interference is checked by post digestion spike samples.

4.4.1 The reducing/oxidizing tendency of each matrix may be determined by characterization of samples for additional analytical parameters, such as pH, ferrous iron, sulfides, and Oxidation Reduction Potential. Other indirect indicators of reducing/oxidizing tendency include Total Organic Carbon

(TOC), Chemical Oxygen Demand (COD), and Biological Oxygen Demand (BOD).

4.5 For waste materials or soils containing soluble Cr (III) concentrations greater than four times the laboratory Cr (VI) reporting limit, Cr (VI) results obtained using this method may be biased high due to method-induced oxidation.

5.0 Safety

Employees must abide by the policies and procedures in the Corporate Environmental Health and Safety Manual (CW-E-M-001) and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum.

5.1. Specific Safety Concerns or Requirements

Samples that contain high concentrations of carbonates or organic material or samples that are at an elevated pH can react violently when acids are added.

5.2. Primary Materials Used

The following is a list of the materials used in this method, which have a serious or significant hazard rating. **Note: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the MSDS for each of the materials listed in the table.** A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the MSDS for each material before using it for the first time or when there are major changes to the MSDS.

Material (1)	Hazards	Exposure Limit (2)	Signs and symptoms of exposure
Nitric Acid	Corrosive Oxidizer Poison	2 ppm-TWA 4 ppm-STEL	Nitric acid is extremely hazardous; it is corrosive, reactive, an oxidizer, and a poison. Inhalation of vapors can cause breathing difficulties and lead to pneumonia and pulmonary edema, which may be fatal. Other symptoms may include coughing, choking, and irritation of the nose, throat, and respiratory tract. Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and stain skin a yellow or yellow-brown color. Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
Potassium Dichromate	Oxidizer Corrosive Carcinogen	0.1 Mg/M3 TWA as CrO3	Extremely destructive to tissues of the mucous membranes and upper respiratory tract. May cause ulceration and perforation of the nasal septum. Symptoms of redness, pain, and severe burn can occur. Dusts and strong solutions may cause severe irritation. Contact can cause blurred vision, redness, pain and severe tissue burns. May cause corneal injury or blindness.
Sulfuric Acid	Corrosive Oxidizer Dehydrator Poison Carcinogen	1 Mg/M3-TWA	Inhalation produces damaging effects on the mucous membranes and upper respiratory tract. Symptoms may include irritation of the nose and throat, and labored breathing. Symptoms of redness, pain, and severe burn can occur. Contact can cause blurred vision, redness, pain and severe tissue burns. Can cause blindness.

6.0 Equipment and Supplies

6.1. Instrument

- Spectrophotometer for use at 540 nm, providing a light path of 1cm or longer
- pH meter, Orion benchtop or equivalent

6.2. Supplies

- Nalgene 115-ml disposable filter unit with 0.45um filter
- Membrane filters, 0.45um and 0.1 um
- Specimen cups (plastic)
- Eppendorf or Finnpipettes, varying volumes
- Class A volumetric flasks
- Class A graduated cylinder
- Vacuum pump
- Magnetic stirrer (Teflon coated)
- Transfer pipettes

7. Reagents and Standards

7.1. Reagents

7.1.1. Sulfuric acid (10% v/v): Measure 100 ml of concentrated reagent grade H_2SO_4 into a 1000 ml volumetric flask (1/2 filled w/D.I. water) and dilute to mark with deionized water. Stable for six months, store at room temperature.

7.1.2. Indicator solution (DPC): Place 5.0 g 1,5-Diphenylcarbazide (AR Grade) in an amber 1000 ml volumetric flask and dilute to mark with acetone. Prepare monthly or when solution becomes cloudy. Store at room temperature.

7.1.3. Acetone: reagent grade; for stability and storage information refer to manufacturer's instructions.

7.1.4. 1:1 HNO3: Add 500ml DI to a 1 Liter volumetric flask and then slowly add 500ml of concentrated reagent grade HNO3. Solution is stable for 6 months. Store at room temperature.

7.1.5. 1N NaOH: Place 4.0g reagent grade NaOH in a 100ml volumetric flask and dilute to the mark with deionized water. Stable for six months, store at room temperature.

7.2 Standards

7.2.1 Potassium Dichromate Primary Standard Solution (1000 mg/L Cr+6): Weigh 0.2829 g of Potassium Dichromate ACS grade, J.T. Baker, cat# 3093-01 (dried for 1 hour at 105ºC) and dissolve in deionized water in a 100 ml flask. Dilute to the mark. Stable for 6 months, store at room temperature.

7.2.2 Potassium Dichromate Secondary Standard Solution (1000 mg/L Cr+6): Weigh 0.2829 g of Potassium Dichromate ACS grade, J.T. Baker, cat# 3090-04 (dried for 1 hour at 105ºC) and dissolve in deionized water in a 100 ml flask. Dilute to the mark. **Note**: Prepare the secondary standard from a source or lot different from the primary standard solution. Stable for 6 months, store at room temperature.

7.2.3 Hexavalent Chromium Primary Spiking Solution (100 mg/L Cr+6): Prepare by adding 10 ml of 1000 mg/L Cr+6 primary standard (Sec 7.2.1) to a 100 ml volumetric flask and dilute to volume with deionized water. Stable for 6 months, store at room temperature.

7.2.4 Hexavalent Chromium Secondary Spiking Solution (100 mg/L Cr+6) Prepare by adding 10 ml of 1000 mg/L Cr+6 secondary standard (Sec 7.2.2) to a 100 ml volumetric flask and dilute to volume with deionized water. Stable for 6 months, store at room temperature.

7.2.5 Lead Chromate: AR Grade; for stability and storage information refer to manufacturer's instructions.

8. Sample Collection, Preservation, Shipment and Storage

Sample container, preservation techniques and holding times may vary and are dependent on sample matrix, method of choice, regulatory compliance, and/or specific contract or client requests. Listed below are the holding times and the references that include preservation requirements.

Matrix	Sample Container [1]	Min. Sample Size[2]	Preservation	Holding Time [3]	Reference
Soils	Glass, plastic	2.5 grams	Cool 4 ± 2°C	30 Days - *from sampling to extraction*	SW846 Method 3060A
				168 Hours – *from extraction to determinative analysis*	SW846 Method 7196A

[1] Containers should not contain stainless steel
[2] Additional volume may be required if the sample is chosen for QA or if a re-prep is required.
[3]The alkaline digestate must be analyzed within 168 hours after extraction from the soil.

9. Quality Control

9.1. **Sample QC** - The following quality control samples are prepared with each batch of 20 samples or less.

9.1.1. Method Blank: One method blank must be digested and analyzed per batch. A method blank consists of 50 ml digestion solution and is carried through the entire digestion and analytical procedure. The concentration of the method blank must be less than the reporting limit or the entire batch must be re-digested and re-analyzed.

9.1.2. Laboratory Control Sample: Two secondary source (LCS) shall be digested and analyzed per batch.

- **LCS soluble (LCSSRM)** is obtained from an independent source (Phenova). Prepare the LCS soluble solution by diluting the concentrated LCS solution as indicated in the manufacturer's instructions. If necessary, prepare a different dilution so that the concentration after analysis falls within the calibration curve. Add 5ml of the diluted LCS soluble solution into 50ml digestion solution. The results must be within vendor specified QC limits or the entire batch must be redigested and re-analyzed. Document the preparation of the LCS soluble solution in the Reagent module in TALS.

- **LCS insoluble (LCSI)** is prepared by adding 0.010g-0.020g of PbCrO4 into 50ml digestion solution. The results must be within 80-120% of the true value or the entire batch must be redigested and re-analyzed. (Typical amount of $PbCrO_4$ added to LCSI is 0.011g, this is equivalent to 708 mg Cr (VI)/Kg).

9.1.3. Predigestion Matrix Spikes: Both a soluble and insoluble pre-digestion matrix spikes must be analyzed per batch of ≤ 20 field samples.

9.1.3.1 Soluble matrix spike (MSS): spike the sample with 1.0 ml of the 100 ppm Cr (VI) primary spiking solution prepared in Sec 7.2.3 (equivalent to 40mg/kg Cr(VI)).

9.1.3.2 Insoluble matrix spike (MSI): to a separate sample aliquot add 0.010g- 0.020g of $PbCrO_4$. It is used to evaluate the dissolution during the digestion process. Typical amount of $PbCrO_4$ added to LCSI is 0.011g, this is equivalent to 708 mg Cr (VI)/Kg.

9.1.3.3 Both matrix spikes are then carried through the digestion process. The acceptance range for the matrix spike recoveries is 75-125%. If the matrix spike recoveries fall outside these recovery limits, the entire batch must be rehomogenized, redigested, and reanalyzed.

- Note: If redigesting/reanalyzing the batch, the Soluble matrix spike (MSS) is spiked at twice the sample concentration or 40mg/kg Cr(VI) whichever is greater.

9.1.3.4 If upon reanalysis, the matrix spike is not within the recovery limits of 75%-125%, but the LCS is within the criteria specified in Section 9.1.2, additional laboratory characterization of each sample in the batch for ORP (see Eurofins Edison SOP ED-WET-066, Redox by SM2580) and pH (see Eurofins Edison SOP ED-WET-061, pH Soil by SW846 9045C) may be required by the client to determine if the sample exhibits reducing conditions. Further characterization for total sulfides, Total Organic Carbon (TOC), Chemical Oxygen Demand (COD), or Biochemical Oxygen Demand (BOD) may also be required by the client.

9.1.4. Duplicate (DU): One duplicate laboratory sample must be analyzed per batch. The sample used for the predigestion spike should be used for this purpose. Duplicate samples must have a Relative Percent Difference (RPD) of ≤20%, if both the original and the duplicate are ≥ four times the laboratory reporting limit. A control limit of ± 2.0mg/kg (laboratory reporting limit) is used when either the original or the duplicate sample is < four times the laboratory reporting limit.

9.1.5. Post Digestion Spike (PDS): Following the analysis (colorimetric determination), a post-digestion spike must be analyzed per batch. The spike concentration must be equivalent to 40mg/kg or twice the sample concentration, whichever is greater. To spike the extract with 40mg/Kg Cr

(VI), add 0.50 ml of 100 ppm Cr (VI) primary standard to a 50.0 ml alkaline extract, pour out 45.0 ml of the spiked sample and add color indicator and adjust pH (see Sec 10.3.4 & 10.3.5); bring the final volume to 50ml with deionized water. The post digestion spike must be performed on a field sample, not on a field blank or preparation blank. If possible perform the post digestion spike analysis on the sample used for the matrix spike. Recovery limits for the post-digestion spike are 85-115% of the true value. If the post digestion spike fails to meet the recovery limits, a post spike must be re-analyzed using the alkaline extract. Adjust the pH of the sample Duplicate (alkaline extract) back up to 8.0-8.5 using 1N NaOH; then respike and reanalyze following Sec. 10.3.4-10.3.5.

9.2. Instrument QC

9.2.1. Initial Calibration Verification (ICV): The ICV (0.50 mg/L Cr (VI)) is analyzed immediately after an acceptable initial calibration. The ICV standard must be from a source separate from the calibration standards (i.e., different manufacturer or separate lot) and its recovery must be within ±10% of the expected value. The ICV is prepared and analyzed similar to the calibration standards; prepare by adding 0.5 ml of 100 ppm Cr (VI) Secondary Spiking Solution (Sec. 7.2.4) into a specimen cup containing 50 ml of digestion fluid. If the measured concentration exceeds the ±10% limit, a second analysis should be performed. If the result still exceeded the ±10% limit, the analysis should be terminated until the source of the problem is identified and corrected.

9.2.2. Continuing Calibration Verification (CCV): A CCV is a mid-point calibration Cr (VI) standard (0.5ppm) from a different source than the calibration standards. Add 0.5 ml of 100 ppm Cr (VI) Secondary Spiking Solution (Sec. 7.2.4) into a specimen cup containing 50 ml of digestion fluid. The CCV is analyzed after every 10 samples (20 readings including backgrounds), and after reading the last sample. Acceptance criteria for the CCV are 90-110% of the true value. If the result is not within the acceptance limits, all samples following the last acceptable CCV must be re-analyzed.

9.2.3. Initial Calibration Blank and Calibration Check Blank (ICB,CCB): An initial calibration blank (ICB) must be analyzed immediately following the calibration curve and a continuing calibration blank (CCB) is analyzed after each CCV. The sample consists of 50 ml digestion solution and is carried through the entire analytical procedure. The concentration of the CCB must be below the reporting limit if not, all samples following the last acceptable CCB must be re-analyzed.

10. Procedure

10.1. Sample Preparation:

10.1.1. Just prior to analysis, SLOWLY adjust the pH of the sample extract to a pH of 7.0-8.0 with constant stirring using 1:1 nitric acid. Record pH and time. If a flocculent precipitate forms after the addition of 1:1 HNO3, filter the sample through a 0.45 um membrane filter, a larger size filter may be used to pre-filter the sample. Monitor the pH with a calibrated pH meter. If the pH drops below 7.0, discard the sample extract and re-digest the sample.

10.1.1.1. Remove and rinse the stir bar. Quantitatively transfer the sample extract to a 100 ml volumetric flask and dilute to the mark with deionized water.

10.1.1.2. If necessary, the solution can be diluted to eliminate the effects of color on the analytical determination. Use the smallest dilution necessary and record results.

10.2. Calibration

10.2.1. Prepare fresh calibration standards everyday or before each analysis.

10.2.2. Prepare a set of 6 calibration standards. Prepare 0.0, 0.05, 0.1, 0.5, 0.75, and 1.25 mg/l $K_2Cr_2O_7$ standards by aliquoting 0, 0.05, 0.1, 0.5, 0.75 and 1.25 mls of 100ppm Cr (VI) Primary Spiking Solution (Sec 7.2.3) respectively into the specimen cups containing 50mls of digestion fluid. At the same time prepare the mid-point Initial Calibration Verification and Initial Calibration Blank, see Sec 9.2.

10.2.3. Adjust pH to 7.5±0.5 with 1:1 HNO_3 and dilute to 100 ml with DI water. Record pH reading and analysis time in the logbook.

10.2.4. Develop the color for the standards as explained in Section 10.3 of this SOP.

10.2.5. Following the preparation of the calibration standards, “zero” the spectrophotometer with the 0 ppm standard. Analyze the standards.

10.2.6. The correlation coefficient must be 0.995 or better.

10.2.7. After calibration is entered into TALS, calculate %RE (%relative error) on two calibration standards, the standard at or near the mid-point of the calibration and the standard at the lowest level. Go to calibration events and click on details, review the column labeled ‘read back amount’ and ‘% Error’ for the low standard and midpoint standard.

Low standard (10ppb): The %RE (relative error) must be +/- 50%; if not, stop the analysis and recalibrate.

Mid-point normal (75ppb): The %RE (relative error) must be +/- 10%; if not, stop the analysis and recalibrate

10.2.8. Immediately following calibration of the spectrophotometer and before reading samples, verify the calibration of the spectrophotometer by analyzing an ICV and ICB.

10.3. Sample Analysis

10.3.1. Warm up spectrophotometer and set to 540nm.

10.3.2. Prepare two rows of plastic cups and label them accordingly (first row with sample no. and the 2nd row as background).

10.3.3. Pour out 45.0 ml of the sample extracts, which have already been pH adjusted to between 7.0 and 8.0, into the appropriately labeled cups. Do the same for the background cups using 10 ml of the sample extract.

10.3.4. Add 1.0 ml indicator solution and swirl. (Do not add reagent to background sample).

10.3.5. Slowly add 10% H_2SO_4 (Sec 7.1.1) dropwise while swirling and monitoring pH until pH is 2 ±0.5. Record reading in the appropriate logbook.

10.3.6. Transfer sample to 50 ml volumetric flask and bring to volume with deionized water. Empty contents into labeled specimen cup to mix.

10.3.7. Let stand 5-10 minutes for full color development.

10.3.8. Read calibration standards, QC samples, and samples in a 1 cm cell on a spectrophotometer at 540 nm. (Note: Calibration standards and samples must be read within the same timeframe following full color development).

10.3.9. Continue analyzing samples and quality control samples by first reading the sample followed by its background sample.

10.3.10. Dilute samples that exceed calibration curve using deioinized water and analyze following Sec. 10.3.3-10.3.7. Add dilution factor to TALS under “dilution” column. Note: The dilution should be made from the sample extract that has not had the indicator added.

10.3.11. After every twenty readings (10 samples) and after reading the last sample in the batch, verify the spectrophotometer calibration by reading a calibration check standard (CCV) and calibration check blank (CCB).

11.0. Calculations / Data Reduction

11.1. Accuracy:

$$\text{ICV / CCV, LCS \% Recovery} = \frac{\text{observed concentration}}{\text{known concentration}} \times 100$$

$$\text{MS \% Recovery} = \frac{\text{(spiked sample) - (unspiked sample)}}{\text{spiked concentration}} \times 100$$

11.2. Precision (RPD):

$$\text{Matrix Duplicate (MD)} = \frac{|\text{orig. sample value - dup. sample value}|}{[(\text{orig. sample value + dup. sample value})/2]} \times 100$$

11.3. Concentration = Hexavalent Chromium in mg/Kg = $\frac{A \times B \times E * 100}{C \times D}$

Where:
A = Concentration from the calibration curve in mg/L
B = Final digested volume in Liters
C = Wet sample weight in kg
D = percent solids
E = Dilution (if necessary)

NOTE: All dry weight corrections are made in TALS at the time the final report is prepared.

11.4. Trivalent Chromium Calculation: When required, the calculation for trivalent chromium is completed using TALS Method '7196a_CR3.' Samples must be logged in under this method as well as the methods for Total chromium (metals) and Hexavalent chromium. Upon completion of the total and hexavalent chromium analyses the analyst may process the trivalent chromium results as follows:

- In order for TALS to perform an automated trivalent chromium calculation enter '1' (for 'yes') in trivalent chromium batch information page in response to the prompt 'automatically perform calculation.' As long as both methods are at 2nd level review status in TALS the program will automatically pull in the metals results for chromium and the hexavalent chromium results to perform the automated calculation. TALS will display an 'ok' message on the worksheet tab if the Cr6 result is less than Total Cr result.
- In cases where Total Cr results are not linked to TALS method 7196a_CR3, trivalent chromium is calculated manually. Enter '0' (for 'no') in batch information page 'Perform calculation.' Results will be entered manually.

11.5. Data reduction:

11.5.1. All data is recorded directly in TALS and recorded in the logbook at the time the analysis is performed.

11.5.2. Attach the prep and analytical logbook pages and calibration curve to the batch as a pdf file.

11.5.3. On the worksheet tab, enter the sample absorbance under 'Uncorrected Abs' and background absorbance under 'Color Blank Abs.' Also, enter the pH between 7-8 as 'initial pH',' pH between 1.5-2.5 as 'Final pH' and the background pH under 'Notes.'

11.5.4. Record special notes and observations in the "worksheet" tab and record reagent information in the prep batch information page (see "view batch information" page of ADII).

11.5.5. Complete the Data Review Checker (DRC) in TALS: Prior to data submission the analyst must execute the DRC (Data Review Checker) program in the applicable analytical batch (TALS Analyst Desktop II module).

11.5.5.1. Open the analytical batch and click on the Edit tab above to enter the Edit Mode.

11.5.5.2. Press F8 command key on the computer keyboard or right click anywhere on the batch worksheet then click on 'Run checklist.'

11.5.5.3. Acknowledge by filling in responses to all unacknowledged findings. Highlight the checklist with findings, then highlight the associated list of findings; right click and choose 'Acknowledge Item.'

11.5.5.4. Fill in appropriate comments in the response box, then hit 'OK.' 'The column labeled 'unacknowledged findings' should show '0' for all questions once completed; then batch is ready for 2nd level review.

12.0. Method Performance

12.1. Method Detection Limit Study (MDL)

The method detection limit (MDL) is the lowest concentration that can be detected for a given analytical method and sample matrix with 99% confidence that the analyte is present. The MDL is determined according to the laboratory's MDL procedure in Section 19 (Test Methods and Method Validation) of Eurofins Edison's Quality Assurance Manual (ED-QA-LQM). MDLs reflect a calculated (statistical) value determined under ideal laboratory conditions in a clean matrix, and may not be achievable in all environmental matrices. The laboratory maintains MDL studies for analyses performed; these are verified at least annually unless method requirements require a greater frequency.

12.2. Demonstration of Capabilities

For DOC procedure refer to Section 19 in the most current revision of Eurofins Edison's Quality Assurance Manual (ED-QA-LQM).

12.3. Training Requirements

Refer to Eurofins Edison SOP No. ED-GEN-022, Training, for the laboratory's training program.

13.0. Pollution Control

It is Eurofins 's policy to evaluate each method and look for opportunities to minimize waste generated (i.e., examine recycling options, ordering chemicals based on quantity needed, preparation of reagents based on anticipated usage and reagent stability).

Employees must abide by the policies in Section 13 of the Corporate Environmental Health and Safety Manual (CW-E-M-001) for "Waste Management and Pollution Prevention."

14.0. Waste Management

14.1. Waste management practices are conducted consistent with all applicable rules and regulations. Excess reagents, samples and method process wastes are disposed of in an accepted manner. Waste description rules and land disposal restrictions are followed. Waste disposal procedures are incorporated by reference to Eurofins Edison SOP No. ED-SPM-008 (Laboratory Waste Disposal Procedures).

14.2. The following waste streams are produced when this method is carried out:

- Expired Standards – The vials are collected in a 1 gallon polyethylene bucket. These vials are then transferred to an open top 55 gallon steel or polyethylene waste drum. These drums are transported to a waste facility for proper disposal.
- Sample waste-After analysis, the samples and standards are collected in a polyethylene container labeled 'Cr6+ waste.' Once the container is full, it is brought to the waste room for disposal.

15.0. References / Cross-References

15.1. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, 3rd ed., U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. U.S. Government Printing Office: Washington, DC, 1995; SW-846, Method 7196A.

15.2. Test America Edison SOP ED-WET-010, The Alkaline Digestion of Soil Samples for the Analysis of Hexavalent Chromium, most current revision.

15.3. TestAmerica Edison Document No. ED-QA-LQM, *Laboratory Quality Manual*, most current revision.

15.4. TestAmerica Edison SOP ED-GEN-022, *Training*, most current revision.

15.5. TestAmerica Edison SOP No. ED-SPM-008, *Laboratory Waste Disposal Procedures*, current revision.

15.6. TestAmerica Edison SOP ED-WET-066, Redox, Analysis of Oxidation-Reduction Potential, most current revision.

15.7. TestAmerica Edison SOP ED-WET-061, Analysis of pH for soil and organic samples electrochemically, Method 9045C, most current revision.

15.8. TestAmerica Corporate Environmental Health and Safety Manual, Document No. CW-E-M-001, most current revision.

16. Method Modifications:

N/A

17. Attachments

N/A

18. Revision History

- **Revision 14, dated 23 September 2024**
  - Updated TestAmerica references to Eurofins throughout the document.
  - Sec 10.2.7: Added requirements and procedures to evaluate %RE in the calibration.

- **Revision 13, dated 14 June 2024**
  - Updated SOP header to Eurofins logo.
  - Sec. 11.5.6: Removed reference to WI EDS-WI-008, manual wetchemistry data review checklist; TALS DRC is used as outlined in Sec. 11.5.5.
- **Revision 12, dated 17 June 2020**
  - Updated SOP header with Eurofins emblem.
  - Sec. 9.1.2: Changed LCS source vendor from ERA to Phenova.
  - Sec. 11.5.5: Revised data review procedure to include TALS DRC procedures.
  - Sec 15.8: Deleted Wetchem Data Review Checklist Work Instruction # EDS-WI-008, not applicable.

- **Revision 11, dated 05 March 2018**
  - Sec 11.4: Added procedure for Trivalent chromium calculation using TALS method 7196a_CR3; subsequent section adjusted accordingly.

- **Revision 10, dated 23 February 2016**
  - Sec 9.1.2 and 9.1.3.2: Revised the allowable amount of PbCrO4 to add to the QC sample LCSI to reflect the range referenced in the Method. Also included the typical amount of $PbCrO_4$ that is added to the QC sample (LCSI and MSI).
  - Sec 9.1.3.3: Added spiking instructions for MSS when redigesting a batch; MSS should be spiked at 2x sample concentration or 40mg/kg, whichever is greater.

- **Revision 9, dated 25 September 2013**
  - Sec 1 & 12: Updated LQM section references to reflect the most current LQM revision.
  - Sec. 9.1.2: Changed nomenclature to LCSSRM and revised the acceptance limits from 85-115% to vendor specified QC limits.
  - Sec. 9.1.3.3: Deleted text: '*Note: If the spiked sample concentration is greater than 4X the predigestion spike concentration, no redigestion/reanalysis is required unless the samples are from a NJ site in which case the project manager should be contacted for further guidance.'*

Per method 3060a, all batches must be rehomogenized, redigested and reanalyzed if MSS or MSI fail regardless of location.

- Sec. 10.3.5: Changed pH range from 1.6-2.2 to pH 2.0 +/-0.5 as per the method.
- Sec. 11.4.3: Changed pH range from 1.6-2.2 to pH 1.5-2.5 as per the method.

- **Revision 8, dated 06 September 2011**
  - Sec 3: Revised the LQM reference for the list of definitions.
  - Sec 9.1.3.4: Clarified lab procedures for failing matrix spikes.
  - Sec. 9.2.2: Added procedure if the CCV is not within acceptance limits.
  - Sec. 9.2.3: Added procedure if CCB is not below reporting limit.
  - Sec. 11.4: Revised data reduction section to reflect actual laboratory practices.
  - Sec 15.9: Reference added.

- **Revision 7, dated 25 August 2009**
  - Revised SOP format in accordance with TestAmerica Corporate Quality SOP No. CW-QS-002 (Rev 0) Writing a Standard Operating Procedure (SOP).
  - Sec 1.1: added laboratory's reporting limit; change the range of analysis to 0.05-1.25mg/L to reflect actual laboratory practices.
  - Sec 9.1.5: Added preparation instruction for Post digestion spike.
  - Sec. 9.2: added ICV in the Instrument QC.
  - Sec 10.1: Added procedure for adjusting pH of sample extract; procedure formerly described in the Digestion SOP (ED-WET-010).
  - Sec 15: Added applicable references.

- **Revision 6a, dated 21 April 2009**
  - Sec.4.3: Added membrane filters, 0.45um and 0.1um.
  - Sec 4.4: Delete Erlenmeyer flasks and beakers
  - Sec 4.8:Add: Eppendorf or Finnipettes; varying volume
  - Sec 5.1, 5.2 & 5.4: Add stability and storage information.
  - Sec 5.5: Added reagent used for the pH adjusted PS: 1N NaOH: Place 4.0g NaOH in a 100 volumetric flask and dilute to the mark with deionized water. Solution is stable for 6 months. Store at room temperature.
  - Sec. 6.1: Potassium Dichromate Primary Standard Solution (1000mg/L Cr+6): Weight 0.2829g of dried (105ºC) potassium dichromate and dissolve in deionized water in a 100ml flask. Dilute to the mark. Store at room temperature. Solution is stable for 6 months.
  - Sec 6.1: Deleted pre-made standard purchased from Inorganic Ventures. Cr6+ Primary Standard will be prepared in the lab.
  - Sec 6.2: Specified source of the 1000 ppm Cr(VI).

- Sec 6.3 and 6.6: Deleted the 10mg/L Cr (VI) working standard for soil analysis.
- Sec 6.5: Add storage information.
- Sec 6.4: Add text: Source must be different from the primary standard.
- Sec 9.2.2: Replace 100 ppm stock standard with 100 ppm Cr6+ Primary spiking solution.
- Sec. 9.2.3: Add text: Record pH reading in the logbook.
- Sec. 9.3.8: Add text: Make the dilution from the sample that has not had the indicator added.
- Sec 9.3.6: Add text: Before reading samples, verify the calibration of the spectrophotometer by analyzing a CCV and CCB.
- Sec. 10.7: Added procedure for reanalyzing Post Spike sample to conform to method requirements: *If the post digestion spike fails to meet the recovery limits, a post spike must be reanalyzed using the alkaline extract. Adjust the pH of the sample Duplicate (alkaline extract) back up to pH 8.0-8.5 using 1N NaOH; then respike and reanalyze*.

- **Revision 6, dated March 2007**

  - Section 7.2: Section deleted (start color development for digested samples within one hour after adjusting pH between 7.5±0.5); section not applicable.
  - Section 9.3.7: The text in italics was inserted to clarify the time period for measuring sample absorbance.

    "Note: Calibration standards and samples must be read within the same timeframe following full color development."
  - Section 10.2: Deleted the requirement that 'CCS is taken through the entire digestion process' to reflect actual laboratory practices.
  - Section 10.4. Revised to specify the types of LCS used including their source and acceptance limits.

- **Revision 5, dated 30 October 2006**

  - Section 9.2.2: Revised the high point of the calibration curve from 1.0 ppm to 1.25 ppm. Standards preparation instructions revised accordingly.
  - Section 9.2.2: Revised to include instructions for preparation of a second source mid-point Calibration Check Standard.
  - Section 10: Inserted a new Section 10.1 explaining the QA batching system and inserted a new section 10.4 detailing the LCS requirements. All existing sections renumbered accordingly.
  - Section 10.6 (previously Section 10.5): The italicized text was added to the following sentence:

    "NOTE: If the spiked sample concentration is greater than 4x the predigestion spike concentration, no redigestion/reanalysis is required *unless the samples are*

from a NJ site in which case the lab project manager should be contacted for further guidance."

- Section 10.6 (previously Section 10.5): Added STL Edison SOP and method references for ORP and pH.
- Section 10.7 (previously Section 10.6): Added the following text: "If the post digestion spike fails to meet the recovery limits, a new aliquot of the sample must be re-spiked and re-analyzed."
- Section 10.8 (previously Section 10.7): Revised first sentence to read "One duplicate laboratory sample per batch *must* be analyzed." ('Must' previously read 'should').

Title: The Analysis of Waters for Hexavalent Chromium by EPA SW846 Method 7196A

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Approvals (Signature/Date):

Jasmine Parillo Department Manager	9/23/2024 Date	Dan Helfrich Health and Safety Manager	9/20/2024 Date
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1.0 Scope and Application

1.1. SW846 Method 7196A may be used to determine the hexavalent chromium content of groundwater samples or digestates of solid samples. This SOP is applicable for the determination of hexavalent chromium in groundwater samples. Groundwater samples associated with regulated drinking water samples (i.e. potable water wells) are not applicable to this Method.

1.2. The range of analysis by this method is 10-200 ug/l hexavalent chromium.

1.3. On occasion clients may request modifications to this SOP. These modifications are handled following the procedures outlined in Sections 7 (Review of Work Request) and 19 (Test Methods and Method Validation) of Eurofins Edison's Quality Assurance Manual (ED-QA-LQM).

2.0 Summary of Method

Hexavalent chromium is determined spectrophotometrically at 540nm by reaction with diphenylcarbazide in acid solution. For each batch of samples a method blank, a laboratory control sample, matrix duplicate, and a post verification spike are analyzed and compared to method limits and laboratory control limits.

3.0 Definitions

For a complete list of definitions refer to Appendix 2 in the most current revision of Eurofins Edison's Quality Assurance Manual (ED-QA-LQM).

4.0 Interferences

4.1. Molybdenum and Mercury react to form color with diphenylcarbazide, however the intensity of color is much lower than those for chromium at the specified pH. Concentrations up to 200 mg/L can be accepted.

4.2. Vanadium interferes strongly, but can be tolerated up to 10 times the concentration of hexavalent chromium present.

4.3. Iron may cause a yellow color but should not affect the colorimetric measurement at 540 nm.

4.4. Reducing matter may reduce hexavalent Cr to trivalent Cr in varying amounts. No preventative measure is available at this time; however, interference is checked by a post verification spike samples.

4.4.1. The reducing/oxidizing tendency of each matrix may be determined by characterization of samples for additional analytical parameters, such as pH, ferrous iron, sulfides, and Oxidation Reduction Potential. Other indirect indicators of reducing/oxidizing tendency include Total Organic Carbon (TOC), Chemical Oxygen Demand (COD), and Biological Oxygen Demand (BOD).

4.5. For waste materials containing soluble trivalent chromium concentrations greater than four times the laboratory hexavalent chromium reporting limit, the hexavalent chromium results obtained using this method may be biased high due to method-induced oxidation.

5.0. Safety

Employees must abide by the policies and procedures in the Corporate Environmental Health and Safety Manual (CW-E-M-001) and this document. This procedure may involve hazardous material, operations and equipment. This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum.

5.1. Specific Safety Concerns or Requirements

Samples that contain high concentrations of carbonates or organic material or samples that are at elevated pH can react violently when acids are added.

5.2. Primary Materials Used

The following is a list of the materials used in this method, which have a serious or significant hazard rating. **Note: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the MSDS for each of the materials listed in the table.** A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the MSDS for each material before using it for the first time or when there are major changes to the MSDS.

Material (1)	Hazards	Exposure Limit (2)	Signs and symptoms of exposure

Nitric Acid	Corrosive Oxidizer Poison	2 ppm-TWA 4 ppm-STEL	Nitric acid is extremely hazardous; it is corrosive, reactive, an oxidizer, and a poison. Inhalation of vapors can cause breathing difficulties and lead to pneumonia and pulmonary edema, which may be fatal. Other symptoms may include coughing, choking, and irritation of the nose, throat, and respiratory tract. Can cause redness, pain, and severe skin burns. Concentrated solutions cause deep ulcers and stain skin a yellow or yellow-brown color. Vapors are irritating and may cause damage to the eyes. Contact may cause severe burns and permanent eye damage.
Potassium Dichromate	Oxidizer Corrosive Carcinogen	0.1 Mg/M3 TWA as CrO3	Extremely destructive to tissues of the mucous membranes and upper respiratory tract. May cause ulceration and perforation of the nasal septum. Symptoms of redness, pain, and severe burn can occur. Dusts and strong solutions may cause severe irritation. Contact can cause blurred vision, redness, pain and severe tissue burns. May cause corneal injury or blindness.
Sulfuric Acid	Corrosive Oxidizer Dehydrator Poison Carcinogen	1 Mg/M3-TWA	Inhalation produces damaging effects on the mucous membranes and upper respiratory tract. Symptoms may include irritation of the nose and throat, and labored breathing. Symptoms of redness, pain, and severe burn can occur. Contact can cause blurred vision, redness, pain and severe tissue burns. Can cause blindness.

6.0. Equipment and Supplies

6.1. Instrumentation

- pH meter, Orion benchtop or equivalent
- Spectrophotometer for use at 540 nm with a light path of 1 cm (Hach DR2800 or equivalent).

6.2. Supplies

- Membrane filters, 0.45 um and 0.1 um (NALGENE disposable)
- Glasswares: volumetric pipets (class A) and volumetric Flasks (class A)
- Graduated Cylinder (class A)
- Transfer pipettes
- Calibrated pipettes: Eppendorf or equivalent
- Vacuum pump
- Specimen Cups (plastic)
- Magnetic stirrer (teflon-coated)

7.0. Reagents and Standards

7.1. Reagents

7.1.1. Sulfuric acid (10% v/v) - Measure 100 ml of concentrated reagent grade H_2SO_4 into a 1000 ml volumetric flask (1/2 filled w/D.I. water) and dilute to mark with deionized water. Reagent is stable for 6 months. Store at room temperature.

7.1.2. Indicator solution - Place 5.0 g 1, 5-Diphenylcarbazide (AR Grade) in an amber 1000ml volumetric flask and dilute to mark with acetone. Prepare monthly or when solution becomes cloudy. Store at room temperature.

7.1.3. Acetone (reagent grade) - Store at room temperature. For stability information, refer to manufacturer's instructions or 2 years from date opened if no instructions are available.

7.2. Standards

7.2.1. Primary Potassium Dichromate ($K_2Cr_2O_7$) Stock Standard (1000 mg/L Cr+6) - Weigh 0.2829 g of dried (105°C) analytical reagent grade (or better) potassium dichromate ($K_2Cr_2O_7$) crystals (J.T.Baker catalog nos. 3090, 3093 or equivalent). Dissolve in deionized water in a 100ml flask. Dilute to the mark. Standard solution is stable for 6 months. Store at room temperature.

7.2.2. Hexavalent Chromium Primary Spiking Solution (100 mg/L Cr+6) - Prepare by adding 10ml of the 1000 mg/L Primary Potassium Dichromate Standard (see Section 7.2.1) to a 100ml volumetric flask and dilute to volume with deionized water. Standard solution is stable for 6 months. Store at room temperature.

7.2.3. Hexavalent Chromium Primary Spiking Solution (10 mg/L Cr+6) - Prepare by adding 1.0ml of 1000 mg/L Cr+6 Standard (see Section 7.2.1) to a 100ml volumetric flask and diluting to volume with deionized water. Standard solution is stable for 6 months. Store at room temperature.

7.2.4. Secondary Potassium Dichromate ($K_2Cr_2O_7$) Stock Standard (1000 mg/L Cr+6) - Weigh 0.2829 g of dried (105°C) analytical reagent grade (or better) potassium dichromate ($K_2Cr_2O_7$) crystals (J.T.Baker catalog nos. 3090, 3093 or equivalent). *The source of this standard must be from a different lot or manufacturer than the Primary Potassium Dichromate Stock Standard detailed in Section 7.2*.1. Dissolve in deionized water in a 100ml flask. Dilute to the mark. Standard solution is stable for 6 months. Store at room temperature.

7.2.5. Hexavalent Chromium Secondary Spiking Solution (100 mg/L Cr+6) - Prepare by adding 10ml of 1000 mg/L Cr+6 Secondary Standard (see Section 7.2.4) to a 100ml volumetric flask and diluting to volume with deionized water. Standard solution is stable for 6 months. Store at room temperature.

7.2.6. Hexavalent Chromium Secondary Spiking Solution (10 mg/L Cr+6) - Prepare by adding 1.0ml of 1000 mg/L Cr+6 Secondary Standard (see Section 7.2.4) to a 100ml volumetric flask and diluting to volume with deionized water. Standard solution is stable for 6 months. Store at room temperature.

8.0. Sample Collection, Preservation, Shipment and Storage

Sample container, preservation techniques and holding times may vary and are dependent on sample matrix, method of choice, regulatory compliance, and/or specific contract or client requests. Listed below are the holding times and the references that include preservation requirements.

Matrix	Sample Container	Min. Sample Size	Preservation	Holding Time [1]	Reference
Waters	HDPE[2]	250 mL	Cool 4 ±2°C	24 Hours	SW 7196A

[1] Samples must be analyzed within 24 hours from time of collection. Store samples at 4°C before analysis.
[2] High-density polypropylene container

9.0. Quality Control

9.1. **Sample QC** - - The following MB, LCS, and PVS are analyzed with each batch of 20 samples or each time samples are setup, whichever is more frequent. The DU is analyzed at a frequency of 1 per 10 samples or each time samples are set up, whichever is more frequent.

9.1.1. Method Blank (MB): Use deionized water for the method blank. Analyze using all reagents in the same volumes as used in the analysis of samples. The blank value should fall below the reporting limit if not, all samples associated with the method blank must be re-analyzed. Do not subtract the blank value from sample values.

9.1.2. Post Verification Spike (PS): The PVS concentration must be two times the concentration of Cr(VI) found in the sample or 30.0 ug/L (whichever is greater). If necessary, dilute the PS to fall within the range of the calibration curve. If the PS recovery is not within 85-115%, dilute the sample and re-analyze.

Note: The post spike is identified as “MS” in TALS QC.

9.1.3. Matrix Duplicate (DU): A duplicate is prepared and analyzed in exactly the same manner as the original sample. The relative percent difference (RPD) between the sample and duplicate should be less than or equal to 20%.

9.1.4. Laboratory Control Sample (LCS): The hexavalent chromium LCS is a certified QC standard purchased from Phenova (Catalog WP

Hexavalent Chromium). The LCS is used to monitor the accuracy of the entire analytical process. The LCS recovery must be within vendor specified QC limits or all samples associated with the LCS must be reanalyzed.

9.2. Instrument QC

9.2.1. Initial Calibration Verification (ICV): The ICV (75.0 ug/L Cr (VI)) is analyzed immediately after an acceptable initial calibration. The ICV standard must be from a source separate from the calibration standards (i.e., different manufacturer or separate lot) and its recovery must be within ±10% of the expected value. The ICV is prepared by adding 0.375ml of a 10 mg/L Cr6+ Hexavalent Chromium Secondary Spiking Solution (Section 7.2.6) into a 50 ml volumetric flask and diluting to 50ml with deionized water. If the measured concentration exceeds the ±10% limit, a second analysis should be performed. If the result still exceeded the ±10% limit, the analysis should be terminated until the source of the problem is identified and corrected.

9.2.2. Calibration Check Verification (CCV): A midpoint Calibration Check Verification spiked at 75.0 ug/L is prepared in the same way as the ICV (See Section 9.2.1). The CCV is analyzed after every 10 samples (20 readings including backgrounds) and after reading the last sample. The result must be within ± 10% of the true value. If not, all samples following the last acceptable CCV must be re-analyzed.

9.2.3. Initial and Continuing Calibration Blank (ICB/CCB): Initial Continuing Calibration Blank (ICB) must be analyzed after the ICV. Continuing Calibration Blank (CCB) must be analyzed after every 10 samples or after each Calibration Check Verification (CCV). Use deionized water for the ICB/CCB. The value of the ICB/CCB should be less than the RL. If not, all samples following the last acceptable ICB/CCB must be re-analyzed.

9.2.4. Minimum Reporting Level (MRL), 10ppb: The MRL must be analyzed daily before samples are analyzed. Prepare the MRL by adding 0.05ml of a 10 mg/L Hexavalent Chromium Primary Spiking Solution (Section 7.2.3) into a 50 ml volumetric flask and diluting to 50ml with deionized water. The results must fall within 50-150% of the true value.

10.0 Procedure

10.1. Calibration

10.1.1. Prepare fresh calibration standards everyday before analysis.

10.1.2. Initial Calibration Standards: (6 points). Place about 25 mL of deionized (DI) water in six 50 ml flasks. Prepare the six points as follows:

Cr(6+) Standard conc. (ug/L)	Volume (ml) of 10 mg/L Cr+6 (Section 7.2.3) to add	Final volume (ml) using Deionized water

0.0	0.0	50
10.0	0.05	50
50.0	0.25	50
75.0	0.375	50
100	0.50	50
200	1.0	50

10.1.3. Analyze the calibration standards in the manner detailed in Sections 10.2.1 thru 10.2.7. Zero the spectrometer with the 0 ug/L standard.

10.1.4. Perform linear regression on data resulting from analysis of the initial calibration. The correlation coefficient must be 0.995.

10.1.5. After calibration is entered into TALS, calculate %RE (%relative error) on two calibration standards, the standard at or near the mid-point of the calibration and the standard at the lowest level. Go to calibration events and click on details, review the column labeled 'read back amount' and '% Error' for the low standard and midpoint standard.

Low standard (10ppb): The %RE (relative error) must be +/- 50%; if not, stop the analysis and recalibrate.

Mid-point normal (75ppb): The %RE (relative error) must be +/- 10%; if not, stop the analysis and recalibrate

10.1.6. Analyze the Initial Calibration Verification (ICV) standard in the same manner as the initial calibration standards detailed above. If the ICV meets the criteria listed in Section 9.2.1, the analyst may continue with sample analysis (Section 10.2).

10.2. Sample Analysis

10.2.1. Warm up spectrophotometer and set to 540 nm.

10.2.2. Place 45.0 mL of sample into a 100 ml specimen cup. Also, place 45 mL of sample in a separate cup for background.

10.2.3. Add 1.0 ml indicator solution (see Section 7.1.2) and swirl. (Do not add indicator to background sample).

10.2.4. Slowly add 10% H_2SO_4 (See Section 7.1.1) dropwise to sample and background while measuring pH until pH is 1.5-2.5. Record reading.

10.2.5. Place sample in a 50 ml volumetric flask and bring to volume with deionized water. Pour back into original cup and swirl.

10.2.6. Let stand 5-10 minutes for full color development.

10.2.7. Read calibration standards, QC samples, and samples on spectrophotometer at 540 nm. Analyze the calibration check standard and calibration check blank immediately following the calibration standards.

10.2.8. Dilute samples that exceed calibration curve using deionized water. Recolorize and read again on spectrophotometer noting dilution factor.

10.2.9. Continue analyzing samples and quality control samples by first reading the sample followed by its background sample.

10.2.10. After every 10 samples and after reading the last sample in the batch, verify the calibration by reading Calibration Check Verification (CCV) and Continuing Calibration Blank (CCB).

11. Calculations / Data Reduction

11.1. Accuracy:

$$\text{ICV / CCV, LCS \% Recovery} = \frac{\text{observed concentration}}{\text{known concentration}} \times 100$$

11.2. Precision (RPD):

$$\text{Matrix Duplicate (MD)} = \frac{|\text{orig. sample value - dup. sample value}|}{[(\text{orig. sample value + dup. sample value})/2]} \times 100$$

11.3. Calculate the hexavalent chromium result for each aqueous sample as follows:

Hexavalent Chromium in ug/L = A x E

A = Concentration from the calibration curve in ug/L
E = Dilution (if necessary)

11.4. Trivalent Chromium Calculation: When required, the calculation for trivalent chromium is completed using the TALS method '7196a_CR3' which must be logged for the samples being processed along with methods for total chromium (metals) and hexavalent chromium. Upon completion of the total and hexavalent chromium analyses the analyst may process the trivalent chromium results as follows:

- To have TALs perform an automated trivalent chromium calculation: on the trivalent chromium batch information page enter '1' (for 'yes') in response to the

prompt to automatically perform the calculation. As long as both methods are at 2nd level review status in TALS the program will automatically pull in the metals results for chromium and the hexavalent chromium results to perform the automated calculation. TALS will display an 'ok' message on the worksheet tab if the Cr6 result is less than Total Cr result.

- If the analyst intends to manually enter trivalent chromium results an entry of '0' (for 'no') should be made the and the results entered manually.

11.5. Data Reduction

11.5.1. Record analytical data directly into TALS and in the 'Hexachrome Run Logbook.'

11.5.2. Record Reagent information on the "batch information" page.

11.5.3. Special comments or observations should be recorded on the "worksheet" tab. Record Sample absorbances and pH readings on the "worksheet" tab.

11.5.4. Attach the calibration curve plot and the logbook pages for the analysis to the analytical batch as pdf files.

11.5.5. Complete the Data Review Checker (DRC) in TALS: Prior to data submission the analyst must execute the DRC (Data Review Checker) program in the applicable analytical batch (TALS Analyst Desktop II module).

11.5.5.1 Open the analytical batch and click on the Edit tab above to enter the Edit Mode.

11.5.5.2 Press F8 command key on the computer keyboard or right click anywhere on the batch worksheet then click on 'Run checklist.'

11.5.5.3 Acknowledge by filling in responses to all unacknowledged findings. Highlight the checklist with findings, then highlight the associated list of findings; right click and choose 'Acknowledge Item.'

11.5.5.4 Fill in appropriate comments in the response box, then hit 'OK.' 'The column labeled 'unacknowledged findings' should show '0' for all questions once completed; then batch is ready for 2nd level review.

12. Method Performance

12.1. Method Detection Limit Study (MDL)

The method detection limit (MDL) is the lowest concentration that can be detected for a given analytical method and sample matrix with 99% confidence that the analyte is present. The MDL is determined according to the laboratory's MDL procedure in Section 19 (Test Methods and Method Validation) of Eurofins Edison's Quality Assurance Manual (ED-QA-LQM). MDLs reflect a calculated (statistical) value

determined under ideal laboratory conditions in a clean matrix, and may not be achievable in all environmental matrices. The laboratory maintains MDL studies for analyses performed; these are verified at least annually unless method requirements require a greater frequency.

12.2. Demonstration of Capabilities

For DOC procedure refer to Section 19 in the most current revision of Eurofins Edison's Quality Assurance Manual (ED-QA-LQM).

12.3. Training Requirements

Refer to Eurofins Edison SOP No. ED-GEN-022, Training, for the laboratory's training program.

13.0 Pollution Control

It is Eurofins 's policy to evaluate each method and look for opportunities to minimize waste generated (i.e., examine recycling options, ordering chemicals based on quantity needed, preparation of reagents based on anticipated usage and reagent stability). Employees must abide by the policies in Section 13 of the Corporate Environmental Health and Safety Manual (CW-E-M-001) for "Waste Management and Pollution Prevention."

14.0. Waste Management

14.1. Waste management practices are conducted consistent with all applicable rules and regulations. Excess reagents, samples and method process wastes are disposed of in an accepted manner. Waste description rules and land disposal restrictions are followed. Waste disposal procedures are incorporated by reference to Eurofins Edison SOP No. ED-SPM-008 (Laboratory Waste Disposal Procedures).

14.2. The following waste streams are generated as a result of this analysis:

- Water Retain Samples -These materials are originally received aqueous samples. These solutions are then transferred into the first drum of the neutralization system and neutralized to a pH of 6 – 9 with sodium bicarbonate (Siedler Chemical SC-0219-25). This solution is discharged into the municipal sewer system.

15.0. References / Cross-References

15.1. Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, 3rd ed., U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. U.S. Government Printing Office: Washington, DC, 1995; SW-846, Method 7196A.

15.2. TestAmerica Edison Document No. ED-QA-LQM, *Laboratory Quality Manual*, most current revision.

15.3. TestAmerica Edison SOP ED-GEN-022, *Training*, most current revision.

15.4. TestAmerica Edison SOP No. ED-SPM-008, *Laboratory Waste Disposal Procedures*, current revision.

15.5. TestAmerica Corporate Environmental Health and Safety Manual, Document No. CW-E-M-001, most current revision.

16.0. Method Modifications:

N/A

17.0. Attachments

N/A

18.0. Revision History

- Revision 12, 23 September 2024
  - Sec. 10.1.5: Added requirements and procedures to evaluate %RE in the calibration
- Revision 11, 10/01/2021
  - Sec. 9.2.4: Added criteria to analyze a Minimum Reporting Level (MRL) daily.
- Revision 10, 14 May 2020
  - Updated SOP header with Eurofins logo.
  - Sec 1.1: Clarified matrix applicability for this SOP.
  - Sec. 9.1: Revised the frequency of Matrix Duplicate from 1/20 samples to 1/10 samples.
- Revision 9, 12 February 2019
  - Sec. 9.1.4: Changed LCS source vendor from ERA to Phenova.
  - Sec. 11.5.5: Replaced Wetchemistry Data review checklist (EDS-WI-008) to TALS Data Review Checker (DRC); instructions added.
  - Deleted Sec 15.6, WI EDS-WI-008, not applicable; subsequent sections adjusted accordingly.
- Revision 8, 30 Nov 2016
  - Sec. 11.4: Added Cr3 calc procedure
- Revision 7, 26 November 2012
  - Section 9.1.2: Revised the minimum concentration for PS from 15 ug/L to 30 ug/L to comply with Method 7196A.
- Revision 6, 04 October 2012
  - Section 1&12: Updated LQM reference to reflect the most current LQM revision.
  - Sec 5: Updated to comply with TestAmerica Corporate Quality SOP No. CW-QS-002 (Rev 0) Writing a Standard Operating Procedure (SOP)

- Sec. 9.1.1: Revised to include corrective action procedure when MB is greater than the RL.
- Sec. 9.1.4: Changed limits from 85-115% to vendor specified QC limits.
- Sec. 9.2.2 & 9.2.3: Revised to include corrective action procedure when CCV and CCB are outside the acceptance limits.

- Revision 5, 7 September 2010
  - Section 2.0: Removed text 'Dissolved;' this SOP is only applicable to aqueous samples for method SW7196A which are not filtered.
  - Sec 3: Revised to update LQM reference for the list of definitions.
  - Section 6.2: Added graduated cylinders (class A) and transfer pipettes to the list of supplies.
  - Removed Nitric acid on list of reagents, not applicable for the analysis of Cr6+ waters.
  - Section 9.1.1: Revised method blank criteria from <MDL to <RL.
  - Section 9.1.4: Replaced LCS vendor specified limits to 85-115%.
  - Section 9.2.2: Removed text: "immediately after analyzing the calibration standards." Renamed CCS to CCV.
  - Section 9.2.3: Revised CCB criteria from <MDL to <RL.
  - Section 10.1.4: Revised the correlation coefficient criteria from ≥0.997 to ≥0.995.
  - Section 13 & 14: Revised to comply with the current Method SOP format (CW-QS-002, Writing a Standard Operating Procedure (SOP)).
  - Section 11.4: Revised Data Reduction section in accordance with TALS.
  - Section 15: Added applicable references.

- Revision 4, January 22, 2008
  - Updated to new format as per TestAmerica's SOP format.
  - Added the shelf-life and storage requirements to reagents in section 7, Reagents and standards.
  - Added J.T.Baker (Catalog Nos. 3090, 3093 or equivalent) as source of primary and secondary standards. Deleted reference to Inorganic Ventures as a source of the primary standard.
  - Replaced the source standard used for the preparation of 10 mg/L Cr+6 (primary and secondary spiking solution) from 100 mg/L Cr+6 to 1000 mg/L Cr+6.
  - Added the control limits for Post Verification Spike (PVS).
  - Added ICV as Instrument QC.
  - Added the preparation procedure and control limits for the Calibration Check Standard (CCS).
  - Deleted Matrix spike (matrix spike low and matrix spike high) as sample QC requirement.
  - Section 10.3.3: Revised pH range from 1.6-2.2 to 1.5-2.5 to reflect method requirements.
  - Standardized all analytical units to ug/L and mg/L.
  - Added the following to the References section: TestAmerica Edison SOP ED-GEN-022 (Training) and TestAmerica Laboratory Quality Manual (ED-QA-LQM).

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Method Description	Method Code	Prep Method	Analyte Description	CAS Number	RL	MDL	LOD	Units
Solid								
Volatile Organic Compounds by GC/MS	8260D	5035A_FW (low level prep)	1,1,1-Trichloroethane	71-55-6	0.00100	0.000233		mg/Kg
			1,1,2,2-Tetrachloroethane	79-34-5	0.00100	0.000214		mg/Kg
			1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	0.00100	0.000301		mg/Kg
			1,1,2-Trichloroethane	79-00-5	0.00100	0.000178		mg/Kg
			1,1-Dichloroethane	75-34-3	0.00100	0.000206		mg/Kg
			1,1-Dichloroethene	75-35-4	0.00100	0.000225		mg/Kg
			1,2,3-Trichlorobenzene	87-61-6	0.00100	0.000181		mg/Kg
			1,2,4-Trichlorobenzene	120-82-1	0.00100	0.000358		mg/Kg
			1,2,4-Trimethylbenzene	95-63-6	0.00100	0.000246		mg/Kg
			1,2-Dibromo-3-Chloropropane	96-12-8	0.00100	0.000460		mg/Kg
			1,2-Dichlorobenzene	95-50-1	0.00100	0.000361		mg/Kg
			1,2-Dichloroethane	107-06-2	0.00100	0.000296		mg/Kg
			1,2-Dichloropropane	78-87-5	0.00100	0.000423		mg/Kg
			1,3,5-Trimethylbenzene	108-67-8	0.00100	0.000314		mg/Kg
			1,3-Dichlorobenzene	541-73-1	0.00100	0.000365		mg/Kg
			1,4-Dichlorobenzene	106-46-7	0.00100	0.000225		mg/Kg
			2-Butanone (MEK)	78-93-3	0.00500	0.000368		mg/Kg
			2-Hexanone	591-78-6	0.00500	0.00171		mg/Kg
			4-Methyl-2-pentanone (MIBK)	108-10-1	0.00500	0.00156		mg/Kg
			Acetone	67-64-1	0.00600	0.00572		mg/Kg
			Benzene	71-43-2	0.00100	0.000258		mg/Kg
			Bromoform	75-25-2	0.00100	0.000425		mg/Kg
			Bromomethane	74-83-9	0.00200	0.00100		mg/Kg
			Carbon disulfide	75-15-0	0.00100	0.000266		mg/Kg
			Carbon tetrachloride	56-23-5	0.00100	0.000387		mg/Kg
			Chlorobenzene	108-90-7	0.00100	0.000177		mg/Kg
			Chlorobromomethane	74-97-5	0.00100	0.000281		mg/Kg
			Chlorodibromomethane	124-48-1	0.00100	0.000194		mg/Kg
			Chloroethane	75-00-3	0.00100	0.000522		mg/Kg
			Chloroform	67-66-3	0.00100	0.000971		mg/Kg
			Chloromethane	74-87-3	0.00100	0.000435		mg/Kg
			cis-1,2-Dichloroethene	156-59-2	0.00100	0.000358		mg/Kg
			cis-1,3-Dichloropropene	10061-01-5	0.00100	0.000273		mg/Kg
			Cyclohexane	110-82-7	0.00100	0.000221		mg/Kg
			Dichlorobromomethane	75-27-4	0.00100	0.000257		mg/Kg
			Dichlorodifluoromethane	75-71-8	0.00100	0.000338		mg/Kg
			Ethylbenzene	100-41-4	0.00100	0.000199		mg/Kg
			Ethylene Dibromide	106-93-4	0.00100	0.000180		mg/Kg
			Isopropylbenzene	98-82-8	0.00100	0.000285		mg/Kg
			Methyl acetate	79-20-9	0.00500	0.00430		mg/Kg
			Methyl tert-butyl ether	1634-04-4	0.00100	0.000512		mg/Kg
			Methylcyclohexane	108-87-2	0.00100	0.000499		mg/Kg
			Methylene Chloride	75-09-2	0.00200	0.00115		mg/Kg
			m-Xylene & p-Xylene	179601-23-1	0.00100	0.000174		mg/Kg
			n-Butylbenzene	104-51-8	0.00100	0.000294		mg/Kg
			N-Propylbenzene	103-65-1	0.00100	0.000175		mg/Kg
			o-Xylene	95-47-6	0.00100	0.000194		mg/Kg
			sec-Butylbenzene	135-98-8	0.00100	0.000288		mg/Kg
			Styrene	100-42-5	0.00100	0.000278		mg/Kg
			tert-Butylbenzene	98-06-6	0.00100	0.000276		mg/Kg
			Tetrachloroethene	127-18-4	0.00100	0.000305		mg/Kg
			Toluene	108-88-3	0.00100	0.000234		mg/Kg

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Method Description	Method Code	Prep Method	Analyte Description	CAS Number	RL	MDL	LOD	Units
Solid								
			trans-1,2-Dichloroethene	156-60-5	0.00100	0.000246		mg/Kg
			trans-1,3-Dichloropropene	10061-02-6	0.00100	0.000266		mg/Kg
			Trichloroethene	79-01-6	0.00100	0.000321		mg/Kg
			Trichlorofluoromethane	75-69-4	0.00100	0.000406		mg/Kg
			Vinyl chloride	75-01-4	0.00100	0.000546		mg/Kg
			Xylenes, Total	1330-20-7	0.00200	0.000174		mg/Kg
			1,2-Dichloroethane-d4 (Surr)	17060-07-0				mg/Kg
			4-Bromofluorobenzene	460-00-4				mg/Kg
			Dibromofluoromethane (Surr)	1868-53-7				mg/Kg
			Toluene-d8 (Surr)	2037-26-5				mg/Kg
Volatile Organic Compounds by GC/MS	8260D	5035A_M (medium level prep)	1,1,1-Trichloroethane	71-55-6	0.0500	0.0140		mg/Kg
			1,1,2,2-Tetrachloroethane	79-34-5	0.0500	0.00991		mg/Kg
			1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	0.0500	0.0170		mg/Kg
			1,1,2-Trichloroethane	79-00-5	0.0500	0.0102		mg/Kg
			1,1-Dichloroethane	75-34-3	0.0500	0.0120		mg/Kg
			1,1-Dichloroethene	75-35-4	0.0500	0.0132		mg/Kg
			1,2,3-Trichlorobenzene	87-61-6	0.0500	0.0175		mg/Kg
			1,2,4-Trichlorobenzene	120-82-1	0.0500	0.0135		mg/Kg
			1,2,4-Trimethylbenzene	95-63-6	0.0500	0.0115		mg/Kg
			1,2-Dibromo-3-Chloropropane	96-12-8	0.0500	0.0106		mg/Kg
			1,2-Dichlorobenzene	95-50-1	0.0500	0.0110		mg/Kg
			1,2-Dichloroethane	107-06-2	0.0500	0.0125		mg/Kg
			1,2-Dichloropropane	78-87-5	0.0500	0.00900		mg/Kg
			1,3,5-Trimethylbenzene	108-67-8	0.0500	0.0125		mg/Kg
			1,3-Dichlorobenzene	541-73-1	0.0500	0.0165		mg/Kg
			1,4-Dichlorobenzene	106-46-7	0.0500	0.0167		mg/Kg
			2-Butanone (MEK)	78-93-3	0.250	0.110		mg/Kg
			2-Hexanone	591-78-6	0.250	0.0568		mg/Kg
			4-Methyl-2-pentanone (MIBK)	108-10-1	0.250	0.0651		mg/Kg
			Acetone	67-64-1	0.250	0.221		mg/Kg
			Benzene	71-43-2	0.0500	0.0101		mg/Kg
			Bromoform	75-25-2	0.0500	0.00900		mg/Kg
			Bromomethane	74-83-9	0.0500	0.0277		mg/Kg
			Carbon disulfide	75-15-0	0.0500	0.0337		mg/Kg
			Carbon tetrachloride	56-23-5	0.0500	0.0165		mg/Kg
			Chlorobenzene	108-90-7	0.0500	0.0120		mg/Kg
			Chlorobromomethane	74-97-5	0.0500	0.0150		mg/Kg
			Chlorodibromomethane	124-48-1	0.0500	0.0110		mg/Kg
			Chloroethane	75-00-3	0.0500	0.0185		mg/Kg
			Chloroform	67-66-3	0.0500	0.0110		mg/Kg
			Chloromethane	74-87-3	0.0500	0.0201		mg/Kg
			cis-1,2-Dichloroethene	156-59-2	0.0500	0.0130		mg/Kg
			cis-1,3-Dichloropropene	10061-01-5	0.0500	0.0111		mg/Kg
			Cyclohexane	110-82-7	0.0500	0.0130		mg/Kg
			Dichlorobromomethane	75-27-4	0.0500	0.00750		mg/Kg
			Dichlorodifluoromethane	75-71-8	0.0500	0.0155		mg/Kg
			Ethylbenzene	100-41-4	0.0500	0.0150		mg/Kg
			Ethylene Dibromide	106-93-4	0.0500	0.00950		mg/Kg
			Isopropylbenzene	98-82-8	0.0500	0.0160		mg/Kg
			Methyl acetate	79-20-9	0.250	0.0392		mg/Kg
			Methyl tert-butyl ether	1634-04-4	0.0500	0.0107		mg/Kg

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Method Description	Method Code	Prep Method	Analyte Description	CAS Number	RL	MDL	LOD	Units
Solid								
			Methylcyclohexane	108-87-2	0.0500	0.0363		mg/Kg
			Methylene Chloride	75-09-2	0.0500	0.0105		mg/Kg
			m-Xylene & p-Xylene	179601-23-1	0.0500	0.0140		mg/Kg
			n-Butylbenzene	104-51-8	0.0500	0.0135		mg/Kg
			N-Propylbenzene	103-65-1	0.0500	0.0145		mg/Kg
			o-Xylene	95-47-6	0.0500	0.0160		mg/Kg
			sec-Butylbenzene	135-98-8	0.0500	0.0155		mg/Kg
			Styrene	100-42-5	0.0500	0.00850		mg/Kg
			tert-Butylbenzene	98-06-6	0.0500	0.0140		mg/Kg
			Tetrachloroethene	127-18-4	0.0500	0.0180		mg/Kg
			Toluene	108-88-3	0.0500	0.0125		mg/Kg
			trans-1,2-Dichloroethene	156-60-5	0.0500	0.00900		mg/Kg
			trans-1,3-Dichloropropene	10061-02-6	0.0500	0.0111		mg/Kg
			Trichloroethene	79-01-6	0.0500	0.0110		mg/Kg
			Trichlorofluoromethane	75-69-4	0.0500	0.0160		mg/Kg
			Vinyl chloride	75-01-4	0.0500	0.0100		mg/Kg
			Xylenes, Total	1330-20-7	0.100	0.0140		mg/Kg
			1,2-Dichloroethane-d4 (Surr)	17060-07-0				mg/Kg
			4-Bromofluorobenzene	460-00-4				mg/Kg
			Dibromofluoromethane (Surr)	1868-53-7				mg/Kg
			Toluene-d8 (Surr)	2037-26-5				mg/Kg
Semivolatile Organic Compounds (GC/MS)	8270E	3546	1,1'-Biphenyl	92-52-4	0.330	0.0115		mg/Kg
			1,2,4,5-Tetrachlorobenzene	95-94-3	0.330	0.0103		mg/Kg
			1,4-Dioxane	123-91-1	0.0330	0.0289		mg/Kg
			2,2'-oxybis[1-chloropropane]	108-60-1	0.330	0.0198		mg/Kg
			2,3,4,6-Tetrachlorophenol	58-90-2	0.330	0.0224		mg/Kg
			2,4,5-Trichlorophenol	95-95-4	0.330	0.0337		mg/Kg
			2,4,6-Trichlorophenol	88-06-2	0.133	0.0425		mg/Kg
			2,4-Dichlorophenol	120-83-2	0.133	0.0212		mg/Kg
			2,4-Dimethylphenol	105-67-9	0.330	0.0395		mg/Kg
			2,4-Dinitrophenol	51-28-5	0.266	0.163		mg/Kg
			2,4-Dinitrotoluene	121-14-2	0.0670	0.0356		mg/Kg
			2,6-Dinitrotoluene	606-20-2	0.0670	0.0239		mg/Kg
			2-Chloronaphthalene	91-58-7	0.330	0.0153		mg/Kg
			2-Chlorophenol	95-57-8	0.330	0.0118		mg/Kg
			2-Methylnaphthalene	91-57-6	0.330	0.00925		mg/Kg
			2-Methylphenol	95-48-7	0.330	0.0124		mg/Kg
			2-Nitroaniline	88-74-4	0.330	0.0252		mg/Kg
			2-Nitrophenol	88-75-5	0.330	0.0331		mg/Kg
			3 & 4 Methylphenol	15831-10-4	0.330	0.0206		mg/Kg
			3,3'-Dichlorobenzidine	91-94-1	0.133	0.0500		mg/Kg
			3-Nitroaniline	99-09-2	0.330	0.0785		mg/Kg
			4,6-Dinitro-2-methylphenol	534-52-1	0.266	0.135		mg/Kg
			4-Bromophenyl phenyl ether	101-55-3	0.330	0.0131		mg/Kg
			4-Chloro-3-methylphenol	59-50-7	0.330	0.0186		mg/Kg
			4-Chloroaniline	106-47-8	0.330	0.0587		mg/Kg
			4-Chlorophenyl phenyl ether	7005-72-3	0.330	0.0117		mg/Kg
			4-Methylphenol	106-44-5	0.330	0.0207		mg/Kg
			4-Nitroaniline	100-01-6	0.330	0.0380		mg/Kg
			4-Nitrophenol	100-02-7	0.670	0.0539		mg/Kg
			Acenaphthene	83-32-9	0.330	0.00943		mg/Kg

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Method Description	Method Code	Prep Method	Analyte Description	CAS Number	RL	MDL	LOD	Units
Solid								
			Acenaphthylene	208-96-8	0.330	0.00946		mg/Kg
			Acetophenone	98-86-2	0.330	0.0162		mg/Kg
			Anthracene	120-12-7	0.330	0.0101		mg/Kg
			Atrazine	1912-24-9	0.133	0.0195		mg/Kg
			Benzaldehyde	100-52-7	0.330	0.0547		mg/Kg
			Benzo[a]anthracene	56-55-3	0.0330	0.0249		mg/Kg
			Benzo[a]pyrene	50-32-8	0.0330	0.00881		mg/Kg
			Benzo[b]fluoranthene	205-99-2	0.0330	0.00856		mg/Kg
			Benzo[g,h,i]perylene	191-24-2	0.330	0.00976		mg/Kg
			Benzo[k]fluoranthene	207-08-9	0.0330	0.00649		mg/Kg
			Bis(2-chloroethoxy)methane	111-91-1	0.330	0.0258		mg/Kg
			Bis(2-chloroethyl)ether	111-44-4	0.0330	0.0115		mg/Kg
			Bis(2-ethylhexyl) phthalate	117-81-7	0.330	0.0175		mg/Kg
			Butyl benzyl phthalate	85-68-7	0.330	0.0155		mg/Kg
			Caprolactam	105-60-2	0.330	0.0515		mg/Kg
			Carbazole	86-74-8	0.330	0.0126		mg/Kg
			Chrysene	218-01-9	0.330	0.0139		mg/Kg
			Dibenz(a,h)anthracene	53-70-3	0.0330	0.0143		mg/Kg
			Dibenzofuran	132-64-9	0.330	0.0110		mg/Kg
			Diethyl phthalate	84-66-2	0.330	0.0107		mg/Kg
			Dimethyl phthalate	131-11-3	0.330	0.0752		mg/Kg
			Di-n-butyl phthalate	84-74-2	0.330	0.0125		mg/Kg
			Di-n-octyl phthalate	117-84-0	0.330	0.0175		mg/Kg
			Fluoranthene	206-44-0	0.330	0.0116		mg/Kg
			Fluorene	86-73-7	0.330	0.00968		mg/Kg
			Hexachlorobenzene	118-74-1	0.0330	0.0157		mg/Kg
			Hexachlorobutadiene	87-68-3	0.0670	0.00704		mg/Kg
			Hexachlorocyclopentadiene	77-47-4	0.330	0.0290		mg/Kg
			Hexachloroethane	67-72-1	0.0330	0.0114		mg/Kg
			Indeno[1,2,3-cd]pyrene	193-39-5	0.0330	0.0129		mg/Kg
			Isophorone	78-59-1	0.133	0.0956		mg/Kg
			Naphthalene	91-20-3	0.330	0.00572		mg/Kg
			Nitrobenzene	98-95-3	0.0330	0.0183		mg/Kg
			N-Nitrosodi-n-propylamine	621-64-7	0.0330	0.0240		mg/Kg
			N-Nitrosodiphenylamine	86-30-6	0.330	0.0272		mg/Kg
			Pentachlorophenol	87-86-5	0.266	0.0678		mg/Kg
			Phenanthrene	85-01-8	0.330	0.0135		mg/Kg
			Phenol	108-95-2	0.330	0.0122		mg/Kg
			Pyrene	129-00-0	0.330	0.00823		mg/Kg
			2,4,6-Tribromophenol (Surr)	118-79-6				mg/Kg
			2-Fluorobiphenyl	321-60-8				mg/Kg
			2-Fluorophenol (Surr)	367-12-4				mg/Kg
			Nitrobenzene-d5 (Surr)	4165-60-0				mg/Kg
			Phenol-d5 (Surr)	4165-62-2				mg/Kg
			Terphenyl-d14 (Surr)	1718-51-0				mg/Kg
Organochlorine Pesticides (GC)	8081B	3546	4,4'-DDD	72-54-8	0.00670	0.00114		mg/Kg
			4,4'-DDE	72-55-9	0.00670	0.000790		mg/Kg
			4,4'-DDT	50-29-3	0.00670	0.00123		mg/Kg
			Aldrin	309-00-2	0.00670	0.00101		mg/Kg
			alpha-BHC	319-84-6	0.00200	0.000680		mg/Kg
			beta-BHC	319-85-7	0.00200	0.000750		mg/Kg

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Method Description	Method Code	Prep Method	Analyte Description	CAS Number	RL	MDL	LOD	Units
Solid								
			Chlordane (technical)	12789-03-6	0.0670	0.0162		mg/Kg
			cis-Chlordane	5103-71-9	0.00670	0.00106		mg/Kg
			delta-BHC	319-86-8	0.00200	0.000410		mg/Kg
			Dieldrin	60-57-1	0.00200	0.000870		mg/Kg
			Endosulfan I	959-98-8	0.00670	0.00102		mg/Kg
			Endosulfan II	33213-65-9	0.00670	0.00172		mg/Kg
			Endosulfan sulfate	1031-07-8	0.00670	0.000840		mg/Kg
			Endrin	72-20-8	0.00670	0.000960		mg/Kg
			Endrin aldehyde	7421-93-4	0.00670	0.00158		mg/Kg
			Endrin ketone	53494-70-5	0.00670	0.00130		mg/Kg
			gamma-BHC (Lindane)	58-89-9	0.00200	0.000620		mg/Kg
			Heptachlor	76-44-8	0.00670	0.000790		mg/Kg
			Heptachlor epoxide	1024-57-3	0.00670	0.00100		mg/Kg
			Methoxychlor	72-43-5	0.00670	0.00153		mg/Kg
			Toxaphene	8001-35-2	0.0670	0.0242		mg/Kg
			DCB Decachlorobiphenyl	2051-24-3				mg/Kg
			Tetrachloro-m-xylene	877-09-8				mg/Kg
Polychlorinated Biphenyls (PCBs) by Gas Chromatography	8082A	3546	Aroclor 1016	12674-11-2	0.0670	0.0178	0.0178	mg/Kg
			Aroclor 1221	11104-28-2	0.0670	0.0178	0.0178	mg/Kg
			Aroclor 1232	11141-16-5	0.0670	0.0178	0.0178	mg/Kg
			Aroclor 1242	53469-21-9	0.0670	0.0178	0.0178	mg/Kg
			Aroclor 1248	12672-29-6	0.0670	0.0178	0.0178	mg/Kg
			Aroclor 1254	11097-69-1	0.0670	0.0178	0.0178	mg/Kg
			Aroclor 1260	11096-82-5	0.0670	0.0178	0.0178	mg/Kg
			Aroclor-1262	37324-23-5	0.0670	0.0178	0.0178	mg/Kg
			Aroclor 1268	11100-14-4	0.0670	0.0178	0.0178	mg/Kg
			Polychlorinated biphenyls, Total	1336-36-3	0.0670	0.0178	0.0178	mg/Kg
			DCB Decachlorobiphenyl	2051-24-3				mg/Kg
			Tetrachloro-m-xylene	877-09-8				mg/Kg
Herbicides (GC)	8151A	8151A_SP	2,4,5-T	93-76-5	0.0333	0.00708		mg/Kg
			2,4-D	94-75-7	0.0333	0.0121		mg/Kg
			Silvex (2,4,5-TP)	93-72-1	0.0333	0.00347		mg/Kg
			2,4-Dichlorophenylacetic acid	19719-28-9				mg/Kg
Metals (ICP/MS)	6020B	3050B	Aluminum	7429-90-5	20.0	5.49		mg/Kg
			Antimony	7440-36-0	1.00	0.146		mg/Kg
			Arsenic	7440-38-2	1.00	0.103		mg/Kg
			Barium	7440-39-3	2.00	0.145		mg/Kg
			Beryllium	7440-41-7	0.400	0.0570		mg/Kg
			Cadmium	7440-43-9	1.00	0.113		mg/Kg
			Calcium	7440-70-2	100	40.7		mg/Kg
			Chromium	7440-47-3	2.00	0.908		mg/Kg
			Cobalt	7440-48-4	2.00	0.148		mg/Kg
			Copper	7440-50-8	2.00	0.368		mg/Kg
			Iron	7439-89-6	60.0	20.2		mg/Kg
			Lead	7439-92-1	0.600	0.200		mg/Kg
			Magnesium	7439-95-4	100	10.2		mg/Kg
			Manganese	7439-96-5	4.00	0.403		mg/Kg
			Nickel	7440-02-0	2.00	0.470		mg/Kg
			Potassium	7440-09-7	100	16.2		mg/Kg

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Method Description	Method Code	Prep Method	Analyte Description	CAS Number	RL	MDL	LOD	Units
Solid								
			Selenium	7782-49-2	1.25	0.128		mg/Kg
			Silver	7440-22-4	0.400	0.0890		mg/Kg
			Sodium	7440-23-5	100	45.7		mg/Kg
			Thallium	7440-28-0	0.400	0.0410		mg/Kg
			Vanadium	7440-62-2	2.00	0.206		mg/Kg
			Zinc	7440-66-6	8.00	3.05		mg/Kg
Mercury (CVAA)	7471B	7471B_Prep	Mercury	7439-97-6	0.0170	0.00800		mg/Kg
Chromium, Hexavalent	7196A	3060A	Cr (VI)	18540-29-9	2.00	0.848		mg/Kg
Chromium, Trivalent (Colorimetric)	7196A_CR3		Cr (III)	16065-83-1	2.00	0.848		mg/Kg
Cyanide, Total andor Amenable	9012B	9012B_Prep	Cyanide, Total	57-12-5	0.240	0.131		mg/Kg
Percent Moisture	Moisture		Percent Moisture	STL00177	1.00			%
			Percent Solids	STL00234	1.00			%
Ground Water								
Volatile Organic Compounds by GC/MS	8260D	5030C	1,1,1-Trichloroethane	71-55-6	1.00	0.238		ug/L
			1,1,2,2-Tetrachloroethane	79-34-5	1.00	0.367		ug/L
			1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	1.00	0.311		ug/L
			1,1,2-Trichloroethane	79-00-5	1.00	0.204		ug/L
			1,1-Dichloroethane	75-34-3	1.00	0.264		ug/L
			1,1-Dichloroethene	75-35-4	1.00	0.264		ug/L
			1,2,3-Trichlorobenzene	87-61-6	1.00	0.357		ug/L
			1,2,4-Trichlorobenzene	120-82-1	1.00	0.365		ug/L
			1,2,4-Trimethylbenzene	95-63-6	1.00	0.374		ug/L
			1,2-Dibromo-3-Chloropropane	96-12-8	1.00	0.376		ug/L
			1,2-Dichlorobenzene	95-50-1	1.00	0.212		ug/L
			1,2-Dichloroethane	107-06-2	1.00	0.430		ug/L
			1,2-Dichloropropane	78-87-5	1.00	0.353		ug/L
			1,3,5-Trimethylbenzene	108-67-8	1.00	0.326		ug/L
			1,3-Dichlorobenzene	541-73-1	1.00	0.342		ug/L
			1,4-Dichlorobenzene	106-46-7	1.00	0.334		ug/L
			2-Butanone (MEK)	78-93-3	5.00	1.85		ug/L
			2-Hexanone	591-78-6	5.00	1.14		ug/L
			4-Methyl-2-pentanone (MIBK)	108-10-1	5.00	1.30		ug/L
			Acetone	67-64-1	5.00	4.42		ug/L
			Benzene	71-43-2	1.00	0.203		ug/L
			Bromoform	75-25-2	1.00	0.536		ug/L
			Bromomethane	74-83-9	1.00	0.550		ug/L
			Carbon disulfide	75-15-0	1.00	0.821		ug/L
			Carbon tetrachloride	56-23-5	1.00	0.208		ug/L
			Chlorobenzene	108-90-7	1.00	0.377		ug/L
			Chlorobromomethane	74-97-5	1.00	0.412		ug/L
			Chlorodibromomethane	124-48-1	1.00	0.281		ug/L
			Chloroethane	75-00-3	1.00	0.320		ug/L
			Chloroform	67-66-3	1.00	0.326		ug/L
			Chloromethane	74-87-3	1.00	0.402		ug/L
			cis-1,2-Dichloroethene	156-59-2	1.00	0.219		ug/L
			cis-1,3-Dichloropropene	10061-01-5	1.00	0.222		ug/L
			Cyclohexane	110-82-7	1.00	0.321		ug/L

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Method Description	Method Code	Prep Method	Analyte Description	CAS Number	RL	MDL	LOD	Units
Solid								
			Dichlorobromomethane	75-27-4	1.00	0.343		ug/L
			Dichlorodifluoromethane	75-71-8	1.00	0.311		ug/L
			Ethylbenzene	100-41-4	1.00	0.298		ug/L
			Ethylene Dibromide	106-93-4	1.00	0.498		ug/L
			Isopropylbenzene	98-82-8	1.00	0.336		ug/L
			Methyl acetate	79-20-9	5.00	0.785		ug/L
			Methyl tert-butyl ether	1634-04-4	1.00	0.216		ug/L
			Methylcyclohexane	108-87-2	1.00	0.707		ug/L
			Methylene Chloride	75-09-2	1.00	0.315		ug/L
			m-Xylene & p-Xylene	179601-23-1	1.00	0.296		ug/L
			n-Butylbenzene	104-51-8	1.00	0.324		ug/L
			N-Propylbenzene	103-65-1	1.00	0.322		ug/L
			o-Xylene	95-47-6	1.00	0.361		ug/L
			sec-Butylbenzene	135-98-8	1.00	0.367		ug/L
			Styrene	100-42-5	1.00	0.415		ug/L
			tert-Butylbenzene	98-06-6	1.00	0.335		ug/L
			Tetrachloroethene	127-18-4	1.00	0.249		ug/L
			Toluene	108-88-3	1.00	0.379		ug/L
			trans-1,2-Dichloroethene	156-60-5	1.00	0.235		ug/L
			trans-1,3-Dichloropropene	10061-02-6	1.00	0.223		ug/L
			Trichloroethene	79-01-6	1.00	0.314		ug/L
			Trichlorofluoromethane	75-69-4	1.00	0.320		ug/L
			Vinyl chloride	75-01-4	1.00	0.171		ug/L
			Xylenes, Total	1330-20-7	2.00	0.654		ug/L
			1,2-Dichloroethane-d4 (Surr)	17060-07-0				ug/L
			4-Bromofluorobenzene	460-00-4				ug/L
			Dibromofluoromethane (Surr)	1868-53-7				ug/L
			Toluene-d8 (Surr)	2037-26-5				ug/L

Semivolatile Organic Compounds (GC/MS)	8270E	3510C_LVI	1,1'-Biphenyl	92-52-4	10.0	1.19		ug/L
			1,2,4,5-Tetrachlorobenzene	95-94-3	10.0	1.24		ug/L
			2,2'-oxybis[1-chloropropane]	108-60-1	10.0	0.629		ug/L
			2,3,4,6-Tetrachlorophenol	58-90-2	10.0	0.746		ug/L
			2,4,5-Trichlorophenol	95-95-4	10.0	0.880		ug/L
			2,4,6-Trichlorophenol	88-06-2	10.0	0.857		ug/L
			2,4-Dichlorophenol	120-83-2	10.0	1.07		ug/L
			2,4-Dimethylphenol	105-67-9	10.0	0.619		ug/L
			2,4-Dinitrophenol	51-28-5	40.0	2.63		ug/L
			2,4-Dinitrotoluene	121-14-2	10.0	0.997		ug/L
			2,6-Dinitrotoluene	606-20-2	2.00	0.826		ug/L
			2-Chloronaphthalene	91-58-7	10.0	1.18		ug/L
			2-Chlorophenol	95-57-8	10.0	0.377		ug/L
			2-Methylnaphthalene	91-57-6	10.0	0.527		ug/L
			2-Methylphenol	95-48-7	10.0	0.671		ug/L
			2-Nitroaniline	88-74-4	10.0	0.474		ug/L
			2-Nitrophenol	88-75-5	10.0	0.747		ug/L
			3 & 4 Methylphenol	15831-10-4	10.0	0.644		ug/L
			3,3'-Dichlorobenzidine	91-94-1	10.0	1.43		ug/L
			3-Nitroaniline	99-09-2	10.0	1.94		ug/L
			4,6-Dinitro-2-methylphenol	534-52-1	20.0	2.99		ug/L
			4-Bromophenyl phenyl ether	101-55-3	10.0	0.745		ug/L
			4-Chloro-3-methylphenol	59-50-7	10.0	0.575		ug/L

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Method Description	Method Code	Prep Method	Analyte Description	CAS Number	RL	MDL	LOD	Units
Solid								
			4-Chloroaniline	106-47-8	10.0	1.88		ug/L
			4-Chlorophenyl phenyl ether	7005-72-3	10.0	1.28		ug/L
			4-Methylphenol	106-44-5	10.0	0.651		ug/L
			4-Nitroaniline	100-01-6	10.0	1.22		ug/L
			4-Nitrophenol	100-02-7	20.0	3.98		ug/L
			Acenaphthene	83-32-9	10.0	1.08		ug/L
			Acenaphthylene	208-96-8	10.0	0.823		ug/L
			Acetophenone	98-86-2	10.0	2.33		ug/L
			Anthracene	120-12-7	10.0	1.30		ug/L
			Atrazine	1912-24-9	2.00	1.35		ug/L
			Benzaldehyde	100-52-7	10.0	2.10		ug/L
			Benzo[a]anthracene	56-55-3	1.00	0.592		ug/L
			Benzo[a]pyrene	50-32-8	1.00	0.405		ug/L
			Benzo[b]fluoranthene	205-99-2	2.00	0.676		ug/L
			Benzo[g,h,i]perylene	191-24-2	10.0	0.702		ug/L
			Benzo[k]fluoranthene	207-08-9	1.00	0.674		ug/L
			Bis(2-chloroethoxy)methane	111-91-1	10.0	0.589		ug/L
			Bis(2-chloroethyl)ether	111-44-4	1.00	0.633		ug/L
			Bis(2-ethylhexyl) phthalate	117-81-7	2.00	0.804		ug/L
			Butyl benzyl phthalate	85-68-7	10.0	0.854		ug/L
			Caprolactam	105-60-2	10.0	2.24		ug/L
			Carbazole	86-74-8	10.0	0.679		ug/L
			Chrysene	218-01-9	2.00	0.907		ug/L
			Dibenz(a,h)anthracene	53-70-3	1.00	0.720		ug/L
			Dibenzofuran	132-64-9	10.0	1.10		ug/L
			Diethyl phthalate	84-66-2	10.0	0.976		ug/L
			Dimethyl phthalate	131-11-3	10.0	0.766		ug/L
			Di-n-butyl phthalate	84-74-2	10.0	0.840		ug/L
			Di-n-octyl phthalate	117-84-0	10.0	0.749		ug/L
			Fluoranthene	206-44-0	10.0	0.842		ug/L
			Fluorene	86-73-7	10.0	0.912		ug/L
			Hexachlorobenzene	118-74-1	1.00	0.396		ug/L
			Hexachlorobutadiene	87-68-3	1.00	0.780		ug/L
			Hexachlorocyclopentadiene	77-47-4	10.0	3.64		ug/L
			Hexachloroethane	67-72-1	2.00	0.803		ug/L
			Indeno[1,2,3-cd]pyrene	193-39-5	2.00	0.939		ug/L
			Isophorone	78-59-1	10.0	0.798		ug/L
			Naphthalene	91-20-3	2.00	0.541		ug/L
			Nitrobenzene	98-95-3	1.00	0.567		ug/L
			N-Nitrosodi-n-propylamine	621-64-7	1.00	0.430		ug/L
			N-Nitrosodiphenylamine	86-30-6	10.0	0.891		ug/L
			Pentachlorophenol	87-86-5	20.0	1.45		ug/L
			Phenanthrene	85-01-8	10.0	1.28		ug/L
			Phenol	108-95-2	10.0	0.292		ug/L
			Pyrene	129-00-0	10.0	1.64		ug/L
			2,4,6-Tribromophenol (Surr)	118-79-6				ug/L
			2-Fluorobiphenyl	321-60-8				ug/L
			2-Fluorophenol (Surr)	367-12-4				ug/L
			Nitrobenzene-d5 (Surr)	4165-60-0				ug/L
			Phenol-d5 (Surr)	4165-62-2				ug/L
			Terphenyl-d14 (Surr)	1718-51-0				ug/L

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Method Description	Method Code	Prep Method	Analyte Description	CAS Number	RL	MDL	LOD	Units
Solid								
Semivolatile Organic Compounds (GC/MS SIM / Isotope Dilution)	8270E_SIM_MS_ID	3510C_LVI	1,4-Dioxane	123-91-1	0.200	0.0720		ug/L
			1,4-Dioxane-d8	17647-74-4	0.400			ug/L
Organochlorine Pesticides (GC)	8081B	3510C_LVI	4,4'-DDD	72-54-8	0.0200	0.00600		ug/L
			4,4'-DDE	72-55-9	0.0200	0.00200		ug/L
			4,4'-DDT	50-29-3	0.0200	0.00400		ug/L
			Aldrin	309-00-2	0.0200	0.00300		ug/L
			alpha-BHC	319-84-6	0.0200	0.00700		ug/L
			beta-BHC	319-85-7	0.0200	0.0150		ug/L
			Chlordane (technical)	12789-03-6	0.500	0.0550		ug/L
			cis-Chlordane	5103-71-9	0.0200	0.00200		ug/L
			delta-BHC	319-86-8	0.0200	0.00500		ug/L
			Dieldrin	60-57-1	0.0200	0.00300		ug/L
			Endosulfan I	959-98-8	0.0200	0.00200		ug/L
			Endosulfan II	33213-65-9	0.0200	0.00400		ug/L
			Endosulfan sulfate	1031-07-8	0.0200	0.00600		ug/L
			Endrin	72-20-8	0.0200	0.00400		ug/L
			Endrin aldehyde	7421-93-4	0.0200	0.00800		ug/L
			Endrin ketone	53494-70-5	0.0200	0.00800		ug/L
			gamma-BHC (Lindane)	58-89-9	0.0200	0.0120		ug/L
			Heptachlor	76-44-8	0.0200	0.00300		ug/L
			Heptachlor epoxide	1024-57-3	0.0200	0.00500		ug/L
			Methoxychlor	72-43-5	0.0200	0.00400		ug/L
			Toxaphene	8001-35-2	0.500	0.110		ug/L
			DCB Decachlorobiphenyl	2051-24-3				ug/L
			Tetrachloro-m-xylene	877-09-8				ug/L
Polychlorinated Biphenyls (PCBs) by Gas Chromatography	8082A	3510C_LVI	Aroclor 1016	12674-11-2	0.400	0.119		ug/L
			Aroclor 1221	11104-28-2	0.400	0.119		ug/L
			Aroclor 1232	11141-16-5	0.400	0.119		ug/L
			Aroclor 1242	53469-21-9	0.400	0.119		ug/L

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Method Description	Method Code	Prep Method	Analyte Description	CAS Number	RL	MDL	LOD	Units
Solid								
			Aroclor 1248	12672-29-6	0.400	0.119		ug/L
			Aroclor 1254	11097-69-1	0.400	0.107		ug/L
			Aroclor 1260	11096-82-5	0.400	0.107		ug/L
			Aroclor-1262	37324-23-5	0.400	0.107		ug/L
			Aroclor 1268	11100-14-4	0.400	0.107		ug/L
			Polychlorinated biphenyls, Total	1336-36-3	0.400	0.119		ug/L
			DCB Decachlorobiphenyl	2051-24-3				ug/L
			Tetrachloro-m-xylene	877-09-8				
Herbicides (GC)	8151A	8151A_AP	2,4,5-T	93-76-5	1.20	0.120		ug/L
			2,4-D	94-75-7	1.20	0.130		ug/L
			Silvex (2,4,5-TP)	93-72-1	1.20	0.110		ug/L
			2,4-Dichlorophenylacetic acid	19719-28-9				ug/L
Chromium, Hexavalent	7196A		Cr (VI)	18540-29-9	10.0	8.14		ug/L
Chromium, Trivalent (Colorimetric)	7196A_CR3		Cr (III)	16065-83-1	10.0	8.14		ug/L
Cyanide, Total	9012B	9012B_Prep	Cyanide, Total	57-12-5	0.0100	0.00400		mg/L
Metals (ICP/MS)	6020B	3005A	Aluminum	7429-90-5	40.0	11.7		ug/L
			Antimony	7440-36-0	2.00	0.475		ug/L
			Arsenic	7440-38-2	2.00	1.15		ug/L
			Barium	7440-39-3	4.00	0.925		ug/L
			Beryllium	7440-41-7	0.800	0.124		ug/L
			Cadmium	7440-43-9	2.00	0.375		ug/L
			Calcium	7440-70-2	500	31.7		ug/L
			Chromium	7440-47-3	4.00	1.65		ug/L
			Cobalt	7440-48-4	4.00	0.412		ug/L
			Copper	7440-50-8	4.00	1.97		ug/L
			Iron	7439-89-6	120	33.7		ug/L
			Lead	7439-92-1	1.20	0.417		ug/L
			Magnesium	7439-95-4	200	21.8		ug/L
			Manganese	7439-96-5	8.00	0.839		ug/L
			Nickel	7440-02-0	4.00	1.39		ug/L
			Potassium	7440-09-7	200	83.3		ug/L
			Selenium	7782-49-2	2.50	0.432		ug/L
			Silver	7440-22-4	2.00	1.30		ug/L
			Sodium	7440-23-5	500	180		ug/L
			Thallium	7440-28-0	0.800	0.191		ug/L
			Vanadium	7440-62-2	4.00	1.00		ug/L
			Zinc	7440-66-6	16.0	4.22		ug/L
Mercury (CVAA)	7470A	7470A_Prep	Mercury	7439-97-6	0.200	0.0910		ug/L

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Method Description	LCS - Low	LCS - High	LCS - RPD %	MS - Low	MS - High	MS - RPD %	Surrogate Low	Surrogate High
Solid								
Volatile Organic Compounds by GC/MS	78	120	30	78	120	30		
	70	133	30	70	133	30		
	75	121	30	75	121	30		
	80	120	30	80	120	30		
	72	120	30	72	120	30		
	76	120	30	76	120	30		
	77	137	30	77	137	30		
	77	136	30	77	136	30		
	75	120	30	75	120	30		
	80	124	30	80	124	30		
	80	120	30	80	120	30		
	70	123	30	70	123	30		
	73	124	30	73	124	30		
	70	120	30	70	120	30		
	80	120	30	80	120	30		
	80	120	30	80	120	30		
	64	128	30	64	128	30		
	75	120	30	75	120	30		
	80	120	30	80	120	30		
	58	122	30	58	122	30		
	75	120	30	75	120	30		
	61	125	30	61	125	30		
	37	150	30	37	150	30		
	57	133	30	57	133	30		
	66	127	30	66	127	30		
	80	120	30	80	120	30		
	76	127	30	76	127	30		
	72	120	30	72	120	30		
	60	123	30	60	123	30		
	79	126	30	79	126	30		
	46	122	30	46	122	30		
	80	123	30	80	123	30		
	75	120	30	75	120	30		
	65	132	30	65	132	30		
	77	124	30	77	124	30		
	45	129	30	45	129	30		
	80	120	30	80	120	30		
	79	120	30	79	120	30		
	74	120	30	74	120	30		
	57	120	30	57	120	30		
	74	125	30	74	125	30		
	66	125	30	66	125	30		
	78	120	30	78	120	30		
	80	120	30	80	120	30		
	72	120	30	72	120	30		
	68	120	30	68	120	30		
	80	120	30	80	120	30		
	78	120	30	78	120	30		
	80	120	30	80	120	30		
	80	120	30	80	120	30		
	73	120	30	73	120	30		
	80	120	30	80	120	30		

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Method Description	LCS - Low	LCS - High	LCS - RPD %	MS - Low	MS - High	MS - RPD %	Surrogate Low	Surrogate High
Solid								
	78	120	30	78	120	30		
	77	120	30	77	120	30		
	80	120	30	80	120	30		
	61	130	30	61	130	30		
	54	122	30	54	122	30		
	80	120	30	80	120	30		
			30			30	65	138
			30			30	71	128
							50	150
			30			30	71	126
Volatile Organic Compounds by GC/MS	76	120	30	76	120	30		
	72	120	30	72	120	30		
	79	120	30	79	120	30		
	80	120	30	80	120	30		
	70	120	30	70	120	30		
	69	120	30	69	120	30		
	80	137	30	80	137	30		
	80	134	30	80	134	30		
	75	120	30	75	120	30		
	68	134	30	68	134	30		
	80	120	30	80	120	30		
	72	124	30	72	124	30		
	74	120	30	74	120	30		
	71	120	30	71	120	30		
	80	120	30	80	120	30		
	80	120	30	80	120	30		
	64	121	30	64	121	30		
	70	120	30	70	120	30		
	64	127	30	64	127	30		
	52	127	30	52	127	30		
	75	120	30	75	120	30		
	68	122	30	68	122	30		
	16	125	30	16	125	30		
	59	127	30	59	127	30		
	77	120	30	77	120	30		
	80	120	30	80	120	30		
	77	120	30	77	120	30		
	80	120	30	80	120	30		
	61	140	30	61	140	30		
	73	120	30	73	120	30		
	42	136	30	42	136	30		
	73	120	30	73	120	30		
	79	120	30	79	120	30		
	76	125	30	76	125	30		
	77	120	30	77	120	30		
	39	140	30	39	140	30		
	80	121	30	80	121	30		
	80	120	30	80	120	30		
	74	125	30	74	125	30		
	40	130	30	40	130	30		
	77	125	30	77	125	30		

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Method Description	LCS - Low	LCS - High	LCS - RPD %	MS - Low	MS - High	MS - RPD %	Surrogate Low	Surrogate High
Solid								
	75	127	30	75	127	30		
	73	120	30	73	120	30		
	79	120	30	79	120	30		
	68	120	30	68	120	30		
	68	120	30	68	120	30		
	80	123	30	80	123	30		
	77	126	30	77	126	30		
	80	124	30	80	124	30		
	80	120	30	80	120	30		
	78	120	30	78	120	30		
	80	120	30	80	120	30		
	70	120	30	70	120	30		
	73	120	30	73	120	30		
	77	120	30	77	120	30		
	61	143	30	61	143	30		
	50	131	30	50	131	30		
	80	120	30	80	120	30		
			30			30	60	150
			30			30	70	150
			30			30	68	150
			30			30	64	157
Semivolatile Organic Compounds (GC/MS)	64	120	30	64	120	30		
	60	120	30	60	120	30		
	27	120	30	27	120	30		
	46	126	30	46	126	30		
	62	120	30	62	120	30		
	64	120	30	64	120	30		
	65	120	30	65	120	30		
	66	120	30	66	120	30		
	46	120	30	46	120	30		
	41	129	30	41	129	30		
	65	124	30	65	124	30		
	67	121	30	67	121	30		
	64	120	30	64	120	30		
	63	120	30	63	120	30		
	64	120	30	64	120	30		
	63	120	30	63	120	30		
	48	120	30	48	120	30		
	64	120	30	64	120	30		
	61	120	30	61	120	30		
	10	120	30	10	120	30		
	18	122	30	18	122	30		
	58	136	30	58	136	30		
	60	120	30	60	120	30		
	66	120	30	66	120	30		
	10	120	30	10	120	30		
	62	120	30	62	120	30		
	61	120	30	61	120	30		
	51	120	30	51	120	30		
	42	132	30	42	132	30		
	65	120	30	65	120	30		

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Method Description	LCS - Low	LCS - High	LCS - RPD %	MS - Low	MS - High	MS - RPD %	Surrogate Low	Surrogate High
Solid								
	64	120	30	64	120	30		
	61	120	30	61	120	30		
	67	120	30	67	120	30		
	32	150	30	32	150	30		
	28	150	30	28	150	30		
	66	120	30	66	120	30		
	73	123	30	73	123	30		
	70	125	30	70	125	30		
	66	120	30	66	120	30		
	67	122	30	67	122	30		
	62	120	30	62	120	30		
	60	120	30	60	120	30		
	64	125	30	64	125	30		
	62	127	30	62	127	30		
	36	150	30	36	150	30		
	64	120	30	64	120	30		
	67	120	30	67	120	30		
	66	128	30	66	128	30		
	61	120	30	61	120	30		
	63	120	30	63	120	30		
	65	120	30	65	120	30		
	66	120	30	66	120	30		
	61	123	30	61	123	30		
	61	120	30	61	120	30		
	64	120	30	64	120	30		
	66	120	30	66	120	30		
	62	120	30	62	120	30		
	13	120	30	13	120	30		
	61	120	30	61	120	30		
	71	137	30	71	137	30		
	61	120	30	61	120	30		
	63	120	30	63	120	30		
	63	120	30	63	120	30		
	56	120	30	56	120	30		
	63	120	30	63	120	30		
	61	126	30	61	126	30		
	66	120	30	66	120	30		
	63	120	30	63	120	30		
	61	121	30	61	121	30		
			30			30	24	137
			30			30	38	128
			30			30	31	133
			30			30	31	120
			30			30	35	132
			30			30	44	147

Organochlorine Pesticides (GC)	70	138	30	70	138	30		
	68	136	30	68	136	30		
	66	149	30	66	149	30		
	69	136	30	69	136	30		
	72	134	30	72	134	30		
	71	130	30	71	130	30		

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Method Description	LCS - Low	LCS - High	LCS - RPD %	MS - Low	MS - High	MS - RPD %	Surrogate Low	Surrogate High
Solid								
	77	120	30	77	120	30		
	69	135	30	69	135	30		
	69	140	30	69	140	30		
	69	134	30	69	134	30		
	69	133	30	69	133	30		
	71	137	30	71	137	30		
	61	140	30	61	140	30		
	67	141	30	67	141	30		
	71	136	30	71	136	30		
	60	146	30	60	146	30		
	72	139	30	72	139	30		
	74	138	30	74	138	30		
	72	134	30	72	134	30		
	60	150	30	60	150	30		
	63	120	30	63	120	30		
						30	17	150
						30	21	150
Polychlorinated Biphenyls (PCBs) by Gas Chromatography	54	136	30	54	136	30		
	53	145	30	53	145	30		
							20	150
							20	150
Herbicides (GC)	69	150	30	69	150	30		
	78	150	30	78	150	30		
	78	150	30	78	150	30		
			30			30	41	150
Metals (ICP/MS)	80	120	20	75	125	20		
	80	120	20	75	125	20		
	80	120	20	75	125	20		
	80	120	20	75	125	20		
	80	120	20	75	125	20		
	80	120	20	75	125	20		
	80	120	20	75	125	20		
	80	120	20	75	125	20		
	80	120	20	75	125	20		
	80	120	20	75	125	20		
	80	120	20	75	125	20		
	80	120	20	75	125	20		
	80	120	20	75	125	20		
	80	120	20	75	125	20		
	80	120	20	75	125	20		

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Method Description	LCS - Low	LCS - High	LCS - RPD %	MS - Low	MS - High	MS - RPD %	Surrogate Low	Surrogate High
Solid								
	80	120	20	75	125	20		
	80	120	20	75	125	20		
	80	120	20	75	125	20		
	80	120	20	75	125	20		
	80	120	20	75	125	20		
	80	120	20	75	125	20		
Mercury (CVAA)	80	120	20	80	120	20		
Chromium, Hexavalent								
Chromium, Trivalent (Colorimetric)								
Cyanide, Total andor Amenable	85	115		29	100	40		
Percent Moisture								
Ground Water								
Volatile Organic Compounds by GC/MS	72	128	30	72	128	30		
	63	139	30	63	139	30		
	65	142	30	65	142	30		
	74	125	30	74	125	30		
	73	130	30	73	130	30		
	68	133	30	68	133	30		
	55	150	30	55	150	30		
	67	132	30	67	132	30		
	75	125	30	75	125	30		
	58	132	30	58	132	30		
	80	120	30	80	120	30		
	66	129	30	66	129	30		
	72	128	30	72	128	30		
	75	125	30	75	125	30		
	80	120	30	80	120	30		
	80	120	30	80	120	30		
	65	142	30	65	142	30		
	72	134	30	72	134	30		
	77	130	30	77	130	30		
	60	133	30	60	133	30		
	71	126	30	71	126	30		
	58	128	30	58	128	30		
	33	150	30	33	150	30		
	35	150	30	35	150	30		
	65	131	30	65	131	30		
	80	120	30	80	120	30		
	71	134	30	71	134	30		
	73	121	30	73	121	30		
	54	150	30	54	150	30		
	78	125	30	78	125	30		
	43	149	30	43	149	30		
	78	121	30	78	121	30		
	74	125	30	74	125	30		
	64	142	30	64	142	30		

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Method Description	LCS - Low	LCS - High	LCS - RPD %	MS - Low	MS - High	MS - RPD %	Surrogate Low	Surrogate High
Solid								
	76	121	30	76	121	30		
	38	144	30	38	144	30		
	78	120	30	78	120	30		
	79	126	30	79	126	30		
	79	125	30	79	125	30		
	50	147	30	50	147	30		
	72	131	30	72	131	30		
	63	138	30	63	138	30		
	74	127	30	74	127	30		
	78	120	30	78	120	30		
	69	135	30	69	135	30		
	68	129	30	68	129	30		
	78	120	30	78	120	30		
	77	129	30	77	129	30		
	82	127	30	82	127	30		
	78	120	30	78	120	30		
	70	127	30	70	127	30		
	78	120	30	78	120	30		
	70	126	30	70	126	30		
	71	127	30	71	127	30		
	73	121	30	73	121	30		
	62	134	30	62	134	30		
	55	144	30	55	144	30		
	80	120	30	80	120	30		
			30			30	70	128
			30			30	76	120
			30			30	77	132
			30			30	80	120

Semivolatile Organic Compounds (GC/MS)	52	129	30	52	129	30		
	40	136	30	40	136	30		
	47	133	30	47	133	30		
	63	131	30	63	131	30		
	63	124	30	63	124	30		
	66	131	30	66	131	30		
	60	120	30	60	120	30		
	37	120	30	37	120	30		
	50	148	30	50	148	30		
	71	142	30	71	142	30		
	71	136	30	71	136	30		
	50	129	30	50	129	30		
	49	120	30	49	120	30		
	42	134	30	42	134	30		
	35	120	30	35	120	30		
	57	134	30	57	134	30		
	62	124	30	62	124	30		
	27	120	30	27	120	30		
	55	145	30	55	145	30		
	51	120	30	51	120	30		
	65	145	30	65	145	30		
	59	132	30	59	132	30		
	54	120	30	54	120	30		

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Method Description	LCS - Low	LCS - High	LCS - RPD %	MS - Low	MS - High	MS - RPD %	Surrogate Low	Surrogate High
Solid								
	43	120	30	43	120	30		
	65	127	30	65	127	30		
	28	120	30	28	120	30		
	57	135	30	57	135	30		
	10	120	30	10	120	30		
	62	127	30	62	127	30		
	58	122	30	58	122	30		
	65	125	30	65	125	30		
	67	127	30	67	127	30		
	13	150	30	13	150	30		
	10	150	30	10	150	30		
	71	131	30	71	131	30		
	75	148	30	75	148	30		
	70	140	30	70	140	30		
	52	143	30	52	143	30		
	71	140	30	71	140	30		
	63	122	30	63	122	30		
	61	125	30	61	125	30		
	65	144	30	65	144	30		
	67	141	30	67	141	30		
	10	120	30	10	120	30		
	68	132	30	68	132	30		
	70	132	30	70	132	30		
	53	150	30	53	150	30		
	64	125	30	64	125	30		
	67	131	30	67	131	30		
	67	129	30	67	129	30		
	71	139	30	71	139	30		
	51	150	30	51	150	30		
	69	137	30	69	137	30		
	67	125	30	67	125	30		
	62	135	30	62	135	30		
	10	147	30	10	147	30		
	10	135	30	10	135	30		
	10	138	30	10	138	30		
	59	150	30	59	150	30		
	65	128	30	65	128	30		
	39	126	30	39	126	30		
	66	127	30	66	127	30		
	63	133	30	63	133	30		
	66	128	30	66	128	30		
	60	140	30	60	140	30		
	68	126	30	68	126	30		
	10	80	30	10	80	30		
	60	137	30	60	137	30		
			30			30	37	150
			30			30	46	139
			30			30	16	80
			30			30	51	145
			30			30	10	56
			30			30	13	159

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Method Description	LCS - Low	LCS - High	LCS - RPD %	MS - Low	MS - High	MS - RPD %	Surrogate Low	Surrogate High
Solid								
Semivolatile Organic Compounds (GC/MS SIM / Isotope Dilution)	42	142	20	42	142	20		
			20			20	10	150
Organochlorine Pesticides (GC)	69	138	30	69	138	30		
	68	130	30	68	130	30		
	57	1505	30	57	150	30		
	67	129	30	67	129	30		
	70	125	30	70	125	30		
	70	129	30	70	129	30		
	45	120	30	45	120	30		
	72	126	30	72	126	30		
	44	120	30	44	120	30		
	72	128	30	72	128	30		
	73	127	30	73	127	30		
	73	134	30	73	134	30		
	61	128	30	61	128	30		
	64	138	30	64	138	30		
	74	133	30	74	133	30		
	56	150	30	56	150	30		
	73	132	30	73	132	30		
	70	134	30	70	134	30		
	75	126	30	75	126	30		
	49	150	30	49	150	30		
	41	140	30	41	140	30		
			30			30	30	131
			30			30	34	120

Polychlorinated Biphenyls (PCBs) by Gas Chromatography	42	120	30	42	120	30		

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Method Description	LCS - Low	LCS - High	LCS - RPD %	MS - Low	MS - High	MS - RPD %	Surrogate Low	Surrogate High
Solid								
	42	126	30	42	126	30		
							18	145
							21	124
Herbicides (GC)	35	150	30	35	150	30		
	25	150	30	25	150	30		
	39	150	30	39	150	30		
			30			30	10	150
Chromium, Hexavalent			20	85	115	20		
Chromium, Trivalent (Colorimetric)			20	85	115	20		
Cyanide, Total	85	115		90	110	35		
Metals (ICP/MS)	80	120	20	75	125	20		
	80	120	20	75	125	20		
	80	120	20	75	125	20		
	80	120	20	75	125	20		
	80	120	20	75	125	20		
	80	120	20	75	125	20		
	80	120	20	75	125	20		
	80	120	20	75	125	20		
	80	120	20	75	125	20		
	80	120	20	75	125	20		
	80	120	20	75	125	20		
	80	120	20	75	125	20		
	80	120	20	75	125	20		
	80	120	20	75	125	20		
	80	120	20	75	125	20		
	80	120	20	75	125	20		
	80	120	20	75	125	20		
	80	120	20	75	125	20		
	80	120	20	75	125	20		
	80	120	20	75	125	20		
	80	120	20	75	125	20		
	80	120	20	75	125	20		
Mercury (CVAA)	80	120	20	75	125	20		

ATTACHMENT 4

Roux's Standard Operating Procedures

Date: May 5, 2000
Revision: April 6, 2015

1.0 PURPOSE

The purpose of this standard operating procedure (SOP) is to explain the quality control (QC) measures taken to ensure the integrity of the samples collected and to establish the guidelines for the collection of QC samples. The objective of the QC program is to ensure that water-quality data of known and reliable quality are developed.

Valid water-chemistry data are integral to adequately characterize water-quality conditions, therefore, the data will typically be confirmed by the implementation of QC samples to verify the collection of representative samples. Without checks on the sampling and analytical procedures, the potential exists for contradictory or incorrect results. The acceptance of water-quality data by regulatory agencies and in litigation-support investigations depends heavily on the proper QC program to justify the results presented. The QC sampling requirements must be determined by the project manager and be clearly defined in the work plan. If data validation (for in-house purposes or for compliance with the United States Environmental Protection Agency [USEPA] regulations) is stipulated as part of the hydrogeologic investigation, QC sampling must be conducted.

2.0 QUALITY CONTROL SAMPLES

2.1 Samples taken for analysis of compounds require the use of quality control samples to monitor sampling activities and laboratory performance. Types of quality control samples may include replicate (sometimes referred to as a duplicate) and/or replicate split, trip blank, field equipment blank, matrix spike and matrix spike duplicate, and fortification. A discussion pertaining to each quality control sample follows:

a. Replicate and Replicate Split - Replicate sample analysis is done to check on the reproducibility of results either within a laboratory or between laboratories. A replicate sample is called a split sample when it is collected with, or turned over to, a second party (e.g., regulatory agency, consulting firm) for an independent analysis. Replicate samples are aliquots (equal portions) from a sample in a common container.

To collect a replicate sample, water from the bailer or pump will be distributed first to fill one container and then to fill the second container. Adequate water should be available to fill the bottles completely before they are capped. If the water is insufficient to fill all the bottles at once, then incrementally fill each bottle with water from two or more bailer volumes or pump cycles.

For some test substances, water may have to be accumulated in a common container and then decanted slowly into the sample bottles. The work plan

should be checked for a description of how replicate samples are to be collected. Additionally, in the case of wells that recover slowly and produce insufficient water to fill all the replicate sample containers, the containers should be filled incrementally and kept on ice in the cooler in between filling periods.

b. Trip Blank - A trip blank sample is a 40-ml vial that is filled with "clean" (e.g., distilled/deionized) water in the laboratory, and travels unopened with the sample bottles. (The USEPA now uses the phrase "demonstrated analyte free water.") It is opened in the laboratory and analyzed along with the field samples for the constituent(s) of interest to detect if contamination has occurred during field handling, shipment, or in the laboratory. Trip blanks are primarily used to check for "artificial" contamination of the sample caused by airborne volatile organic compounds (VOCs) but may also be used to check for "artificial" contamination of the sample by a test substance or other analyte(s). Two sealed laboratory filled 40-ml vials will be submitted per trip blank set. A trip blank set will be included in each cooler containing VOC samples, or other analyte(s) of interest, per day.

c. Field Equipment Blank - A field equipment blank (field blank) sample is collected to check on the sampling procedures implemented in the field. A field blank is made with "clean" (e.g., distilled/deionized/demonstrated analyte free) water by exposing it to sampling processes (i.e., the clean water must pass through the actual sampling equipment). For example, if samples are being collected with a bailer, the field blank would be made by pouring the clean water into a bailer which has been decontaminated and is ready for sampling, and then pouring from the bailer into the sample containers. If a metals equipment blank is to be made, and the water was filtered, then the sample must be filtered (i.e., exposed to the sampling process). One equipment blank would be incorporated into the sampling program for each day's collection of samples and analyzed for the identical suite of constituents as the sample.

A special type of field blank may be needed where ambient air quality may be poor. This field blank sample would be taken to determine if airborne contaminants will interfere with constituent identification or quantification. This field blank sample is a sample bottle that is filled and sealed with "clean" (e.g., distilled/deionized/demonstrated analyte free) water in the analytical laboratory, and travels unopened with the sample bottles. It is opened in the field and exposed to the air at a location(s) to check for potential atmospheric interference(s). The field blank is resealed and shipped to the contract laboratory for analysis.

d. Matrix Spike and Matrix Spike Duplicate - Spikes of compounds (e.g., standard compound, test substance, etc.) may be added to samples in the laboratory to determine if the ground-water matrix is interfering with

constituent identification or quantification, as well as a check for systematic errors and lack of sensitivity of analytical equipment. Samples for spikes are collected in the identical manner as for standard analysis, and shipped to the laboratory for spiking. Additional volume is required for MS/MSD samples. Matrix spike duplicate sample collection, and laboratory spiking and analysis is done to check on the reproducibility of matrix spike results and should be collected, when possible, from a location expected to be relatively free from contamination

e. Fortification - A fortification, which is performed in the field, is used to check on the laboratory's ability to recover the test substance (analyte) added as well as its stability between fortification and analysis.

A field fortification (spike) is prepared by filling the container(s) with field or distilled/deionized/demonstrated analyte free water (as specified by the laboratory) to a predetermined volume (as specified by the laboratory) and adding the spike (supplied by the laboratory). The predetermined volume of water is measured with a clean (decontaminated) graduated cylinder. Field spikes will be prepared following the collection, labeling, and sealing of nonspiked samples in a separate cooler. The spike is kept at a safe distance from the sampling point (e.g., in the hotel room).

f. Temperature Blank - A temperature blank is a container of water shipped with each cooler of samples requiring preservation by cooling to 6EC (ice). The temperature of the blank is measured at the time of sample receipt by the laboratory.

2.2 The work plan must be referred to for details regarding the type of QC samples to be collected and the QC sample collection method.

3.0 PROCEDURE

3.1 Implement QC sampling as outlined above, depending on the type of QC sample(s) specified in the work plan.

3.2 Ensure unbiased handling and analysis of replicate and blank QC samples by concealing their identity by means of coding so that the analytical laboratory cannot determine which samples are included for QC purposes. Attempt to use a code that will not cause confusion if additional samples are collected or additional monitoring wells are installed. For example, if there are three existing monitoring wells (MW-1, 2 and 3), do not label the QC blank MW-4. If an additional monitoring well were installed, confusion could result.

3.3 Label matrix spike and field fortification (spike) QC samples so that the analytical laboratory knows which samples are to be spiked in the laboratory and which samples were fortified (spiked) in the field, respectively. In certain situations, the field fortification will be "blind" or undisclosed to the laboratory to independently verify their analytical ability.

3.4 Verify that each sample is placed in an individual "zip-lock" bag, wrapped with "bubble wrap," and placed in its appropriate container (holder) in the cooler, and that the cooler has sufficient ice (wet ice or blue packs) to preserve the samples for transportation to the analytical laboratory. Consult the site work plan to determine if a particular ice is specified as the preservative for transportation (e.g., the USEPA prefers the use of wet ice because they claim that blue ice will not hold the samples at 4° Centigrade/Celsius).

3.5 Document the QC samples on the appropriate field form and in the field notebook. On the chain-of-custody form, replicate and blank QC samples will be labeled using the codes (Number 3.2, above), and matrix spike and field fortification QC samples will be identified as such (Number 3.3, above).

3.6 Follow standard shipping procedures for samples (i.e., retain one copy of the chain-of-custody form, secure the cooler with sufficient packing tape and a custody seal, forward the samples via overnight [express] mail, by courier or hand deliver to the designated analytical laboratory preferably within 24 hours but no later than 48 hours after sampling). However, check the site work plan for information on the analyte(s), as some have to be analyzed immediately (e.g., CN).

END OF PROCEDURE

Date: May 5, 2000

1.0 PURPOSE

The purpose of this standard operating procedure (SOP) is to provide procedures and standards for record keeping and maintenance, for all field activities conducted by Roux Associates, Inc. (Roux Associates).

Strict quality assurance/quality control (QA/QC) is necessary to properly and accurately document and preserve all project-related information. Quality assurance is implemented to corroborate that quality control procedures are followed. Quality control provides a means to monitor investigation activities (e.g., sampling and laboratory performance) as a check on the quality of the data.

Valid data and information are integral to all aspects of Roux Associates' field activities. These aspects include, but are not necessarily limited to, activities that involve: drilling; sediment, sludge, and soil sampling (lithologic, and soil-quality and analysis); well construction and development; aquifer testing and analysis; water-quality sampling and analysis (surface water and ground water); free-product sampling and analysis; air-quality sampling and analysis; geophysical testing; demolition activities; waste removal operations; engineering installations; etc. The data will be confirmed by QA/QC methods established and set forth in the work plan/scope of work. Without checks on the field and analytical procedures, the potential exists for contradictory results, and associated incomplete or incorrect results from the interpretation of potentially questionable data.

Documentation will be entered in the field notebook and must be transcribed with extreme care, in a clear and concise manner, as the information recorded will become part of the permanent legal record. Because field notes are the legal record of site activities, they must be taken in a standard and consistent manner. If abbreviations are used, then they must first be spelled out for clarity (i.e., to avoid ambiguity and misunderstanding). All entries must be dated and initialed, and the time (military time) of the entry included. Field notebooks and forms must be assigned to an individual project and properly identified (i.e., client name, project number, location and name of site, individual recording information, dates, times, etc.). Change of possession of field notebooks or forms must be documented with the date and time, and initialed by both individuals. Any cross outs of text (from grammatical errors or misspellings) must be followed by the field personnel’s initials. Following each day's entries, the field notebook or form must be photocopied in the event that the original documentation is lost or stolen. All field notebooks must have the company name and address legibly printed in indelible ink along with the message "If found, then please forward to Roux Associates, Inc. at the above address - REWARD OFFERED."

Information must be recorded while onsite because it may be difficult to recall details at a later date. Furthermore, information must be documented immediately as it provides unbiased information which will be used for writing the report when the field activities

are completed. Project-related documentation is an irreplaceable, important record for other individuals who may become involved in the project, and provides the project manager with a complete history of project-related activities. Written information must be accompanied by maps, sketches, and photographs where appropriate, especially if these supplemental sources of information assist in the documentation process. A new page must be used in the field notebook for each new day's entries (i.e., unused portions of a previous page must have an "X" placed through it). The end of the day's records must be initialed and dated.

As part of record keeping and QA/QC activities, state and federal regulatory agencies should be contacted to check if special or different protocols are required and/or if particular or unconventional methods are required for the given field activity. Thus, the record keeping and QA/QC activities implemented by Roux Associates are based on technically sound standard practices and incorporate Roux Associates own, extensive experience in conducting hydrogeologic field activities.

2.0 MATERIALS

In order to track investigation activities, specific materials are required. These materials include the following:

a. A bound, waterproof field notebook.

b. Appropriate Roux Associates' forms (e.g., daily log, geologic log, monitoring well construction log, well sampling data form, location sketch, chain of custody, telephone conversation record, meeting notes, etc.).

c. Appropriate labels (e.g., sample, Roux Associates' Custody Seal, etc.)

d. Work plan/scope of work.

e. Health and safety plan (HASP).

f. Appropriate Roux Associates' SOPs.

g. Black pens, and indelible markers.

h. Camera and film.

3.0 DOCUMENTATION

3.1 Before the Roux Associates personnel leave the field, they must ensure that their field notes include comprehensive descriptions of the hydrogeologic conditions, and all investigation-related activities and results (onsite and offsite). This will safeguard against the inability to reconstruct and comprehend all aspects of the field investigation after its completion, and will serve to facilitate the writing of an accurate report. Properly documented information provides the QA/QC tracking (back-up) required for all Roux Associates' projects. General types of

information that must be recorded (where pertinent to the investigation being conducted) include, but may not necessarily be limited to, the following:

a. List of Roux Associates personnel on site.

b. Name, date, and time of arrival on site by Roux Associates personnel, including temporary departures from, and returns to, the site during the work day.

c. Client and project number.

d. Name and location of study area.

e. Date and time of arrival on site by non-Roux Associates personnel (names and affiliation) and equipment (e.g., subcontractors and facility personnel, and drilling equipment, respectively, etc.), including temporary departures from, and returns to, the site during the work day, and departure at the end of the work day.

f. List of non-Roux Associates personnel on site.

g. Weather conditions at the beginning of the day as well as any changes in weather that occur during the working day.

h. Health and safety procedures including level of protection, monitoring of vital signs, frequency of air monitoring, and any change (i.e., downgrade or upgrade) in the level of protection for Roux Associates and other on-site personnel (e.g., subcontractors, facility personnel, etc.).

i. Health and safety procedures not in compliance with the HASP (for all on-site personnel).

j. Site reconnaissance information (e.g., topographic features, geologic features, surface-water bodies, seeps, areas of apparent contamination, facility/plant structures, etc.).

k. Air monitoring results (i.e., photoionization detector [PID], etc. measurements).

l. Task designation and work progress.

m. Work-related and site-related discussions with subcontractors, regulatory agency personnel, plant personnel, the general public, and Roux Associates personnel.

n. Delays, unusual situations, problems and accidents.

o. Field work not conducted in accordance with the work plan/scope of work, and rationale and justification for any change(s) in field procedures

including discussions with personnel regarding the change(s) and who authorized the change(s).

p. QA/QC procedures not conducted in accordance with the QA/QC procedures established in the work plan/scope of work and rationale and justification for any change(s) in QA/QC procedures including discussions with personnel regarding the change(s) and who authorized the change(s).

q. Equipment and instrument problems.

r. Decontamination and calibration procedures.

s. Activities in and around the site and work area by any and all on-site personnel which may impact field activities.

t. Sketches, maps, and/or photographs (with dates and times) of the site, structures, equipment, etc. that would facilitate explanations of site conditions.

u. Contamination evidenced as a result of work-related activities (e.g., visible contaminants [sheen] in drilling fluids or on drilling equipment; sheen on, or staining of, sediments; color of, or separate [nonaqueous] phase on, water from borehole or well; vapors or odors emanating from a borehole or well; etc.); make all observations as objectively as possible (e.g., grey-blue, oil-like sheen; black and orange, rust-like stain; fuel-like odor; etc.) and avoid using nontechnical or negative-sounding terms (e.g., slimy, goopy, foul-smelling).

v. Date and time of final departure from the site of all personnel at the end of the work day.

3.2 In addition to the general types of information that must be recorded (as presented in Section 3.1), task-specific information must also be properly documented. Task-specific information which is required is provided in each respective task-oriented SOP, and the documentation procedures outlined in each SOP must be followed.

END OF PROCEDURE

Date: March 4, 2015

1.0 PURPOSE

The purpose of this standard operating procedure (SOP) is to establish guidelines for sample handling which will allow consistent and accurate results. Valid chemistry data are integral to investigations that characterize media-quality conditions. Thus, this SOP is designed to ensure that once samples are collected, they are preserved, packed and delivered in a manner which will maintain sample integrity to as great an extent as possible. The procedures outlined are applicable to most sampling events and any required modifications must be clearly described in the work plan.

2.0 CONSIDERATIONS

Sample containers, sampling equipment decontamination, quality assurance/quality control (QA/QC), sample preservation, and sample handling are all components of this SOP.

2.1 Sample Containers

Prior to collection of a sample, considerations must be given to the type of container that will be used to store and transport the sample. The type and number of containers selected is usually based on factors such as sample matrix, potential contaminants to be encountered, analytical methods requested, and the laboratory's internal quality assurance requirements. In most cases, the overriding considerations will be the analytical methodology, or the state or federal regulatory requirements because these regulations generally encompass the other factors. The sample container selected is usually based on some combination of the following criteria:

a. Reactivity of Container Material with Sample

Choosing the proper composition of sample containers will help to ensure that the chemical and physical integrity of the sample is maintained. For sampling potentially hazardous material, glass is the recommended container type because it is chemically inert to most substances. Plastic containers are not recommended for most hazardous wastes because the potential exists for contaminants to adsorb to the surface of the plastic or for the plasticizer to leach into the sample.

In some instances, however, the sample characteristics or analytes of interest may dictate that plastic containers be used instead of glass. Because some metals species will adhere to the sides of the glass containers in an aqueous matrix, plastic bottles (e.g., nalgene) must be used for samples collected for metals analysis. A separate, plastic container should accompany glass containers if metals analysis is to be performed along with other analyses. Likewise, other sample characteristics may dictate that glass cannot be used. For example, in the

case of a strong alkali waste or hydrofluoric solution, plastic containers may be more suitable because glass containers may be etched by these compounds and create adsorptive sites on the container's surface.

b. Volume of the Container

The volume of sample to be collected will be dictated by the analysis being performed and the sample matrix. The laboratory must supply bottles of sufficient volume to perform the required analysis. In most cases, the methodology dictates the volume of sample material required to complete the analysis. However, individual laboratories may provide larger volume containers for various analytes to ensure sufficient quantities for duplicates or other QC checks.

To facilitate transfer of the sample from the sampler into the container and to minimize spillage and sample disturbance, wide-mouth containers are recommended. Aqueous volatile organic samples must be placed into 40-milliliter (ml) glass vials with polytetrafluoroethylene (PTFE) (e.g., TeflonTM) septums. Non-aqueous volatile organic samples should be collected in the same type of vials or in 4-ounce (oz) wide-mouth jars provided by the laboratory. These jars should have PTFE-lined screw caps.

c. Color of Container

Whenever possible, amber glass containers should be used to prevent photodegradation of the sample, except when samples are being collected for metals analysis. If amber containers are not available, then containers holding samples should be protected from light (i.e., place in cooler with ice immediately after filling).

d. Container Closures

Container closures must screw on and off the containers and form a leak-proof seal. Container caps must not be removed until the container is ready to be filled with the sample, and the container cap must be replaced (securely) immediately after filling it. Closures should be constructed of a material which is inert with respect to the sampled material, such as PTFE (e.g., TeflonTM). Alternately, the closure may be separated from the sample by a closure liner that is inert to the sample material such as PTFE sheeting. If soil or sediment samples are being collected, the threads of the container must be wiped clean with a dedicated paper towel or cloth so the cap can be threaded properly.

e. Decontamination of Sample Containers

Sample containers must be laboratory cleaned by the laboratory performing the analysis. The cleaning procedure is dictated by the specific analysis to be performed on the sample. Sample containers must be carefully examined to ensure that all containers appear clean. Do not mistake the preservative as unwanted residue. The bottles should not be field cleaned. If there is any question regarding the integrity of the bottle, then the laboratory must be contacted immediately and the bottle(s) replaced.

f. Sample Bottle Storage and Transport

No matter where the sample bottles are, whether at the laboratory waiting to be packed for shipment or in the field waiting to be filled with sample, care must be taken to avoid contamination. Sample shuttles or coolers, and sample bottles must be stored and transported in clean environments. Sample bottles and clean sampling equipment must never be stored near solvents, gasoline, or other equipment that is a potential source of cross-contamination. When under chain of custody, sample bottles must be secured in locked vehicles, and custody sealed in shuttles or in the presence of authorized personnel. Information which documents that proper storage and transport procedures have been followed must be included in the field notebook and on appropriate field forms.

2.2 Decontamination of Sampling Equipment

Proper decontamination of all re-usable sampling equipment is critical for all sampling episodes. The SOP for Decontamination of Field Equipment and SOPs for method-specific or instrument-specific tasks must also be referred to for guidance for decontamination of various types of equipment.

2.3 Quality Assurance/Quality Control Samples

QA/QC samples are intended to provide control over the proper collection and tracking of environmental measurements, and subsequent review, interpretation and validation of generated analytical data. The SOPs for Collection of Quality Control Samples(SOP-3.1), for Evaluation and Validation of Data (SOP-3.4), and for Field Record Keeping and Quality Assurance/Quality Control (SOP-3.2) must be referred to for detailed guidance regarding these respective procedures. SOPs for method-specific or instrument-specific tasks must also be referred to for guidance for QA/QC procedures.

2.4 Sample Preservation Requirements

Certain analytical methodologies for specific analytes require chemical additives in order to stabilize and maintain sample integrity. Generally, this is accomplished under the following two scenarios:

a. Sample bottles are preserved at the laboratory prior to shipment into the field.

b. Preservatives are added in the field immediately after the samples are collected.

Many laboratories provide pre-preserved bottles as a matter of convenience and to help ensure that samples will be preserved immediately upon collection. A problem associated with this method arises if not enough sample could be collected, resulting in too much preservative in the sample. More commonly encountered problems with this method include the possibility of insufficient preservative provided to achieve the desired pH level or the need for additional preservation due to chemical reactions caused by the addition of sample liquids to pre-preserved bottles. The use of pre-preserved bottles is acceptable; however, field sampling teams must always be prepared to add additional preservatives to samples if the aforementioned situations occur. Furthermore, care must be exercised not to overfill sample bottles containing preservatives to prevent the sample and preservative from spilling and therefore diluting the preservative (i.e., not having enough preservative for the volume of sample).

When samples are preserved after collection, special care must be taken. The transportation and handling of concentrated acids in the field requires additional preparation and adherence to appropriate preservation procedures. All preservation acids used in the field should be trace-metal or higher-grade.

2.5 Sample Handling

After the proper sample bottles have been received under chain-of-custody, properly decontaminated equipment has been used to collect the sample, and appropriate preservatives have been added to maintain sample integrity, the final step for the field personnel is checking the sample bottles prior to proper packing and delivery of the samples to the laboratory.

All samples should be organized and the labels checked for accuracy. The caps should be checked for tightness and any 40-ml volatile organic compound (VOC) bottles must be checked for bubbles. A plastic (garbage) bag should line the inside of the cooler and all ice and samples should be placed inside to prevent leaking during transportation. Each sample bottle must be placed in an individual "zip-lock" bag to protect the label, and placed on ice. The bottles must be carefully packed, preferably with bubble wrap, to prevent breakage during transport. When several bottles have been collected for an individual sample, they should not be placed adjacent to each other in the cooler to prevent possible breakage of all bottles for a given sample. If there are any samples which are known or suspected to be highly contaminated, these should be placed in an individual cooler under separate chain-of-custody to prevent possible cross contamination. Sufficient ice (wet or blue packs) should be placed in the cooler to maintain the temperature at 4 degrees Celsius (°C) until delivery at the laboratory. Consult the work plan to determine if a particular ice is specified as the preservation for transportation (e.g., the United States Environmental Protection Agency does not like the use of blue packs because they claim that the samples will not hold at 4°C). If additional coolers are required, then they should be purchased. The chain-of-custody form should be properly completed, placed

in a "zip-lock" bag, and placed in the cooler. One copy must be maintained for the project files. The plastic (garbage) bag encompassing all samples and ice shall be secured tightly with a zip tie. The cooler should be sealed with packing tape and a custody seal. The custody seal number should be noted in the field book. Samples collected from Monday through Friday will be delivered to the laboratory within 24 hours of collection. If Saturday delivery is not available, samples collected on Friday must be delivered by Monday morning. Check the work plan to determine if certain analytes require a shorter delivery time. If overnight mail is utilized, then the shipping bill must be maintained for the files and the laboratory must be called the following day to confirm receipt.

3.0 EQUIPMENT AND MATERIALS

3.1 General equipment and materials may include, but not necessarily be limited to, the following:

a. Sample bottles of proper size and type with labels.

b. Cooler with ice (wet or blue pack).

c. Field notebook, appropriate field form(s), chain-of-custody form(s), custody seals.

d. Black pen and indelible marker.

e. Packing tape, large plastic (garbage) bag, zip ties, "bubble wrap", and "zip-lock" bags.

f. Overnight (express) mail forms and laboratory address.

g. Health and safety plan (HASP).

h. Work plan/scope of work.

i. Pertinent SOPs for specified tasks and their respective equipment and materials.

3.2 Preservatives for specific samples/analytes as specified by the laboratory. Preservatives must be stored in secure, spillproof glass containers with their content, concentration, and date of preparation and expiration clearly labeled.

3.3 Miscellaneous equipment and materials including, but not necessarily limited to, the following:

a. Graduated pipettes.

b. Pipette bulbs.

c. Litmus paper.

d. Glass stirring rods.

e. Protective goggles.

f. Disposable nitrile gloves.

g. Lab apron.

h. First aid kit.

i. Portable eye wash station.

j. Water supply for immediate flushing of spillage, if appropriate.

k. Shovel and container for immediate containerization of spillage-impacted soils, if appropriate.

4.0 PROCEDURE

4.1 Examine all bottles and verify that they are clean and of the proper type, number, and volume for the sampling to be conducted.

4.2 Label bottles carefully and clearly with project name and number, site location, sample identification, date, time, and the sampler's initials using an indelible marker.

4.3 Collect samples in the proper manner (refer to specific sampling SOPs).

4.4 Conduct preservation activities as required after each sample has been collected. Field preservation must be done immediately and must not be done later than 30 minutes after sample collection.

4.5 Conduct QC sampling, as required.

4.6 Seal each container carefully and place in an individual "zip lock" bag.

4.7 Organize and carefully pack all samples in the cooler immediately after collection (e.g., bubble wrap). Insulate samples so that breakage will not occur.

4.8 Complete and place the chain-of-custody form in the cooler after all samples have been collected. Maintain one copy for the project file. If the cooler is to be transferred several times prior to shipment or delivery to the laboratory, it may be easier to tape the chain-of-custody to the exterior of the sealed cooler. When exceptionally hazardous samples are known or suspected to be present, this should be identified on the chain-of-custody as a courtesy to the laboratory personnel.

4.9 Add additional ice as necessary to ensure that it will last until receipt by the laboratory.

4.10 Seal the cooler with packing tape and a custody seal. Record the number of the custody seal in the field notebook and on the field form. If there are any exceptionally hazardous samples, then shipping regulations should be examined to ensure that the sample containers and coolers are in compliance and properly labeled.

4.11 Samples collected from Monday through Friday will be delivered to the laboratory within 24 hours of collection. If Saturday delivery is not available, samples collected on Friday must be delivered by Monday morning. Check the work plan to determine if certain analytes require a shorter delivery time.

4.12 Maintain the shipping bill for the project files if overnight mail is utilized and call the laboratory the following day to confirm receipt.

END OF PROCEDURE

Date: January 10, 2011
Revision: May 7, 2015

1.0 PURPOSE

The purpose of this standard operating procedure (SOP) is to establish guidelines for sampling monitoring wells for dissolved constituents in groundwater using low flow (low stress) techniques. Low flow purging and sampling results in the collection of groundwater samples from monitoring wells that are representative of groundwater conditions in the geological formation by minimizing stress on the geological formation, and minimizing the disturbance of sediment in the bottom of the well. This procedure also minimizes aeration of the groundwater during sample collection, which improves the representativeness of the sample for VOC analysis.

As part of the SOP for the sampling of groundwater monitoring wells, sample collection equipment and devices must be considered, and equipment decontamination and pre-sampling procedures (e.g., measuring water levels, and purging wells) must be implemented. The sampling objectives will be provided in specific investigation work plans that will be approved by the applicable regulatory agency. Unless otherwise specified in an approved work plan, all groundwater purging and sampling should typically be performed using low stress (low flow) sample collection techniques.

2.0 EQUIPMENT AND MATERIALS

2.1 In order to sample groundwater from monitoring wells, specific equipment and materials are required. The equipment and materials list may include, but not necessarily be limited to, the following:

a. Safety first. Obtain the appropriate Job Safety Analysis (JSA) and personal protection equipment (PPE), as specified in the site Health and Safety Plan (HASP).

b. Adjustable rate, positive displacement groundwater sampling pump (e.g., low-flow centrifugal submersible pump or bladder pump constructed of stainless steel, Teflon or other inert material).

c. Teflon or Teflon-lined polyethylene tubing with ¼-inch or 3/8-inch inner diameter to collect samples for organic analysis. Teflon or Teflon-lined polyethylene tubing, PVC, Tygon or polyethylene tubing with ¼-inch or 3/8-inch inner diameter to collect samples for inorganic analysis. Sufficient tubing of the appropriate material must be available so that each well has dedicated tubing.

d. Appropriate power source (compressor or compressed gas tank, controller, generator, etc.).

e. Monitoring instrument for water quality indicator parameters (Horiba U-22 or equivalent) including temperature, dissolved oxygen, turbidity, specific conductance, pH and redox potential (Eh).

f. Flow measurement supplies (e.g., graduated cylinder and stop watch or in-line flow meter).

g. Electronic interface probe with a minimum of 0.01 foot accuracy.

h. Decontamination supplies including Non-phosphate laboratory-grade detergent, distilled/deionized water and potable water.

i. Roux Associates' low flow well sampling/purging data form and field notebook.

j. Well construction data logs, field data from previous sampling event, and site map with well locations.

k. Well security keys.

l. Plastic sheeting.

m. Paper towels, clean rags.

n. Teflon™ tape, .

o. Calculator.

p. Black pen and water-proof marker.

q. Tools (e.g., wrenches, screwdrivers, hammer, pliers, flashlight, etc.) or alternatives recommended in the JSAs.

r. Disposable Nitrile gloves.

s. Laboratory-supplied sample containers with labels.

t. Cooler(s).

u. Ice (wet, blue packs).

v. Masking, duct, and packing tape.

w. Chain-of-custody form(s) and custody seal(s).

x. Field Sampling Plan (FSP) and Quality Assurance Project Plan (QAPP) or equivalent summary.

y. Site health and safety plan (HASP).

z. Packing material (e.g., bubble wrap)

aa. "Zip-lock" plastic bags.

bb. Overnight (express) mail forms (or schedule courier pickup if available).

3.0 DECONTAMINATION

3.1 Make sure all equipment is decontaminated and cleaned before use (refer to the Roux SOP-9.1 for Decontamination of Field Equipment for detailed decontamination methods; a summary of pump decontamination procedures is provided below). Use new, clean materials when decontamination is not appropriate (e.g., tubing, disposable gloves). Document, and initial and date the decontamination procedures on the appropriate field form and in the field notebook.

A. Before sampling:

The manufacturer recommendations on pump disassembly for cleaning, if any, should take precedence to the disassembly recommendations presented below.

1) Wear disposable Nitrile and cut proof gloves.
2) Pre-rinse: Operate the pump first in an appropriate container with potable water for 5 minutes.
3) Wash: Operate the pump in an appropriate container with a non-phosphate, laboratory-grade detergent such as Alcanox and potable water solution for 5 minutes.
4) Rinse: Operate the pump in an appropriate container for 5 minutes with potable water.
5) Disassemble pump (refer to manufacturer's manual).
6) Wash pump parts: Place the disassembled parts of the pump into an appropriate container with non-phosphate detergent solution. Scrub the disassembled pump parts with an appropriate brush.
7) Rinse pump parts with potable water.
8) Rinse the following parts with distilled/deionized water: inlet screen, shaft, suction interconnector, motor lead assembly, and stator housing.
9) Rinse impeller with potable water.

B. After each sample collection, decontaminate by:

1) Wear disposable Nitrile gloves.

2) Pre-rinse: Operating the pump first with potable water for 5 minutes.

3) Wash: Operate the pump in an appropriate container with a non-phosphate, laboratory-grade detergent such as Alcanox and potable water solution for 5 minutes.

4) Rinse: Operate the pump in an appropriate container for 5 minutes with potable water

5) Final Rinse: Operate the pump in an appropriate container to pump out 1 to 2 gallons of distilled/deionized water

6) Wipe pump-related equipment (e.g., electrical lines, cables) first with a clean cloth and detergent solution and then rinsing or wiping with a clean cloth and distilled/deionized water or potable water.

3.2 Note that the decontamination procedures for pumps are the minimum that must be performed. Check the work plan to determine if additional chemicals specified by individual state regulatory agencies also must be used for decontamination procedures (e.g., hexane, nitric acid, acetone, isopropanol, etc.).

4.0 CALIBRATION OF FIELD ANALYSIS EQUIPMENT

Calibrate field analysis equipment before use (e.g., water quality meter, photoionization detector, flame ionization detector) according to the Manufacturer's calibration instructions. Document, initial and date the calibration procedures on the appropriate field form and in the field notebook.

5.0 PROCEDURE

5.1 As practicable under field conditions, start at the well that is known or believed to have the least contaminated groundwater and proceed systematically to the well that is known or believed to have the most contaminated groundwater.

5.2 Document, initial and date well identification, pre-sampling information, and problems encountered on the appropriate field form and in the field notebook as needed.

5.3 Inspect the protective casing of the well and the well casing, and note any items of concern such as a missing lock, or bent or damaged casing(s).

5.4 Place plastic sheeting around the well to protect sampling equipment from potential cross contamination.

5.5 When vapor concerns are present, measure the VOCs at the rim of the unopened well utilizing a photoionization detector (PID) or flame ionization detector (FID) instrument and record the reading in the field notebook.

5.6 Remove the well cap or plug and, if necessary, clean the top of the well off with a clean rag. Place the cap or plug on the plastic sheeting. If the well is not vented, allow several minutes for the water level in the well to equilibrate. Never inhale the vapors.

5.7 Measure the depth to water (DTW) to 0.01 ft from the measuring point (MP) on the well (top of well casing) using an electronic interface probe or water level meter. Calculate the water-level elevation. Document, initial and date the information on the appropriate field form and in the field notebook.

5.9 Decontaminate the interface probe or water level meter with a non-phosphate, laboratory-grade detergent solution followed by a distilled/deionized water rinse.

5.10 Install Pump: Slowly lower the pump, safety cable, tubing and electrical lines into the well at midpoint of the immerged well screen or at the most permeable zone within the immerged well screen. The pump intake is to be kept at least two feet above the bottom of the well to prevent disturbance and re-suspension of any sediment or a sinking separate phase product (DNAPL) present in the bottom of the well.

If separate-phase product was identified in a measurable quantity, then the tubing should be installed using PVC with a tethered cap inserted into the well to bypass the LNAPL. The sample tubing should be inserted through the PVC, pushing out the cap at a depth below the LNAPL in order to sample the groundwater below the LNAPL.

5.11 Measure Water Level: Before starting the pump, measure the water level again with the pump in the well. Leave the electronic interface probe in the well.

5.12 Purge well: Start pumping the well at 200 to 500 milliliters per minute (mL/min). The water level should be monitored approximately every five minutes. Ideally, a steady flow rate should be maintained that results in a stabilized water level (drawdown of 0.3 ft or less). Pumping rates should be, if needed, reduced to the minimum capabilities of the pump to ensure stabilization of the water level. The flow rate should, however, be sufficient to maintain pump suction and to avoid cascading or air bubble formation in the tubing. Record each adjustment made in the pump rate and the water level measured immediately after each adjustment.

5.13 Record the physical appearance of the water (i.e., color, turbidity, odor, etc.) on the appropriate field form and in the field notebook, as it is purged. Note any changes that occur during purging.

5.14 Monitor Indicator Parameters: During purging of the well, monitor and record the field indicator parameters (turbidity, temperature, specific conductance, pH, redox potential, and dissolved oxygen) approximately every five minutes. The well is considered stabilized and ready for sample collection when the indicator parameters have stabilized for three consecutive readings as follows:

±0.1 for pH

±3% for specific conductance and temperature

±10 mV for redox potential

±10% for DO and turbidity

And turbidity to be less than 50 NTU prior to sampling

The pump must not be removed from the well between purging and sampling.

ADDRESSING POTENTIAL PROBLEMS

Insufficient Yield

If the formation cannot produce enough water to sustain purging, then the well should be pumped to "near-dry" conditions (i.e., leaving some water in the well). Purging should be interrupted before the water level in the well drops below the top of the pump, as this may induce cascading of the sand pack. Pumping the well dry should be avoided to the extent possible in all cases. When preparing to conduct a sampling round, review drilling, well development and previous sampling information (if available) to identify low-yielding wells in order to purge them first, and potentially allow time for the well to recover for sampling.

Sampling should commence as soon as the volume in the well has recovered sufficiently to allow collection of samples. However, depending on the rate of recovery and the time needed to complete the sampling round, one of the following procedures may have to be implemented:

1) The well may have to be sampled over a period of more than one day.
2) The well may not yield enough water to collect a complete suite of samples and only select (most important) samples will be collected.
3) The well may not recover, which will preclude sampling.

Regardless of the option that must be followed, the sampling procedure must be fully documented in the field notebook.

Failure to Stabilize Key Indicator Parameters

If one or more key indicator parameters fail to stabilize after 4 hours or after 5 well volumes have been purged, one of four options should be considered:

1) Continue purging in an attempt to achieve stabilization.
2) Discontinue purging, do not collect samples, and document attempts to reach stabilization in the field notebook.
3) Discontinue purging, collect samples, and document attempts to reach stabilization in the field notebook.
4) Secure the well, purge and collect samples the next day (preferred)

The key indicator parameter for VOCs is dissolved oxygen.

The key indicator parameter for all other samples is turbidity.

Regardless of the option that is followed, the sampling procedure must be fully documented in the field notebook.

5.15 Collect Samples: Collect samples at a flow rate between 100 and 250 mL/min and such that drawdown of the water level within the well does not exceed the maximum allowable drawdown of 0.3 ft.

VOC samples must be collected first. If a bladder pump is used, best practice would have it to match one compression stroke to the fill one VOC sampling vial.

Remove each appropriate container's cap only when ready to fill each with the water sample, and then replace and secure the cap immediately.

5.16 During sample collection, make sure that the pump discharge line or the bailer does not contact the sample container. Fill each appropriate, pre-labeled sample container by allowing the ground water to flow from the tubing gently down the inside of the container to prevent: 1) agitating or creating turbulence; 2) breaking the container; 3) entry of, or contact with, any other medium; and 4) spilling/splashing the sample and exposing the sampling team to contaminated water. Immediately place the filled sample container in an ice-filled (wet ice or blue pack) cooler for storage. If wet ice is used it is recommended that it be repackaged in zip-lock bags to help keep the cooler dry and the sample labels secure. Check the work plan as to whether wet ice or blue packs are specified for cooling the samples because certain regulatory agencies may specify the use of one and not the other.

5.17 Fill containers for VOCs until a convex surface is observed and tightly seal with Teflon™-lined septums held in place by open-top screw caps to prevent volatilization. Ensure that there are no bubbles by turning the container upside down and tapping it gently.

5.18 Consult the work plan if filtered sampled should also be collected for dissolved metals analysis.

5.19 Collect quality control (QC) samples as required in the work plan to monitor sampling and laboratory performance.

5.20 Note and record the "final" physical appearance of the water (after purging and sampling) on an appropriate field form and in the field notebook.

5.21 Remove pump and tubing.

5.22 Measure the total depth of the well from the MP with an interface probe. Document, initial and date the information on the appropriate field form and in the field notebook.

5.23 Wipe the well cap/j-plug with a clean rag, replace the well cap/j-plug and protective cover. Lock the protective cover.

5.24 Verify that each sample is placed in an individual "zip-lock" bag, wrapped with "bubble wrap," placed in the cooler, and that the cooler has sufficient ice (wet ice or blue packs) to preserve the samples for transportation to the analytical laboratory.

5.25 Decontaminate field equipment following Roux SOP-9.1 for Decontamination of Field Equipment. Wrap decontaminated equipment with a suitable material (e.g., clean plastic bag or aluminum foil). Discard rags, gloves, etc. in a manner consistent with site conditions.

5.26 Complete all necessary field forms, field notebook entries, and the chain-of-custody forms. Retain one copy of each chain-of-custody form. Secure the cooler with sufficient packing tape and a custody seal.

5.27 Samples will be delivered according to the QAPP schedule.

6.0 REFERENCES

U.S. Environmental Protection Agency – Region I. Low Stress (Low Flow) Purging and Sampling Procedure for the Collection of Groundwater Samples from Monitoring Wells. Revised January 19, 2010.

END OF PROCEDURE

Date: March 5, 2015

1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to establish guidelines for the collection of soil samples for laboratory analysis. This SOP is applicable to soil samples collected from split-spoon samplers during drilling, hand auger samples, grab samples from stockpiled soils, surface samples, test pit samples, etc.

2.0 CONSIDERATIONS

Soil samples may be collected in either a random or biased manner. Random samples can be based on a grid system or statistical methodology. Biased samples can be collected in areas of visible impact or suspected source areas. Soil samples can be collected at the surface, shallow subsurface, or at depth. When samples are collected at depth the water content should be noted, since generally "soil sampling" is restricted to the unsaturated zone. Equipment selection will be determined by the depth of the sample to be collected. A thorough description of the sampling locations and proposed methods of sample collection should be included in the work plan.

Commonly, surface sampling refers to the collection of samples at a 0 to 6 inch depth interval. Certain regulatory agencies may define the depth interval of a surface sample differently, and this must be defined in the work plan. Collection of surface soil samples is most efficiently accomplished with the use of a stainless steel trowel or scoop. For samples at greater depths a decontaminated bucket auger or power auger may be needed to advance the hole to the point of sample collection. Another clean bucket auger should then be used to collect the sample. To collect samples at depths of greater than approximately six feet the use of a drill rig and split spoon samples will usually be necessary. In some situations, sample locations are accessed with the use of a backhoe.

3.0 MATERIALS/EQUIPMENT

a. Safety first. Obtain the appropriate Job Safety Analysis (JSA) and personal protection equipment (PPE), as specified in the site Health and Safety Plan (HASP).

b. A work plan which outlines soil sampling requirements.

c. Field notebook, field form(s), maps, chain-of-custody forms, and custody seals.

d. Decontamination supplies (including: non-phosphate, laboratory grade detergent, buckets, brushes, potable water, distilled water, regulatory-required reagents, aluminum foil, plastic sheeting, etc.).

e. Sampling device (split-spoon sampler, stainless steel hand auger, stainless steel trowel, etc.).

f. Stainless steel spoons or spatulas.

g. Disposable nitrile sampling gloves.

h. Laboratory-supplied sample containers with labels.

i. Cooler with blue or wet ice.

j. Plastic sheeting.

k. Black pen and indelible marker.

l. Zip-lock bags and packing material (e.g., bubble wrap).

m. Tape measure.

n. Paper towels or clean rags.

o. Masking and packing tape.

p. Overnight (express) mail forms or schedule currier pickup.

4.0 DECONTAMINATION

All reusable sampling equipment will be thoroughly cleaned according to the decontamination SOP. Where possible, thoroughly pre-cleaned and wrapped sampling equipment should be used and dedicated to individual sampling locations. Disposable items such as sampling gloves, aluminum foil, and plastic sheeting will be changed after each use and discarded in an appropriate manner.

5.0 PROCEDURE

5.1 Prior to collecting soil samples, ensure that all sampling equipment has been thoroughly cleaned according to the decontamination SOP. If samples are to be collected at depth, then the boring must be advanced with thoroughly cleaned equipment to the desired sampling horizon and a different thoroughly cleaned sampler must be used to collect the sample.

5.2 Using disposable gloves and a pre-cleaned, stainless steel spatula or spoon, extract the soil sample from the sampler, measure the recovery, and separate the wash from the true sample. Where allowed by regulatory agency(ies), disposable plastic spoons may be used.

5.3 Place the sample in a laboratory-supplied, pre-cleaned sample container. This should be done as quickly as possible and this is especially important when sampling for volatile organic compounds (VOCs). Samples to be analyzed for VOCs must be collected prior to other constituents.

5.4 The sample container will be labeled with appropriate information such as, client name, site location, sample identification (location, depth, etc.), date and time of collection, and sampler's initials.

5.5 Using the remaining portion of soil from the sampler, log the sample in detail and record sediment characteristics (color, odor, moisture, texture, density, consistency, organic content, layering, grain size, etc.).

5.6 If soil samples are to be composited in the field, then equal portions from selected locations will be placed on a clean plastic sheet and homogenized. Alternately, several samples may be submitted to the laboratory for compositing by weight. The method used is dependent upon regulatory requirements. Specific compositing procedures shall be approved by the appropriate regulatory agency and described in the work plan. Samples to be analyzed for VOCs will not be composited unless required by a regulatory agency.

5.7 After the sample has been collected, labeled, and logged in detail, it is placed in a zip-lock bag and stored in a cooler at 4°C.

5.8 A chain-of-custody form is completed for all samples collected. One copy is retained and two are sent with the samples in a zip-lock bag to the laboratory. A custody seal is placed on the cooler prior to shipment.

5.9 Samples collected from Monday to Friday are to be delivered to the laboratory within 24 hours of collection. If Saturday delivery is unavailable, samples collected on Friday must be delivered by Monday morning. Check the work plan to determine if any analytes require a shorter delivery time.

5.10 The field notebook and appropriate forms should include, but not be limited to the following: client name, site location, sample location, sample depth, sample identification, date and time collected, sampler's name, method of sample collection, number and type of containers, geologic description of material, description of decontamination procedures, etc. A site map should be prepared with exact measurements to each sample location in case follow-up sampling is necessary.

5.11 All reusable sampling equipment must be thoroughly cleaned in accordance with the decontamination SOP. Following the final decontamination (after all samples are collected) the sampling equipment is wrapped in aluminum foil. Discard any gloves, foil, plastic, etc. in an appropriate manner that is consistent with site conditions.

END OF PROCEDURE

Date: January 9, 2011
Revision: May 12, 2015

1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to establish guidelines for the collection of soil samples for laboratory analysis. This SOP is applicable to soil samples collected from split-spoon, Geoprobe™ core samples, and Sonic core samplers during drilling, hand auger samples, grab samples from stockpiled soils, surface samples, test pit samples, etc.

2.0 CONSIDERATIONS

Soil samples may be collected in either a random or biased manner. Random samples can be based on a grid system or statistical methodology. Biased samples can be collected in areas of visible impact or suspected source areas. Soil samples can be collected at the surface, shallow subsurface, or at depth. When samples are collected at depth, the water content should be noted, since generally "soil sampling" is restricted to the unsaturated zone. Equipment selection will be determined by the depth of the sample to be collected. A thorough description of the sampling locations and proposed methods of sample collection should be included in the work plan.

Commonly, surface sampling refers to the collection of samples at a 0 to 6 inch depth interval. Certain regulatory agencies may define the depth interval of a surface sample differently, and this must be defined in the work plan. Collection of surface soil samples is most efficiently accomplished with the use of a stainless steel trowel or scoop. For samples at greater depths, a Geoprobe™ or other direct push sampling method, or a decontaminated bucket auger or power auger may be needed to advance the hole to the point of sample collection. If augering to depth, once the sampling depth is reached a clean bucket auger should be used to collect the sample. To collect samples at depths of greater than approximately six feet, the use of a drill rig (direct push, split spoon, etc) will usually be necessary. In some situations, such as an excavation or trench, sample locations are accessed with the use of a backhoe.

3.0 EQUIPMENT AND MATERIALS

a. Safety first. Obtain the appropriate Job Safety Analysis (JSA) and personal protection equipment (PPE), as specified in the site Health and Safety Plan (HASP).

b. A work plan which outlines soil sampling requirements.

c. Field notebook, field form(s), maps, chain-of-custody forms, and custody seals.

d. Decontamination supplies (including: non-phosphate laboratory grade detergent, buckets, brushes, potable water, distilled water, plastic sheeting, etc.).

e. Sampling device (split-spoon sampler, stainless steel hand auger, stainless steel trowel, etc.).

f. Stainless steel spoons or spatulas.

g. Disposable Nitrile sampling gloves and cut-proof gloves.

h. Laboratory-supplied sample containers with labels.

i. Cooler with blue or wet ice.

j. Plastic sheeting.

k. Black pen and indelible marker.

l. Zip-lock bags and packing material.

m. Tape measure.

n. Paper towels or clean rags.

o. Masking and packing tape.

p. Overnight (express) mail forms or schedule courier pickup.

4.0 DECONTAMINATION

All reusable sampling equipment will be thoroughly cleaned according to the decontamination SOP (ROUX SOP 9.1). Where possible, thoroughly pre-cleaned and wrapped sampling equipment should be used and dedicated to individual sampling locations. Disposable items such as sampling gloves and plastic sheeting will be changed after each use and discarded in an appropriate manner.

5.0 PROCEDURE

5.1 Prior to collecting soil samples, ensure that all sampling equipment has been thoroughly cleaned according to the ROUX SOP 9.1 decontamination procedures. If samples are to be collected at depth, then the boring must be advanced with thoroughly cleaned equipment to the desired sampling horizon and a different thoroughly cleaned sampler must be used to collect the sample.

5.2 Using disposable gloves and a pre-cleaned, stainless steel spatula or spoon, extract the soil sample from the sampler, measure the recovery, and separate the wash from the true sample. Where allowed by regulatory agency(ies), disposable plastic spoons may be used. The gloves should not come in contact with the media being sampled and should be changed any time during sample collection when their cleanliness is compromised

When sampling shallow soils, if a thick, matted root zone, gravel, concrete, etc. is present at or near the surface, it should be removed before the sample is collected. The depth measurement for the sample begins at the top of the soil horizon, immediately following any removed materials.

When using direct push sampling methods, it is important to maintain the proper orientation of the sample when the sampling liners are removed from the sample tubes define precisely the depth at which an aliquot was collected. This is particularly important when multiple sample depths are collected from the same push.

When utilizing a split spoon sampling method, always discard the top several inches of material in the spoon before removing any portion for sampling. This material normally consists of borehole wall material that has sloughed off of the boregole wall after removal of the drill string prior to inserting the split spoon.

When utilizing a backhoe to collect soil samples from a trench or excavation, measures should be taken to ensure that the bucket is decontaminated and that no paint, grease, and rust is present prior to sample collection.

5.3 Place the sample in a laboratory-supplied, pre-cleaned sample container. Cut-proof gloves should be worn at all times when handling glassware. This should be done as quickly as possible and this is especially important when sampling for volatile organic compounds (VOCs). Samples to be analyzed for VOCs must be collected prior to other constituents.

If samples are to be analyzed for VOCs, they should be collected in a manner that minimizes disturbance of the sample. ***Samples for VOC analysis must not be homogenized.***

5.4 The sample container will be labeled with appropriate information such as, client name, site location, sample identification (location, depth, etc.), date and time of collection, and sampler's initials.

5.5 Using the remaining portion of soil from the sampler, log the sample in detail and record physical characteristics (color, odor, moisture, texture, density, consistency, organic content, layering, grain size, etc.). Refer to Soil Classification and logging SOP.

5.6 If soil samples are to be composited in the field, then equal portions from selected locations will be placed on a clean plastic sheet or in a Zip-lock bag and homogenized. make sure that each composite location (aliquot) consist of equal volumes,(i.e., same number of equal spoonfuls). Alternately, several samples may be submitted to the laboratory for compositing by weight. The method used is dependent upon regulatory requirements. Specific compositing procedures shall be approved by the appropriate regulatory agency and described in the work

plan. Samples to be analyzed for VOCs will not be composited unless required by a regulatory agency.

5.7 After the sample has been collected, labeled, and logged in detail, it is placed in a zip-lock bag and stored in a cooler with ice, at 4°C. Store the sample cooler in a secure location.

5.8 A chain-of-custody form is completed for all samples collected. One copy is retained and two are sent with the samples in a Zip-lock bag to the laboratory. A signed and dated custody seal is placed on the cooler prior to shipment.

5.9 Samples collected from Monday to Friday are typically to be delivered to the laboratory within 24 hours of collection. If Saturday delivery is unavailable, samples collected on Friday must be delivered by Monday morning. Check the work plan to determine if any analytes require a shorter delivery time.

5.10 The field notebook and appropriate forms should include, but not be limited to, the following: client name, site location, sample location, sample depth, sample identification, sample date and time collected, sampler's name, method of sample collection, number and type of containers, geologic description of material, description of decontamination procedures, etc. A site map should be prepared with exact measurements to each sample location in case follow-up sampling is necessary.

5.11 All reusable sampling equipment must be thoroughly cleaned in accordance with the ROUX SOP 9.1 decontamination procedures. Following the final decontamination (after all samples are collected), the sampling equipment is wrapped with plastic. Discard any gloves, plastic, etc. in an appropriate manner that is consistent with site conditions.

END OF PROCEDURE

1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to establish guidance to obtain accurate and consistent descriptions of soil characteristics during soil-sampling operations. Consistency with description is essential for creating subsurface interpretations.

This SOP discusses the use of the Unified Soil Classification System (USCS) as a guideline for classifying and describing lithology encountered in boreholes, test pits, and surface sampling.

The Unified Soil Classification System (USCS) is based on numerical values of certain soil properties that are measured by laboratory tests (ASTM D 2487). It is possible, however, to estimate these values in the field with reasonable accuracy using visual-manual procedures (ASTM D 2488). In addition, some elements of a complete soil description, such as the presence of cobbles or boulders, changes in strata, and the relative proportions of soil types in a bedded deposit can be obtained only in the field.

2.0 MATERIALS/EQUIPMENT

a) Indelible pens

b) Tape measure or ruler

c) Field logbook

d) Squirt bottle/Spray bottle with water

e) Rock- or soil-color chart (e.g., Munsell)

f) Grain-size chart

g) Hand lens

h) Unified Soil Classification System index charts and tables to help with soil classification

i) Workplan or event-specific field instructions. Planned borehole depth, proposed well construction/specifications, and field sampling summary table, if available.

3.0 DECONTAMINATION

All reusable sampling equipment will be thoroughly cleaned according to the decontamination ROUX SOP 9.1. Where possible, thoroughly pre-cleaned and wrapped sampling equipment should be used and dedicated to individual sampling locations. Disposable items such as sampling gloves, aluminum foil, and plastic sheeting will be changed after each use and discarded in an appropriate manner consistent with site conditions

4.0 PROCEDURE

This section covers several aspects of the soil characterization: instructions for completing soil boring logs.

4.1 Record the following general site information in the field book:

a. Boring/Well ID. Enter the boring/well number. A numbering system should be chosen that does not conflict with information recorded for previous exploratory work done at the site. Number the sheets consecutively for each boring.

b. Client/Project Name

c. Site Location.

d. Drilling Contractor. Enter the name of the drilling company and the city and state where the company is based.

e. Drilling Method and Equipment. Identify the bit size and type, drilling fluid (if used), and method of drilling (e.g., rotary, hollow-stem auger, sonic). Information on the drilling equipment (e.g., CME 55, Mobile B61) should be noted.

f. Date and Time. Include Start time and End time.

g. Name and/or initials of the field personnel logging the soil.

4.2 Record the following technical data in the field book and/or log forms:

a. Depth Below Surface.

b. Sample Interval.

c. PID readings (if specified by work plan). Refer to ROUX SOP 5.4 for soil screening procedures.

d. Blow Counts.

e. Sample Recovery.

f. Soil Description.

g. Soil Classification.

4.3 Soil Classification

Soil descriptions should be precise and comprehensive without being verbose. The correct overall impression of the soil should not be distorted by excessive emphasis on insignificant details. In general, similarities rather than differences between consecutive samples should be stressed.

Field descriptions should include as a minimum:

a. Color: The basic color of the soil.

b. Soil name: The basic name of the predominant constituent and a single word modifier indicating the major subordinate constituent.

c. Particle Size Distribution: An estimate of the percentage and grain-size range of each of the soil's subordinate constituents (trace, little, some). This parameter is critical for assessing hydrogeology of the site and should be carefully and fully documented.

d. Gradation or Plasticity: For granular soil (sands or gravels) that should be described as well-graded, poorly graded, uniform, or gap-graded. Cohesive soil (silts or clays) should be described as non-plastic, low plastic, medium plastic, or highly plastic.

e. Other Components: Examine the soil sample to identify other components that may be present including roots and root mass, vegetation, peat, organic matter, shells or fossils, accessory minerals slag, cinder or charcoal, trash, rubbish, fill, bricks, glass.

f. Moisture Content. The amount of soil moisture described as dry, moist, or wet/saturated.

g. Odor: The odor should only be described if it is organic or unusual. An organic odor will have distinctive decaying vegetation smell. Unusual odors, petroleum product, chemical, and the like should be noted.

h. Unusual characteristics: If staining or discoloration of soils is present it should be noted.

4.4 The soil logs should also include a complete description of any tests run in the borehole; placement and construction details of piezometers, wells, and other monitoring equipment; abandonment records; geophysical logging techniques used; and notes on readings obtained by air monitoring instruments.

4.5 Backfilling

When a boring is completed, the boring shall be abandoned with procedures specified in the workplan. The destruction of the hole shall be noted on the log Proper borehole abandonment procedures are documented in ROUX SOP 5.4.

END OF PROCEDURE

Date: January 9, 2011
Revision: April 17, 2015

1.0 PURPOSE

The purpose for this standard operating procedure (SOP) is to establish the guidelines for measuring field parameters of groundwater samples. The parameters are measured in the field using a water quality meter (Horiba U-22 or equivalent). The water quality parameters include pH, temperature, conductivity, ORP, dissolved Oxygen and turbidity. The manufacturer's instrument manual for each water quality meter, which is maintained with the instrument, will be referred to for calibration, use, repair, maintenance, or trouble-shooting operations.

The pH will be measured in standard units (SU) and can be recorded with or without the SU designation. The conventional means of recording a pH value is without a unit designation (e.g., 7.0); however, the SU designation may be used provided the term is defined as standard units when first referenced. The pH is measured in the field to provide the pH of the water under ambient (in situ) conditions. The pH is a measure of the acidic (<7.0) or basic (>7.0) nature of the water and is used to assist in evaluating the mobility of contaminants. In addition, pH measurements can be used during well purging to help determine when sufficient groundwater has been purged (removed) from a well (i.e., the standing water in the well has been removed and replaced with "fresh" water from the aquifer).

Conductivity will be measured and recorded in micromhos/centimeter (µmhos/cm). Some water quality meters measure directly in µmhos/cm while others have to be converted to this unit. The specific conductivity is measured in the field as a measure of the total dissolved solids (TDS) in the water samples. TDS data can then be used as a qualitative measure of contamination and to assist in evaluating electrical resistivity and borehole geophysical data. In addition, specific conductivity measurements can be used during well purging to help determine when sufficient groundwater has been purged (removed) from a well (i.e., the standing water in the well has been removed and replaced with "fresh" water from the aquifer).

Temperature will be measured and recorded in degrees Celsius/Centigrade (° C). Temperature data is collected in the field to determine the temperature of the water sample under ambient (in-situ) conditions. Temperature data can be used to evaluate the mobility of compounds in groundwater and flow conditions. In addition, temperature measurements can be used during well purging to help determine when sufficient groundwater has been purged (removed) from a well (i.e., the standing water in the well has been removed and replaced with "fresh" water from the aquifer).

ORP will be measured and recorded in millivolts (mV). ORP data is collected in the field for monitoring and controlling chemical addition of oxidizing or reducing agents. In addition, ORP data can be used during well purging to help determine when sufficient groundwater has been purged (removed) from a well (i.e., the standing water in the well has been removed and replaced with "fresh" water from the aquifer).

Dissolved Oxygen (DO) will be measured and recorded in mg/L. DO data is collected in the field for monitoring the amount of oxygen dissolved in a unit volume of water. In addition, DO data can be used during well purging to help determine when sufficient groundwater has been purged (removed) from a well (i.e., the standing water in the well has been removed and replaced with "fresh" water from the aquifer).

Turbidity will be measured and recorded in Nephelometric Turbidity Units (NTU). Turbidity data is collected to measure the presence of suspended particulates in water.

2.0 CALIBRATION

Prior to calibration, all water quality meters must be cleaned and the battery checked according to the manufacturer's instructions. Document, initial and date the pre-calibration procedure on the appropriate field form, and in the field notebook.

2.1 Safety first. Obtain the appropriate Job Safety Analysis (JSA) and personal protection equipment (PPE), as specified in the site Health and Safety Plan (HASP).

2.2 Calibration of the water quality meter(s) is to be performed at the beginning and end of each day's use in accordance with the manufacturer's specific calibration instructions. At the end of each day, a calibration check is performed to verify that the instrument(s) remained in calibration throughout the day. This check is to be performed while the instrument(s) is in measurement mode, not calibration mode. Usual procedures are given below.

2.3 Recalibration must occur if: 1) the parameter being measured is outside the previous calibration range (if meter readings are zero or a negative number for DO, pH, conductivity or turbidity [negative value only]); 2) the procedure or use conditions warrant frequent calibrations; 3) four or more hours have elapsed; or 4) the instrument has been moved from one area to another (e.g., offsite or out of the study area).

2.4 The volume of the calibration solutions must be sufficient to cover both the probe and temperature sensor (see manufacturer's instructions for the volume to be used). Note that most instrument manual's state there is no calibration for the temperature sensor, but the temperature sensor must be checked to determine its accuracy. If the accuracy check date/information is not included with the instrument or the last check was over a year, the temperature sensor accuracy needs to be checked at the beginning of the water quality measuring event.

2.5 A minimum of two standards should be used to bracket the instruments measurement range for all parameters except ORP (refer to manufacturer's instructions).

2.6 The following information is documented in the calibration logbook and /or field notebook at the time of calibration:

a. Date.

b. Water Quality meter identification.

c. Pre-cleaning and battery check.

d. Calibration results.

e. Initials of the individual performing calibration.

3.0 PROCEDURE

3.1 A warm-up period may or may not be necessary for the instrument, depending on instrument requirements. The manufacturer's instrument manual must be followed.

3.2 See SOPs 4.3 and 4.4 for information regarding well sampling/purging procedures. Follow instruction manual for proper set up and deployment of monitoring device.

3.3 The groundwater quality parameters will be continuously measured by the water quality meter utilizing a flow-through-cell. If the accumulation of sediment buildup in the cell is observed, continue pumping and disconnect the cell for cleaning, then reconnect after cleaning and continue monitoring activities. If air bubbles accumulation is observed in the cell, place the meter at a 45 degree angle with the port facing upward to help evacuate any air bubble buildup.

3.5 Pertinent data are documented in the field notebook and/or appropriate field form, initialed and dated.

3.6 Follow decontamination procedures documented in SOP 9.1 after each use to avoid potential cross contamination. Ensure that the electrodes are rinsed with distilled or deionized water and the unit stored properly in accordance with the manufacturer's instructions (e.g., capping and storing in a buffer such as altex electrode storage solution). The electrodes are not to be stored in potable water, or distilled or deionized water.

END OF PROCEDURE

Date: January 9, 2011
Revision: May 5, 2015

1.0 PURPOSE

The purpose for this standard operating procedure (SOP) is to establish the guidelines for decontamination of all field equipment potentially exposed to contamination during field investigation activities (i.e. drilling, soil and water sampling).

The objective of decontamination is to ensure that all field samplingequipment is decontaminated (free of potential contaminants): 1) prior to being brought onsite to avoid the introduction of potential contaminants to the site; 2) between drilling and sampling events/activities onsite to eliminate the potential for cross-contamination between boreholes and/or wells; and 3) prior to the removal of equipment from the site to prevent the transportation of potentially contaminated equipment offsite.

The decontamination line is setup so that the first station is used to clean the most contaminated item. It progresses to the last station where the least contaminated item is cleaned. A site is typically divided up into the following boundaries: Hot Zone or Exclusion Zone (EZ), the Contamination Reduction Zone (CRZ), and the Support or Safe Zone (SZ). The decontamination line should be setup in the Contamination Reduction Corridor (CRC).

In considering decontamination procedures, state and federal regulatory agency requirements must be considered because of potential variability between state and federal requirements. Decontamination procedures must be in compliance with state and/or federal protocols in order that regulatory agency(ies) scrutiny of the procedures and data collected do not result in non acceptance (invalidation) of the work undertaken and data collected.

The equipment and materials list for decontamination activities may include, but not necessarily be limited to, the following:

a. A work plan and health and safety plan which outlines decontamination procedures and requirements.

b. Field notebook and field form(s).

c. Decontamination solutions, including as necessary: non-phosphate, laboratory-grade detergent; distilled/deionized water; potable water; cleaning solvents if needed [e.g., hexane, acetone, nitric acid).

d. Long and short handled brushes,

e. Bottle brushes

f. Drop cloth/plastic sheeting

g. Paper towels

h. Plastic or galvanized tubs or buckets

i. Pressure washers or steam cleaners

j. Solvent sprayers

k. Trash / bilge pumps

l. Aluminum foil

m. 55-gallon drums.

2.0 PROCEDURE FOR DRILLING EQUIPMENT

The following is a minimum decontamination procedure for drilling equipment. Drilling equipment decontamination procedures will be documented on an appropriate field form or in the field notebook, especially any variation from the method itemized below:

2.1 Safety first. Obtain the appropriate Job Safety Analysis (JSA) and personal protection equipment (PPE), as specified in the site Health and Safety Plan (HASP). Prior to mobilization to a site, the expected types of contamination should be evaluated to determine if the field cleaning and decontamination activities will generate rinsates and other waste waters that might be considered RCRA hazardous waste or may require special handling.

2.2 The drill rig and all associated equipment should be properly decontaminated by the contractor before arriving at the site.

2.3 The augers, drilling casings, rods, samplers, tools, and any piece of equipment that can come in contact (directly or indirectly) with the soil, requires proper decontamination on-site prior to commencing drilling. The project work plan or HASP, and appropriate regulatory requirements, should be consulted to determine site-specific decontamination requirements.

2.4 The same decontamination procedures used prior to drilling will be followed between boreholes (at a fixed on-site location[s], if appropriate) and before leaving the site at the end of the investigation.

2.5 All on-site steam cleaning or (decontamination) activities will be monitored and documented by a member(s) of the staff of Roux Associates, Inc. and should be performed on a decontamination pad that meets the following specifications:

1. The pad should be constructed in an area known or believed to be free of surface contamination.
2. A temporary pad should be lined with a water impermeable material with no seams within the pad. This material should be either easily replaced disposable) or repairable.The pad should be regularly inspected to ensure there are no leaks.

3. Water should be removed from the decontamination pad frequently.

2.6 If drilling activities are conducted in the presence of thick, sticky oils (e.g., PCB oil) which coat drilling equipment, then special decontamination procedures may have to be utilized before steam cleaning (e.g., hexane scrub and wash).

2.7 Containment of decontamination fluids may be necessary (e.g., rinseate from steam cleaning) or will be required (e.g., hexane), and disposal must be in accordance with state and/or federalregulatory requirements.

3.0 PROCEDURE FOR SOIL-SAMPLING EQUIPMENT

The following is a minimum decontamination procedure for soil-sampling equipment (e.g., split spoons, stainless-steel spatulas). Soil-sampling equipment decontamination procedures, especially any variation from the method itemized below, will be documented on an appropriate field form or in the field notebook.

3.1 Safety first. Obtain JSA and PPE, as specified in the site HASP.

3.2 Wear disposable gloves while cleaning equipment to avoid cross-contamination and change gloves as needed.

3.3 Steam clean the sampler or rinse with potable water. If soil-sampling activities are conducted in the presence of thick, sticky oils (e.g., PCB oil) which coat sampling equipment, then special decontamination procedures may have to be utilized before steam cleaning and washing in detergent solution (e.g., hexane scrub and wash).

3.4 Prepare a non-phosphate, laboratory-grade detergent solution and distilled or potable water in a clean bucket.

3.5 Disassemble the sampler, as necessary and immerse all parts and other sampling equipment in the solution.

3.6 Scrub all equipment in the bucket with a brush to remove any adhering particles.

3.7 Rinse all equipment with copious amounts of potable water followed by distilled or deionized water.

3.8 Place clean equipment on a clean plastic sheet (e.g., polyethylene)

3.9 Reassemble the cleaned sampler, as necessary.

3.10 After equipment has been cleaned, all individuals involved in equipment handling should don clean gloves, or wrap the equipment with a suitable material (e.g., plastic bag, aluminum foil).

As part of the decontamination procedure for soil-sampling equipment, state and/or federal protocols must be considered. These may require procedures above

those specified as minimum for Roux Associates, Inc., such as the use of nitric acid, acetone, etc. Furthermore, the containment and proper disposal of decontamination fluids must be considered with respect to regulatory agency(ies) requirements.

4.0 PROCEDURE FOR WATER-SAMPLING EQUIPMENT

The following is a decontamination procedure for water-sampling equipment (e.g., bailers, pumps). Water-sampling equipment decontamination procedures, especially any variation from the method itemized below, will be documented on an appropriate field form or in the field notebook.

4.1 Safety first. Obtain the JSAs and PPE, as specified in the site HASP.

4.2 Decontamination procedures for bailers follow:

a. Wear disposable gloves while cleaning bailer to avoid cross-contamination and change gloves as needed.

b. Prepare a non-phosphate, laboratory-grade detergent solution and potable water in a bucket.

c. Disassemble sampling equipment. Discard all used sampling tubes and cords in an appropriate manner. Disconnect all power sources from electrical equipment (i.e. pumps). Scrub each piece of equipment with a brush and solution.

d. Rinse all sampling equipment with copious amounts of potable, distilled or deionized water, Reassemble equipment as per the manufacturer's instructions.

f. Air dry.

g. Wrap equipment with a suitable material (e.g., clean plastic bag, aluminum foil).

4.3 Decontamination procedures for pumps follow:

a. Wear disposable gloves while cleaning pump to avoid cross-contamination and change gloves as needed.

b. Prepare a non-phosphate, laboratory-grade detergent solution and potable water in a clean bucket, clean garbage can, or clean 55-gallon drum.

c. Flush the pump and discharge hose (if not disposable) with the detergent solution, and discard disposable tubing and/or cord in an appropriate manner.

d. Flush the pump and discharge hose (if not disposable) with potable water.

e. Place the pump on clear plastic sheeting.

f. Wipe any pump-related equipment (e.g., electrical lines, cables, discharge hose) that entered the well with a clean cloth and detergent solution, and rinse or wipe with a clean cloth and potable water.

g. Air dry.

h. Wrap equipment with a suitable material (e.g., clean plastic bag).

As part of the decontamination procedure for water-sampling equipment, state and/or federal protocols must be considered. These may require procedures above those specified as minimum for Roux Associates, Inc., such as the use of nitric acid, acetone, etc. Furthermore, the containment and proper disposal of decontamination fluids must be considered with respect to regulatory agency(ies) requirements.

END OF PROCEDURE

APPENDIX H

Stormwater Pollution Prevention Plan

Stormwater Pollution Prevention Plan (SWPPP)

for

35-10 Steinway Street

35-10 Steinway Street, Astoria, New York 11101

Queens/Block: 668/Lot: 6

Prepared For:

35-18 Steinway Street LLC

102 Motor Parkway, Suite 410, Hauppauge, New York 11788

Bernard Kennedy

(212) 233-0495

steinway1owner@lmxd.com

Prepared By:

Key Civil Engineering, P.C.

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SWPPP Preparation Date:

November 2025

Yuriy Tupychak, P.E.

Professional Engineer #101425

NYC DEP Application ID #S415225

Stormwater Pollution Prevention Plan

Acronyms

Acronym	Definition
BEPA	Bureau of Environmental Planning and Administration
BMP	Best Management Practice
CFR	Code of Federal Regulations
CGP	Construction General Permit
CPESC	Certified Professional in Erosion and Sediment Control
Cp_V	Channel Protection Volume
CSS	Combined Sewer System
DEC	Department of Environmental Conservation
DEP	Department of Environmental Protection
DOB	Department of Buildings
EPA	Environmental Protection Agency
ESC	Erosion and Sediment Control
HSG	Hydrologic Soil Group
NNI	No Net Increase
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NRCC	Northeast Regional Climate Center
NRCS	Natural Resources Conservation Service
NYCDEP	New York City Department of Environmental Protection
NYS	New York State
NYSESCCP	New York State Erosion and Sediment Control Certificate Program
NYSDEC	New York State Department of Environmental Conservation
PE	Professional Engineer
POC	Pollutant of Concern
QI	Qualified Inspector
RLA	Registered Landscape Architect
RR_V	Runoff Reduction Volume
SMP	Stormwater Management Practice
SPCC	Spill Prevention Control and Countermeasure
SPDES	State Permit Discharge Elimination System
SWM	Stormwater Manual
SWMDM	Stormwater Management Design Manual
SWPPP	Stormwater Pollution Prevention Plan
SWPTS	Stormwater Permitting and Tracking System
TC	Trained Contractor
TN	Total Nitrogen
USCS	Unified Soil Classification System
USWR	Unified Stormwater Rule
WQ_V	Water Quality Volume

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Section 1: Contact Information and Responsibilities

Instructions (CGP Part III.A.6):

- This section is intended to be completed after the SWPPP is approved by DEP and before construction begins. Once completed, this section shall be attached to the approved SWPPP and kept on site.
- Identify the Contractor(s) that will be responsible for the installation, construction, repair, replacements, inspection, and maintenance of the erosion and sediment control (ESC) practices, or the post-construction stormwater management practices (SMP) at the site.
- See additional requirements in:
    - Appendix E: Certifications
    - Appendix F: Inspections

Retain this instruction for use during construction.

TABLE 1 – CONSTRUCTION TEAM	
PRIMARY CONTRACTOR *Principal entity retained by the Owner/Applicant to construct the covered development project.* *Responsible for compliance with the SWPPP.*	**NAME** Insert Name **COMPANY/ORGANIZATION** Insert Company/Organization **ADDRESS** Insert Address **PHONE NUMBER** Insert Phone Number **EMAIL** Insert Email
SUB-CONTRACTOR(S) *Entity retained to construct some elements of the covered development project.* *Responsible for compliance with the SWPPP.*	**NAME** Insert Name **COMPANY/ORGANIZATION** Insert Company/Organization **ADDRESS** Insert Address **PHONE NUMBER** Insert Phone Number **EMAIL** Insert Email
TRAINED CONTRACTOR(S) *Person employed with the Primary Contractor or a Sub-Contractor and knowledgeable in the principles and practices of ESC.* *Responsible for conducting daily inspections that ensure compliance with the SWPPP.*	**NAME** Insert Name **COMPANY/ORGANIZATION** Insert Company/Organization **ADDRESS** Insert Address **PHONE NUMBER** Insert Phone Number **EMAIL** Insert Email **NYS DEC EROSION AND SEDIMENT CONTROL TRAINING:** • **CERTIFICATE NUMBER:** Insert Number • **EXPIRATION DATE:** Insert Date
QUALIFIED PROFESSIONAL(S)[1] *Licensed professional knowledgeable in the principles and practices of stormwater management.* *Responsible for certifying correct installation of SMPs*	**NAME** Insert Name **COMPANY/ORGANIZATION** Insert Company/Organization **ADDRESS** Insert Address **PHONE NUMBER** Insert Phone Number **EMAIL** Insert Email **QUALIFYING LICENSE:** ☐ PE ☐ RLA

QUALIFIED INSPECTOR(S) *Licensed or Certified professional knowledgeable in the principles and practices of ESC.* *Responsible for conducting and/or certifying QI inspections at the required frequency for the project.*	**NAME** Insert Name **COMPANY/ORGANIZATION** Insert Company/Organization **ADDRESS** Insert Address **PHONE NUMBER** Insert Phone Number **EMAIL** Insert Email **NYS DEC EROSION AND SEDIMENT CONTROL TRAINING** • **CERTIFICATE NUMBER:** Insert Number • **EXPIRATION DATE:** Insert Date **QUALIFYING CREDENTIALS[2]:** ☐ PE ☐ RLA ☐ CPESC ☐ NYSESCCP
SUPERVISED QUALIFIED INSPECTOR(S)[3] *A person working under the direct supervision of, and at the same company as, the licensed Professional Engineer or Registered Landscape Architect.* *May conduct QI inspections, under the supervision of the Licensed QI, provided they have received four (4) hours of NYS DEC endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District or other NYSDEC endorsed entity.*	**NAME** Insert Name **COMPANY/ORGANIZATION** Insert Company/Organization **ADDRESS** Insert Address **PHONE NUMBER** Insert Phone Number **EMAIL** Insert Email **NYS DEC EROSION AND SEDIMENT CONTROL TRAINING:** • **CERTIFICATE NUMBER:** Insert Number • **EXPIRATION DATE:** Insert Date **QUALIFYING SUPERVISOR[3]:** Insert name of Licensed QI under whose supervision the Supervised QI will work

[Add rows as needed.]

[1]The Qualified Professional must be a licensed Professional Engineer (PE) or Registered Landscape Architect (RLA) in the State of New York. The Qualified Professional may also serve as the Qualified Inspector.

[2]On projects that include post-construction SMPs, the Qualified Inspector must be a licensed Professional Engineer (PE) or Registered Landscape Architect (RLA) in the State of New York. On projects that only include ESC practices, the Qualified Inspector may be a CPESC or a NYSESCCP.

[3]The supervised Qualified Inspector must work at the same company and under the direct supervision of the Qualified Inspector listed in this table. This field only applies to projects with post-construction SMPs.

Section 2: Project Location

TABLE 2 – PROJECT LOCATION AND PLAN	
PROJECT/SITE NAME(S):	35-10 Steinway Street
PROJECT/SITE STREET ADDRESS(ES):	35-10 Steinway Street, Astoria, New York 11101
PROJECT PLAN OF DEVELOPMENT	Is this project part of a Larger Common Plan of Development[1]? ☒ No ☐ Yes, the project is part of a Larger Common Plan of Development: Click or tap here to enter text.
Please insert location plan below.	

[1] *A Larger Common Plan of Development is a contiguous area where multiple separate and distinct development activities are occurring, or will occur, under one plan. Refer to NYC SWM Glossary for a complete definition.*

Section 3: Project Introduction

Section 3.1: Project and Site Description

TABLE 3.1 – NATURE OF CONSTRUCTION			
COVERED DEVELOPMENT PROJECT:	Are all of the development activities that are proposed for this project listed in Table 2.2 of NYC SWM? ☐ Yes, all activities are listed in Table 2.2 of NYC SWM ☒ No, at least one activity is not listed in Table 2.2 of NYC SWM		
TOTAL PROPERTY AREA[1]	**DISTURBED AREA[2]**	**EXISTING IMPERVIOUS IN DISTURBED AREA[3]**	**FUTURE IMPERVIOUS IN DISTURBED AREA**
32,167 sf	Total = 58,655 sf On-Site = 32,167 sf ROW = 26,488 sf	Total = 57,866 sf On-Site = 32,167 sf ROW = 25,699 sf	Total = 53,681 sf On-Site = 27,593 sf ROW = 26,088 sf

[1]For projects that include multiple properties, use the sum of all property areas.
[2]Total disturbed area must include all disturbances within the property boundaries (on-site) and those outside the boundaries of properties (ROW).
[3]Existing impervious area may include impervious areas that were removed from a project site within the last 5 years of the proposed development.

Section 3.1.1: Project Scope and Development Activity Description

The site is 0.738 acres (32,167 SF) in area and the total area of disturbance is 1.347 acres (58,655 SF), which includes 0.608 acres (26,488 SF) of right-of-way work. The existing site is a paved parking lot a total of 32,167 SF of impervious area. The site is bounded by 35th Avenue to the north, Steinway Street to the east, 38th Street to the west, and existing 1 story brick, concrete block and stucco building to the south.

The proposed work will include subdividing an existing 75,272 SF parcel into two and the construction of a proposed 27-story 31,074 SF footprint mixed-use building with cellar floor within the 32,167 SF subdivided property and stormwater system in accordance with the City of New York requirements. The breakdown of post development conditions is 31,074 SF of new building footprint and 1,093 SF concrete pavement that will cover the entire property. The new building will consist of 27,593 SF standard roof and 3,481 SF green roof (1,279 SF intensive green roof and 2,202 SF extensive green roof). Also, approximately a total of 9,770 square feet of concrete sidewalk, 533 linear feet of steel-faced concrete curb, and 16,020 square feet of asphalt pavement are proposed to be replaced in the right-of-way fronting the project site.

The post-construction stormwater management practices include:

- 3,481 SF Green Roof (1,279 SF Intensive Green Roof and 2,202 SF Extensive Green Roof)
- 1,128 SF Detention Tank

The proposed stormwater system will consist of a detention tank, where outflow will be controlled by a re-entrant orifice tube. Roof runoff from the building is collected via roof drains and green roof with controlled flow roof drains and piped directly into the detention tank. Surface topography generally contains slopes averaging 0.1-1.5% around the building and in most paved areas.

The construction activities required include:

- Site Removals
- Foundation Work
- Building Construction including Detention Tank and Green Roof Installation
- Utility connections
- Builders Pavement Plan in R.O.W
- Final stabilization

The remaining construction items consist of a sewer connection from the building to the sewer main in the street for sanitary and storm water discharge from the building, sidewalk/curb replacement, and roadway resurfacing under the Builder's Pavement Plan application.

The covered development activity according to Table 2.3 of the NYC SWM is mixed-use commercial development (retail trade establishment and residential use). The project is not within an MS4 area. Therefore, a Notice of Intent (NOI) does not need to be

submitted. A Builders Pavement Plan is required as part of this project. The project is not part of a Larger Common Plan of Development.

Section 3.1.2: Existing Site Conditions

The existing site is used as parking with a total of 32,167 SF impervious cover. A guard rail surrounds the subject property to the north, east and west. The site is bounded by 35th Avenue to the north, Steinway Street to the east, 38th Street to the west, and existing 1 story brick, concrete block and stucco building to the south.

Slopes on the existing subject site range from approximately 0 to 1.5%. The stormwater source is from runoff flowing across the existing pavement areas. Stormwater on this site generally flows to the existing area drains on-site. Existing impervious surfaces, light poles, signs and base columns, guard rail and area drains on site are to be removed during site removal.

Non soil-based pollutants, hotspots, protected and contaminated areas do not exist on the subject property. No Regulatory programs or policies apply to the site.

No stormwater management practices, buffer zones, wetlands, floodplains, outfalls, areas of known contamination, surface waters or sewage treatment systems exist on the subject property. Furthermore, there is no Offsite contributing areas, Offsite contributing areas, Offsite staging areas within ¼ mile of the site and offsite wetlands and waterbodies.

Section 3.1.3: Proposed Site Conditions

The proposed work will include the subdivision of an existing 75,272 SF parcel into two and the construction of a proposed 27-story 31,074 SF footprint mixed-use building with cellar floor and stormwater system in accordance with the City of New York requirements. The breakdown of post development conditions is 31,074 SF of new building footprint and 1,093 SF concrete pavement that will cover the entire property. The new building will consist of 27,593 SF standard roof and 3,481 SF green roof. Also, approximately a total of 9,770 square feet of concrete sidewalk, 533 linear feet of steel-faced concrete curb, and 16,020 square feet of asphalt pavement are proposed to be replaced in the right-of-way fronting the project site. The project's land use is classified as mixed-use commercial development (retail trade establishment and residential use). Therefore, it is not considered a stormwater hotspot.

The stormwater management system (detention tank and green roof) comply with state and city stormwater management requirements. The Stormwater Interactive Map identifies the 90% rainfall event for this region as 1.50 inches. Following that guidance, the water quality volume (WQv) was calculated using 1.50 inches of rainfall and the resulting volume of 3,819.83 cubic feet (0.088 acre-feet). The total storage volume of the proposed detention tank and green roof is 5,055.33 cubic feet (0.116 acre-feet).

The channel protection volume (CPv: 1-year storm), overbank flood control criteria (Qp: 10-year storm) and extreme flood control criteria (Qf: 100-year storm) are waived for this project since the site discharges are detained on-site via detention system and combined sewers front the subject site.
The proposed stormwater system will consist of a detention tank, where outflow will be controlled by a re-entrant orifice tube. Roof runoff from the building is collected via roof drains and green roof with roof drains piped directly into the detention tank.

Surface topography generally contains slopes averaging 0.1-1.5% around the building and in most paved areas. Surface water from the paved areas will be collected by area drains and connected to the detention tank via pipes. The total contributing area to detention tank and green roof is 32,167 SF.

No proposed offsite features will affect the proposed project, including proposed offsite staging areas.

Section 3.1.4: Soils Information

TABLE 3.2 – HYDROLOGIC SOIL GROUP			
HSG A	**HSG B**	**HSG C**	**HSG D**
100 %	**0** %	**0** %	**0** %

According to the NRCS soil survey obtained from the USDA website, soils on the site consist primarily of UoA, Urban land, outwash substratum, 0 to 3 percent slopes. The onsite soil can be categorized as 100% hydrologic group D (HSG A) per the National Engineering Handbook Chapter 7 630.0701. The soil information is indicated in the USDA NRCS Soils Report with Hydrologic Soil Group Map in Appendix D.

As per the USDA, NRCS Hydrology National Engineering Handbook, the soils on the site comply with the requirements for HSG A. Group A soils typically have less than 10% clay and more than 90% sand or gravel and have sand or gravel texture. The limits on the diagnostic characteristics of HSG A are as follows. The saturated hydraulic conductivity of all soil layers exceeds 5.67 in/hr. The depth to any water impermeable layer is greater than 20 inches. The depth to the water table is greater than 24 inches.

This section contains details of the subsoil investigation performed by JZN Engineering, P.C. The following subsections provide generalized descriptions of the soil and groundwater conditions encountered during the subsurface investigation. More detailed descriptions of the subsurface conditions are provided in the attached boring logs.

Subsurface Conditions

Details of the subsurface materials encountered are presented on the Boring Exploration Records presented in Appendix A of this report. The stratification lines designating the interface between soil types on the boring log represent approximate boundaries. The transition between materials may be gradual, and one or more strata may be absent at specific locations. In general, the subsurface soils conditions are consistent with the regional geology of the area. The boring exploration borings revealed the following generalized strata in order of increasing depth below ground surface:

Surface Cover: The exploration borings encountered asphalt pavement at the surface with thickness of approximately between three (3) inches and four (4) inches.

Stratum I – Existing Fill Materials (NYC Class 7): Underlying the surface cover, existing fill materials were encountered and extended to depths that ranged between approximately five (5) feet and 11 feet below the existing ground surface. The existing fill materials generally consisted of medium to fine sand with varying amounts of gravel, silt, and debris (brick, and concrete fragments). We anticipate that deeper fill materials may be present within locations not explored as part of this investigation, especially near underground utilities and neighboring public structures due to the site's proximity to the NYCT subway lines.

Stratum II – Natural Alluvial Deposits (NYC Class 6, 3b & 3a): Underlying the existing fill materials, generally medium dense to very dense natural alluvial deposits were encountered and extended to the boring termination depths that ranged approximately between 52 feet and 101.2 feet below the existing ground surface. These deposits generally consisted of sand with varying amounts of silt and gravel. Loose pockets of sand were encountered within the upper portions of the alluvial deposits and were encountered to depths up to approximately 15 feet below the existing ground surface. In addition, the natural alluvial deposits generally increased in relative densities as depth increased. No bedrock was encountered within the upper 100 foot of our deeper boring locations; however, the presence of sporadic boulders and very dense gravely deposits were encountered within the Stratum II deposits.

Groundwater Conditions

Groundwater conditions were encountered at depths that ranged approximately between 20 feet and 25 feet below the existing ground surface; corresponding to elevations of approximately between +/-Elev. 21.6 ft. and +/-Elev. 16.3 ft.

Two (2) groundwater monitoring wells (identified as MW-1 and MW-2) were installed on site to depths of ranging between approximately 30 feet below the existing ground surface. A piezometer was mounted inside each groundwater monitoring well to measure the groundwater depth at the well locations. Two (2) Onset HOBO U20 piezometers were installed by JZN Engineering, PC on March 6, 2025 in monitoring wells MW-1 MW-2 and continuously recorded water level data between March 6, 2025 and March 12, 2025 as follows:

Table 1: Water Logger Summary Table			
Well Location	**Logger Serial No.**	**Highest Groundwater Elevation Recorded**	**Lowest Groundwater Elevation Recorded**
MW-1	20715060	+20.6 ft.	+19.8 ft.
MW-2	20715059	+21.3 ft	+20.4 ft

It should be noted that fluctuations in the level of groundwater may occur due to variations in season, rainfall, snow melt, surface infiltration, temperature, construction activities, pumping of dewatering systems, leakage from utilities and other factors not evident at the time measurements were made and reported herein. As a result, water levels observed during and after construction may vary from those observed in the test borings during drilling.

In Situ Permeability Test Results

A total of two (2) in-situ permeability tests were performed within the proposed development at locations IB-1 and IB-2 at depths of approximately 10 feet and 15 feet below the existing ground surface. The field Infiltration tests were performed in accordance to the procedures outlined in Appendix B of the New York State Stormwater Management Design Manual. The results of the field infiltration tests are included in Table 2.

Table 2: Field Infiltration Test Results				
Infiltration Test	**Test Depth (ft)**	**Test Elevation (ft)**	**Percolation Test**	
			Stratum	**Average Field infiltration Test (in/hr.)**
IB-1	± 10	± 31.25	Stratum II	22 in/hr.
IB-1	± 10	± 31.25	Stratum II	21 in/hr.
IB-1	± 15	± 26.25	Stratum II	21 in/hr.
IB-2	± 10	± 28.5	Stratum II	11.5 in/hr.
IB-2	±15	± 23.5	Stratum II	67 in/hr.

Section 3.1.5: Flood Hazard Area

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations (BFEs) shown on this map apply only landward of 0.0' National Geodetic Vertical Datum of 1929 (NGVD 29). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations tables in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations tables should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was New York State Plane FIPSZONE 3104. The **horizontal datum** was NAD 83, GRS80 spheroid. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the National Geodetic Vertical Datum of 1929. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, NNGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3182
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was provided in digital format by the Department of Information Technology and Telecommunication, City of New York. This information was derived from digital orthophotos produced at a scale of 1:1,200 with 2-foot pixel resolution from photography dated 2004.

Based on updated topographic information, this map reflects more detailed and up-to-date **stream channel configurations** and **floodplain delineations** than those shown on the previous FIRM for this jurisdiction. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map. Also, the road to floodplain relationship for unrevised streams may differ from what is shown on previous maps.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occured after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map showing the layout of map panels for this jurisdiction.

Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://msc.fema.gov.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov.

LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual flood (100 year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A — No Base Flood Elevations determined.
ZONE AE — Base Flood Elevations determined.
ZONE AH — Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO — Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR — Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99 — Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V — Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE — Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X — Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X — Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D — Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAS)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% annual chance floodplain boundary
0.2% annual chance floodplain boundary
Floodway boundary
Zone D boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Areas of different Base Flood elevations, flood depths or flood velocities.
~~ 513 ~~ Base Flood Elevation line and value; elevation in feet*
(EL. 987) Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the National Geodetic Vertical Datum of 1929

Cross section line
Transect line
97°07'48", 32°22'30" Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), western hemisphere
4276000 FT 1000-meter Universal Transverse Mercator grid values, zone 18
600000 FT 5000-foot grid values: New York State Plane coordinate system, Long Island zone (FIPSZONE 3104), Lambert Conformal Conic projection
DX5510 Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5 River mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
June 16, 1978

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
June 1, 1978

FLOOD INSURANCE RATE MAP EFFECTIVE
November 15, 1983

FLOOD INSURANCE RATE MAP REVISED
September 5, 2007 - to change Special Flood Hazard Areas, to reflect updated topographic information, and to update corporate limits

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'
250 0 500 1000 FEET
150 0 150 300 METERS

NFIP

PANEL 0093F

FIRM

FLOOD INSURANCE RATE MAP

CITY OF
NEW YORK,
NEW YORK
BRONX, RICHMOND, NEW YORK,
QUEENS, AND KINGS COUNTIES

PANEL 93 OF 457

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
NEW YORK, CITY OF	360497	0093	F

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
3604970093F

MAP REVISED
SEPTEMBER 5, 2007

Federal Emergency Management Agency

NATIONAL FLOOD INSURANCE PROGRAM

Section 3.3: Applicable Stormwater Management Requirements

TABLE 3.5 – APPLICABLE REQUIREMENTS		
REQUIREMENT	**WHEN APPLICABLE**	**APPLICABLE ON THIS PROJECT?**
EROSION & SEDIMENT CONTROL (ESC)	All covered development projects	☒ Yes
WATER QUALITY (WQ_V)	Covered development project Except for activities listed in NYC SWM Table 2.2	☒ Yes ☐ No
RUNOFF REDUCTION (RR_V)	Covered development project Except for activities listed in NYC SWM Table 2.2	☒ Yes ☐ No
NO-NET INCREASE (NNI)	Project area of 20,000 sf or more AND Project located in MS4 area AND Discharges to an impaired water body (NYC SWM Table 2.4) AND increases impervious area	☐ Yes ☒ No
SEWER OPERATIONS (V_V)	Project is connected to or will be connected to a sewer.	☒ Yes ☐ No
CHANNEL PROTECTION VOLUME (CP_V)	Covered development project Except in the following circumstances: - Reduction of the entire Cp_v volume is achieved at a site through green infrastructure or infiltration systems - The site discharges directly to tidal water, fifth order (fifth downstream) or larger systems or CSS.	☐ Yes ☒ No
OVERBANK FLOOD CONTROL (Q_P)	Covered development project Except in the following conditions: - The site discharges directly to tidal water, fifth order (fifth downstream) or larger systems or CSS. - A downstream analysis reveals that overbank control is not needed	☐ Yes ☒ No
EXTREME FLOOD CONTROL (Q_F)	Covered development project Except in the following circumstances: - The site discharges directly to tidal waters or fifth order (fifth downstream) or larger systems or CSS - Development is prohibited within the ultimate 100-year floodplain - A downstream analysis reveals that 100-year control is not needed	☐ Yes ☒ No

Section 4: Erosion and Sediment Control (ESC)

Section 4.1: Conforming ESC Practices

TABLE 4.1(a) – CONFORMING ESC PRACTICE: Dust Control	
DESCRIPTION OF PRACTICE *Include type, dimensions, material specifications, installation details*	A water spray or mist shall be applied to control dust at earth work sites or access roads when necessary.
INTENT *Select the appropriate practice type and describe intent, specific to construction activity*	Sediment Control The intent of dust control is to prevent sediment from leaving the site via surface and air movement that may cause off-site damage, health hazards and traffic safety problems.
REFERENCE DETAIL *Include drawing sheet and detail number*	Sheet C-200.00 – Detail 1
REFERENCED STANDARD *From NYSDEC Standards and Specifications for Erosion and Sediment Control*	Page 2.25 of 2016 NYS Blue Book Reference
MINIMUM MAINTENANCE REQUIREMENTS *Indicate minimum frequency of replacement once practice is installed and designate any additional maintenance triggers for the practice*	Maintain dust control measures through dry weather periods until all disturbed areas are stabilized.
STABILIZATION COMPLETION TIMELINE[1] *Identify stabilization requirements for the site, and describe how this practice will comply*	N/A

TABLE 4.1(b) – CONFORMING ESC PRACTICE: Stabilized Construction Entrance	
DESCRIPTION OF PRACTICE *Include type, dimensions, material specifications, installation details*	Stone anti-tracking pads will be installed at each access point to the work area to prevent the off-site transport of sediment by construction vehicles. The stabilized construction exits will be at least fifty feet long and will consist of a 6-inch thick layer of crushed stone (1 to 4 inches in diameter). The stone will be placed over a layer of non-woven filter fabric.
INTENT *Select the appropriate practice type and describe intent, specific to construction activity*	Sediment Control The intent of the stabilized construction entrance is to prevent the off-site transport of sediment by construction vehicles.
REFERENCE DETAIL *Include drawing sheet and detail number*	Sheet C-200.00 – Detail 2
REFERENCED STANDARD *From NYSDEC Standards and Specifications for Erosion and Sediment Control*	Page 2.23 of 2016 NYS Blue Book Reference
MINIMUM MAINTENANCE REQUIREMENTS *Indicate minimum frequency of replacement once practice is installed and designate any additional maintenance triggers for the practice*	Visible mud shall be cleaned by hand using a broom and water spray from vehicle tires and treads as practical before vehicles exit the site. Inspect construction roads and parking areas periodically for condition of surface. Top dress with new gravel as needed.
STABILIZATION COMPLETION TIMELINE[1] *Identify stabilization requirements for the site, and describe how this practice will comply*	N/A

TABLE 4.1(c) – CONFORMING ESC PRACTICE: **Storm Drain Inlet Protection**	
DESCRIPTION OF PRACTICE *Include type, dimensions, material specifications, installation details*	Type IV Storm Drain Inlet Protection as per plan. The proposed inlets will be protected from sediment inflow during the work period with inlet protection as specified by the "Blue Book". The contractor may use the type suitable for the situation and their means and methods unless otherwise noted on the drawing. A layer of filter fabric, silt fence materials, or geotextile is NOT an acceptable inlet protection practice. The site drains into catch basins owned and operated by the City of New York. No device may be placed in, on or over the catch basin inlet that restricts flow during storm events. The contractor is responsible to retain all sediment on the property and not allow a discharge of sediment laden water into the City's drainage system. Builder's Pavement and utility work that may expose soil in the areas that contribute stormwater runoff to the City's catch basins must be scheduled considering expected storm events to minimize the potential for the discharge of sediment laden water to City owned catch basins. All inlet protection devices must be removed immediately after the stabilization of the area or before any rain event that is expected to produce 0.5" or more rainfall.
INTENT *Select the appropriate practice type and describe intent, specific to construction activity*	Sediment Control The intent of drain inlet protection is to prevent sediment laden runoff from entering drainage systems on and near the construction site.
REFERENCE DETAIL *Include drawing sheet and detail number*	Sheet C-200.00 – Detail 3
REFERENCED STANDARD *From NYSDEC Standards and Specifications for Erosion and Sediment Control*	Page 5.57 – 5.62 of 2016 NYS Blue Book Reference

MINIMUM MAINTENANCE REQUIREMENTS *Indicate minimum frequency of replacement once practice is installed and designate any additional maintenance triggers for the practice*	These protection measures will be inspected daily and will be routinely maintained until the drainage area tributary to each inlet has been stabilized by vegetation and/or covered by pavement. Any sediment that collects behind the barrier or in the sacks will be removed and will be either reused onsite or disposed of at a suitable off-site location.
STABILIZATION COMPLETION TIMELINE[1] *Identify stabilization requirements for the site, and describe how this practice will comply*	N/A

TABLE 4.1(d) – CONFORMING ESC PRACTICE: Silt Fence	
DESCRIPTION OF PRACTICE *Include type, dimensions, material specifications, installation details*	Prior to any ground disturbance, a barrier of silt fence shall be placed at the down gradient limit of work. When necessary, additional silt fence barriers will be installed immediately down gradient of erosion-prone areas, such as the base of steep exposed slopes and around the base of stockpiles, throughout the construction phase of the project. The barriers will be entrenched into the substrate to prevent underflow. 6' long wood posts shall be spaced horizontally 8' on center maximum and shall support the 2' tall, approved filter fabric fence. The stakes shall be installed 2' into the ground. A 6" wide and 6" tall trench shall be dug to bury the bottom 1' of filter fabric in place. Alternatively, filter sock can be used on paved surfaces.
INTENT *Select the appropriate practice type and describe intent, specific to construction activity*	Sediment Control The intent of the silt fence is to intercept sediment laden runoff from small drainage areas of disturbed soil by temporarily ponding the sediment laden runoff allowing settlement to occur.
REFERENCE DETAIL *Include drawing sheet and detail number*	Sheet C-200.00 – Detail 4

REFERENCED STANDARD *From NYSDEC Standards and Specifications for Erosion and Sediment Control*	Page 5.54 – 5.56 of 2016 NYS Blue Book Reference
MINIMUM MAINTENANCE REQUIREMENTS *Indicate minimum frequency of replacement once practice is installed and designate any additional maintenance triggers for the practice*	The erosion control barriers will be inspected daily and after every storm event. Once sediment buildup has reached half the height of the silt fence (or more often as site conditions and schedule dictates) any sediment that has collected behind the barriers will be removed and will be either reused at the site or disposed of at a suitable offsite location. Any damaged sections of silt fence will be repaired or replaced.
STABILIZATION COMPLETION TIMELINE[1] *Identify stabilization requirements for the site, and describe how this practice will comply*	N/A

TABLE 4.1(e) – CONFORMING ESC PRACTICE: Protecting Vegetation	
DESCRIPTION OF PRACTICE *Include type, dimensions, material specifications, installation details*	Tree Protection Fences made of wood or other protective material will be constructed around existing trees for protection from construction equipment. 6' long wood posts shall be spaced horizontally 8' on center maximum and shall support the 4' tall fence. The stakes shall be installed 2' into the ground.
INTENT *Select the appropriate practice type and describe intent, specific to construction activity*	The intent of the tree protection fence is to prevent damage from construction equipment. The intent is to preserve existing vegetation determined to be important for soil erosion control, water quality protection, shade, screening, buffers, wildlife habitat and other values.
REFERENCE DETAIL *Include drawing sheet and detail number*	Sheet C-200.00 – Detail 5

REFERENCED STANDARD *From NYSDEC Standards and Specifications for Erosion and Sediment Control*	Page 2.26 – 2.27 of 2016 NYS Blue Book Reference
MINIMUM MAINTENANCE REQUIREMENTS *Indicate minimum frequency of replacement once practice is installed and designate any additional maintenance triggers for the practice*	The tree protection fence to be inspected weekly for damaged fence and to ensure the tree is protected. Damaged fence to be repaired as necessary.
STABILIZATION COMPLETION TIMELINE[1] *Identify stabilization requirements for the site, and describe how this practice will comply*	N/A

TABLE 4.1(f) – CONFORMING ESC PRACTICE: Concrete Washout	
DESCRIPTION OF PRACTICE *Include type, dimensions, material specifications, installation details*	Concrete washout will receive all wash water from the cleaning of chutes, mixers, hoppers, vibrators, placing equipment, trowels, and screeds. Under no circumstances will wash water from these operations be allowed to infiltrate into the soil or enter surface waters or stormwater management facilities. The minimum length and width of the concrete washout container is 8 feet x 8 feet. The minimum depth is 2 feet.
INTENT *Select the appropriate practice type and describe intent, specific to construction activity*	Runoff Control The intent of the concrete washout is to collect waste from concrete pour activities.
REFERENCE DETAIL *Include drawing sheet and detail number*	Sheet C-200.00 – Detail 6
REFERENCED STANDARD	Page 2.24 of 2016 NYS Blue Book Reference

From NYSDEC Standards and Specifications for Erosion and Sediment Control	
MINIMUM MAINTENANCE REQUIREMENTS *Indicate minimum frequency of replacement once practice is installed and designate any additional maintenance triggers for the practice*	A. All concrete washout facilities shall be inspected daily. Damaged or leaking facilities shall be deactivated and repaired or replaced immediately. shall be removed when 75% of the storage capacity of the structure is filled. Any excess wash water shall be pumped into a containment vessel and properly disposed of off-site.
STABILIZATION COMPLETION TIMELINE[1] *Identify stabilization requirements for the site, and describe how this practice will comply*	N/A

[1]This row is required for all soil stabilization practices. Mark as "N/A" for runoff and sediment control practices

TABLE 4.1(g) – CONFORMING ESC PRACTICE: Material Stockpile	
DESCRIPTION OF PRACTICE *Include type, dimensions, material specifications, installation details*	Prior to grading or spreading of soils, material stockpiles shall be created using the excavated and stripped site soils. Stockpile surfaces must be stabilized. Stockpile surfaces can be stabilized by vegetation, geotextile or plastic covers. The maximum height of a soil stockpile is 15 feet. A maximum 1:1 slope must be maintained. Soil stockpile shall be placed no less than 10 feet from the perimeter silt fence.
INTENT *Select the appropriate practice type and describe intent, specific to construction activity*	Sediment Control The intent of material stockpiles is to store site soils on site for future grading purposes and minimize erosion and sediment transport from soils or other erodible materials stored at the construction site.
REFERENCE DETAIL *Include drawing sheet and detail number*	Sheet C-200.00 – Detail 7
REFERENCED STANDARD	Page 4.59 of 2016 NYS Blue Book Reference

From NYSDEC Standards and Specifications for Erosion and Sediment Control	
MINIMUM MAINTENANCE REQUIREMENTS *Indicate minimum frequency of replacement once practice is installed and designate any additional maintenance triggers for the practice*	Soil stockpiles must be stabilized. Stockpile surfaces can be stabilized by vegetation, geotextile or plastic covers.
STABILIZATION COMPLETION TIMELINE[1] *Identify stabilization requirements for the site, and describe how this practice will comply*	N/A

Section 4.2: Non-Conforming ESC Practices

N/A

Section 4.3: Allowable Non-Stormwater Discharges

TABLE 4.3 – AUTHORIZED NON-STORMWATER DISCHARGES	
TYPE OF AUTHORIZED NON-STORMWATER DISCHARGE	**LIKELY TO BE PRESENT ON SITE?**
LANDSCAPE IRRIGATION	☐ Yes ☒ No
WATERS USED TO WASH VEHICLES AND EQUIPMENT (CLEANSERS ARE NOT USED)	☒ Yes ☐ No
WATER USED TO CONTROL DUST	☒ Yes ☐ No
POTABLE WATER INCLUDING UNCONTAMINATED WATER LINE FLUSHINGS	☒ Yes ☐ No
EXTERNAL BUILDING WASH DOWN (SOAPS/SOLVENTS ARE NOT USED, AND EXTERNAL SURFACES DO NOT CONTAIN HAZARDOUS SUBSTANCES)	☒ Yes ☐ No
PAVEMENT WASH WATERS (SPILLS OR LEAKS HAVE NOT OCCURRED)	☒ Yes ☐ No
UNCONTAMINATED AIR CONDITIONING OR COMPRESSOR CONDENSATE*	☐ Yes ☒ No
UNCONTAMINATED, NON-TURBID DISCHARGES OF GROUND WATER OR SPRING WATER*	☐ Yes ☒ No
FOUNDATION OR FOOTING DRAINS*	☐ Yes ☒ No
DISCHARGES FROM CONSTRUCTION DE-WATERING OPERATIONS*	☐ Yes ☒ No

**Require permits from DEP's Bureau of Water and Sewer Operations, DEP's Bureau of Wastewater Treatment, Department of Buildings and/or NYSDEC.*

Section 4.4: Pollution Prevention Measures

TABLE 4.4 – POTENTIAL SOURCE OF POLLUTION PRESENT ON SITE	
MATERIALS OR ACTIVITY	**LIKELY TO BE PRESENT ON SITE?**
Dewatering Operations	☐ Yes ☒ No
Paving Operations	☒ Yes ☐ No
Concrete, Paint and Stucco Washout	☒ Yes ☐ No
Fuelling and Maintenance of Equipment Vehicles	☒ Yes ☐ No
Washing of Equipment, Vehicles, and Buildings	☒ Yes ☐ No
Storage, Handling, and Disposal of Chemicals	☒ Yes ☐ No

(e.g. asphalt sealants, copper flashing, roofing materials, adhesives, concrete fixtures, gravel, mulch stockpiles).	
Construction and Domestic Wastes *(e.g. packaging materials, scrap construction materials, masonry products, timber, pipe and electrical cuttings, plastics, styrofoam, concrete)*	☒ Yes ☐ No
Landscape Materials, Fertilizers, Pesticides, Herbicides	☒ Yes ☐ No
Detergents	☒ Yes ☐ No
Sanitary Waste	☒ Yes ☐ No
Hazardous and Toxic Materials and Wastes (e.g. paints, solvents, petroleum-based products, wood preservatives, additives, curing compounds, acids)	☒ Yes ☐ No
Other: Click or tap here to enter text.	☐ Yes ☐ No

[Add rows as needed.]

TABLE 4.5(a) – MATERIALS OR ACTIVITY TO BE MITIGATED: Paving Operations	
POLLUTANTS AT RISK OF BEING DISCHARGED	Chemicals and sealants
POLLUTION PREVENTION MEASURE	Products shall be stored in original containers with the original labels in legible condition. If surplus product must be disposed of, the General Contractor must follow the manufacturers or applicable jurisdictional requirements for proper disposal.
SPILL PREVENTION AND RESPONSE (if applicable)	N/A
DESIGN SPECIFICATIONS (if applicable)	N/A
MAINTENANCE REQUIREMENTS (if required)	N/A

TABLE 4.5(b) – MATERIALS OR ACTIVITY TO BE MITIGATED: Concrete, Paint and Stucco Washout	
POLLUTANTS AT RISK OF BEING DISCHARGED	Concrete, paint or stucco
POLLUTION PREVENTION MEASURE	Concrete, paint, and stucco washout shall be conducted in an area where the likelihood of the area contributing to stormwater discharges is negligible. If required, additional Best Management Practices must be implemented to prevent concrete, paint and stucco wastes from contributing to stormwater discharges. Products shall be stored in original containers with the original labels in legible condition. If surplus product must be disposed of, the General Contractor must follow the manufacturers or applicable jurisdictional requirements for proper disposal.
SPILL PREVENTION AND RESPONSE (if applicable)	The General Contractor shall train designated personnel in spill prevention and response procedures. Spilled hazardous materials or hazardous wastes must be contained and remediated to avoid possible contact with stormwater. In order to minimize the potential for a spill of hazardous materials to come into contact with stormwater, the following steps shall be implemented: 1. All materials with hazardous properties (such as pesticides, petroleum products, fertilizers, detergents, construction chemicals, acids, paints, paint solvents, cleaning solvents, additives for soil stabilization, concrete curing compounds and additives, etc.) shall be stored in a secure location and covered when not in use. 2. The minimum practical quantity of all such materials shall be kept on the job site. 3. A spill response kit (e.g., absorbent materials, brooms, dust pans, mops, rags, gloves, goggles, plastic and metal trash containers, etc.) shall be maintained at the job site for use in the event of a spill. 4. Manufacturer's recommended methods for spill cleanup shall be clearly posted and site personnel shall be trained regarding these procedures and the location of the information and cleanup supplies. In the event of spills of reportable quantity, the following procedures shall be followed: 1. All spills shall be cleaned up immediately after discovery.

	2. The spill area shall be kept well ventilated and personnel shall wear appropriate protective clothing to prevent injury from contact with the hazardous substances. 3. The project manager and the Engineer of Record shall be notified immediately. Spills of toxic or hazardous materials shall be reported to the appropriate federal, state, and/or local government agency, regardless of the size of the spill. Spills of amounts that exceed Reportable Quantities of certain substances specifically mentioned in federal regulations (40 CFR 110, 40 CFR 117, and 40 CFR 302) must be immediately reported to the EPA National Response Center, telephone 1-800-424-8802 and the NYS DEC Spill Hotline 1-800-457-7362. 4. If the spill exceeds a Reportable Quantity, the SWPPP must be modified within seven (7) calendar days of knowledge of the discharge to provide a description of the release, the circumstances leading to the release, and the date of the release. The plans must identify measures to respond to such releases and to prevent the recurrence of such releases.
DESIGN SPECIFICATIONS (if applicable)	Page 2.29 of 2016 NYS Blue Book Reference
MAINTENANCE REQUIREMENTS (if required)	N/A

TABLE 4.5(c) – MATERIALS OR ACTIVITY TO BE MITIGATED: Fuelling and Maintenance of Equipment Vehicles	
POLLUTANTS AT RISK OF BEING DISCHARGED	Fuel – e.g. Petroleum
POLLUTION PREVENTION MEASURE	All on-site vehicles and equipment shall be monitored for leaks and receive regular preventative maintenance to reduce the chance of leakage. Petroleum products shall be stored in tightly sealed containers and clearly labeled. Any petroleum storage tanks stored onsite shall be located within a containment area that is designed with an impervious surface between the tank and the ground. The secondary containment must be designed to provide a containment volume that is equal to 110% of the volume

	of the largest tank. Drip pans shall be provided for all dispensers. Any asphalt substances used onsite shall be applied according to the manufacturer's recommendations. The location of any fuel tanks and/or equipment storage areas must be identified on Soil Erosion & Sediment Control Plan by the General Contractor once the locations have been determined. Fuel tanks and dispensers shall be locked at all times and located in a secured area.
SPILL PREVENTION AND RESPONSE (if applicable)	The General Contractor shall train designated personnel in spill prevention and response procedures. Spilled hazardous materials or hazardous wastes must be contained and remediated to avoid possible contact with stormwater. In order to minimize the potential for a spill of hazardous materials to come into contact with stormwater, the following steps shall be implemented: 1. All materials with hazardous properties (such as pesticides, petroleum products, fertilizers, detergents, construction chemicals, acids, paints, paint solvents, cleaning solvents, additives for soil stabilization, concrete curing compounds and additives, etc.) shall be stored in a secure location and covered when not in use. 2. The minimum practical quantity of all such materials shall be kept on the job site. 3. A spill response kit (e.g., absorbent materials, brooms, dust pans, mops, rags, gloves, goggles, plastic and metal trash containers, etc.) shall be maintained at the job site for use in the event of a spill. 4. Manufacturer's recommended methods for spill cleanup shall be clearly posted and site personnel shall be trained regarding these procedures and the location of the information and cleanup supplies. In the event of spills of reportable quantity, the following procedures shall be followed: 1. All spills shall be cleaned up immediately after discovery. 2. The spill area shall be kept well ventilated and personnel shall wear appropriate protective clothing to prevent injury from contact with the hazardous substances.

	3. The project manager and the Engineer of Record shall be notified immediately. Spills of toxic or hazardous materials shall be reported to the appropriate federal, state, and/or local government agency, regardless of the size of the spill. Spills of amounts that exceed Reportable Quantities of certain substances specifically mentioned in federal regulations (40 CFR 110, 40 CFR 117, and 40 CFR 302) must be immediately reported to the EPA National Response Center, telephone 1-800-424-8802 and the NYS DEC Spill Hotline 1-800-457-7362. 4. If the spill exceeds a Reportable Quantity, the SWPPP must be modified within seven (7) calendar days of knowledge of the discharge to provide a description of the release, the circumstances leading to the release, and the date of the release. The plans must identify measures to respond to such releases and to prevent the recurrence of such releases.
DESIGN SPECIFICATIONS (if applicable)	Page 2.29 of 2016 NYS Blue Book Reference
MAINTENANCE REQUIREMENTS (if required)	N/A

TABLE 4.5(d) – MATERIALS OR ACTIVITY TO BE MITIGATED: Washing of Equipment, Vehicles and Buildings	
POLLUTANTS AT RISK OF BEING DISCHARGED	Cleaning Compounds
POLLUTION PREVENTION MEASURE	Washing of Equipment, Vehicles and Buildings shall be conducted in an area where the likelihood of the area contributing to stormwater discharges is negligible. If required, additional Best Management Practices must be implemented to prevent concrete wastes from contributing to stormwater discharges.
SPILL PREVENTION AND RESPONSE (if applicable)	N/A
DESIGN SPECIFICATIONS (if applicable)	Page 2.29 of 2016 NYS Blue Book Reference
MAINTENANCE REQUIREMENTS (if required)	N/A

TABLE 4.5(e) – MATERIALS OR ACTIVITY TO BE MITIGATED: Storage, Handling, and Disposal of Chemicals	
POLLUTANTS AT RISK OF BEING DISCHARGED	Chemicals
POLLUTION PREVENTION MEASURE	All on-site vehicles and equipment shall be monitored for leaks and receive regular preventative maintenance to reduce the chance of leakage. Petroleum products shall be stored in tightly sealed containers and clearly labeled. Any petroleum storage tanks stored onsite shall be located within a containment area that is designed with an impervious surface between the tank and the ground. The secondary containment must be designed to provide a containment volume that is equal to 110% of the volume of the largest tank. Drip pans shall be provided for all dispensers. Any asphalt substances used onsite shall be applied according to the manufacturer's recommendations. The location of any fuel tanks and/or equipment storage areas must be identified on Soil Erosion & Sediment Control Plan by the General Contractor once the locations have been determined. Fuel tanks and dispensers shall be locked at all times and located in a secured area.
SPILL PREVENTION AND RESPONSE (if applicable)	The General Contractor shall train designated personnel in spill prevention and response procedures. Spilled hazardous materials or hazardous wastes must be contained and remediated to avoid possible contact with stormwater. In order to minimize the potential for a spill of hazardous materials to come into contact with stormwater, the following steps shall be implemented: 1. All materials with hazardous properties (such as pesticides, petroleum products, fertilizers, detergents, construction chemicals, acids, paints, paint solvents, cleaning solvents, additives for soil stabilization, concrete curing compounds and additives, etc.) shall be stored in a secure location and covered when not in use. 2. The minimum practical quantity of all such materials shall be kept on the job site. 3. A spill response kit (e.g., absorbent materials, brooms, dust pans, mops, rags, gloves, goggles, plastic and metal trash containers, etc.) shall be maintained at the job site for use in the event of a spill.

	4. Manufacturer's recommended methods for spill cleanup shall be clearly posted and site personnel shall be trained regarding these procedures and the location of the information and cleanup supplies. In the event of spills of reportable quantity, the following procedures shall be followed: 1. All spills shall be cleaned up immediately after discovery. 2. The spill area shall be kept well ventilated and personnel shall wear appropriate protective clothing to prevent injury from contact with the hazardous substances. 3. The project manager and the Engineer of Record shall be notified immediately. Spills of toxic or hazardous materials shall be reported to the appropriate federal, state, and/or local government agency, regardless of the size of the spill. Spills of amounts that exceed Reportable Quantities of certain substances specifically mentioned in federal regulations (40 CFR 110, 40 CFR 117, and 40 CFR 302) must be immediately reported to the EPA National Response Center, telephone 1-800-424-8802 and the NYS DEC Spill Hotline 1-800-457-7362. 4. If the spill exceeds a Reportable Quantity, the SWPPP must be modified within seven (7) calendar days of knowledge of the discharge to provide a description of the release, the circumstances leading to the release, and the date of the release. The plans must identify measures to respond to such releases and to prevent the recurrence of such releases.
DESIGN SPECIFICATIONS (if applicable)	Page 2.29 of 2016 NYS Blue Book Reference
MAINTENANCE REQUIREMENTS (if required)	N/A

TABLE 4.5(f) – MATERIALS OR ACTIVITY TO BE MITIGATED: Construction and Domestic Wastes	
POLLUTANTS AT RISK OF BEING DISCHARGED	Solid waste
POLLUTION PREVENTION MEASURE	All waste materials shall be collected and stored in a covered container leased from a local waste management company licensed to do business in New York State and the local jurisdiction. The container must comply with all local and state solid waste management regulations. All trash and construction debris from the site shall be deposited in the container. The container shall be emptied a minimum of once per week or more often if necessary, and the trash shall be hauled to a landfill approved by the local jurisdiction. No construction waste materials shall be buried on site. All personnel shall be instructed regarding the correct procedures for waste disposal. All waste containers shall be located in an area where the likelihood of the containers contributing to stormwater discharges is negligible. If required, additional Best Management Practices must be implemented, such as sandbags around the base, to prevent wastes from contributing to stormwater discharges.
SPILL PREVENTION AND RESPONSE (if applicable)	N/A
DESIGN SPECIFICATIONS (if applicable)	Page 2.29 of 2016 NYS Blue Book Reference
MAINTENANCE REQUIREMENTS (if required)	The container shall be emptied a minimum of once per week or more often if necessary, and the trash shall be hauled to a landfill approved by the local jurisdiction.

TABLE 4.5(g) – MATERIALS OR ACTIVITY TO BE MITIGATED: Detergents	
POLLUTANTS AT RISK OF BEING DISCHARGED	Detergents
POLLUTION PREVENTION MEASURE	Products shall be stored in original containers with the original labels in legible condition. Original labels and material safety data sheets (MSDS's) shall be compiled for each detergent used. If surplus product must be disposed of, the General Contractor must follow the manufacturers or applicable jurisdictional requirements for proper disposal. Detergents shall be used in an area where the likelihood of the product contributing to stormwater discharges is negligible. Site personnel shall be instructed in these practices by the General Contractor's

	superintendent, who shall also be responsible for seeing that these practices are followed.
SPILL PREVENTION AND RESPONSE (if applicable)	The General Contractor shall train designated personnel in spill prevention and response procedures. Spilled hazardous materials or hazardous wastes must be contained and remediated to avoid possible contact with stormwater. In order to minimize the potential for a spill of hazardous materials to come into contact with stormwater, the following steps shall be implemented: 1. All materials with hazardous properties (such as pesticides, petroleum products, fertilizers, detergents, construction chemicals, acids, paints, paint solvents, cleaning solvents, additives for soil stabilization, concrete curing compounds and additives, etc.) shall be stored in a secure location and covered when not in use. 2. The minimum practical quantity of all such materials shall be kept on the job site. 3. A spill response kit (e.g., absorbent materials, brooms, dust pans, mops, rags, gloves, goggles, plastic and metal trash containers, etc.) shall be maintained at the job site for use in the event of a spill. 4. Manufacturer's recommended methods for spill cleanup shall be clearly posted and site personnel shall be trained regarding these procedures and the location of the information and cleanup supplies. In the event of spills of reportable quantity, the following procedures shall be followed: 1. All spills shall be cleaned up immediately after discovery. 2. The spill area shall be kept well ventilated and personnel shall wear appropriate protective clothing to prevent injury from contact with the hazardous substances. 3. The project manager and the Engineer of Record shall be notified immediately. Spills of toxic or hazardous materials shall be reported to the appropriate federal, state, and/or local government agency, regardless of the size of the spill. Spills of amounts that exceed Reportable Quantities of certain substances specifically

	mentioned in federal regulations (40 CFR 110, 40 CFR 117, and 40 CFR 302) must be immediately reported to the EPA National Response Center, telephone 1-800-424-8802 and the NYS DEC Spill Hotline 1-800-457-7362. 4. If the spill exceeds a Reportable Quantity, the SWPPP must be modified within seven (7) calendar days of knowledge of the discharge to provide a description of the release, the circumstances leading to the release, and the date of the release. The plans must identify measures to respond to such releases and to prevent the recurrence of such releases.
DESIGN SPECIFICATIONS (if applicable)	Page 2.29 of 2016 NYS Blue Book Reference
MAINTENANCE REQUIREMENTS (if required)	N/A

TABLE 4.5(h) – MATERIALS OR ACTIVITY TO BE MITIGATED: Sanitary Waste	
POLLUTANTS AT RISK OF BEING DISCHARGED	Sanitary waste
POLLUTION PREVENTION MEASURE	All sanitary waste shall be collected from the portable units a minimum of once per week by a licensed portable facility provider in compliance with local and state regulations. Sanitary waste units shall be located in an area where the likelihood of the unit contributing to stormwater discharges is negligible. If required, additional BMP's must be implemented to prevent wastes from contributing to stormwater discharges.
SPILL PREVENTION AND RESPONSE (if applicable)	N/A
DESIGN SPECIFICATIONS (if applicable)	Page 2.29 of 2016 NYS Blue Book Reference
MAINTENANCE REQUIREMENTS (if required)	All sanitary waste shall be collected from the portable units a minimum of once per week by a licensed portable facility provider in compliance with local and state regulations.

TABLE 4.5(i) – MATERIALS OR ACTIVITY TO BE MITIGATED: Hazardous and Toxic Materials and Wastes	
POLLUTANTS AT RISK OF BEING DISCHARGED	Hazardous and Toxic Materials and Wastes
POLLUTION PREVENTION MEASURE	The General Contractor shall maintain Material Safety Data Sheets (MSDS's) for each substance with hazardous properties that are used on the job site and shall be responsible for the proper management of potential wastes that may result from these products. An MSDS shall be posted in the immediate area where such product is stored and/or used and another copy of each MSDS must be maintained in an MSDS file at the job site construction office. Each employee who handles substances with hazardous properties shall be instructed on the use of MSDS sheets and the specific information in the applicable MSDS for the product being used, particularly information regarding spill control techniques. In addition, products shall be stored in original containers with the original labels in legible condition. Original labels and material safety data sheets (MSDS's) shall be compiled for each material used. If surplus product must be disposed of, the General Contractor must follow the manufacturers or applicable jurisdictional requirements for proper disposal. Site personnel shall be instructed in these practices by the General Contractor's superintendent, who shall also be responsible for seeing that these practices are followed.
SPILL PREVENTION AND RESPONSE (if applicable)	The General Contractor shall train designated personnel in spill prevention and response procedures. Spilled hazardous materials or hazardous wastes must be contained and remediated to avoid possible contact with stormwater. In order to minimize the potential for a spill of hazardous materials to come into contact with stormwater, the following steps shall be implemented: 1. All materials with hazardous properties (such as pesticides, petroleum products, fertilizers, detergents, construction chemicals, acids, paints, paint solvents, cleaning solvents, additives for soil stabilization, concrete curing compounds and additives, etc.) shall be stored in a secure location and covered when not in use. 2. The minimum practical quantity of all such materials shall be kept on the job site. 3. A spill response kit (e.g., absorbent materials, brooms, dust pans, mops, rags, gloves, goggles, plastic and metal trash containers, etc.) shall be maintained at the job site for use in the event of a spill.

	4. Manufacturer's recommended methods for spill cleanup shall be clearly posted and site personnel shall be trained regarding these procedures and the location of the information and cleanup supplies. In the event of spills of reportable quantity, the following procedures shall be followed: 1. All spills shall be cleaned up immediately after discovery. 2. The spill area shall be kept well ventilated and personnel shall wear appropriate protective clothing to prevent injury from contact with the hazardous substances. 3. The project manager and the Engineer of Record shall be notified immediately. Spills of toxic or hazardous materials shall be reported to the appropriate federal, state, and/or local government agency, regardless of the size of the spill. Spills of amounts that exceed Reportable Quantities of certain substances specifically mentioned in federal regulations (40 CFR 110, 40 CFR 117, and 40 CFR 302) must be immediately reported to the EPA National Response Center, telephone 1-800-424-8802 and the NYS DEC Spill Hotline 1-800-457-7362. 4. If the spill exceeds a Reportable Quantity, the SWPPP must be modified within seven (7) calendar days of knowledge of the discharge to provide a description of the release, the circumstances leading to the release, and the date of the release. The plans must identify measures to respond to such releases and to prevent the recurrence of such releases.
DESIGN SPECIFICATIONS (if applicable)	Page 2.29 of 2016 NYS Blue Book Reference
MAINTENANCE REQUIREMENTS (if required)	N/A

Section 4.5: Construction Phasing, Staging, and Sequencing of Development Activities

Construction shall commence once the proposed erosion and sediment control practices are in place, i.e. stabilized construction entrance, silt fence, etc. All grading and excavation will be conducted such that associated stormwater run-off is not directed off-site.

- Minimize exposed soil areas through temporary seeding and construction sequencing;
- Place structures to manage stormwater runoff and erosion; and
- Establish permanent stabilization as soon as practicable.

All manufactured control measures must be installed and maintained in accordance with the manufacturer's specifications. The following sections describe the erosion and sedimentation controls that will be used on this site. The Owner/Operator, under the supervision of a licensed Engineer or NYSDEC certified inspector, will implement and add to these site conditions, when required.

Stabilization practices will be initiated as soon as practicable in portions of the site where construction activities have temporarily or permanently ceased. The temporary soil erosion and sediment control practices that will be utilized for this project are described below. Construction will be performed in several phases. Each applicable temporary soil erosion and sediment control practice for those phases are identified in Table 4.6.

Temporary shutdown

If a covered development project requires temporary shutdown for less than 12 months, the developer must notify DEP a minimum of seven days before the shutdown and submit documentation showing that the site is stable and that all SMPs are operational. The developer will be responsible for having a qualified inspector visit the site and inspect it at least once every 30 days during the shutdown. In addition, all permits must be kept current during the suspension of development activities.

Temporary Stabilization should include the following:

1. Sediments barriers must be installed at all appropriate perimeter and sensitive locations. Silt fence and other practices requiring earth disturbance must be installed before the ground freezes.
2. Soil stockpiles must be protected by the use of geotextile, plastic, or other durable covering. A barrier (silt fence) must be installed at least 15 feet from the toe of the stockpile to prevent soil migration and to capture loose soil.
3. In areas where soil disturbance activity has temporarily or permanently ceased, the application of soil stabilization measures should be initiated by the end of the next business day and completed within three (3) days. Rolled erosion control blankets must be used on all slopes 3 horizontal to 1 vertical or steeper.

4. Use stabilized construction entrance to stabilize access perimeters of buildings under construction and areas where construction vehicle traffic is anticipated. Stabilized construction entrance should be a minimum 12 feet in width but wider as necessary to accommodate equipment.
5. If the site will not have earth disturbing activities ongoing during the "winter season", all bare exposed soil must be stabilized by established vegetation, straw or other acceptable mulch, matting, rock, or other approved material such as rolled erosion control products. Seeding of areas with mulch cover is preferred but seeding alone is not acceptable for proper stabilization. Refer to Standard and Specifications for Winter Stabilization on page 76 of this report.

TABLE 4.6(a) – CONSTRUCTION SEQUENCING			
PHASE # 1: Removal of existing structures, pavement, or materials for further development. **STAGE # 1: Site Removals**			
CONSTRUCTION ACTIVITY (in sequential order)	**PRACTICE(S) INSTALLED PRIOR TO ACTIVTY[1]**	**PRACTICE(S) INSTALLED DURING ACTIVTY[1]**	**PRACTICE(S) INSTALLED WITHIN ONE BUSINESS DAY OF COMPLETING ACTIVTY[1]**
Site preparation activities can include: Clearing, grubbing, or excavation that exposes soils. Removal of existing asphalt pavement and site features such as guard rail, light pole, signs and base columns, and area drains. This phase is considered stabilized after the disturbed soil is covered with RCA or gravel.	Stabilized Construction Entrance Silt Fence Protecting Vegetation Material Stockpile	Dust control	Identify soil stockpile storage and construction staging areas

TABLE 4.6(b) – CONSTRUCTION SEQUENCING			
PHASE # 2: Construction activities associated with foundation work such as site preparation, earthwork, concrete/foundation pouring within the property line. **STAGE # 2: Foundation Work**			
CONSTRUCTION ACTIVITY (in sequential order)	**PRACTICE(S) INSTALLED PRIOR TO ACTIVTY[1]**	**PRACTICE(S) INSTALLED DURING ACTIVTY[1]**	**PRACTICE(S) INSTALLED WITHIN ONE BUSINESS DAY OF COMPLETING ACTIVTY[1]**
Foundation work activities can include: The excavation of foundation area, establishment of foundation footings, walls and the foundation slab. This phase is considered stabilized once foundation and floor slab are installed.	Stabilized Construction Entrance Silt Fence Concrete Washout Protecting Vegetation Material Stockpile	Dust Control	None

TABLE 4.6(c) – CONSTRUCTION SEQUENCING			
PHASE # 3: Building Construction including Detention Tank and Green Roof Installation **STAGE # 3: Building Construction**			
CONSTRUCTION ACTIVITY (in sequential order)	**PRACTICE(S) INSTALLED PRIOR TO ACTIVTY[1]**	**PRACTICE(S) INSTALLED DURING ACTIVTY[1]**	**PRACTICE(S) INSTALLED WITHIN ONE BUSINESS DAY OF COMPLETING ACTIVTY[1]**
Building construction may include: erection of building frame, construction of walls, façade, & roof. Stormwater management practices, including the detention tank and green roof will be installed at this time. This phase is considered stabilized once the building is constructed.	Concrete Washout Protecting Vegetation	Dust Control	None

TABLE 4.6(d) – CONSTRUCTION SEQUENCING			
PHASE # 4: Utility Connections including trenching, installing and backfilling all utility connections. **STAGE # 4: Utility Connections**			
CONSTRUCTION ACTIVITY (in sequential order)	**PRACTICE(S) INSTALLED PRIOR TO ACTIVTY[1]**	**PRACTICE(S) INSTALLED DURING ACTIVTY[1]**	**PRACTICE(S) INSTALLED WITHIN ONE BUSINESS DAY OF COMPLETING ACTIVTY[1]**
Utility connections includes trenching, installing and backfilling all utility connections. This phase is considered stabilized after the utilities to service providers in the street are installed, backfilled, and trenches are covered with temporary pavement.	Storm Drain Inlet Protection Concrete Washout Protecting Vegetation	Dust Control	None

TABLE 4.6(f) – CONSTRUCTION SEQUENCING			
PHASE # 5: Replacement of concrete sidewalk, steel faced curb, and asphalt within the R.O.W. fronting the subject property. **STAGE # 5: Builders Pavement Plan in R.O.W.**			
CONSTRUCTION ACTIVITY (in sequential order)	**PRACTICE(S) INSTALLED PRIOR TO ACTIVTY[1]**	**PRACTICE(S) INSTALLED DURING ACTIVTY[1]**	**PRACTICE(S) INSTALLED WITHIN ONE BUSINESS DAY OF COMPLETING ACTIVTY[1]**
Builder's pavement plan includes the replacement of concrete sidewalk, steel faced curb, and asphalt within the R.O.W. fronting the suject property. This phase is considered stabilized once the sidewalk, curb and asphalt roadway pavement work is complete.	Storm Drain Inlet Protection Concrete Washout Protecting Vegetation	Dust Control	None.

TABLE 4.6(g) – CONSTRUCTION SEQUENCING			
PHASE # 6: Final soil stabilization of all exposed soils as a result of all construction activity associated with this project. **STAGE # 6: Final Stabilization**			
CONSTRUCTION ACTIVITY (in sequential order)	**PRACTICE(S) INSTALLED PRIOR TO ACTIVTY[1]**	**PRACTICE(S) INSTALLED DURING ACTIVTY[1]**	**PRACTICE(S) INSTALLED WITHIN ONE BUSINESS DAY OF COMPLETING ACTIVTY[1]**
Final Stabilization is achieved when all disturbed surfaces are paved or covered by the permanent structure (building) and vegetative cover with a density of 80% is established over the entire green roof. All temporary soil erosion and sediment control practices are removed after final stabilization is achieved.	None	None	None

This Phase involves Final Stabilization measures. Final stabilization is achieved when all disturbed surfaces are paved or covered by the permanent structure (building) and vegetative cover with a density of 80% is established over the entire green roof. All temporary soil erosion and sediment control practices are removed after final stabilization is achieved.

Final Stabilization for Prior Phases:
Phase I is considered stabilized after the disturbed soil is covered with Recycle Concrete Aggregate (RCA) or gravel.
Phase II is considered stabilized once foundation and floor slab are installed.
Phase III is considered stabilized once the building is constructed.
Phase IV is considered stabilized after the utilities to service providers in the street are installed, backfilled, and trenches are covered with temporary pavement
P hase V is considered stabilized once the sidewalk, curb and asphalt roadway pavement work is complete.
If during any of the above phases there is exposed soils, the area would be considered not stabilized.

The final stabilization for each phase is deemed final by the qualified inspector or licensed professional engineer of record.

Section 5: Construction Inspections

TABLE 5 – OVERVIEW OF INSPECTION REQUIREMENTS	
TC INSPECTION FREQUENCY	☒ **Daily**
QI INSPECTION FREQUENCY[1]	☒ **Standard inspection frequency applies:** The Qualified Inspector shall conduct a site inspection at least once every seven (7) calendar days. ☐ **Enhanced inspection frequency:** The Qualified Inspector shall conduct at least two (2) site inspections every seven (7) calendar days. The two (2) inspections shall be separated by a minimum of two (2) full calendar days. This applies if one or both of the following conditions have been met: • Sites that have received approval to disturb greater than five (5) acres of soil at any one time • Sites that discharge to a 303(d) waterbody identified in Appendix E of the NYSDEC CGP.

[1]During a temporary shutdown, the Developer will be responsible for having a Qualified Inspector visit the site and inspect it, at least once every 30 days during the shutdown. Refer to NYC Rules Section 19.01-03 (b)(9)(ix) for additional requirements applicable to temporary shutdowns.

Section 6: Post-Construction Stormwater Management

Section 6.1: Project Requirements

Section 6.1.1: Requirements Applicable to All Areas

TABLE 6.1 – PROJECT REQUIREMENTS			
SITE-WIDE NUMERICAL REQUIREMENTS			
Water Quality (WQ_V)	**Runoff Reduction (RR_V)**	**Sewer Operations (V_V)**	**Maximum Release Rate (Q_{DRR})**
Required WQ_V = 3,819.83 cf Provided WQ_V = 3,819.83 cf	Target RR_V = 413.37 cf Provided RR_V = 413.37 cf	Required V_V = 4,562.35 cf Provided V_V = 4,590.96 cf	Required Q_{DRR} = 0.074 cfs Provided Q_{DRR} = 0.046 cfs
ADJUSTMENTS TO REQUIREMENTS			
Storm Event Used to Establish Requirement	**Were the WQ_V and RR_V requirements adjusted to meet enhanced phosphorus removal requirements?** ☒ No, the standard requirements provided by Eq. 2.1 of the NYC SWM were used. No adjustments applied. ☐ Yes, the requirements were enhanced to meet the 1-yr 24-hour storm event for enhanced phosphorus removal: • Storm depth: _ _ _ _ inches • Source[1]: Choose an item.		
Minimum Runoff Reduction	**Was the total WQ_V reduced using RR techniques?** ☒ Yes, the Provided RR_V was greater than or equal to the Required WQ_V. ☐ No, the Provided RR_V was less than the required WQ_V[2] • Site limitations: Click or tap here to enter text. • Minimum RR_V = _ _ _ _		
Applicability of Sewer Operations Requirements	**Does the site connect to a sewer?** ☒ Yes, standard sewer operations requirements apply (V_V, Q_{DRR}). ☐ No, the site does not connect to a sewer, so sewer operations requirements above were marked as N/A.		

[1]*Data used for establishing storm event depths shall be taken from NRCC and NRCS joint collaborative website (http://precip.eas.cornell.edu); or National Oceanic and Atmospheric Administration (NOAA) - Atlas 14 (https://hdsc.nws.noaa.gov/hdsc/pfds/).*

[2]*If this checkbox is selected, describe the specific site limitations that prevent 100% reduction of the WQ_V and calculate the Minimum RR_V using NYC SWM Eq 2.2. In no case shall the Provided RR_V be less than the Minimum RR_V.*

[3]*Post-development total impervious area is less than pre-development total impervious area; therefore RR_V Min. = 0*

Section 6.2: Site Constraints Analysis

Section 6.2.1 Site Constraints Summary

TABLE 6.3 – SITE CONSTRAINTS SUMMARY			
TYPE	**PRESENT?**	**LOCATION AND IMPACT[1]**	**REFERENCE[2]**
Soil Constraints	☐ Yes ☒ No	Click or tap here to enter text.	Click or tap here to enter text.
Subsurface Constraints	☐ Yes ☒ No	Click or tap here to enter text.	Click or tap here to enter text.
Hotspot Constraints	☐ Yes ☒ No	Click or tap here to enter text.	Click or tap here to enter text.
Surface Constraints	☒ Yes ☐ No	The site is covered by building. Infiltration SMPs are not provided since they do not meet setback requirements to property lines and building foundations.	C-300.00
Space Constraints	☒ Yes ☐ No	The site is covered by building. Infiltration SMPs are not provided since they do not meet setback requirements to property lines and building foundations.	C-300.00

[Add rows as needed to identify all site constraints].

[1]Provide a brief description of the areas affected by the constraints, and the resulting impacts on the selection and design of stormwater management practices.

[2]Refer to specific drawings and reports included in the appendices which delineate and describe the relevant constraints in detail.

Section 6.2.2 Surface and Space Constraints

The majority of the site is covered by roof area (31,074 sf) and the remainder of the site is covered by impervious pavement area (1,093 sf). The proposed Retail Establishment and Residential Use requires a large building footprint, which creates the surface and space constraints.

Section 6.3: Stormwater Management Practices

Section 6.3.1: Meeting Water Quality, Runoff Reduction, and Sewer Operations Requirements

Section 6.3.1.1: Volume-Based SMPs

Tier 1 Practices

Tier 1 practice used on this site is green roof. Other Tier 1 practice could not be used on this site because of surface and space constraints. The majority of the site is covered by building and the remainder of the site is covered by pavement. With this, other tier 1 practices are found to be not feasible.

TABLE 6.4(a) – TIER 1 **SMP ID #** 1: Green Roof		
PRACTICE DESCRIPTION		
Function & Narrative Description[1]		
Primary Function: Evapotranspiration **Secondary Function:** Detention **Narrative Description:** Series of built-up layers on a rooftop that supports vegetation. Commonly consists of a green roof media and drainage course. Some systems include other specialized layers for enhanced storage, fi ltration, or detention capabilities..		
Location Category	**Location Coordinates**	
☒ On site ☐ Right-of-Way	**Latitude:** 40.755067 °N **Longitude:** -73.922782 °W	
Practice Area[2]	**Drawing Reference**	
3,481 sf	**SCP-100**	
SOIL AND PERMEABILITY TESTING INFORMATION[3]		
Elevation of Bottom of Practice	**Elevation of Groundwater Encountered**	**Elevation of Bedrock Encountered**
VARIES	20.00 FT EL ☐ Not encountered	_ _ _ _ FT EL ☒ Not encountered
Soil Sample Test Elevations	**Boring ID**	**USCS Symbol (% Passing No 200 Sieve)**
Start Depth: _ _ _ _ FT EL End Depth: _ _ _ _ FT EL	_ _ _ _	_ _ (_ _ %)
Infiltration Test Elevation	**Infiltration Test ID**	**Infiltration Rate**
_ _ _ _ FT EL	_ _ _ _	_ _ _ _ in/hr
PRACTICE DESIGN REQUIREMENTS[4]		

Contributing Area[5]	Design Point ID[6]	Water Quality Volume Required to be Managed by Practice[7]
A = 3,481 sf	DP# 1	Required WQv = 413.37 cf

VOLUME MANAGED[8]			
Storage Volume Provided	**Water Quality Volume Achieved**	**Runoff Reduction Volume Achieved**	**Sewer Operations Volume Achieved**
V_{SMP} = 464.37 cf	WQv = 413.37 cf	RRv = 413.37 cf	Vv = _ _ _ _ cf

RELEASE RATES FOR DETENTION SYSTEMS[9]			
Detention System in Series?	**Max Release Rate for Site[10]**	**Proportional Max Release Rate for Contributing Area[11]**	**Actual Detention Release Rate[12]**
No.	$Q_{DRR,Site}$ = _ _ _ _ cfs	$Q_{DRR,Proportional}$ = _ _ _ _ cfs	Q_O = _ _ _ _ cfs

Tier 3 Practices

TABLE 6.6(a) – TIER 3 **SMP ID #** 2: Detention Tank	
PRACTICE DESCRIPTION	
Function & Narrative Description[1]	
Primary Function: Detention **Secondary Function:** None **Narrative Description:** Enclosed tank with a device that controls the release rate of water. Device included is a control-flow orifice structure and detention pipe system.	
Location Category	**Location Coordinates**
☒ On site ☐ Right-of-Way	**Latitude:** 40.755132 °N **Longitude:** -73.922451 °W
Practice Area[2]	**Drawing Reference**
1,128 sf	**SCP-100**

SOIL AND PERMEABILITY TESTING INFORMATION[3]		
Elevation of Bottom of Practice	**Elevation of Groundwater Encountered**	**Elevation of Bedrock Encountered**
6.00 FT EL	20.00 FT EL ☐ Not encountered	_ _ _ _ FT EL ☒ Not encountered
Soil Sample Test Elevations	**Boring ID**	**USCS Symbol (% Passing No 200 Sieve)**
Start Depth: _ _ _ _ FT EL End Depth: _ _ _ _ FT EL	_ _ _ _	_ _ (_ _ %)
Infiltration Test Elevation	**Infiltration Test ID**	**Infiltration Rate**
_ _ _ _ FT EL	_ _ _ _	_ _ _ _ in/hr
PRACTICE DESIGN REQUIREMENTS[4]		

Contributing Area[5]	Design Point ID[6]	Water Quality Volume Required to be Managed by Practice[7]
A = 32,167 sf	DP# 2	Required WQ_v = 3,819.83 cf

VOLUME MANAGED[8]			
Storage Volume Provided	**Water Quality Volume Achieved**	**Runoff Reduction Volume Achieved**	**Sewer Operations Volume Achieved**
V_{SMP} = 4,590.96 cf	WQ_v = 3,819.83 cf	RR_v = _ _ _ _ cf	V_v = 4,562.35 cf

RELEASE RATES FOR DETENTION SYSTEMS[9]			
Detention System in Series?	**Max Release Rate for Site[10]**	**Proportional Max Release Rate for Contributing Area[11]**	**Actual Detention Release Rate[12]**
No.	$Q_{DRR,Site}$ = 0.074 cfs	$Q_{DRR,Proportional}$ = _ _ _ _ cfs	Q_O = 0.046 cfs

[Duplicate table as needed. One table shall be created per practice. Label subsequent tables alphabetically as Table 6.6(b-z).]

[1]Include a description of the practice, and any associated pre-treatment components. If any elements of the design are not in conformance with the performance criteria in the NYC SWM, include the reason for the deviation and provide information which demonstrates equivalent performance of the practice.

[2]The practice area listed must be the contiguous area of a single practice. Each contiguous area requires its own table and SMP ID; the sum of areas of multiple identical practices may not be listed as a single practice.

[3]Soil and permeability testing are required at various depths; the soil and infiltration testing results requested in this table are intended specifically to highlight the test results 2 feet below the bottom of the practice for on-site practices, and at the base of the SMP for Right-of-Way practices.

[4]This section is intended to provide an overview of the practice-specific water quality volume requirements that this SMP must meet.

[5]The contributing area is the sum of the individual drainage areas from which stormwater drains to the specified design point at the practice location, except if that area exceeds the maximum practice-to-contributing area loading ratio defined in the NYC SWM (Tables 4.2-4.5). In the latter case, the maximum shall be used.

[6]The design point ID listed in this section must match the design point ID called out in the Cover and Contributing Drainage Area Plan in Appendix A.

[7]The required practice WQ_v is calculated by plugging in the contributing area (A) in NYC SWM Eq. 2.1, and subtracting the storage volumes provided by upstream practices.

[8]V_{SMP} listed in this section can be calculated using NYC SWM Eq. 4.1. The resulting WQ_v, RR_v and V_v reductions achieved can be calculated using NYC SWM Eq. 4.8 and NYC SWM Table 4.1.

[9]Complete this section if the SMP includes detention-based functions or leave blank if not applicable. For detention systems in series, NYC SWM Appendix G may be used for calculations, and included under Appendix B of the SWPPP.

[10]The maximum release rate from site can be calculated by plugging in the site area as A in NYC SWM Eq. 2.5.

[11]The proportional maximum release rate can be calculated by plugging in the contributing area (A) to the practice into NYC SWM Eq. 2.5, or by an accepted BWSO SCP Master Plan. This input is required for projects which connect to multiple sewers, or for projects where the detention practice contributes to meeting the Water Quality volume requirement.

[12]The actual detention release rate is based on the depth of flow from the practice and can be calculated using NYC SWM Eq. 4.15-4.1

Section 6.3.4: Meeting Underground Injection Control Requirements

TABLE 6.15 – DETERMINATION OF UIC APPLICABILITY	
QUESTION	**ANSWER**
1. ARE ANY OF THE PRACTICES USED ON THE PROJECT INFILTRATION PRACTICES?	☐ Yes ☒ No
2. DO ANY OF THE INFILTRATION PRACTICES USED DISCHARGE TO THE SUBSURFACE?	☐ Yes ☒ No ☐ N/A
3. DO ANY OF THE INFILTRATION PRACTICES USED CONSIST OF A DRILLED OR DRIVEN SHAFT, OR DUG HOLE, OR TRENCH THAT IS DEEPER THAN IT IS WIDE?	☐ Yes ☐ No ☒ N/A
4. DOES ANY OF THE INFILTRATION PRACTICES USED RELY ON A NATURALLY OCCURRING SINKHOLE, A DRYWELL, OR A SEEPAGE PIT FOR INFILTRATION?	☐ Yes ☐ No ☒ N/A
5. DOES ANY OF THE INFILTRATION PRACTICES USED INCLUDE ANY SUBSURFACE PIPING, PERFORATED PIPING, DRAIN TILES, OR ANY OTHER UNDERGROUND COMPONENTS THAT DISCHARGE FLUIDS TO THE SUBSURFACE?	☐ Yes ☐ No ☒ N/A
6. DOES ANY OF THE INFILTRATION PRACTICES USED INCLUDE ANY COMMERCIALLY MANUFACTURED STORMWATER INFILTRATION DEVICES, SUCH AS A DETENTION VAULT, CHAMBER, OR OTHER DEVICE DESIGNED TO CAPTURE AND INFILTRATE STORMWATER RUNOFF BELOW THE SURFACE OF THE GROUND?	☐ Yes ☐ No ☒ N/A
DETERMINATION	
Do the infiltration practices used on this project require compliance with UIC? ☒ No, the Answers to Questions 1 and 2 were "No". ☐ Yes, at least one of the answers to Questions 3-6 was "Yes". The applicable practices are: • **SMP ID # ___:** Click or tap here to enter text.	

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Appendix I: Draft Post-Construction Operation and Maintenance Manual…….. 250

Appendix J: NYSDEC General Permit for Stormwater Discharges from Construction Sites…… 275

Appendix L: Underground Injection Well Documentation…… 368

Appendix Z: Additional Documentation…… 369

Appendix A: Drawings

Documents included:

☐ Historical Impervious Area Plan **(Include when historical cover within the last 5-years does not match current surveyed conditions)**, including:

- Delineation of impervious and pervious surfaces, including impervious areas that were removed from a project site within the last 5-years (can be shown on aerial map).
- Area of impervious and pervious surfaces.

☒ Existing Site Plan, showing:

- A minimum of 50' beyond the project limits
- Total project site area, delineated by a line to show boundary
- Indicate area disturbed on-site and off-site, delineated separately by lines to show boundaries
- Existing site surface features, including buildings, structures, and site furnishings, as well as surface footprints of any existing stormwater management practices (SMPs)
- On-site and adjacent off-site surface water(s)
- Callouts for key site features, as needed

☒ Existing Drainage Utility Plan, showing:

- Existing site surface features, including buildings, structures, and site furnishings, as well as surface footprints of any existing SMPs
- Existing drainage structures, including manholes, inlets, rooftop drains, outfalls, and catch basins
- Existing drainage pipes
- Subsurface drainage features of existing SMPs, including the subsurface footprint (when different from the surface footprint) and any internal pipes or structures
- Existing on-site sewage treatment systems
- Existing topographic contours, or spot elevations if the site is relatively flat
- Callouts for all existing points of discharge from the site, including sewer connections, outfalls, on-site disposal systems, direct discharges, or any others related to other SPDES permits
- Callouts for each existing SMP, including the type, size, and storage volume
- Callouts for drainage structures and pipes, including sizes, materials, and inverts, as known

☒ Existing Cover and Contributing Drainage Area Plan, showing:

- Existing site surface features, including buildings, structures, and site furnishings, as well as surface footprints of any existing SMPs
- Existing drainage structures, including manholes, inlets, rooftop drains, and catch basins
- Existing drainage pipes
- Delineation of all individual drainage areas across the entire site (i.e. no overlapping drainage areas). Indicate the "drainage point" (or cluster of points for simple sites and drainage areas) associated with each individual drainage area
- Within the boundary of each drainage area, also delineate each cover type shown in Table 2.8 of the NYC SWM, using a different hatch for each type
- Add "design points" of interest, where the total contributing drainage area to that point is required for design or reporting purposes. At a minimum, include design points for each existing SMP and any points of discharge, including sewer connections, outfalls, on-site disposal systems, direct discharges, or any others related to other SPDES permits

- Callouts for each design point, including the IDs of all individual drainage areas that contribute to the design point, the total contributing area to the design point, and the total area of each surface type within the total contributing area

☒ Construction Sequencing and ESC Site Plans, showing the following details for each phase and stage of construction (minimum of one separate plan per phase)**:**

- Sequence of construction activities
- Erosion and sediment control practices, including location and size
- Interim contributing drainage areas and point(s) of discharge
- Contract Limit Line
- Limit of Disturbance for the specific phase
- Wetland Boundary – Fresh Water (100) and Tidal
- Wetlands and drainage patterns that could be affected by construction activity
- Temporary stabilization practices
- Relevant off-site features that will be contributing drainage area during construction, including all staging areas

☒ Erosion and Sediment Control Practice Detail Plans, including:

- Dimensions
    - Note: details must indicate specific dimensions rather than "variable" dimensions, or include tables that specify dimensions in cases where standards include "variable" dimensions
- Material specifications
- Installation details
- Maintenance & replacement requirements

☒ Surface and Space Constraint Plan **(Include when these constraints impact the use of SMPs)**, showing:

- Delineation of each constraint area
- Notes with justification of each constraint, including references to supporting documentation
- When applicable, a drawing showing the sustainable roofing zone per Section 1512.2 of the NYC Building Code

☐ Soil, Subsurface, and Hotspot Constraint Plan **(Include when these constraints impact the use of SMPs),** showing:

- Delineation of each constraint area
- Notes with justification of each constraint, including references to supporting documentation

☒ Proposed Site Plan, showing:

- A minimum of 50' beyond the project limits
- Total project site area, delineated by line to show boundary
- Disturbed areas on-site and off-site, delineated separately by lines to show boundaries
- Proposed site surface features, including buildings, structures, and site furnishings, as well as surface footprints of any proposed SMPs
- On-site and adjacent off-site surface water(s)
- Callouts for key site features, as needed
- Relevant off-site features that will be contributing drainage area during construction

☒ Proposed Drainage Utility Plan, including:

- Proposed site surface features, including buildings, structures, and site furnishings, as well as surface footprints of any proposed SMPs
- Proposed drainage structures, including manholes, inlets, rooftop drains, outfalls, and catch basins
- Proposed drainage pipes
- Subsurface drainage features of proposed SMPs, including the subsurface footprint (when different from the surface footprint) and any internal pipes or structures
- On-site sewage treatment system locations
- Proposed topographic contours, or spot elevations if the site is relatively flat
- Callouts for all points of discharge from the site, including sewer connections, outfalls, on-site disposal systems, direct discharges, or any others related to other SPDES permits
- Callouts for each proposed SMP, including the type, size, and storage volume
- Callouts for drainage structures and pipes, including sizes, materials, and inverts, as known

☒ Proposed Cover and Contributing Drainage Area Plan, including:

- Proposed site surface features, including buildings, structures, and site furnishings, as well as surface footprints of any proposed SMPs
- Proposed drainage structures, including manholes, inlets, rooftop drains, and catch basins
- Proposed drainage pipes
- Delineation of all individual drainage areas across the entire site (i.e. no overlapping drainage areas). Indicate the "drainage point" (or points) associated with each individual drainage area
- Within the boundary of each drainage area, also delineate each cover type shown in Table 2.8 of the NYC SWM, using a different hatch for each type
- Add "design points" of interest, where the total contributing drainage area to that point is required for design or reporting purposes. At a minimum, include design points for each proposed SMP and any points of discharge, including sewer connections, outfalls, on-site disposal systems, direct discharges, or any others related to other SPDES permits
- Callouts for each design point, including the IDs of all individual drainage areas that contribute to the design point, the total contributing area to the design point, and the total area of each surface type within the total contributing area
- Delineation of the limits of disturbance

☒ Proposed Grading Plan, showing proposed topographic contours, or spot elevations if the site is relatively flat

☒ Final Landscaping and Stabilization Plan

- Can include landscaping plan and materials plan/roof plan.
- Delineation of all vegetated areas noting practices to achieve final stabilization
- Delineation of type of soil disturbance across the entire site, as categorized in NYS DEC Stormwater Design Manual Table 5.3
- Callouts for each runoff reduction practice that requires Soil Restoration measures to be applied over and adjacent to the practice.
- Callouts for each type of soil disturbance and soil restoration activity (see NYS DEC Stormwater Design Manual Table 5.3)

☒ SMP Section/Detail Plans, showing:

- Elevations for bottom of practice, interface of each media layer, top of ponding, and top of practice

- Elevations for inverts in, inverts out, and/or overflows
- Elevations of any groundwater table or bedrock
- Elevations for the top and bottom of active storage zones
- Ponding depths
- Media slope, depths, and specifications
- Any observation wells and their materials specifications
- Any pre-treatment devices and proprietary SMPs

☒ Drainage Section/Detail Plans, for any manholes, inlets, outlet-control structures, or other drainage structures.

For projects that will disturb more than 5 acres at any one time,

☐ Cut and Fill Plan

☐ Phasing Plan defining maximum disturbed Area per phase

☐ Master Phasing Plan **(Include when project is part of a Larger Common Plan)**, showing a delineation of separate projects under the Larger Common Plan, their projected start/end dates, and their application IDs.

If any of the above documents are not included, explain why below:

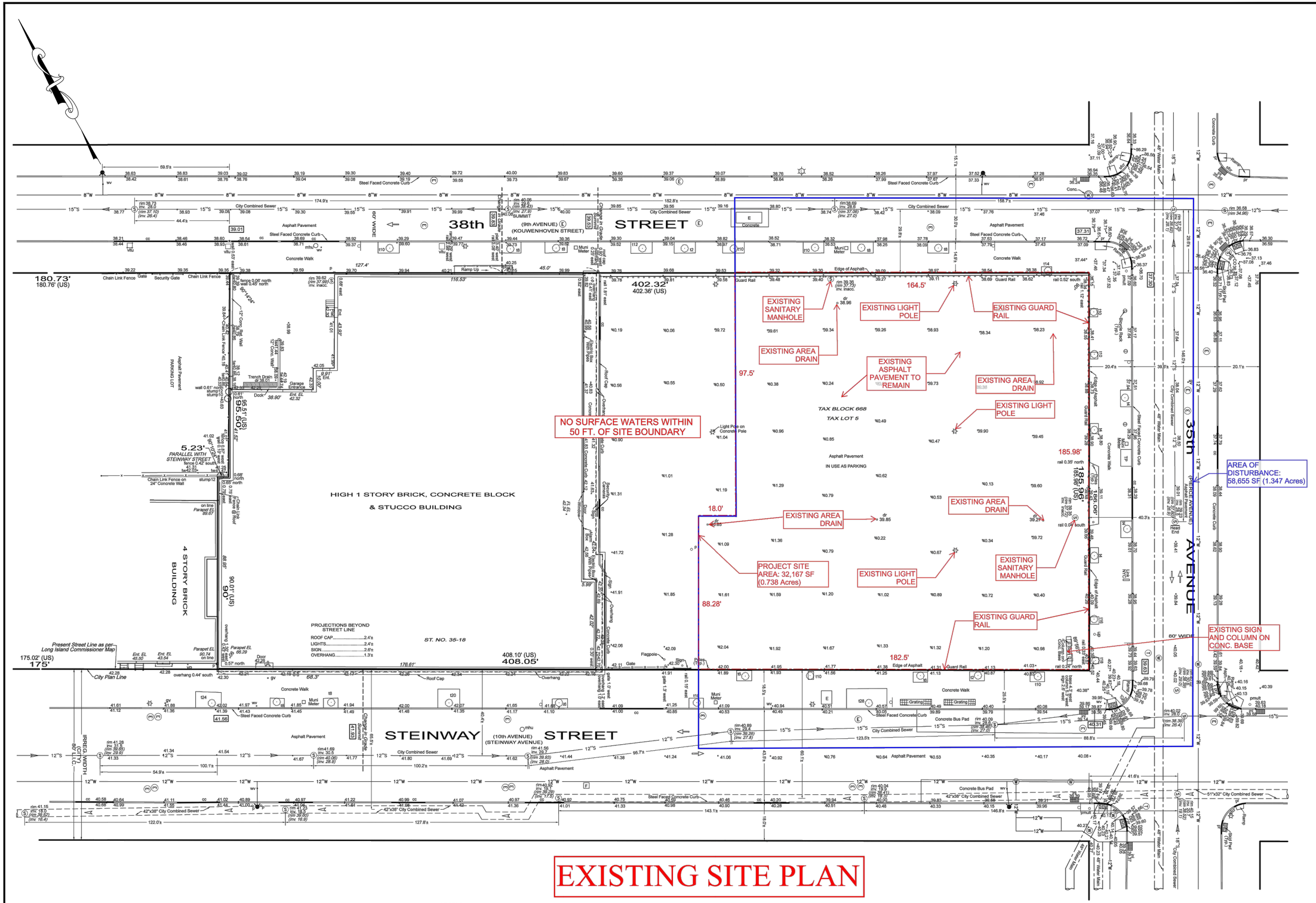
Historical Impervious Area Plan: Historical cover within the last 5-years matches current surveyed conditions according to 2018 NYS GIS Orthoimagery.

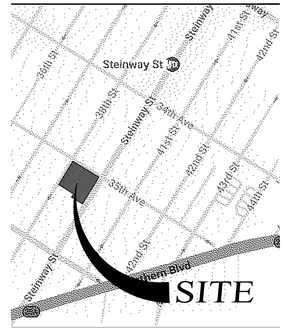
Soil, Subsurface, and Hotspot Constraint Plan: No soil, subsurface or hotspot constraints impact the use of SMPs.

Cut and Fill Plan: The project will disturb less than 5 acres at any one time.

Phasing Plan: The project will disturb less than 5 acres at any one time.

Master Phasing Plan: The project will disturb less than 5 acres at any one time and the project is not part of a Larger Common Plan.





VICINITY MAP
N.T.S.

PROJECT DATA

OWNER/APPLICANT	35-18 STEINWAY STREET LLC 102 MOTOR PARKWAY, SUITE 410 HAUPPAUGE, NY 11788 (212) 233-0495
TAX MAP NUMBER	Block 668, Lot 6
SITE AREA	32,167 SF (0.738 Acres)
CURRENT ZONING	M1-4/R9, M1-4/R7-3, MX-24 (ZONING MAP: 9b)
CURRENT USE	EXISTING PARKING LOT
PROPOSED USES	RETAIL TRADE ESTABLISHMENT (GROUP VI) RESIDENTIAL USE (GROUP II)
EXISTING FOOTPRINT	0 SF
PROPOSED FOOTPRINT	31,074 SF
GREEN ROOF AREA	3,481 SF
PAVEMENT/CONCRETE AREA	1,093 SF

NO.	DATE	BY	DESCRIPTION
2	10/23/25	MGC	REV. PER DEP COMMENTS
1	08/08/25	MGC	REV. PER OWNER INFO

REVISIONS

KEY CIVIL ENGINEERING
664 BLUE POINT ROAD, UNIT B
HOLTSVILLE, NEW YORK 11742
(631) 961-0506
www.KeyCivilEngineering.com

PROJECT NAME

35-10 STEINWAY STREET

35-10 STEINWAY STREET, ASTORIA
QUEENS, NY 11101
BOROUGH & COUNTY OF QUEENS
BLOCK: 668, LOT: 6
ZONE M1-3/R7-3, M1-4/R9 & MX-24, MAP 9b

DRAWING TITLE

EXISTING SITE PLAN

DATE:	04/15/2025
SCALE:	1" = 20'
PROJECT NUMBER:	24245
DRAWING BY:	MGC
CHECKED BY:	YT
APPROVED BY:	YT

SEAL & SIGNATURE:

STATE OF NEW YORK
YURIY TUPYCHAK
NOT VALID WITHOUT ORIGINAL SEAL
101425
LICENSED PROFESSIONAL ENGINEER

YURIY TUPYCHAK, P.E.
NEW YORK STATE PROFESSIONAL ENGINEER #101425

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DRAWING No: A1

PAGE No: 1 OF 1

GRAPHIC SCALE
20 0 10 20 40 80
(IN FEET)
1 inch = 20 ft.

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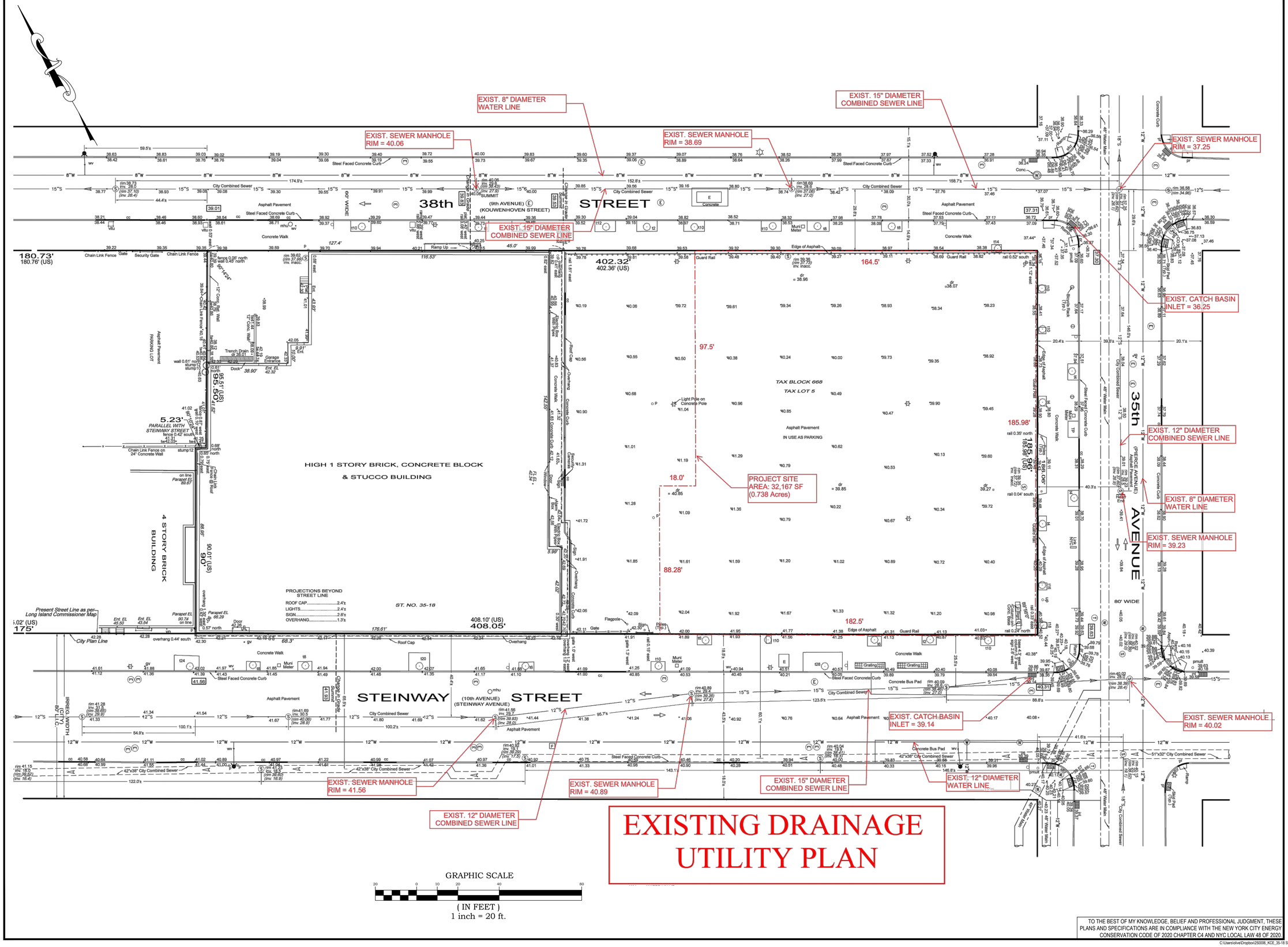
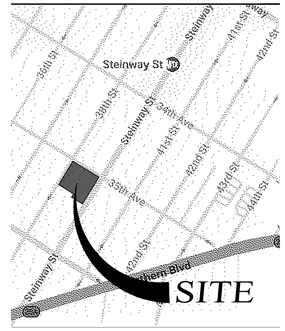
C:\Users\olive\Dropbox\250006_KCE_35-18 Steinway Street, Astoria\MGCES to KCE\Drawings\Key Civil\24245_2025.10.23_BPP6_SESC2_CC3_PK3.dwg

EXISTING SITE PLAN





VICINITY MAP
N.T.S.

PROJECT DATA

OWNER/APPLICANT	35-18 STEINWAY STREET LLC 102 MOTOR PARKWAY, SUITE 410 HAUPPAUGE, NY 11788 (212) 233-0495
TAX MAP NUMBER	Block 668, Lot 6
SITE AREA	32,167 SF (0.738 Acres)
CURRENT ZONING	M1-4/R9, M1-4/R7-3, MX-24 (ZONING MAP: 9b)
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NO.	DATE	BY	DESCRIPTION
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REVISIONS

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HOLTSVILLE, NEW YORK 11742
(631) 961-0506
www.KeyCivilEngineering.com

PROJECT NAME

35-10 STEINWAY STREET

35-10 STEINWAY STREET, ASTORIA
QUEENS, NY 11101
BOROUGH & COUNTY OF QUEENS
BLOCK: 668, LOT: 6
ZONE M1-3/R7-3, M1-4/R9 & MX-24, MAP 9b

DRAWING TITLE

EXISTING DRAINAGE UTILITY PLAN

DATE:	04/15/2025
SCALE:	1" = 20'
PROJECT NUMBER:	24245
DRAWING BY:	MGC
CHECKED BY:	YT
APPROVED BY:	YT

SEAL & SIGNATURE:

STATE OF NEW YORK — YURIY TUPYCHAK — NOT VALID WITHOUT ORIGINAL SIGNATURE — 101425 — LICENSED PROFESSIONAL ENGINEER

YURIY TUPYCHAK, P.E.
NEW YORK STATE PROFESSIONAL ENGINEER #101425

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PAGE No: 1 OF 1

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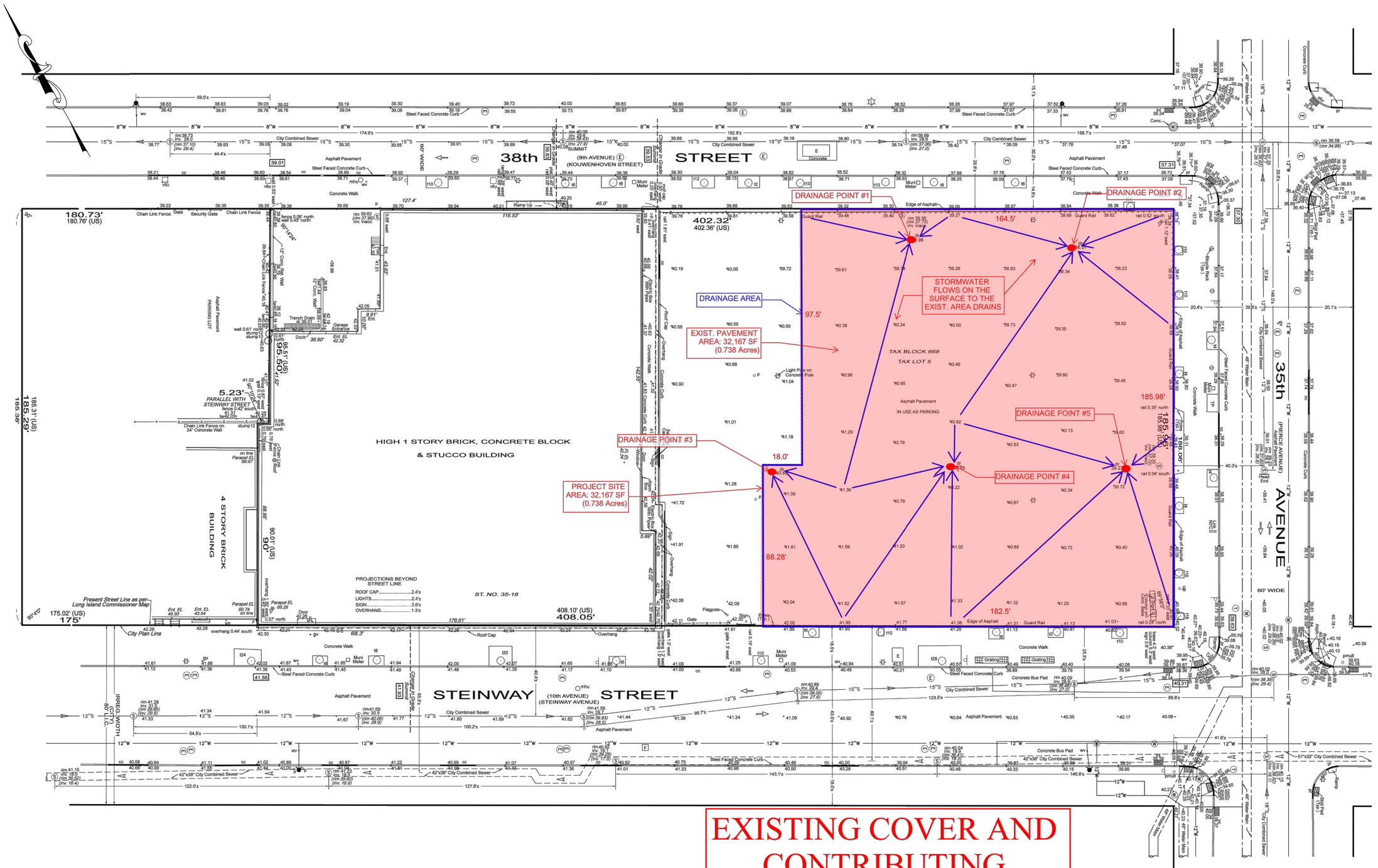
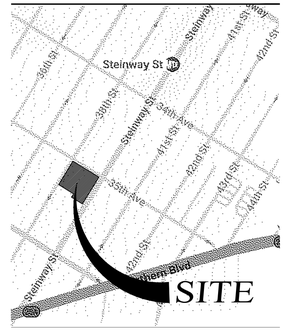
C:\Users\olive\Dropbox\250006_KCE_35-10 Steinway Street, Astoria\MGCE\5 to KCE\Drawings\Key Civil\24245_2025.10.23_BPP6_SESC2_CC3_PK3.dwg



EXISTING COVER AND CONTRIBUTING DRAINAGE AREA PLAN



VICINITY MAP
N.T.S.

PROJECT DATA

OWNER/APPLICANT	35-18 STEINWAY STREET LLC 102 MOTOR PARKWAY, SUITE 410 HAUPPAUGE, NY 11788 (212) 233-0495
TAX MAP NUMBER	Block 668, Lot 6
SITE AREA	32,167 SF (0.738 Acres)
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PAVEMENT/CONCRETE AREA	1,093 SF

NO.	DATE	BY	DESCRIPTION
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1	08/08/25	MGC	REV. PER OWNER INFO

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HOLTSVILLE, NEW YORK 11742
(631) 961-0506
www.KeyCivilEngineering.com

PROJECT NAME

35-10 STEINWAY STREET

35-10 STEINWAY STREET, ASTORIA
QUEENS, NY 11101
BOROUGH & COUNTY OF QUEENS
BLOCK: 668, LOT: 6
ZONE M1-3/R7-3, M1-4/R9 & MX-24, MAP 9b

DRAWING TITLE

EXISTING COVER AND CONTRIBUTING DRAINAGE AREA PLAN

DATE:	04/15/2025
SCALE:	1" = 20'
PROJECT NUMBER:	24245
DRAWING BY:	MGC
CHECKED BY:	YT
APPROVED BY:	YT

SEAL & SIGNATURE:

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YURIY TUPYCHAK, P.E.
NEW YORK STATE PROFESSIONAL ENGINEER #101425

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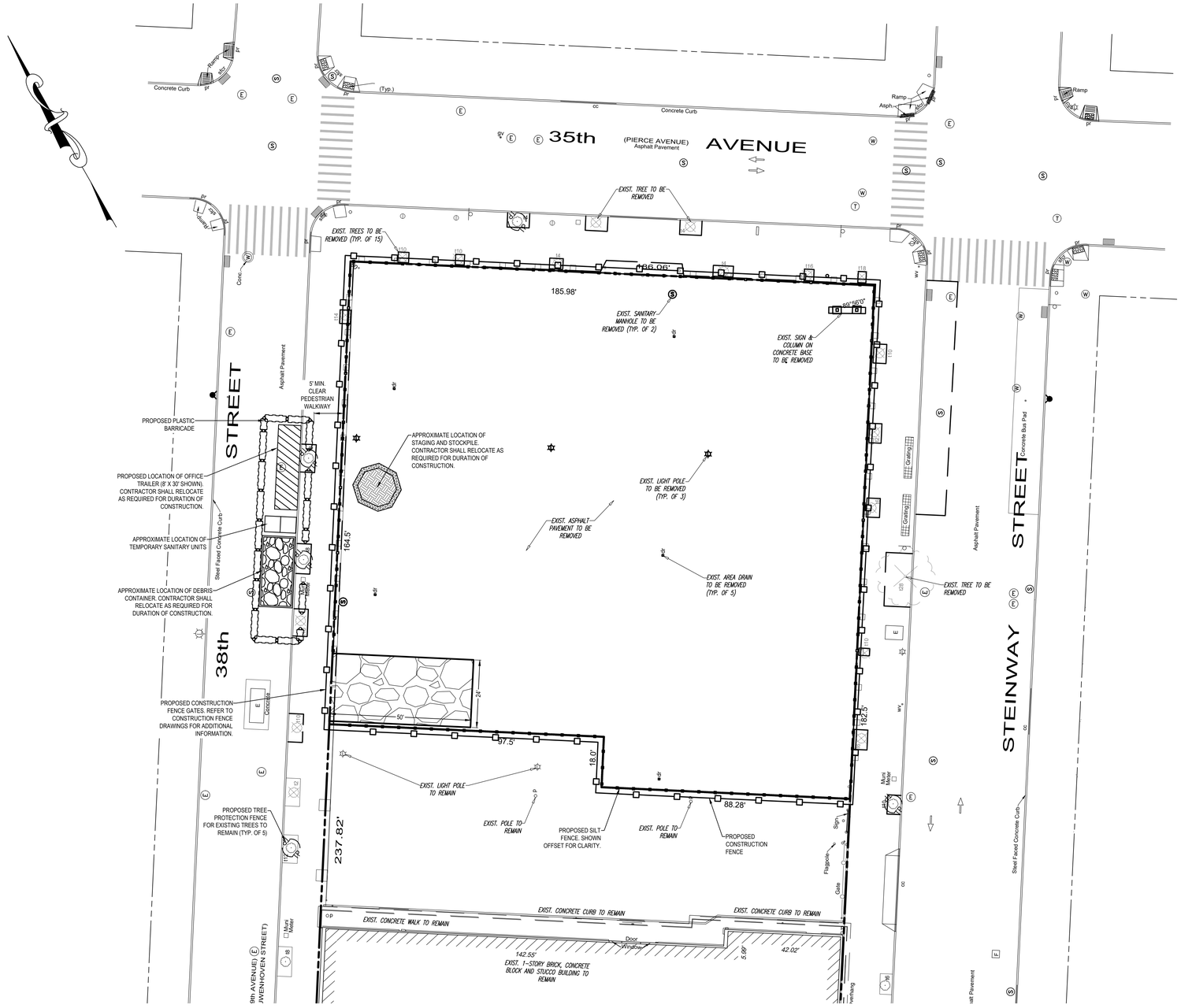


GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)

1 inch = 20 ft.

LEGEND

EXISTING	ITEM	REMOVALS
	PROPERTY LINE	
	STEEL FACED CONCRETE CURB	
	SIGN	
	PARKING METER	
	TRAFFIC LIGHT	
	BICYCLE RACK	
E	ELECTRIC MANHOLE COVER	
T	TELEPHONE MANHOLE COVER	
W	WATER MANHOLE COVER	
	CATCH BASIN	
	AREA DRAIN	dr
S	SEWER MANHOLE COVER	S
	LINK NYC SIGN	
	UTILITY POLE	
	LIGHT POLE	
	BOLLARD	
GV	GAS VALVE	
	TREE	

NOTES:

1.) STORMWATER WITHIN THE SITE TO BE DIVERTED TO A LOW POINT AND WILL INFILTRATE INTO THE GROUND. REFER TO EXISTING COVER AND CONTRIBUTING DRAINAGE AREA PLAN FOR INTERIM DRAINAGE PATTERNS.

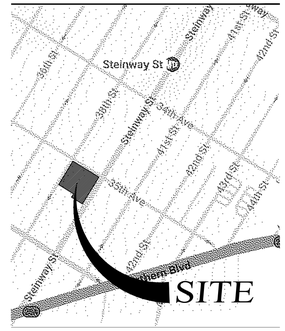
PHASE I

SITE REMOVALS

PHASE I IS CONSIDERED STABILIZED AFTER THE DISTURBED SOIL IS COVERED WITH RECYCLE CONCRETE AGGREGATE (RCA) OR GRAVEL.

CONSTRUCTION ACTIVITIES	EROSION AND SEDIMENT CONTROL PRACTICES	GENERAL MAINTENANCE PROCEDURES
SITE REMOVALS	DUST CONTROL	CHECK AREAS PROTECTED TO ENSURE COVERAGE. MAINTAIN DUST CONTROL MEASURES THROUGH DRY WEATHER PERIODS UNTIL ALL DISTURBED AREAS ARE STABILIZED.
	STABILIZED CONSTRUCTION ENTRANCE	VISIBLE MUD SHALL BE CLEANED BY HAND USING A BROOM AND WATER SPRAY FROM VEHICLE TIRES AND TREADS AS PRACTICAL BEFORE VEHICLES EXIT THE SITE.
	SILT FENCE	THE EROSION CONTROL BARRIERS WILL BE INSPECTED DAILY AND AFTER EVERY STORM EVENT. ONCE SEDIMENT BUILDUP HAS REACHED HALF THE HEIGHT OF THE SILT FENCE (OR MORE OFTEN AS SITE CONDITIONS AND SCHEDULE DICTATES) ANY SEDIMENT THAT HAS COLLECTED BEHIND THE BARRIERS WILL BE REMOVED AND WILL BE EITHER REUSED AT THE SITE OR DISPOSED OF AT A SUITABLE OFFSITE LOCATION. ANY DAMAGED SECTIONS OF SILT FENCE WILL BE REPAIRED OR REPLACED.
	PROTECTING VEGETATION	THE INTENT OF THE TREE PROTECTION FENCE IS TO PREVENT DAMAGE FROM CONSTRUCTION EQUIPMENT. THE INTENT IS TO PRESERVE EXISTING VEGETATION DETERMINED TO BE IMPORTANT FOR SOIL EROSION CONTROL, WATER QUALITY PROTECTION, SHADE, SCREENING, BUFFERS, WILDLIFE HABITAT AND OTHER VALUES. REPLACE OR REPAIR TREE PROTECTION FENCE WHEN DAMAGED.
	MATERIAL STOCKPILE	SOIL STOCKPILES MUST BE STABILIZED. STOCKPILE SURFACES CAN BE STABILIZED BY VEGETATION, GEOTEXTILE OR PLASTIC COVERS.

811 Know what's below. Call before you dig. 1-800-272-4480



VICINITY MAP
N.T.S.

PROJECT DATA

OWNER/APPLICANT	35-18 STEINWAY STREET LLC 102 MOTOR PARKWAY, SUITE 410 HAUPPAUGE, NY 11788 (212) 233-0495
TAX MAP NUMBER	Block 668, Lot 6
SITE AREA	32,167 SF (0.738 Acres)
CURRENT ZONING	M1-4/R9, M1-4/R7-3, MX-24 (ZONING MAP: 9b)
CURRENT USE	EXISTING PARKING LOT
PROPOSED USES	RETAIL TRADE ESTABLISHMENT (GROUP VI) RESIDENTIAL USE (GROUP II)
EXISTING FOOTPRINT	0 SF
PROPOSED FOOTPRINT	31,074 SF
GREEN ROOF AREA	3,481 SF
PAVEMENT/CONCRETE AREA	1,093 SF

NO.	DATE	BY	DESCRIPTION
2	10/23/25	MGC	REV. PER DEP COMMENTS
1	08/08/25	MGC	REV. PER OWNER INFO

REVISIONS

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(631) 961-0506
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PROJECT NAME

35-10 STEINWAY STREET

35-10 STEINWAY STREET, ASTORIA
QUEENS, NY 11101
BOROUGH & COUNTY OF QUEENS
BLOCK: 668, LOT: 6
ZONE M1-3/R7-3, M1-4/R9 & MX-24, MAP 9b

DRAWING TITLE

CONSTRUCTION SEQUENCING & ESC SITE PLANS - PHASE I

DATE:	04/15/2025
SCALE:	1" = 20'
PROJECT NUMBER:	24245
DRAWING BY:	MGC
CHECKED BY:	YT
APPROVED BY:	YT

SEAL & SIGNATURE:

STATE OF NEW YORK · YURIY TUPYCHAK · NOT VALID WITHOUT SEAL · 101425 · LICENSED PROFESSIONAL ENGINEER

YURIY TUPYCHAK, P.E.
NEW YORK STATE PROFESSIONAL ENGINEER #101425

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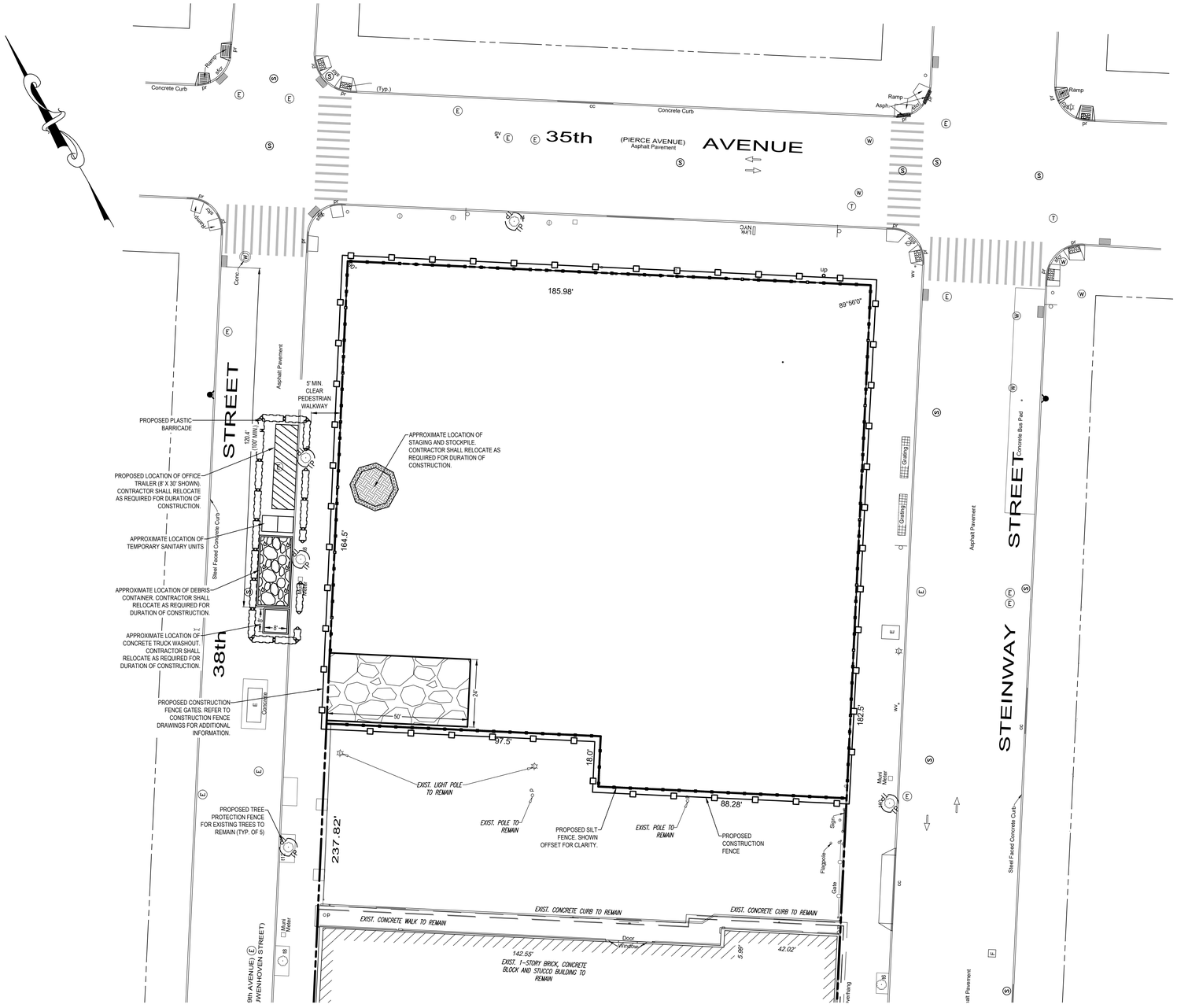


GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)

1 inch = 20 ft.

LEGEND

EXISTING	ITEM	PROPOSED
	PROPERTY LINE	
	BUILDING	
	STEEL FACED CONCRETE CURB	
	SIGN	
	PARKING METER	
	TRAFFIC LIGHT	
	BICYCLE RACK	
(E)	ELECTRIC MANHOLE COVER	
(T)	TELEPHONE MANHOLE COVER	
(W)	WATER MANHOLE COVER	
	CATCH BASIN	
(S)	SEWER MANHOLE COVER	
	LINK NYC SIGN	
	UTILITY POLE	
	BOLLARD	
GV	GAS VALVE	
	TREE	

NOTES:

1.) STORMWATER WITHIN THE SITE TO BE DIVERTED TO A LOW POINT AND WILL INFILTRATE INTO THE GROUND. REFER TO EXISTING COVER AND CONTRIBUTING DRAINAGE AREA PLAN FOR INTERIM DRAINAGE PATTERNS.

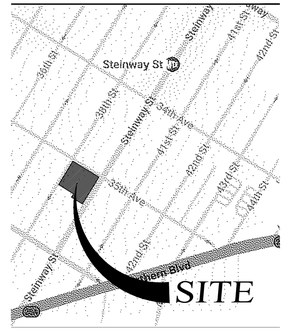
PHASE II

FOUNDATION WORK

PHASE II IS CONSIDERED STABILIZED ONCE FOUNDATION AND FLOOR SLAB ARE INSTALLED.

CONSTRUCTION ACTIVITIES	EROSION AND SEDIMENT CONTROL PRACTICES	GENERAL MAINTENANCE PROCEDURES
FOUNDATION WORK	DUST CONTROL	CHECK AREAS PROTECTED TO ENSURE COVERAGE. MAINTAIN DUST CONTROL MEASURES THROUGH DRY WEATHER PERIODS UNTIL ALL DISTURBED AREAS ARE STABILIZED.
	STABILIZED CONSTRUCTION ENTRANCE	VISIBLE MUD SHALL BE CLEANED BY HAND USING A BROOM AND WATER SPRAY FROM VEHICLE TIRES AND TREADS AS PRACTICAL BEFORE VEHICLES EXIT THE SITE.
	SILT FENCE	THE EROSION CONTROL BARRIERS WILL BE INSPECTED DAILY AND AFTER EVERY STORM EVENT. ONCE SEDIMENT BUILDUP HAS REACHED HALF THE HEIGHT OF THE SILT FENCE (OR MORE OFTEN AS SITE CONDITIONS AND SCHEDULE DICTATES) ANY SEDIMENT THAT HAS COLLECTED BEHIND THE BARRIERS WILL BE REMOVED AND WILL BE EITHER REUSED AT THE SITE OR DISPOSED OF AT A SUITABLE OFFSITE LOCATION. ANY DAMAGED SECTIONS OF SILT FENCE WILL BE REPAIRED OR REPLACED.
	CONCRETE WASHOUT	A. ALL CONCRETE WASHOUT FACILITIES SHALL BE INSPECTED DAILY. DAMAGED OR LEAKING FACILITIES SHALL BE DEACTIVATED AND REPAIRED OR REPLACED IMMEDIATELY. B. ACCUMULATED HARDENED MATERIAL SHALL BE REMOVED WHEN 75% OF THE STORAGE CAPACITY OF THE STRUCTURE IS FILLED. ANY EXCESS WASH WATER SHALL BE PUMPED INTO A CONTAINMENT VESSEL AND PROPERLY DISPOSED OF OFF-SITE.
	PROTECTING VEGETATION	THE INTENT OF THE TREE PROTECTION FENCE IS TO PREVENT DAMAGE FROM CONSTRUCTION EQUIPMENT. THE INTENT IS TO PRESERVE EXISTING VEGETATION DETERMINED TO BE IMPORTANT FOR SOIL EROSION CONTROL, WATER QUALITY PROTECTION, SHADE, SCREENING, BUFFERS, WILDLIFE HABITAT AND OTHER VALUES. REPLACE OR REPAIR TREE PROTECTION FENCE WHEN DAMAGED.
	MATERIAL STOCKPILE	SOIL STOCKPILES MUST BE STABILIZED. STOCKPILE SURFACES CAN BE STABILIZED BY VEGETATION, GEOTEXTILE OR PLASTIC COVERS.

811 Know what's below. Call before you dig. 1-800-272-4480



VICINITY MAP
N.T.S.

PROJECT DATA

OWNER/APPLICANT	35-18 STEINWAY STREET LLC 102 MOTOR PARKWAY, SUITE 410 HAUPPAUGE, NY 11788 (212) 233-0495
TAX MAP NUMBER	Block 668, Lot 6
SITE AREA	32,167 SF (0.738 Acres)
CURRENT ZONING	M1-4/R9, M1-4/R7-3, MX-24 (ZONING MAP: 9b)
CURRENT USE	EXISTING PARKING LOT
PROPOSED USES	RETAIL TRADE ESTABLISHMENT (GROUP VI) RESIDENTIAL USE (GROUP II)
EXISTING FOOTPRINT	0 SF
PROPOSED FOOTPRINT	31,074 SF
GREEN ROOF AREA	3,481 SF
PAVEMENT/CONCRETE AREA	1,093 SF

NO.	DATE	BY	DESCRIPTION
2	10/23/25	MGC	REV. PER DEP COMMENTS
1	08/08/25	MGC	REV. PER OWNER INFO

REVISIONS

KEY CIVIL ENGINEERING
664 BLUE POINT ROAD, UNIT B
HOLTSVILLE, NEW YORK 11742
(631) 961-0506
www.KeyCivilEngineering.com

PROJECT NAME

35-10 STEINWAY STREET

35-10 STEINWAY STREET, ASTORIA
QUEENS, NY 11101
BOROUGH & COUNTY OF QUEENS
BLOCK: 668, LOT: 6
ZONE M1-3/R7-3, M1-4/R9 & MX-24, MAP 9b

DRAWING TITLE

CONSTRUCTION SEQUENCING & ESC SITE PLANS - PHASE II

DATE:	04/15/2025
SCALE:	1" = 20'
PROJECT NUMBER:	24245
DRAWING BY:	MGC
CHECKED BY:	YT
APPROVED BY:	YT

SEAL & SIGNATURE:

STATE OF NEW YORK · YURIY TUPYCHAK · NOT VALID WITHOUT ORIGINAL SEAL · 101425 · LICENSED PROFESSIONAL ENGINEER

YURIY TUPYCHAK, P.E.
NEW YORK STATE PROFESSIONAL ENGINEER #101425

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PAGE No: 2 OF 7

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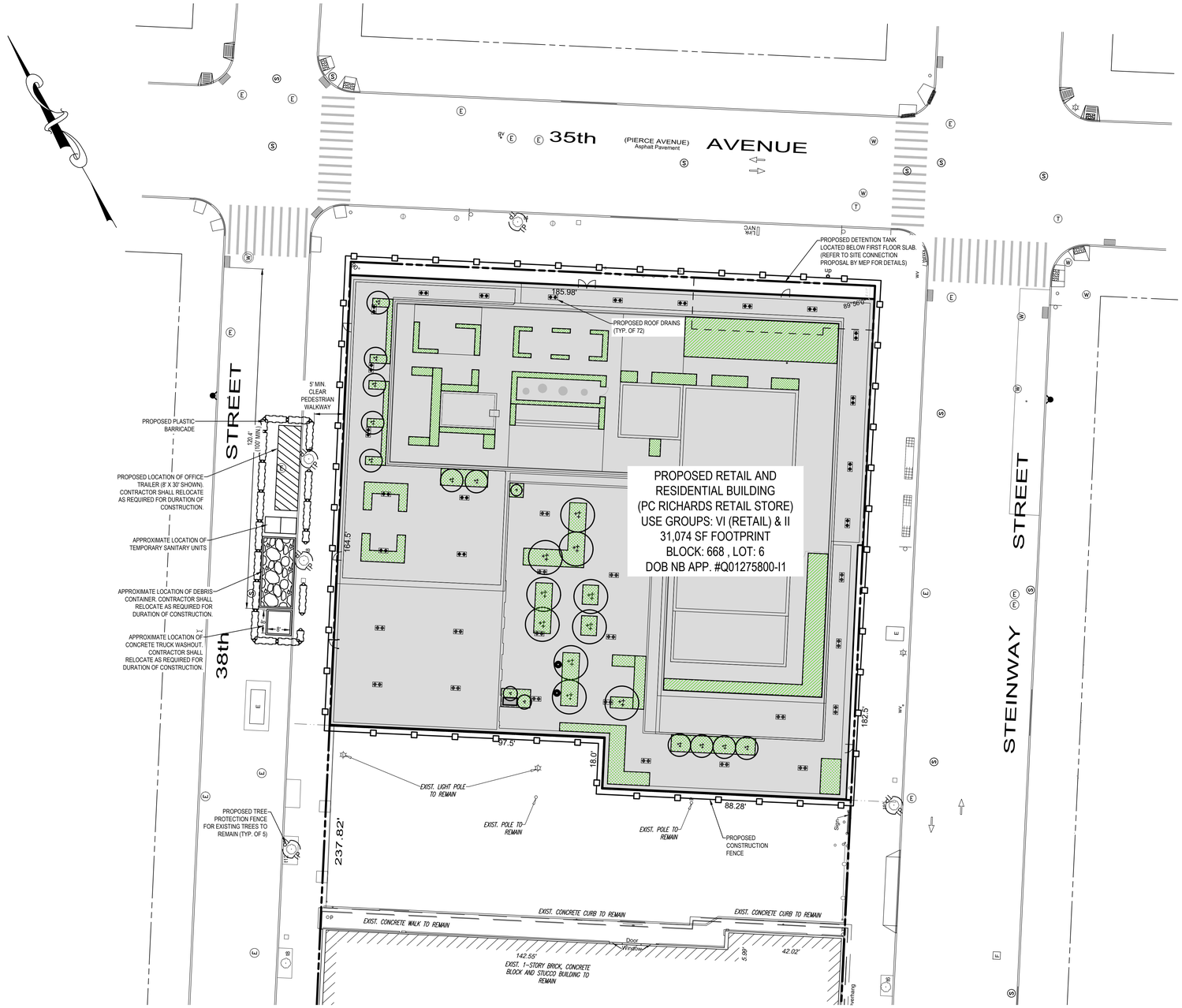

GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)
1 inch = 20 ft.

LEGEND

EXISTING	ITEM	PROPOSED
	PROPERTY LINE	
	BUILDING	
	STEEL FACED CONCRETE CURB	
	SIGN	
	PARKING METER	
	TRAFFIC LIGHT	
	BICYCLE RACK	
(E)	ELECTRIC MANHOLE COVER	
(T)	TELEPHONE MANHOLE COVER	
(W)	WATER MANHOLE COVER	
	CATCH BASIN	
(S)	SEWER MANHOLE COVER	
	LINK NYC SIGN	
	UTILITY POLE	
	BOLLARD	
	GAS VALVE	
	TREE	

PHASE III

BUILDING CONSTRUCTION INCLUDING DETENTION TANK AND GREEN ROOF INSTALLATION

PHASE III IS CONSIDERED STABILIZED ONCE THE BUILDING IS CONSTRUCTED.

CONSTRUCTION ACTIVITIES	EROSION AND SEDIMENT CONTROL PRACTICES	GENERAL MAINTENANCE PROCEDURES
BUILDING CONSTRUCTION	DUST CONTROL	CHECK AREAS PROTECTED TO ENSURE COVERAGE. MAINTAIN DUST CONTROL MEASURES THROUGH DRY WEATHER PERIODS UNTIL ALL DISTURBED AREAS ARE STABILIZED.
	CONCRETE WASHOUT	A. ALL CONCRETE WASHOUT FACILITIES SHALL BE INSPECTED DAILY. DAMAGED OR LEAKING FACILITIES SHALL BE DEACTIVATED AND REPAIRED OR REPLACED IMMEDIATELY. B. ACCUMULATED HARDENED MATERIAL SHALL BE REMOVED WHEN 75% OF THE STORAGE CAPACITY OF THE STRUCTURE IS FILLED. ANY EXCESS WASH WATER SHALL BE PUMPED INTO A CONTAINMENT VESSEL AND PROPERLY DISPOSED OF OFF-SITE.
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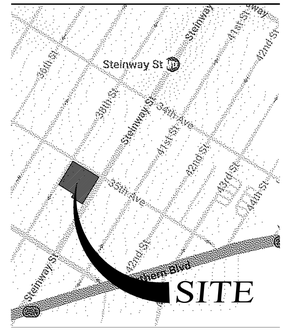

VICINITY MAP
N.T.S.

PROJECT DATA

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EXISTING FOOTPRINT	0 SF
PROPOSED FOOTPRINT	31,074 SF
GREEN ROOF AREA	3,481 SF
PAVEMENT/CONCRETE AREA	1,093 SF

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REVISIONS

KEY CIVIL ENGINEERING
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HOLTSVILLE, NEW YORK 11742
(631) 961-0506
www.KeyCivilEngineering.com

PROJECT NAME

35-10 STEINWAY STREET

35-10 STEINWAY STREET, ASTORIA
QUEENS, NY 11101
BOROUGH & COUNTY OF QUEENS
BLOCK: 668, LOT: 6
ZONE M1-3/R7-3, M1-4/R9 & MX-24, MAP 9b

DRAWING TITLE

CONSTRUCTION SEQUENCING & ESC SITE PLANS - PHASE III

DATE:	04/15/2025
SCALE:	1" = 20'
PROJECT NUMBER:	24245
DRAWING BY:	MGC
CHECKED BY:	YT
APPROVED BY:	YT

SEAL & SIGNATURE:

STATE OF NEW YORK
YURIY TUPYCHAK
NOT VALID WITHOUT RAISED SEAL
101425
LICENSED PROFESSIONAL ENGINEER

YURIY TUPYCHAK, P.E.
NEW YORK STATE PROFESSIONAL ENGINEER #101425

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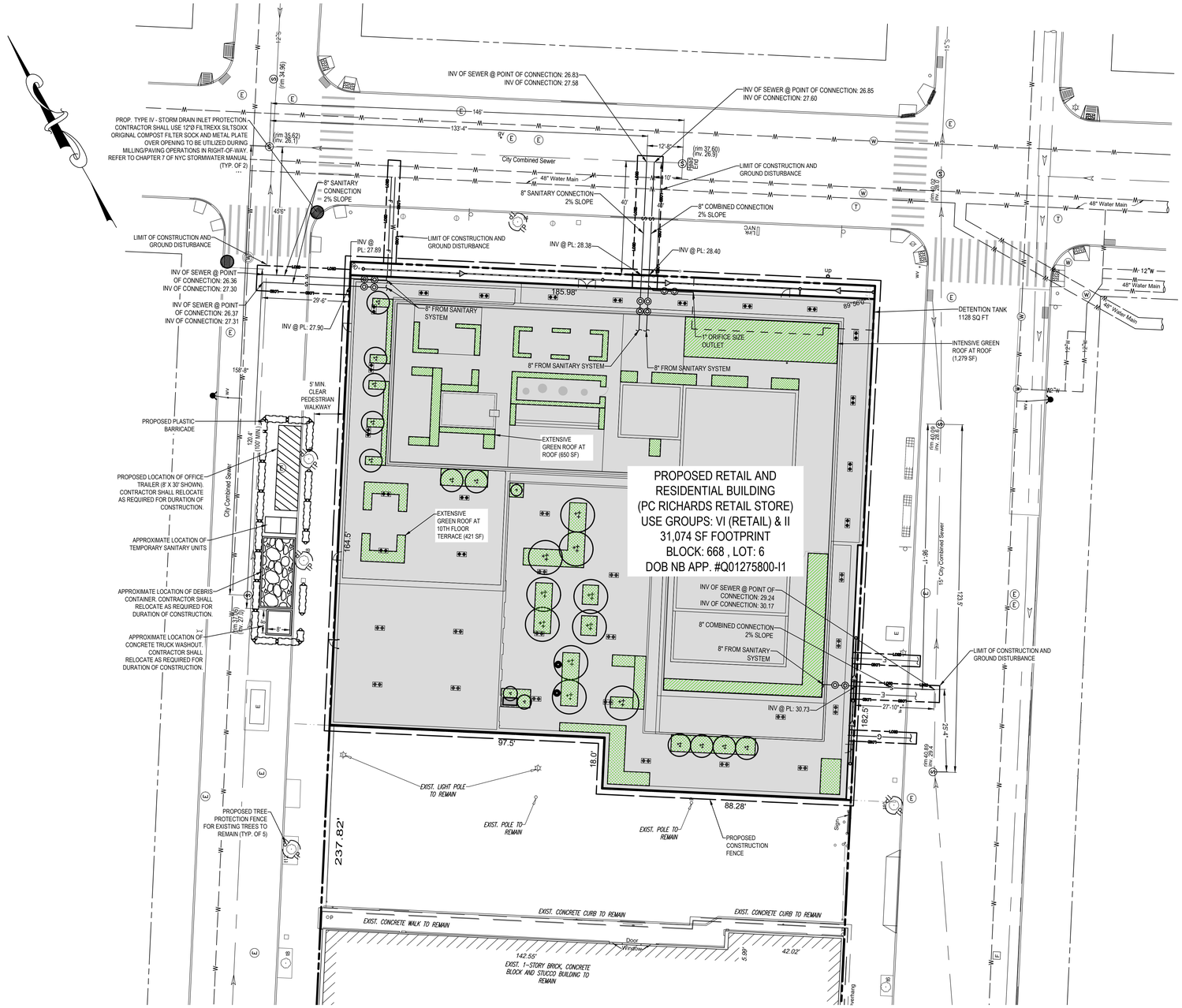

GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)
1 inch = 20 ft.

LEGEND

EXISTING	ITEM	PROPOSED
	PROPERTY LINE	
	BUILDING	
	STEEL FACED CONCRETE CURB	
	SIGN	
	PARKING METER	
	TRAFFIC LIGHT	
	BICYCLE RACK	
E	ELECTRIC MANHOLE COVER	
T	TELEPHONE MANHOLE COVER	
W	WATER MANHOLE COVER	
	CATCH BASIN	
S	SEWER MANHOLE COVER	
	LINK NYC SIGN	
	UTILITY POLE	
	BOLLARD	
GV	GAS VALVE	
	GAS SERVICE	G
	WATER SERVICE	W
	FIRE SERVICE	F
	CITY COMBINED SEWER SERVICE	
	SANITARY LINE	S
	TREE	

PHASE IV
UTILITY CONNECTIONS

PHASE IV IS CONSIDERED STABILIZED AFTER THE UTILITIES TO SERVICE PROVIDERS IN THE STREET ARE INSTALLED, BACKFILLED, AND TRENCHES ARE COVERED WITH TEMPORARY PAVEMENT.

CONSTRUCTION ACTIVITIES	EROSION AND SEDIMENT CONTROL PRACTICES	GENERAL MAINTENANCE PROCEDURES
UTILITY CONNECTIONS	DUST CONTROL	CHECK AREAS PROTECTED TO ENSURE COVERAGE. MAINTAIN DUST CONTROL MEASURES THROUGH DRY WEATHER PERIODS UNTIL ALL DISTURBED AREAS ARE STABILIZED.
	CONCRETE WASHOUT	A. ALL CONCRETE WASHOUT FACILITIES SHALL BE INSPECTED DAILY. DAMAGED OR LEAKING FACILITIES SHALL BE DEACTIVATED AND REPAIRED OR REPLACED IMMEDIATELY. B. ACCUMULATED HARDENED MATERIAL SHALL BE REMOVED WHEN 75% OF THE STORAGE CAPACITY OF THE STRUCTURE IS FILLED. ANY EXCESS WASH WATER SHALL BE PUMPED INTO A CONTAINMENT VESSEL AND PROPERLY DISPOSED OF OFF-SITE.
	STORM DRAIN INLET PROTECTION	THESE PROTECTION MEASURES WILL BE INSPECTED DAILY AND WILL BE ROUTINELY MAINTAINED UNTIL THE DRAINAGE AREA TRIBUTARY TO EACH INLET HAS BEEN STABILIZED BY VEGETATION AND/OR COVERED BY PAVEMENT. ANY SEDIMENT THAT COLLECTS BEHIND THE BARRIER OR IN THE SACKS WILL BE REMOVED AND WILL BE EITHER REUSED ONSITE OR DISPOSED OF AT A SUITABLE OFF-SITE LOCATION.
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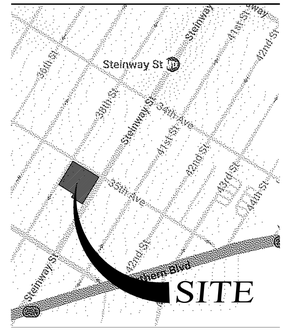

VICINITY MAP
N.T.S.

PROJECT DATA

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PROPOSED USES	RETAIL TRADE ESTABLISHMENT (GROUP VI) RESIDENTIAL USE (GROUP II)
EXISTING FOOTPRINT	0 SF
PROPOSED FOOTPRINT	31,074 SF
GREEN ROOF AREA	3,481 SF
PAVEMENT/CONCRETE AREA	1,093 SF

NO.	DATE	BY	DESCRIPTION
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1	08/08/25	MGC	REV. PER OWNER INFO

REVISIONS

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HOLTSVILLE, NEW YORK 11742
(631) 961-0506
www.KeyCivilEngineering.com

PROJECT NAME

35-10 STEINWAY STREET

35-10 STEINWAY STREET, ASTORIA
QUEENS, NY 11101
BOROUGH & COUNTY OF QUEENS
BLOCK: 668, LOT: 6
ZONE M1-3/R7-3, M1-4/R9 & MX-24, MAP 9b

DRAWING TITLE

CONSTRUCTION SEQUENCING & ESC SITE PLANS - PHASE IV

DATE:	04/15/2025
SCALE:	1" = 20'
PROJECT NUMBER:	24245
DRAWING BY:	MGC
CHECKED BY:	YT
APPROVED BY:	YT

SEAL & SIGNATURE:

STATE OF NEW YORK · YURIY TUPYCHAK · NOT VALID WITHOUT SEAL · LICENSE NO. 101425 · LICENSED PROFESSIONAL ENGINEER

YURIY TUPYCHAK, P.E.
NEW YORK STATE PROFESSIONAL ENGINEER #101425

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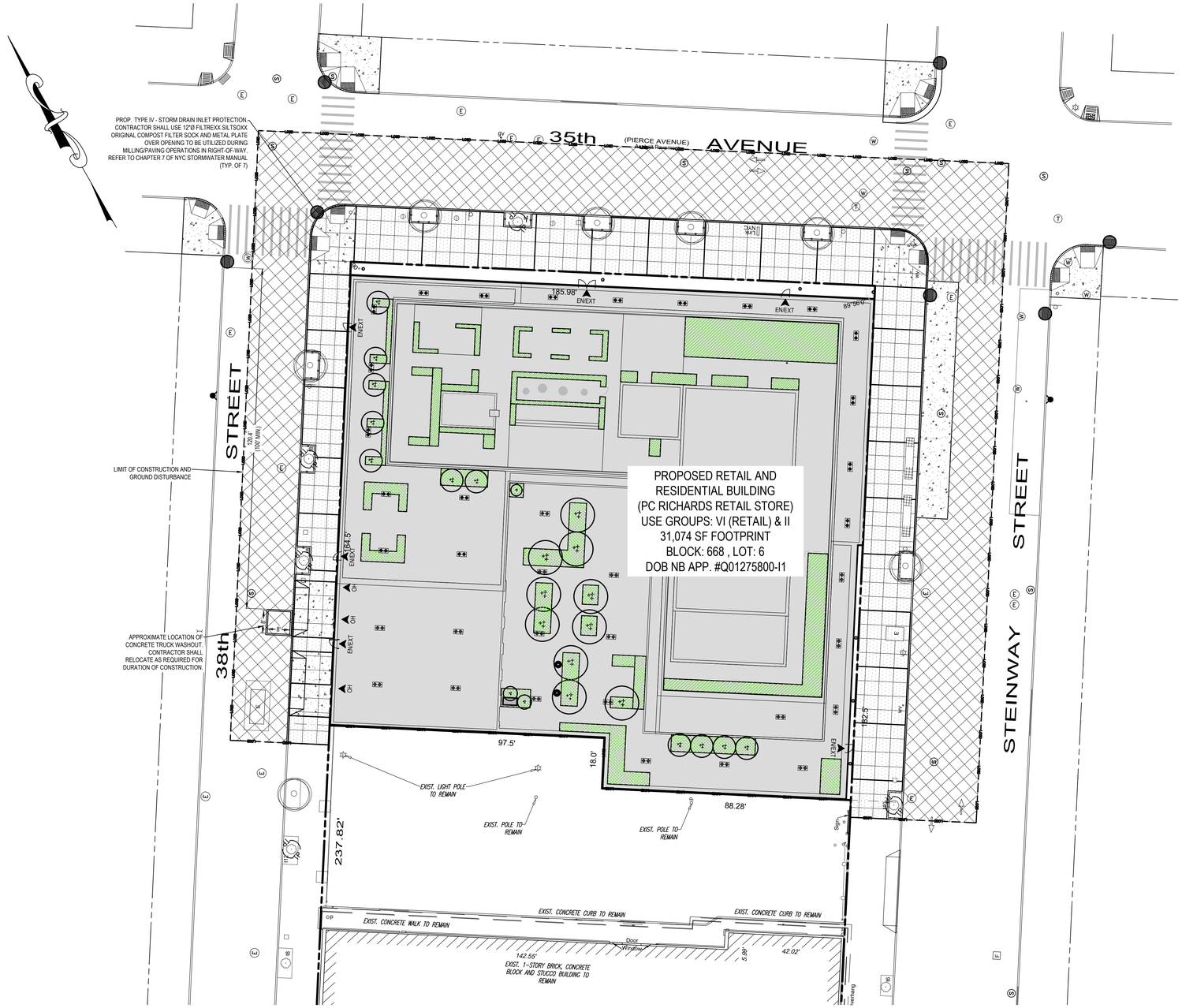

LEGEND

EXISTING	ITEM	PROPOSED
	PROPERTY LINE	
	BUILDING	
	STEEL FACED CONCRETE CURB	
	SIGN	
	PARKING METER	
	TRAFFIC LIGHT	
	BICYCLE RACK	
(E)	ELECTRIC MANHOLE COVER	
(T)	TELEPHONE MANHOLE COVER	
(W)	WATER MANHOLE COVER	
	CATCH BASIN	
(S)	SEWER MANHOLE COVER	
	LINK NYC SIGN	
	UTILITY POLE	
	BOLLARD	
GV	GAS VALVE	
	TREE	
	PROPERTY LINE ELEVATION	
	4" THICK CONCRETE SIDEWALK IN RIGHT-OF-WAY	
	7" THICK CONCRETE SIDEWALK IN RIGHT-OF-WAY	
	ASPHALT PAVEMENT REPLACEMENT IN RIGHT-OF-WAY	

PHASE V
BUILDERS PAVEMENT PLAN IN R.O.W.

PHASE V IS CONSIDERED STABILIZED AFTER THE REPLACEMENT OF SIDEWALK, CURB, AND ROADWAY PAVEMENT AND COMPLETED.

CONSTRUCTION ACTIVITIES	EROSION AND SEDIMENT CONTROL PRACTICES	GENERAL MAINTENANCE PROCEDURES
SIDEWALK & CURB REPLACEMENT AND ROADWAY PAVEMENT WORK	DUST CONTROL	CHECK AREAS PROTECTED TO ENSURE COVERAGE. MAINTAIN DUST CONTROL MEASURES THROUGH DRY WEATHER PERIODS UNTIL ALL DISTURBED AREAS ARE STABILIZED.
	STORM DRAIN INLET PROTECTION	THESE PROTECTION MEASURES WILL BE INSPECTED DAILY AND WILL BE ROUTINELY MAINTAINED UNTIL THE DRAINAGE AREA TRIBUTARY TO EACH INLET HAS BEEN STABILIZED BY VEGETATION AND/OR COVERED BY PAVEMENT. ANY SEDIMENT THAT COLLECTS BEHIND THE BARRIER OR IN THE SACKS WILL BE REMOVED AND WILL BE EITHER REUSED ONSITE OR DISPOSED OF AT A SUITABLE OFF-SITE LOCATION.
	CONCRETE WASHOUT	A. ALL CONCRETE WASHOUT FACILITIES SHALL BE INSPECTED DAILY. DAMAGED OR LEAKING FACILITIES SHALL BE DEACTIVATED AND REPAIRED OR REPLACED IMMEDIATELY. B. ACCUMULATED HARDENED MATERIAL SHALL BE REMOVED WHEN 75% OF THE STORAGE CAPACITY OF THE STRUCTURE IS FILLED. ANY EXCESS WASH WATER SHALL BE PUMPED INTO A CONTAINMENT VESSEL AND PROPERLY DISPOSED OF OFF-SITE.
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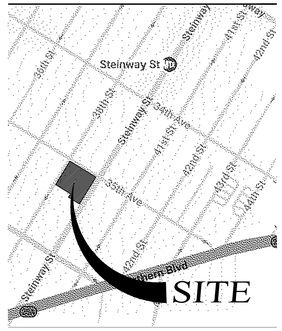

VICINITY MAP
N.T.S.

PROJECT DATA

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TAX MAP NUMBER	Block 668, Lot 6
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PROPOSED USES	RETAIL TRADE ESTABLISHMENT (GROUP VI) RESIDENTIAL USE (GROUP II)
EXISTING FOOTPRINT	0 SF
PROPOSED FOOTPRINT	31,074 SF
GREEN ROOF AREA	3,481 SF
PAVEMENT/CONCRETE AREA	1,093 SF

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REVISIONS

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www.KeyCivilEngineering.com

PROJECT NAME

35-10 STEINWAY STREET

35-10 STEINWAY STREET, ASTORIA
QUEENS, NY 11101
BOROUGH & COUNTY OF QUEENS
BLOCK: 668, LOT: 6
ZONE M1-3/R7-3, M1-4/R9 & MX-24, MAP 9b

DRAWING TITLE

CONSTRUCTION SEQUENCING & ESC SITE PLANS - PHASE V

DATE:	04/15/2025
SCALE:	1" = 20'
PROJECT NUMBER:	24245
DRAWING BY:	MGC
CHECKED BY:	YT
APPROVED BY:	YT

SEAL & SIGNATURE:

STATE OF NEW YORK
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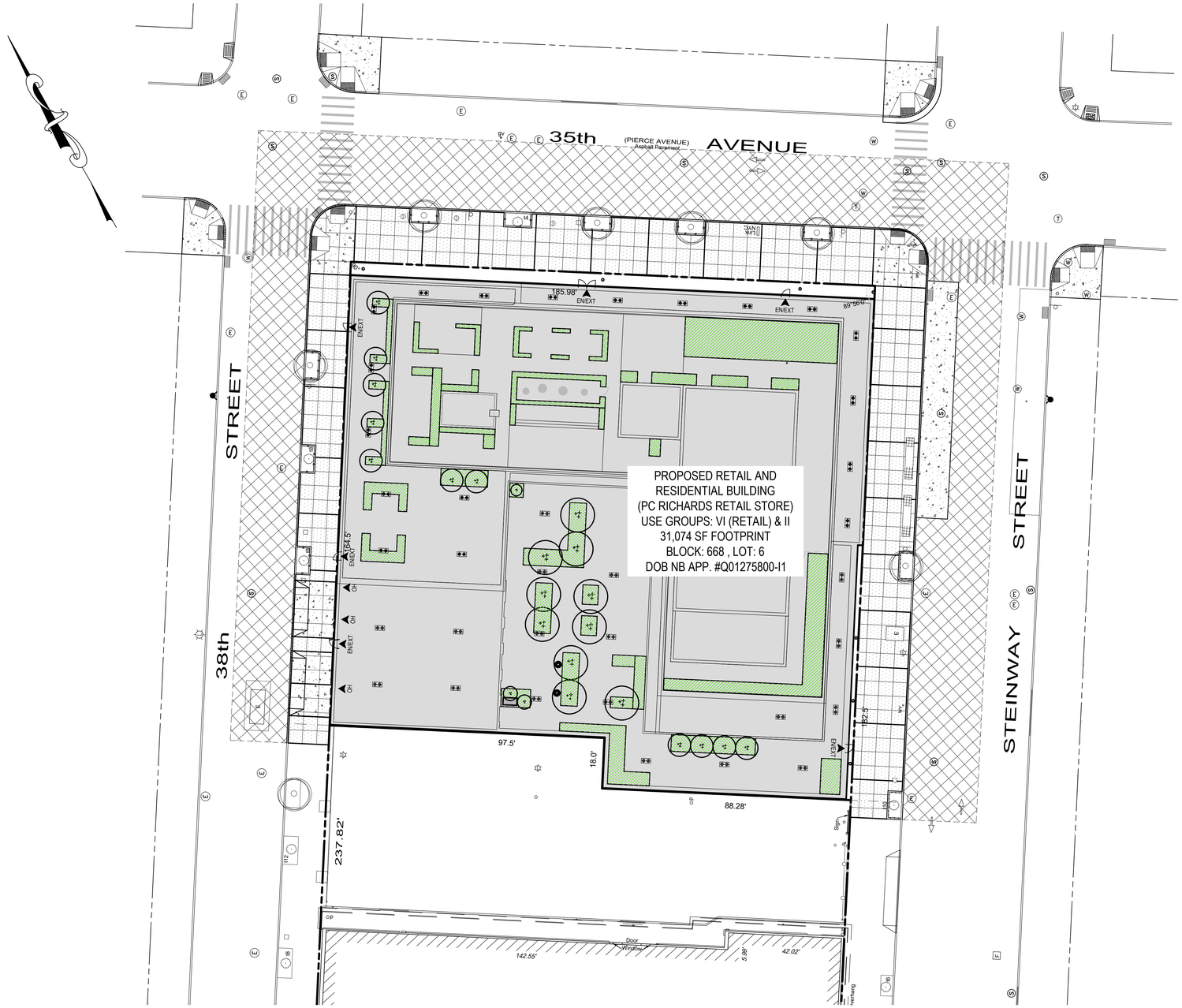

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20 0 10 20 40 80

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LEGEND

EXISTING	ITEM	PROPOSED
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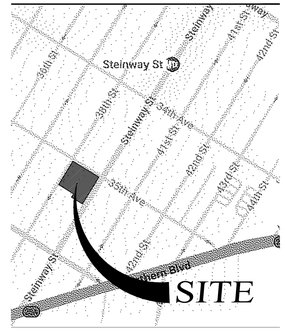
	LINK NYC SIGN	
	UTILITY POLE	
	BOLLARD	
GV	GAS VALVE	
	TREE	
	PROPERTY LINE ELEVATION	
	4" THICK CONCRETE SIDEWALK IN RIGHT-OF-WAY	
	7" THICK CONCRETE SIDEWALK IN RIGHT-OF-WAY	
	ASPHALT PAVEMENT REPLACEMENT IN RIGHT-OF-WAY	

PHASE VI
FINAL STABILIZATION

FINAL STABILIZATION IS ACHIEVED WHEN ALL DISTURBED SURFACES ARE PAVED, COVERED BY PERMANENT STRUCTURE AND VEGETATIVE COVER WITH A DENSITY OF 80% IS ESTABLISHED OVER THE ENTIRE GREEN ROOF.
ALL TEMPORARY SOIL EROSION AND SEDIMENT CONTROL PRACTICES ARE REMOVED. THE FINAL STABILIZATION FOR EACH PHASE IS DEEMED FINAL BY THE QUALIFIED INSPECTOR OR LICENSED PROFESSIONAL ENGINEER OF RECORD.

CONSTRUCTION ACTIVITIES	EROSION AND SEDIMENT CONTROL PRACTICES
FINAL STABILIZATION	REMOVAL OF TEMPORARY SOIL EROSION AND SEDIMENT CONTROL PRACTICES

811 Know what's below. Call before you dig. 1-800-272-4480



VICINITY MAP
N.T.S.

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HOLTSVILLE, NEW YORK 11742
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PROJECT NAME

35-10 STEINWAY STREET

35-10 STEINWAY STREET, ASTORIA
QUEENS, NY 11101
BOROUGH & COUNTY OF QUEENS
BLOCK: 668, LOT: 6
ZONE M1-3/R7-3, M1-4/R9 & MX-24, MAP 9b

DRAWING TITLE

CONSTRUCTION SEQUENCING & ESC SITE PLANS - PHASE VI

DATE:	04/15/2025
SCALE:	1" = 20'
PROJECT NUMBER:	24245
DRAWING BY:	MGC
CHECKED BY:	YT
APPROVED BY:	YT

SEAL & SIGNATURE:

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C-106.00

PAGE No: 6 OF 7

DEFINITION
THE CONTROL OF DUST RESULTING FROM LAND-DISTURBING ACTIVITIES.

PURPOSE
TO PREVENT SURFACE AND AIR MOVEMENT OF DUST FROM DISTURBED SOIL SURFACES THAT MAY CAUSE OFF-SITE DAMAGE, HEALTH HAZARDS, AND TRAFFIC SAFETY PROBLEMS.

CONDITIONS WHERE PRACTICE APPLIES
ON CONSTRUCTION ROADS, ACCESS POINTS, AND OTHER DISTURBED AREAS SUBJECT TO SURFACE DUST MOVEMENT AND DUST BLOWING WHERE OFF-SITE DAMAGE MAY OCCUR IF DUST IS NOT CONTROLLED.

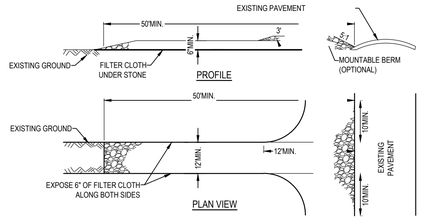
DESIGN CRITERIA
CONSTRUCTION OPERATIONS SHOULD BE SCHEDULED TO MINIMIZE THE AMOUNT OF AREA DISTURBED AT ONE TIME. BUFFER AREAS OF VEGETATION SHOULD BE LEFT WHERE PRACTICAL. TEMPORARY OR PERMANENT STABILIZATION MEASURES SHALL BE INSTALLED. NO SPECIFIC DESIGN CRITERIA IS GIVEN; SEE CONSTRUCTION SPECIFICATIONS BELOW FOR COMMON METHODS OF DUST CONTROL.

WATER QUALITY SHOULD BE CONSIDERED WHEN MATERIALS ARE SELECTED FOR DUST CONTROL. WHERE THERE IS A POTENTIAL FOR THE MATERIAL TO WASH OFF TO A STREAM, INGREDIENT INFORMATION MUST BE PROVIDED TO THE NYSDEC. NO POLYMER APPLICATION SHALL TAKE PLACE WITHOUT WRITTEN APPROVAL FROM THE NYSDEC.

CONSTRUCTION SPECIFICATIONS
SPRINKLING - THE SITE MAY BE SPRAYED UNTIL THE SURFACE IS WET. THIS IS ESPECIALLY EFFECTIVE ON HAUL ROADS AND ACCESS ROUTES TO PROVIDE SHORT TERM LIMITED DUST CONTROL.

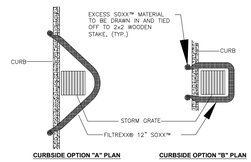
MAINTENANCE
MAINTAIN DUST CONTROL MEASURES THROUGH DRY WEATHER PERIODS UNTIL ALL DISTURBED AREAS ARE STABILIZED.

1/8 **DUST CONTROL**
N.T.S.



STABILIZED CONSTRUCTION ACCESS NOTES:
1. STONE SIZE - USE 1-4 INCH STONE.
2. LENGTH - NOT LESS THAN 50 FEET (EXCEPT ON A SINGLE RESIDENCE LOT WHERE A 30 FOOT MINIMUM LENGTH WOULD APPLY).
3. THICKNESS - NOT LESS THAN SIX (6) INCHES.
4. WIDTH - TWELVE (12) FOOT MINIMUM, BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS OR EGRESS OCCURS. TWENTY-FOUR (24) FOOT IF SINGLE ENTRANCE TO SITE.
5. GEOTEXTILE - WILL BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING OF STONE.
6. SURFACE WATER - ALL SURFACE WATER FLOWING OR DIVERTED TOWARD CONSTRUCTION ACCESS SHALL BE PIPED BENEATH THE ENTRANCE. IF PIPING IS IMPRACTICAL, A MOUNTABLE BERM WITH 5:1 SLOPES WILL BE PERMITTED.
7. MAINTENANCE - THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS-OF-WAY. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHTS-OF-WAY MUST BE REMOVED IMMEDIATELY.
8. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON A AREA STABILIZED WITH STONE AND WHICH DRAINS INTO AN APPROVED SEDIMENT TRAPPING DEVICE.
9. PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED AFTER EACH RAIN.
10. CONTRACTOR TO ENSURE THAT THE TRACKING PREVENTION REMAINS EFFECTIVE DURING ALL CONSTRUCTION PHASES.
11. ALL SEDIMENT SHALL BE PREVENTED FROM ENTERING STORM DRAINS, DITCHES, OR WATERCOURSES.
12. CONTRACTOR TO RELOCATE TRACKING PADS AS NECESSARY.
13. EXPOSE 6" END OF FILTER CLOTH ON BOTH OF THE LONGER SIDES FOR THE ENTIRE LENGTH.

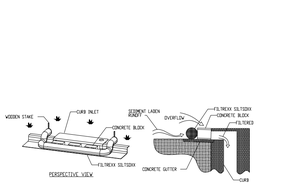
2/7 **STABILIZED CONSTRUCTION ENTRANCE**
N.T.S.



FLAT-GRATE DRAIN INLET

NOTES:
1. ALL MATERIAL TO MEET FILTREXX® SPECIFICATIONS.
2. FILTER MEDIA™ FILL TO MEET APPLICATION REQUIREMENTS.
3. COMPOST MATERIAL TO BE DISPERSED ON SITE, AS DETERMINED BY ENGINEER.

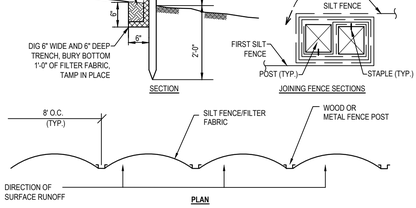
3/7 **TYPE IV STORM DRAIN INLET PROTECTION**
N.T.S.



CURB INLET

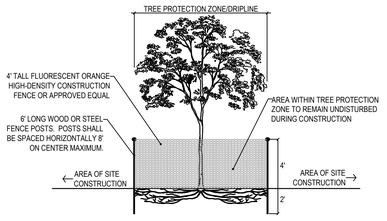
NOTES:
1. INSTALL FILTREXX SILTSOXX IN FRONT OF CURB OPENING TO A MINIMUM OF 12" BEYOND THE OPENING, EACH SIDE.
2. ANCHOR THE FILTREXX SILTSOXX BEHIND THE CURB WITH A WOODEN STAKE. STAKES SHALL BE ANCHORED A MINIMUM OF 12" INTO SOIL.
3. STANDARD INLET PROTECTION FOR CURB INLET PROTECTION AND CURB SEGMENT CONTAINMENT WILL USE 8" DIAMETER INLET PROTECTION. DURING CURB INSTALLATION, INLET PROTECTION SHALL BE COMPACTED TO BE SLIGHTLY SHORTER THAN CURB HEIGHT.
4. IF INLET PROTECTION BECOMES CLOGGED WITH DEBRIS AND SEDIMENT, THEY SHALL BE MAINTAINED SO AS TO ASSURE PROPER DRAINAGE AND WATER FLOW INTO THE STORM DRAIN. IN SEVERE STORM EVENTS, OVERFLOW OF THE INLET PROTECTION MAY BE ACCEPTABLE TO KEEP THE AREA FROM FLOODING.
5. CURB AND DRAIN INLET PROTECTION SHALL BE POSITIONED SO AS TO PROVIDE A PERMEABLE PHYSICAL BARRIER TO THE DRAIN ITSELF, ALLOWING SEDIMENT TO COLLECT ON THE OUTSIDE OF THE INLET PROTECTION.
6. CONCRETE BLOCKS SHALL BE USED A SPACER TO KEEP THE FILTREXX SILTSOXX FROM BLOCKING THE CURB OPENING. CONCRETE BLOCKS SHALL BE USED AT BOTH ENDS OF THE OPENING AND EVERY 4'.

SILT FENCE NOTES
1. PLACE SILT FENCE AT LOCATIONS AS SHOWN ON PLANS AS WELL AS DETAILS.
2. SILT FENCE SHALL BE INSTALLED SO WATER CANNOT BYPASS THE FENCE AROUND THE ENDS.
3. SILT FENCE SHALL REMAIN IN PLACE FOR THE DURATION OF THE PROJECT UNLESS OTHERWISE DIRECTED BY THE GOVERNING AGENCY.
4. DO NOT PLACE MATERIAL AGAINST SILT FENCE.
5. INSPECT SILT FENCE IMMEDIATELY AFTER PLACING ANY MATERIAL NEARBY.
6. REPAIR OR REPLACEMENT SHALL BE MADE PROMPTLY.



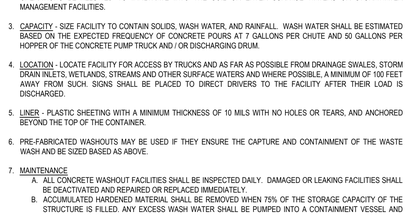
STANDARD SILT FENCE NOTES:
1. THE SLOPE OF THE LAND FOR AT LEAST 30 FEET ADJACENT AND UPSTREAM TO STANDARD SILT FENCE SHALL NOT EXCEED 5 %.
2. WHEN TWO SECTIONS OF FILTER FABRIC ADJOIN EACH OTHER THE END POSTS SHALL BE ROLLED TOGETHER A MINIMUM OF 3 TIMES.

4/7 **SILT FENCE**
N.T.S.



TREE PROTECTION FENCE NOTES:
1. TREE PROTECTION FENCE SHALL BE INSTALLED TO FOLLOW TREE CANOPY DRIP LINE OR PROPOSED LIMITS OF DISTURBANCE.
2. CONSTRUCTION VEHICLES TO STAY AS FAR AS POSSIBLE FROM TREE PROTECTION FENCE TO PREVENT COMPACTION OF TREE ROOTS.

5/7 **PROTECTING VEGETATION**
N.T.S.



NOTES
1. ALL WASH OFF AND NON-SOLID CONCRETE AND GROUT WASTE MUST BE CONTAINED IN THE WASHOUT CONTAINER.
2. THIS FACILITY WILL RECEIVE ALL WASH WATER FROM THE CLEANING OF CHUTES, MIXERS, HOPPERS, VIBRATORS, PLACING EQUIPMENT, TROWELS, AND SCREEDS. UNDER NO CIRCUMSTANCES WILL WASH WATER FROM THESE OPERATIONS BE ALLOWED TO INFILTRATE INTO THE SOIL OR ENTER SURFACE WATERS OR STORMWATER MANAGEMENT FACILITIES.
3. CAPACITY - SIZE FACILITY TO CONTAIN SOLIDS, WASH WATER, AND RAINFALL. WASH WATER SHALL BE ESTIMATED BASED ON THE EXPECTED FREQUENCY OF CONCRETE POURS AT 7 GALLONS PER CHUTE AND 50 GALLONS PER HOPPER OF THE CONCRETE PUMP TRUCK AND / OR DISCHARGING DRUM.
4. LOCATION - LOCATE FACILITY FOR ACCESS BY TRUCKS AND AS FAR AS POSSIBLE FROM DRAINAGE SWALES, STORM DRAIN INLETS, WETLANDS, STREAMS AND OTHER SURFACE WATERS AND WHERE POSSIBLE, A MINIMUM OF 100 FEET AWAY FROM SUCH. SIGNS SHALL BE PLACED TO DIRECT DRIVERS TO THE FACILITY AFTER THEIR LOAD IS DISCHARGED.
5. LINER - PLASTIC SHEETING WITH A MINIMUM THICKNESS OF 10 MILS WITH NO HOLES OR TEARS, AND ANCHORED BEYOND THE TOP OF THE CONTAINER.
6. PRE-FABRICATED WASHOUTS MAY BE USED IF THEY ENSURE THE CAPTURE AND CONTAINMENT OF THE WASTE WASH AND BE SIZED BASED AS ABOVE.
7. MAINTENANCE
   A. ALL CONCRETE WASHOUT FACILITIES SHALL BE INSPECTED DAILY. DAMAGED OR LEAKING FACILITIES SHALL BE DEACTIVATED AND REPAIRED OR REPLACED IMMEDIATELY.
   B. ACCUMULATED HARDENED MATERIAL SHALL BE REMOVED WHEN 75% OF THE STORAGE CAPACITY OF THE STRUCTURE IS FILLED. ANY EXCESS WASH WATER SHALL BE PUMPED INTO A CONTAINMENT VESSEL AND PROPERLY DISPOSED OF OFF-SITE.
   C. DISPOSAL OF THE HARDENED MATERIAL TO BE OFF-SITE BY PRIVATE DISPOSAL SERVICE.
   D. THE PLASTIC LINER SHALL BE REPLACED WITH EACH CLEANING OF THE WASHOUT FACILITY.
   E. INSPECT THE PROJECT SITE FREQUENTLY TO ENSURE THAT NO CONCRETE DISCHARGES ARE TAKING PLACE IN NON-DESIGNATED AREAS.

6/7 **CONCRETE WASHOUT**
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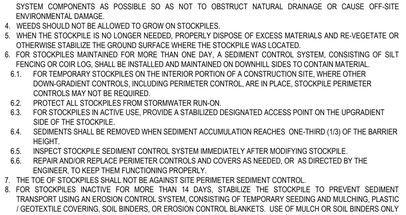


STOCKPILE NOTES:
1. STOCKPILE MANAGEMENT INCLUDES MEASURES TO MINIMIZE EROSION AND SEDIMENT TRANSPORT FROM SOILS OR OTHER ERODIBLE MATERIALS STORED AT THE CONSTRUCTION SITE. SPECIAL ATTENTION SHOULD BE GIVEN TO STOCKPILES IN CLOSE PROXIMITY TO NATURAL OR MANMADE STORM SYSTEMS. PROTECTION OF STOCKPILES IS A YEAR-ROUND REQUIREMENT.
2. THIS DETAIL DOES NOT APPLY TO CONTAMINATED MATERIALS WHICH REQUIRE ADDITIONAL MEASURES.
3. LOCATE STOCKPILES AS FAR AWAY FROM BODIES OF WATER, INFILTRATION AREAS, INLETS, AND OTHER DRAINAGE SYSTEM COMPONENTS AS POSSIBLE SO AS NOT TO OBSTRUCT NATURAL DRAINAGE OR CAUSE OFF-SITE ENVIRONMENTAL DAMAGE.
4. WEEDS SHOULD NOT BE ALLOWED TO GROW ON STOCKPILES.
5. WHEN THE STOCKPILE IS NO LONGER NEEDED, PROPERLY DISPOSE OF EXCESS MATERIALS AND RE-VEGETATE OR OTHERWISE STABILIZE THE GROUND SURFACE WHERE THE STOCKPILE WAS LOCATED.
6. FOR STOCKPILES MAINTAINED FOR MORE THAN ONE DAY, A SEDIMENT CONTROL SYSTEM, CONSISTING OF SILT FENCING OR COIR LOG, SHALL BE INSTALLED AND MAINTAINED ON DOWNHILL SIDES TO CONTAIN MATERIAL.
   6.1. FOR TEMPORARY STOCKPILES ON THE INTERIOR PORTION OF A CONSTRUCTION SITE, WHERE OTHER DOWN-GRADIENT CONTROLS, INCLUDING PERIMETER CONTROL, ARE IN PLACE, STOCKPILE PERIMETER CONTROLS MAY NOT BE REQUIRED.
   6.2. PROTECT ALL STOCKPILES FROM STORMWATER RUN-ON.
   6.3. FOR STOCKPILES IN ACTIVE USE, PROVIDE A STABILIZED DESIGNATED ACCESS POINT ON THE UPGRADIENT SIDE OF THE STOCKPILE.
   6.4. SEDIMENTS SHALL BE REMOVED WHEN SEDIMENT ACCUMULATION REACHES ONE-THIRD (1/3) OF THE BARRIER HEIGHT.
   6.5. INSPECT STOCKPILE SEDIMENT CONTROL SYSTEM IMMEDIATELY AFTER MODIFYING STOCKPILE.
   6.6. REPAIR AND/OR REPLACE PERIMETER CONTROLS AND COVERS AS NEEDED, OR AS DIRECTED BY THE ENGINEER, TO KEEP THEM FUNCTIONING PROPERLY.
7. THE TOE OF STOCKPILES SHALL NOT BE AGAINST SITE PERIMETER SEDIMENT CONTROL.
8. FOR STOCKPILES INACTIVE FOR MORE THAN 14 DAYS, STABILIZE THE STOCKPILE TO PREVENT SEDIMENT TRANSPORT USING AN EROSION CONTROL SYSTEM, CONSISTING OF TEMPORARY SEEDING AND MULCHING, PLASTIC / GEOTEXTILE COVERING, SOIL BINDERS, OR EROSION CONTROL BLANKETS. USE OF MULCH OR SOIL BINDERS ONLY IS ACCEPTABLE IF THE STOCKPILE WILL BE IN PLACE FOR NO MORE THAN 60 DAYS.
9. IMPLEMENT DUST CONTROL PRACTICES AS APPROPRIATE ON ALL STOCKPILED MATERIAL.

7/7 **MATERIAL STOCKPILE**
N.T.S.

AREA DATA

PROPERTY AREA.....		32,167 SF (0.738 Acres)	
TOTAL DISTURBED AREA.....		58,655 SF (1.347 Acres)	
EXISTING	**IMPERVIOUS AREA**...	32,167 SF (0.738 Acres)	
	PERVIOUS AREA.....	0 SF (0.0 Acres)	
PROPOSED	**IMPERVIOUS AREA**...	STANDARD ROOF:	27,593 SF (0.633 Acres)
		PAVEMENT AREA:	1,093 SF (0.025 Acres)
		TOTAL IMPERVIOUS AREA:	**28,686 SF (0.658 Acres)**
	PERVIOUS AREA...	GREEN ROOF:	3,481 SF (0.080 Acres)
		TOTAL PERVIOUS AREA:	**3,481 SF (0.080 Acres)**

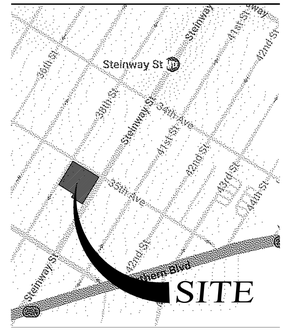
SOIL EROSION & SEDIMENT CONTROL NOTES:

1. THE STORMWATER POLLUTION PREVENTION PRACTICES PROPOSED HEREON HAVE BEEN IDENTIFIED AS THE MINIMUM RECOMMENDED PRACTICES. ADDITIONAL STORMWATER MANAGEMENT FACILITIES OR PRACTICES SHALL BE INSTALLED TO COMPLY WITH ALL APPLICABLE CODES AND STANDARDS AND PREVENT THE INCIDENTAL DISCHARGE OF SILT-LADEN RUNOFF FROM EXITING THE SITE. CONTRACTOR TO NOTIFY IN WRITING AND CONSULT WITH THE ENGINEER OF RECORD IF ADDITIONAL MEASURES ARE REQUIRED OR IF THERE IS EVIDENCE INDICATING POTENTIAL OR REALIZED IMPACTS ON WATER QUALITY DUE TO ANY STORMWATER DISCHARGE ASSOCIATED WITH CONSTRUCTION ACTIVITIES.
2. NOTHING IN THIS STORMWATER POLLUTION PREVENTION PLAN'S DRAWINGS OR ANY ASSOCIATED REPORTS RELIEVES THE CONTRACTOR OR OWNER/OPERATOR FROM OBTAINING ANY OTHER PERMITS REQUIRED BY LAW OR COMPLIANCE WITH TAKING ALL REASONABLE STEPS TO MINIMIZE OR PREVENT ANY DISCHARGE IN VIOLATION OF NYS DEC OR WHICH HAS A REASONABLE LIKELIHOOD OF ADVERSELY AFFECTING HUMAN HEALTH OR THE ENVIRONMENT.
3. CONTRACTOR SHALL BE FAMILIAR WITH THE NEW YORK STATE STANDARDS AND SPECIFICATIONS FOR EROSION AND SEDIMENT CONTROL ("BLUE BOOK") DATED NOVEMBER 2016, ANY REPORTS PREPARED SPECIFICALLY FOR THIS PROJECT, AND THE REQUIREMENTS OF THE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION FOR STORMWATER DISCHARGE.
4. EROSION CONTROL MEASURES TO PREVENT THE INCIDENTAL DISCHARGE OF SILT-LADEN RUNOFF FROM EXITING THE SITE SHALL, AT A MINIMUM, CONFORM TO THE NYS STANDARDS AND SPECIFICATIONS FOR EROSION AND SEDIMENT CONTROL UNLESS ADDITIONAL MEASURES ARE NOTED OR REQUIRED BY THE ENGINEER OF RECORD.
5. IT SHALL NOT BE A DEFENSE FOR A CONTRACTOR OR AN OWNER/OPERATOR IN AN ENFORCEMENT ACTION THAT IT WOULD HAVE BEEN NECESSARY TO HALT OR REDUCE THE CONSTRUCTION ACTIVITY IN ORDER TO MAINTAIN COMPLIANCE WITH THE NYS DEC STORMWATER DISCHARGE REQUIREMENTS OR IMPLEMENT EROSION AND SEDIMENT CONTROL PRACTICES. SOIL EROSION CONTROL MEASURES SHALL BE ADJUSTED/ RELOCATED BY CONTRACTOR AS IDENTIFIED DURING SITE INSPECTIONS IN ORDER TO MAINTAIN EFFECTIVENESS OF CONTROL MEASURES.
6. THE COSTS OF INSTALLING AND MAINTAINING THE EROSION CONTROL MEASURES SHALL BE DEEMED INCLUDED IN THE PRICE BID FOR THE SITE WORK.
7. INSTALLATION OF EROSION CONTROL, CLEARING, AND SITE WORK SHALL BE DONE AS INDICATED IN THE CONSTRUCTION SEQUENCE.
8. INSTALLATION OF EROSION CONTROL DEVICES SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS AND REQUIREMENTS.
9. CONTRACTOR SHALL INSPECT THE EROSION AND SEDIMENT CONTROL PRACTICES AND POLLUTION PREVENTION MEASURES BEING IMPLEMENTED AFTER EACH RAINFALL EVENT AND DAILY WITHIN THE ACTIVE WORK AREA TO ENSURE THAT THEY ARE BEING MAINTAINED IN EFFECTIVE OPERATING CONDITION AT ALL TIMES. INSPECTION OF ALL IMPLEMENTED PRACTICES SHALL OCCUR WEEKLY AT A MINIMUM. IF DEFICIENCIES ARE IDENTIFIED, THE CONTRACTOR SHALL BEGIN IMPLEMENTING CORRECTIVE ACTIONS WITHIN ONE BUSINESS DAY AND SHALL COMPLETE THE CORRECTIVE ACTIONS IN A REASONABLE TIME FRAME.
10. CONTRACTOR SHALL REMOVE ANY SILT FROM SOIL EROSION AND SEDIMENT CONTROL MEASURES WHEN IT REACHES (1/2) ONE-HALF CAPACITY UNLESS OTHERWISE NOTED OR AS DIRECTED BY THE ENGINEER. THE MATERIAL SHOULD BE INCORPORATED INTO THE SITE IN A STABILIZED MANNER.
11. CONTINUE INSPECTION AND REPAIR OF STORMWATER POLLUTION PREVENTION MEASURES UNTIL THE COMPLETION OF CONSTRUCTION AND PERMANENT STABILIZATION IS ACHIEVED.
12. REMOVE EROSION CONTROL MEASURES, SILT, AND DEBRIS UPON ESTABLISHMENT OF PERMANENT STABILIZED COVER OF ALL UPSTREAM / TRIBUTARY AREAS.
13. DEBRIS SHALL NOT BE BURIED ON THE SUBJECT SITE. ALL UNSUITABLE MATERIAL AND DEBRIS SHALL BE DISPOSED OF IN ACCORDANCE WITH ALL CITY, STATE, AND FEDERAL LAWS AND APPLICABLE CODES.
14. THESE PLANS ARE BASED ON INFORMATION AVAILABLE TO OUR OFFICE AT THE TIME OF PLAN PREPARATION. CONTRACTOR SHALL FIELD-VERIFY EXISTING CONDITIONS AND NOTIFY OUR OFFICE IF ACTUAL SITE CONDITIONS DIFFER FROM THAT SHOWN ON THE PLAN, OR IF THE PROPOSED WORK WOULD BE IMPACTED BY ANY OTHER SITE FEATURES.
15. CONTRACTOR SHALL CLEAN ALL ON-SITE EXISTING & PROPOSED DRAINAGE STRUCTURES AND INTERCONNECTING PIPE AT END OF PROJECT AS WELL AS ANY OFF-SITE DRAINAGE STRUCTURES THAT MAY HAVE RECEIVED RUNOFF FROM THE SITE.
16. CONTRACTOR SHALL PROVIDE TEMPORARY STORM DRAIN INLET PROTECTION BEYOND THE LIMITS OF DISTURBED AREA AS NECESSARY TO PREVENT SILT AND DEBRIS FROM CONSTRUCTION ACTIVITIES GETTING INTO ANY DRAINAGE SYSTEM FOR WHICH THE PROJECT IMPACTS.
17. CONTRACTOR SHALL LOCATE CONCRETE WASHOUT AREA, STOCKPILE AREA, AND CONSTRUCTION WASTE MATERIAL STORAGE AREAS SO AS TO MINIMIZE EXPOSURE TO STORMWATER. CONSTRUCTION WASTE SHALL BE IMMEDIATELY PLACED IN ON-SITE STORAGE CONTAINERS UNTIL READY FOR OFF-SITE DISPOSAL. CONTRACTOR SHALL MAINTAIN SPILL PREVENTION & RESPONSE EQUIPMENT AND MAKE AVAILABLE ON-SITE FOR USE BY CONTRACTOR'S EMPLOYEES TRAINED IN THE APPLICATION OF SPILL PREVENTION & RESPONSE PROCEDURES.
18. CONTRACTOR SHALL IDENTIFY LOCATION OF WASTE CONTAINERS, FUEL STORAGE TANKS, CONCRETE WASHOUT AREAS AND ANY OTHER LOCATIONS WHERE HAZARDOUS MATERIALS ARE STORED ON THE PLAN.
19. THE FOLLOWING EROSION CONTROL MEASURES ARE PROPOSED FOR THIS SITE:
    a. STABILIZED CONSTRUCTION ENTRANCE/ EXIT - A TEMPORARY GRAVEL CONSTRUCTION ENTRANCE/ EXIT SHALL BE INSTALLED AT THE DRIVEWAY ON FLANDERS ROAD, THIS AREA SHALL BE GRADED SO THAT RUNOFF WATER WILL BE RETAINED ON-SITE.
    b. STORM DRAIN INLET PROTECTION - IMMEDIATELY INSTALL FOR EACH INLET AS DRAINAGE STRUCTURES ARE INSTALLED.
    c. DUST CONTROL - STOCKPILES OF SOIL SHOULD BE LIMITED TO 15' MAXIMUM HEIGHT AND REMOVED OR UTILIZED FOR SITE CONSTRUCTION AS SOON AS PRACTICABLE. SHOULD EXCESSIVE DUST BE GENERATED, THE CONTRACTOR SHALL APPLY WATER TO BARE SOIL SURFACES TO MINIMIZE BLOWING DUST.
20. THE RIGHT-OF-WAY IS NOT TO BE USED FOR STORAGE OR STAGING OF EQUIPMENT OR MATERIALS DURING CONSTRUCTION. THE CONTRACTOR WILL BE RESPONSIBLE FOR MAINTAINING THE RIGHT-OF-WAY DURING CONSTRUCTION AND SHOULD INSTALL FENCING ALONG THE PROPERTY'S FRONTAGE TO LIMIT ACCESS FOR CONSTRUCTION VEHICLES TO DEFINED POINTS OF INGRESS/EGRESS.
21. IN AREAS WHERE SOIL DISTURBANCE ACTIVITY HAS PERMANENTLY OR TEMPORARILY (EXISTING DISTURBED AREA WILL NOT BE DISTURBED AGAIN WITHIN 14 CALENDAR DAYS OF THE PREVIOUS SOIL DISTURBANCE) CEASED, THE APPLICATION OF SOIL STABILIZATION MEASURES MUST BE INITIATED BY THE END OF THE NEXT BUSINESS DAY AND COMPLETED WITHIN FOURTEEN (14) DAYS FROM THE DATE THE CURRENT SOIL DISTURBANCE ACTIVITY CEASED.

811 Know what's below. Call before you dig. 1-800-272-4480

CONTRACTOR SHALL SUBMIT SHOP DRAWINGS TO ENGINEER OF RECORD FOR REVIEW PRIOR TO CONSTRUCTION FOR ANY DETAIL NOT PROVIDED IN THIS PLAN SET.

TO THE BEST OF MY KNOWLEDGE, BELIEF AND PROFESSIONAL JUDGMENT, THESE PLANS AND SPECIFICATIONS ARE IN COMPLIANCE WITH THE NEW YORK CITY ENERGY CONSERVATION CODE OF 2020 CHAPTER C4 AND NYC LOCAL LAW 48 OF 2020.



VICINITY MAP
N.T.S.

PROJECT DATA

OWNER/APPLICANT.....	35-18 STEINWAY STREET LLC 102 MOTOR PARKWAY, SUITE 410 HAUPPAUGE, NY 11788 (212) 233-0495
TAX MAP NUMBER.....	Block 668, Lot 6
SITE AREA.....	32,167 SF (0.738 Acres)
CURRENT ZONING.....	M1-4/R9, M1-4/R7-3, MX-24 (ZONING MAP: 9b)
CURRENT USE.....	EXISTING PARKING LOT
PROPOSED USES.....	RETAIL TRADE ESTABLISHMENT (GROUP VI) RESIDENTIAL USE (GROUP II)
EXISTING FOOTPRINT.....	0 SF
PROPOSED FOOTPRINT.....	31,074 SF
GREEN ROOF AREA.....	3,481 SF
PAVEMENT/CONCRETE AREA....	1,093 SF

NO.	DATE	BY	DESCRIPTION
2	10/23/25	MGC	REV. PER DEP COMMENTS
1	08/08/25	MGC	REV. PER OWNER INFO

REVISIONS

KEY CIVIL ENGINEERING
664 BLUE POINT ROAD, UNIT B
HOLTSVILLE, NEW YORK 11742
(631) 961-0506
www.KeyCivilEngineering.com

PROJECT NAME
35-10 STEINWAY STREET
35-10 STEINWAY STREET, ASTORIA
QUEENS, NY 11101
BOROUGH & COUNTY OF QUEENS
BLOCK: 668, LOT: 6
ZONE M1-3/R7-3, M1-4/R9 & MX-24, MAP 9b

DRAWING TITLE
SOIL EROSION & SEDIMENT CONTROL NOTES AND DETAILS

DATE:	04/15/2025
SCALE:	N.T.S.
PROJECT NUMBER:	24245
DRAWING BY:	MGC
CHECKED BY:	YT
APPROVED BY:	YT

SEAL & SIGNATURE:

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DRAWING No:
C-200.00

YURIY TUPYCHAK, P.E.
NEW YORK STATE PROFESSIONAL ENGINEER #101425

PAGE No:
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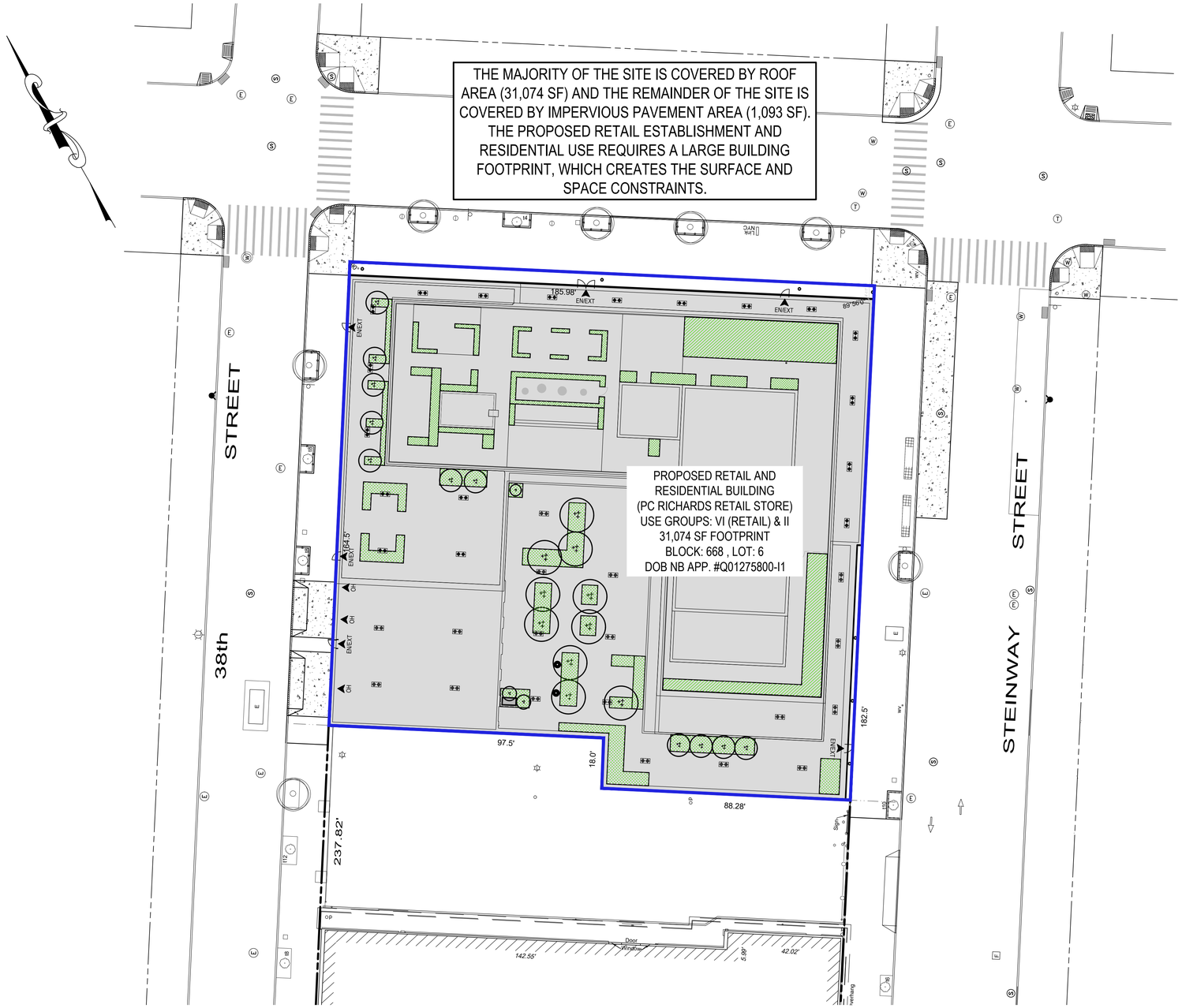
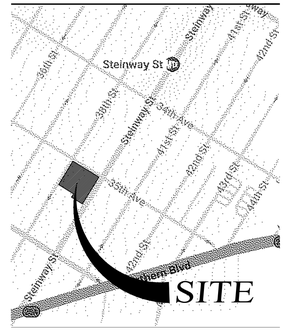
THE MAJORITY OF THE SITE IS COVERED BY ROOF AREA (31,074 SF) AND THE REMAINDER OF THE SITE IS COVERED BY IMPERVIOUS PAVEMENT AREA (1,093 SF). THE PROPOSED RETAIL ESTABLISHMENT AND RESIDENTIAL USE REQUIRES A LARGE BUILDING FOOTPRINT, WHICH CREATES THE SURFACE AND SPACE CONSTRAINTS.



GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)
1 inch = 20 ft.



VICINITY MAP
N.T.S.

PROJECT DATA

OWNER/APPLICANT	35-18 STEINWAY STREET LLC 102 MOTOR PARKWAY, SUITE 410 HAUPPAUGE, NY 11788 (212) 233-0495
TAX MAP NUMBER	Block 668, Lot 6
SITE AREA	32,167 SF (0.738 Acres)
CURRENT ZONING	M1-4/R9, M1-4/R7-3, MX-24 (ZONING MAP: 9b)
CURRENT USE	EXISTING PARKING LOT
PROPOSED USES	RETAIL TRADE ESTABLISHMENT (GROUP VI) RESIDENTIAL USE (GROUP II)
EXISTING FOOTPRINT	0 SF
PROPOSED FOOTPRINT	31,074 SF
GREEN ROOF AREA	3,481 SF
PAVEMENT/CONCRETE AREA	1,093 SF

NO.	DATE	BY	DESCRIPTION
1	10/23/25	MGC	REV. PER DEP COMMENTS

REVISIONS

KEY CIVIL ENGINEERING
664 BLUE POINT ROAD, UNIT B
HOLTSVILLE, NEW YORK 11742
(631) 961-0506
www.KeyCivilEngineering.com

PROJECT NAME

35-10 STEINWAY STREET

35-10 STEINWAY STREET, ASTORIA
QUEENS, NY 11101
BOROUGH & COUNTY OF QUEENS
BLOCK: 668, LOT: 6
ZONE M1-3/R7-3, M1-4/R9 & MX-24, MAP 9b

DRAWING TITLE

SURFACE AND SPACE CONSTRAINTS PLAN

DATE:	08/08/2025
SCALE:	1" = 20'
PROJECT NUMBER:	24245
DRAWING BY:	MGC
CHECKED BY:	YT
APPROVED BY:	YT

SEAL & SIGNATURE:

STATE OF NEW YORK · YURIY TUPYCHAK · NOT VALID WITHOUT ORIGINAL SEAL · 101425 · LICENSED PROFESSIONAL ENGINEER

YURIY TUPYCHAK, P.E.
NEW YORK STATE PROFESSIONAL ENGINEER #101425

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PAGE No: 1 OF 4

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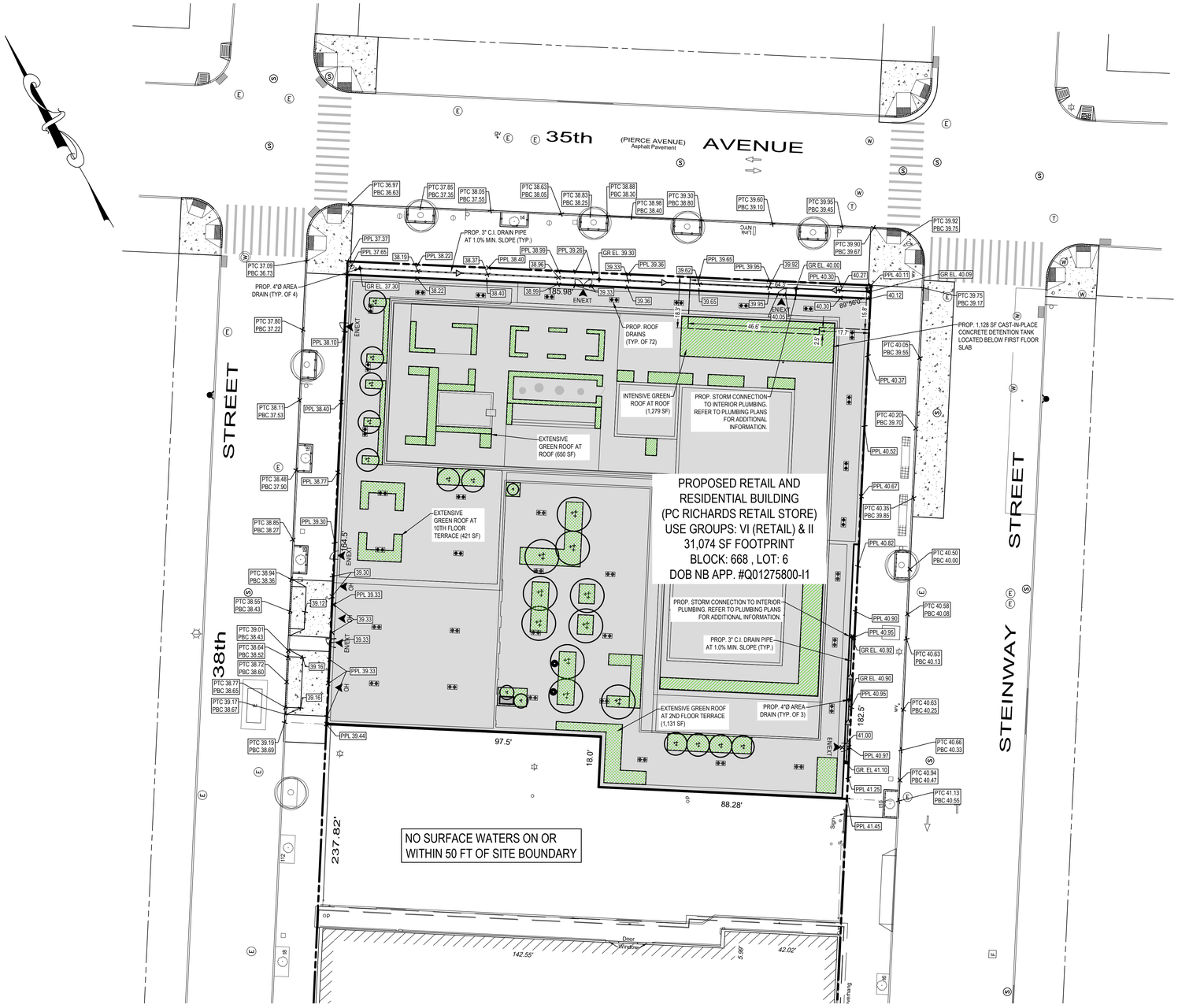

GRAPHIC SCALE

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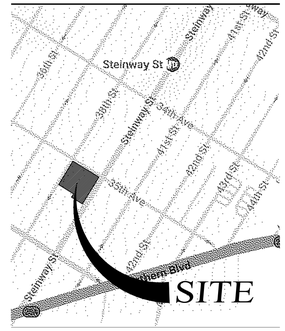
(IN FEET)

1 inch = 20 ft.



VICINITY MAP
N.T.S.

PROJECT DATA

OWNER/APPLICANT	35-18 STEINWAY STREET LLC 102 MOTOR PARKWAY, SUITE 410 HAUPPAUGE, NY 11788 (212) 233-0495
TAX MAP NUMBER	Block 668, Lot 6
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PROPOSED USES	RETAIL TRADE ESTABLISHMENT (GROUP VI) RESIDENTIAL USE (GROUP II)
EXISTING FOOTPRINT	0 SF
PROPOSED FOOTPRINT	31,074 SF
GREEN ROOF AREA	3,481 SF
PAVEMENT/CONCRETE AREA	1,093 SF

NO.	DATE	BY	DESCRIPTION
1	10/23/25	MGC	REV. PER DEP COMMENTS

REVISIONS

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(631) 961-0506
www.KeyCivilEngineering.com

PROJECT NAME

35-10 STEINWAY STREET

35-10 STEINWAY STREET, ASTORIA
QUEENS, NY 11101
BOROUGH & COUNTY OF QUEENS
BLOCK: 668, LOT: 6
ZONE M1-3/R7-3, M1-4/R9 & MX-24, MAP 9b

DRAWING TITLE

PROPOSED SITE PLAN

DATE:	08/08/2025
SCALE:	1" = 20'
PROJECT NUMBER:	24245
DRAWING BY:	MGC
CHECKED BY:	YT
APPROVED BY:	YT

SEAL & SIGNATURE:

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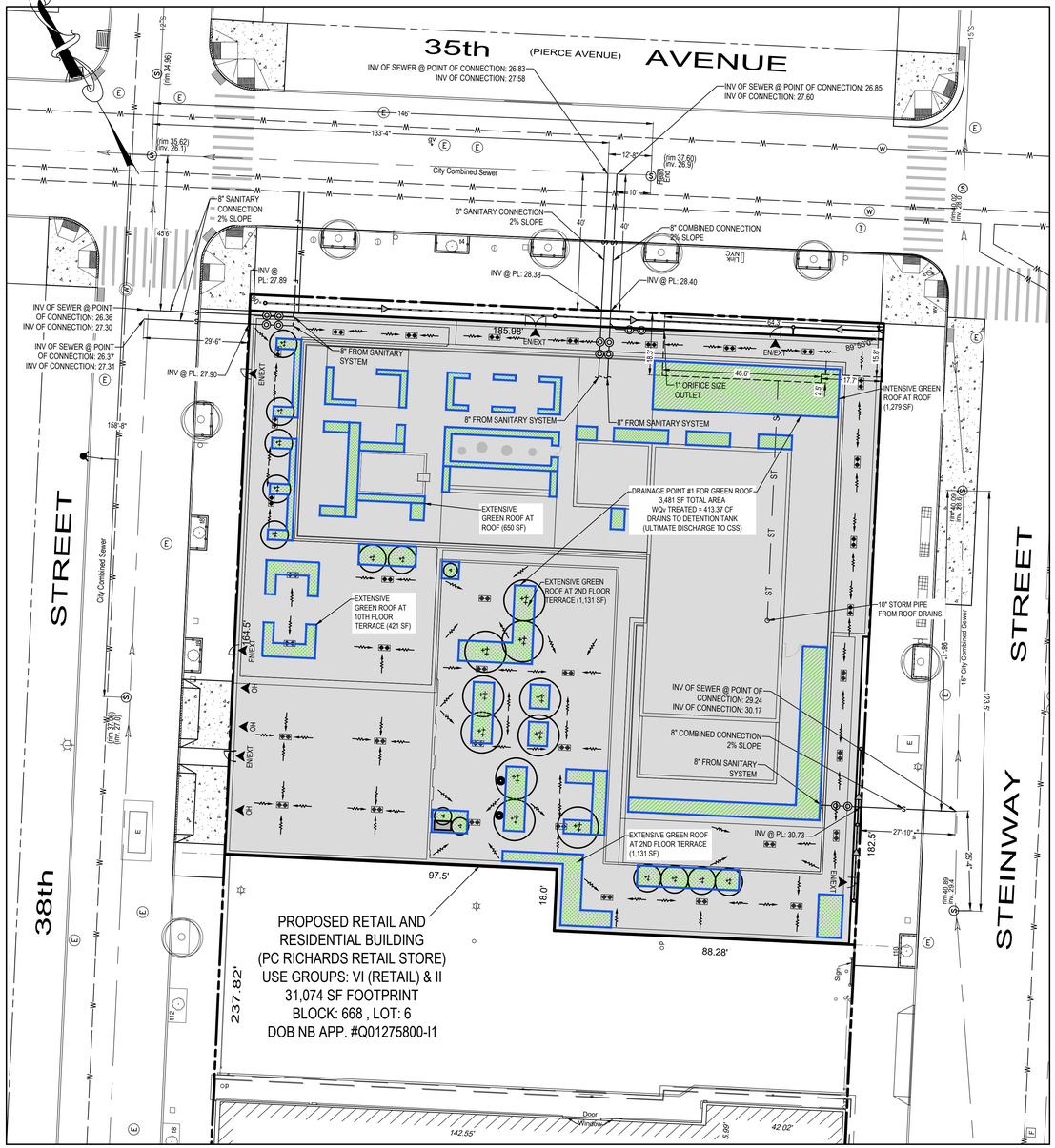
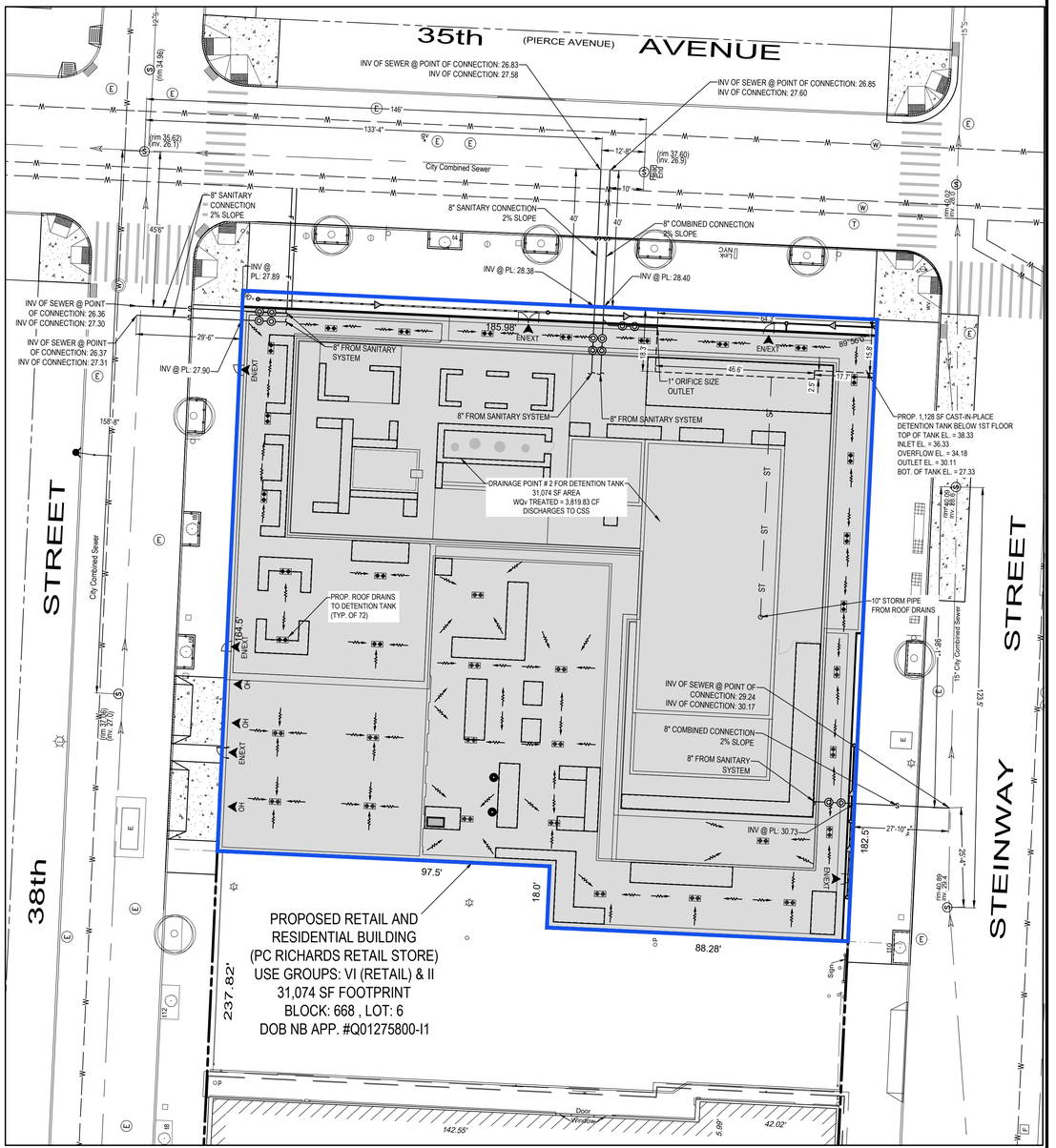


GREEN ROOF TRIBUTARY AREA

SCALE: 1" = 20'



DETENTION TANK TRIBUTARY AREA

SCALE: 1" = 20'

GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)
1 inch = 20 ft.

811
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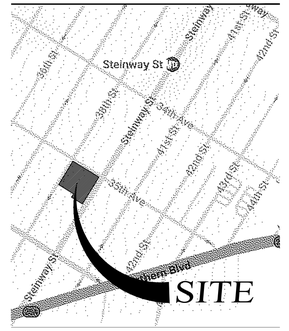

VICINITY MAP
N.T.S.

PROJECT DATA

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NO.	DATE	BY	DESCRIPTION
1	10/23/25	MGC	REV. PER DEP COMMENTS

REVISIONS

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PROJECT NAME

35-10 STEINWAY STREET

35-10 STEINWAY STREET, ASTORIA
QUEENS, NY 11101
BOROUGH & COUNTY OF QUEENS
BLOCK: 668, LOT: 6
ZONE M1-3/R7-3, M1-4/R9 & MX-24, MAP 9b

DRAWING TITLE

PROPOSED DRAINAGE PLAN

DATE:	08/08/2025
SCALE:	1" = 20'
PROJECT NUMBER:	24245
DRAWING BY:	MGC
CHECKED BY:	YT
APPROVED BY:	YT

SEAL & SIGNATURE:

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YURIY TUPYCHAK, P.E.
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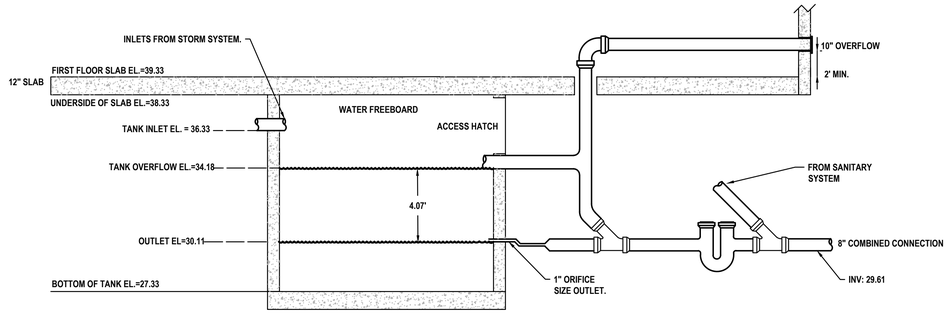
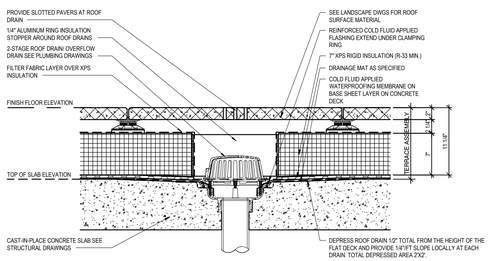


DETENTION FACILITY-CONCRETE TANK
1128 SQ. FT. TANK AREA FOOTPRINT
DETENTION VOLUME REQUIRED = 4,573 CU.FT.
USABLE VOLUME: 1128 SF X 4.07 FT = 4,590.96 CU.FT.

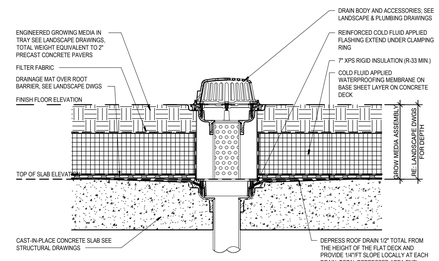
DETENTION TANK SECTION

SCALE 1/4" = 1'-0"



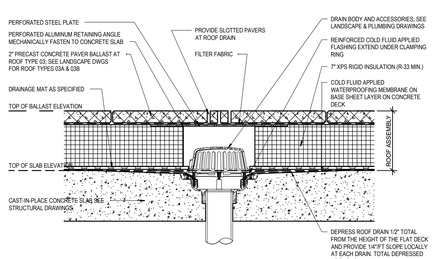
ROOF 01 - PAVERS ON PEDESTAL IRMA ROOFING

1 1/2" = 1'-0"



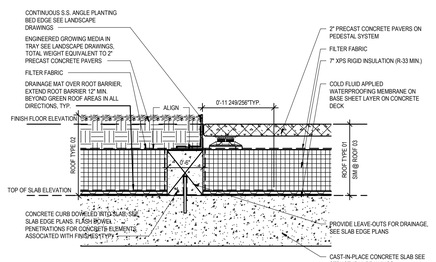
ROOF 02 - GREEN ROOF ON IRMA ROOFING

1 1/2" = 1'-0"



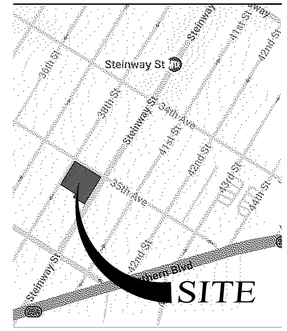
ROOF 03 - PAVER BALLAST ON IRMA ROOFING

1 1/2" = 1'-0"



ROOF 04 - BALLAST PAVERS TO GREEN ROOF

1 1/2" = 1'-0"



VICINITY MAP

N.T.S.

PROJECT DATA

OWNER/APPLICANT	35-18 STEINWAY STREET LLC 102 MOTOR PARKWAY, SUITE 410 HAUPPAUGE, NY 11788 (212) 233-0495
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PROPOSED FOOTPRINT	31,074 SF
GREEN ROOF AREA	3,481 SF
PAVEMENT/CONCRETE AREA	1,093 SF

NO.	DATE	BY	DESCRIPTION
1	10/23/25	MGC	REV. PER DEP COMMENTS

REVISIONS

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664 BLUE POINT ROAD, UNIT B
HOLTSVILLE, NEW YORK 11742
(631) 961-0506
www.KeyCivilEngineering.com

PROJECT NAME

35-10 STEINWAY STREET

35-10 STEINWAY STREET, ASTORIA
QUEENS, NY 11101
BOROUGH & COUNTY OF QUEENS
BLOCK: 668, LOT: 6
ZONE M1-3/R7-3, M1-4/R9 & MX-24, MAP 9b

DRAWING TITLE

SMP DETAIL SHEET

DATE:	08/08/2025
SCALE:	N.T.S.
PROJECT NUMBER:	24245
DRAWING BY:	MGC
CHECKED BY:	YT
APPROVED BY:	YT

SEAL & SIGNATURE:

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YURIY TUPYCHAK, P.E.
NEW YORK STATE PROFESSIONAL ENGINEER #101425

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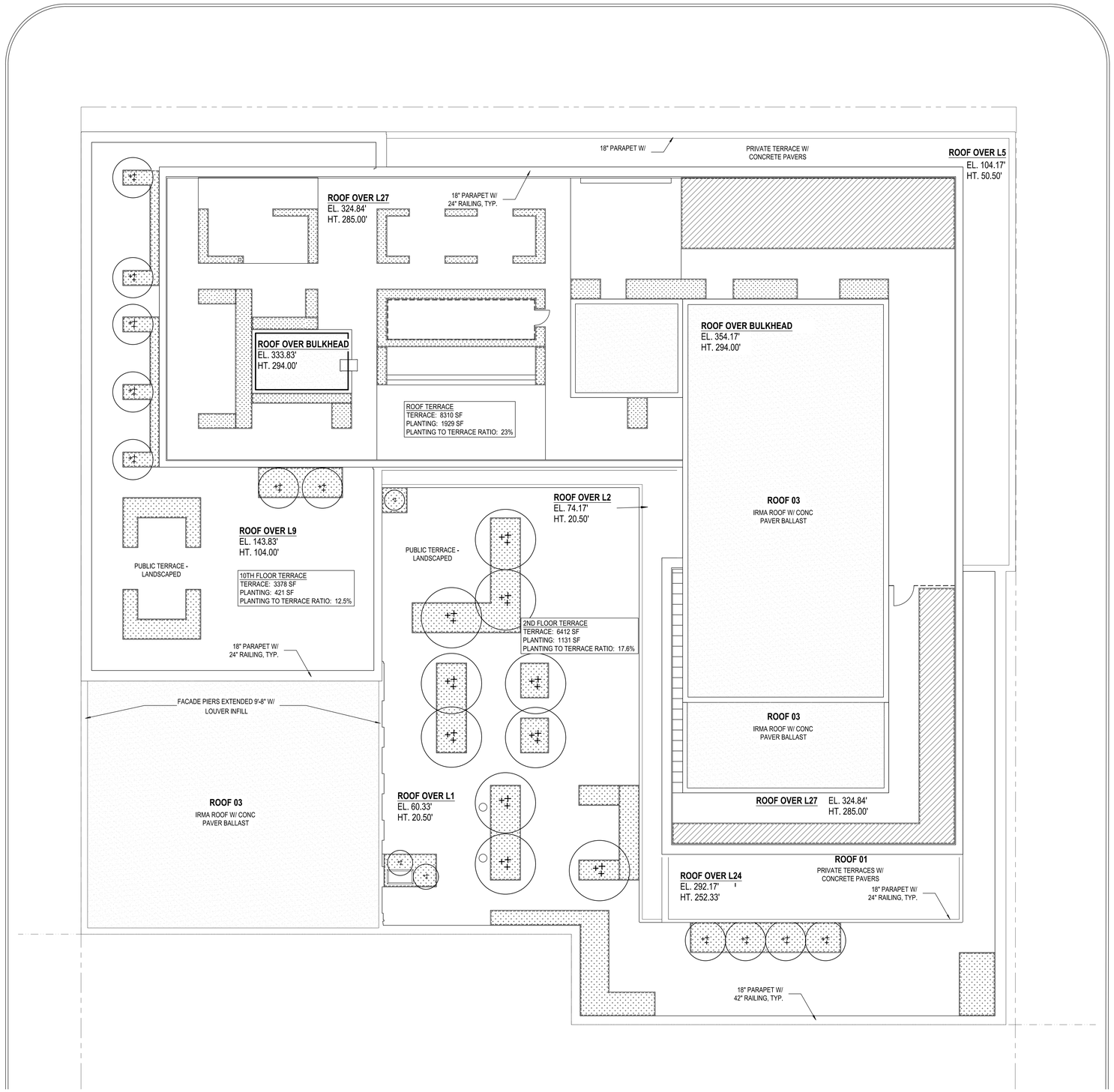


1 ROOF PLAN

1/8" = 1'-0"

0 4' 8' 16'

Scale: 1/8" = 1'-0"

N

PLANTING LEGEND

EXTENSIVE GREEN ROOF

SEDUM MIX
SEDUM ALBUM 'CORAL CARPET'
SEDUM KAMTSCHATICUM 'VARIEGATUM'
SEDUM KAMTSCHATICUM 'WEIHENSTEPH GOLD'
SEDUM SEXANGULARE
SEDUM SPURIUM 'ALBUM SUPERBUM'
SEDUM SPURIUM 'FULDAGLUT'
SEDUM SPURIUM 'SUMMER GLORY'
SEDUM TAKESIMENSIS 'GOLDEN CARPET'

INTENSIVE GREEN ROOF

SHRUBS
COTINUS COGGYGRIA 'ROYAL PURPLE'
ILEX GLABRA 'SHAMROCK'
LEUCOTHOE FONTANESIANA
RHUS AROMATICA 'GRO-LOW'

GRASSES & PERENNIALS
AMSONIA HUBRICHTII
CALAMAGROSTIS X ACUTIFLORA 'KARL FOERSTER'
CAREX FLACCA 'BLUE ZINGER'
DESCHAMPSIA CESPITOSA 'GOLDTAU'
SALVIA NEMOROSA 'MAINACHT'
SCHIZACHYRIUM SCOPARIUM 'STANDING OVATION'
SESLERIA AUTUMNALIS

TREES
BETULA NIGRA 'CULLY'
CORNUS FLORIDA VAR. RUBRA
JUNIPERUS CHINENSIS 'HETZII COLUMNARIS'

Soil Specification for Planters

Soil specification to meet the requirements of NYC Stormwater Manual Table 4.6 for Engineered Soil (CSS Area).

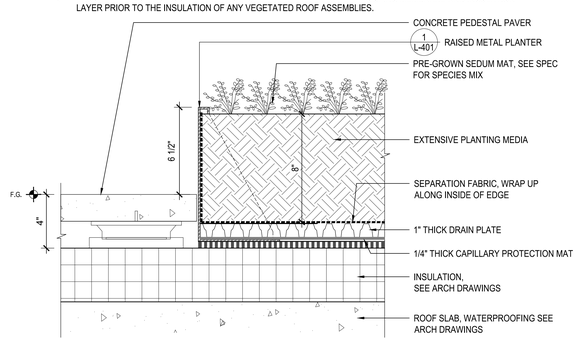
Sand (0.05-2mm) 80-8%, of which: Course Sand (0.5-1mm) 0-5% Medium Sand (0.25-0.5mm) 55-75% Fine Sand (0.1-0.25mm) 20-40%	Phosphorous - 80 - 100 lbs/acre Potasium - 100 - 300 lbs/acre Acid-producing Soil Test pH > 4.5
Silt (0.002-0.05mm) 5-10%	Free of refuse, hard clods, woody vegetation, stiff clay, construction debris (of any kind), boulders, stones greater than 1-1/2 inch, chemicals, or other deleterious material toxic to any vegetation used on this project.
Clay (<0.002mm) 3-8%	
Organic Matter 3-6%	

Soil Specification for Green Roof

Soil specification to meet the requirements of NYC Stormwater Manual Table 4.6 for Green Roof Media.

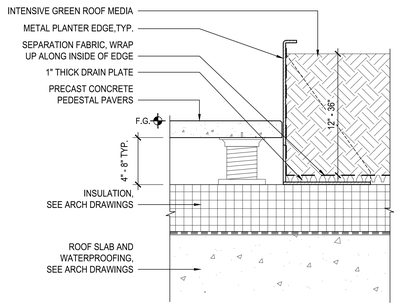
Green roof media	By weight: Silt (0.002-0.05mm) ≤ 10% Clay (<0.002mm) ≤ 2% Organic Matter ≤ 8%	pH 6.0-8.5 Maximum water holding capacity 35-65%

NOTES:
1. SHIM ALUMINUM EDGE AS REQUIRED TO MAINTAIN 3/4" REVEAL
2. EXTENSIVE GREEN ROOF SHALL BE IRRIGATED WITH DRIP IRRIGATION 12" O.C. LINE SPACING WITH 14" O.C. EMITTER SPACING
3. FOR WATERPROOFING AND ROOT BARRIER, SEE ARCHITECTURE DRAWINGS AND DIVISION 7 SPECIFICATIONS
4. ENSURE THAT 40 MILS ROOT BARRIER IS INSTALLED BETWEEN WATERPROOFING MEMBRANE AND INSULATION LAYER PRIOR TO THE INSULATION OF ANY VEGETATED ROOF ASSEMBLIES.



2 EXTENSIVE GREEN ROOF

3" = 1'-0"



3 INTENSIVE GREEN ROOF

1 1/2" = 1'-0"

35-10 STEINWAY STREET, ASTORIA, NY 11101

BEYER BLINDER BELLE

120 Broadway, 20th Fl, New York, NY 10271

CLIENT
STEINWAY 1 OWNER LLC
2 Park Avenue, 23rd Floor
New York, NY 10016

STRUCTURAL ENGINEER
DeSimone Consulting Engineers
140 Broadway, 25th Floor
New York NY 10005

MEPFP ENGINEER
EP Engineering
100 William Street, Suite 1205
New York, NY 10038

CIVIL ENGINEER
Key Civil Engineering
(631) 961-0506

VERTICAL CIRCULATION
Fortune Shepler Sailing, Inc.
(862) 400-6382

GEOTECH ENGINEER
JNZ Engineering
959 S. Springfield Avenue
Springfield, NJ 07081

ACOUSTIC CONSULTANT
WSP
One Penn Plaza
New York, New York, 10119

ENVELOPE CONSULTANT
RIMKUS Consulting Group, Inc
229 West 28th Street
New York, New York 10001

SUSTAINABILITY CONSULTANT
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80 Broad Street
New York, NY 10004

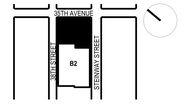
ACCESSIBILITY CONSULTANT
Accessibility Services
(718) 803-3782

LOW VOLTAGE CONSULTANT
Younity Inc.
18 West 18th Street, 2nd Floor
New York, NY, 10018

LANDSCAPE CONSULTANT
Starr Whitehouse Landscape Architects
80 Broad Street, Suite 1700
New York, NY 10004

LIGHTING CONSULTANT
Light Vs. Light
12 East 49th Street - Suite 1623
New York, NY 10017

KEY PLAN



STAMP

NO	DATE	DESCRIPTION
4	10/14/25	50% CD
3	08/22/25	DOB / HPD SUBMISSION
2	08/01/25	100% DD
1	04/18/25	100% SD

REVISIONS

SUBMITTAL

50% CONSTRUCTION DOCUMENTATION

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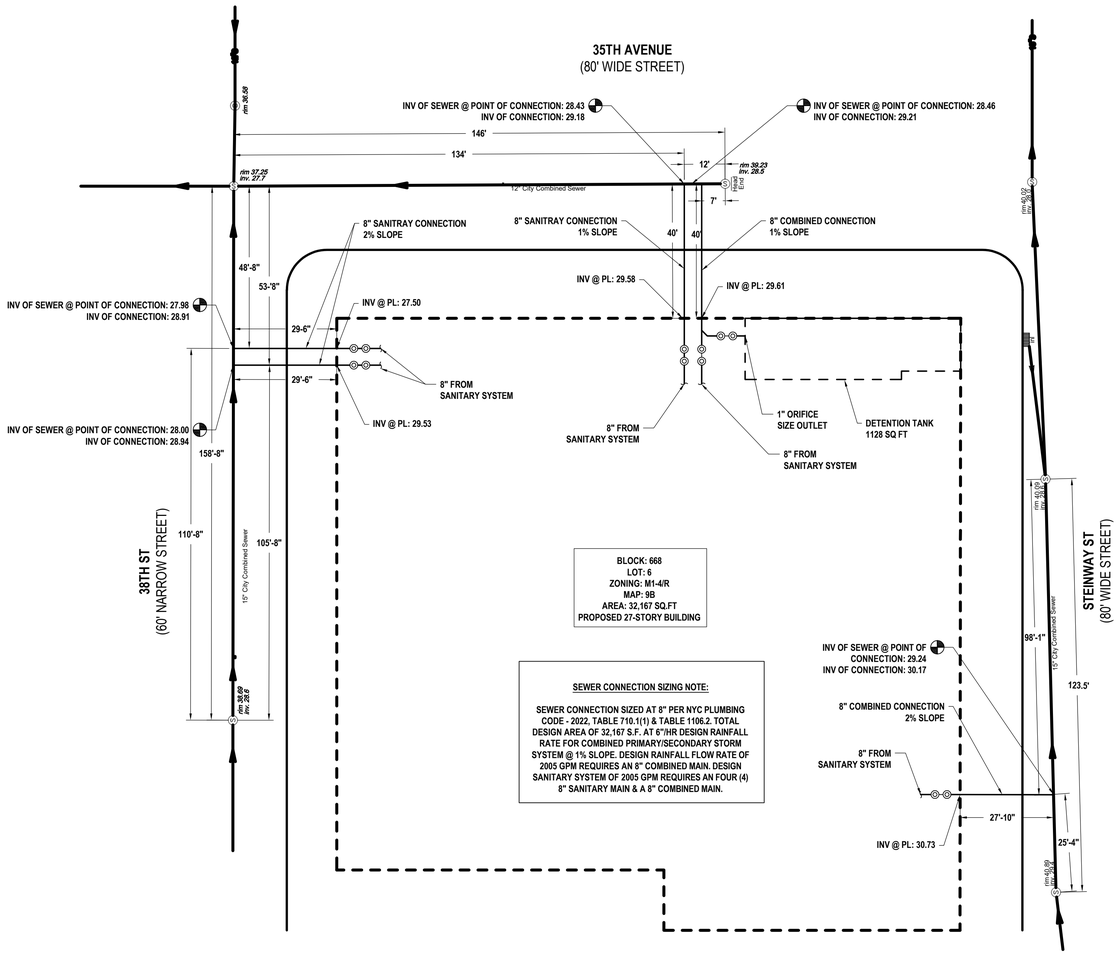
SWPPP PLAN & DETAILS

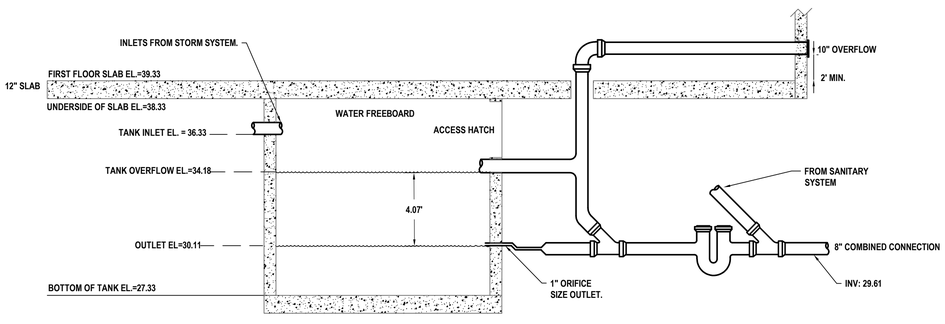
SCALE
DATE 10/06/25
PROJECT NUMBER 3053.00
DRAWING NUMBER

G-001.00

OF

DOB NOW JOB #





DETENTION FACILITY-CONCRETE TANK
1128 SQ. FT. TANK AREA FOOTPRINT
DETENTION VOLUME REQUIRED = 4,573 CU.FT.
USABLE VOLUME: 1128 SF X 4.07 FT = 4,590.96 CU.FT.

DETENTION TANK SECTION

SCALE 1/4" = 1'-0"

BUILDING INFO:
BLOCK: 668, LOT: 6, ZONING: M1-4/R, ZONING MAP 9B
35-18 STEINWAY STREET ASTORIA, NY
LOT AREA: 32,167 SQ.FT. (0.738 AC)
DOB # Q01275800-S5

STORM WATER RUNOFF CALCULATIONS

DEVELOPED FLOW:

TOTAL AREA (C=0.90)
ROOF AREA = 28,606 SF = 0.656 ACRES
GREEN ROOF AREA = 3,561 SF = 0.081 ACRES

TOTAL EFFECTIVE AREA = 32,167 X 0.922 = 29,668.4 SF

Q(DEV) = 29,668.4 / 7,320 = 4.05 CFS

STORM FLOW OF 4.05 CFS WILL BE RESTRICTED TO 0.074 CFS BY MEANS OF STORMWATER DETENTION TANK AND CONSTANT RATE OUTFLOW.

DETENTION FACILITY DESIGN CRITERIA (CONSTANT OUTFLOW)
Q(RR) = 0.074 CFS
REQUIRED DETENTION VOLUME (VARIABLE OUTFLOW)
W = [(1.85/12)*32167*0.92] = 4,573.88 CU FT

DETENTION TANK VOLUME PROVIDED = 4,590.96 CU FT

SEWER FLOW CALCULATION:
M1-4/R ZONING
150 GALLONS/PERSON/DAY
20000 GPD/AC
AREA = 32,167 SF = 0.738 AC
Q(SAN)=0.046 CFS

TOTAL FLOW TO SEWER:
TOTAL STORM FLOW: 0.074 CFS
TOTAL SANITARY FLOW: 0.046 CFS
TOTAL COMBINED FLOW: 0.120 CFS

BEPA FACILITY:
BEPA FACILITY IS THE STORMWATER DETENTION TANK SHOWN ON PLAN
VOLUME REQUIRED: 3844.6 CF
VOLUME PROVIDED: 4590.96 CF

EP ENGINEERING
EP BUILDS. EP KNOWS. EP CARES.
212.257.6190 TEL
212.994.8091 FAX
100 WILLIAM STREET
SUITE 1205
NEW YORK, NY 10038
www.EPENGINEERING.com

	PRINT ISSUE	DATE
	FIRST SUBMISSION	04/15/25
	SECOND SUBMISSION	10/20/25

PROJECT:
35-18 STEINWAY STREET, ASTORIA, NY 11101

DOB NOW NO:

DRAWING TITLE:
SITE CONNECTION PLAN

ENGINEER OF RECORD:
STATE OF NEW YORK · BROWN E. MELENDEZ · 095911 · LICENSED PROFESSIONAL ENGINEER

DATE: 04/15/25
PROJECT NO: 2025.006
SCALE: 3/32" = 1'-0"
DRAWN: NK CHECKED: NK
DRAWING NO: *SCP-100*
PAGE: 01 OF 01

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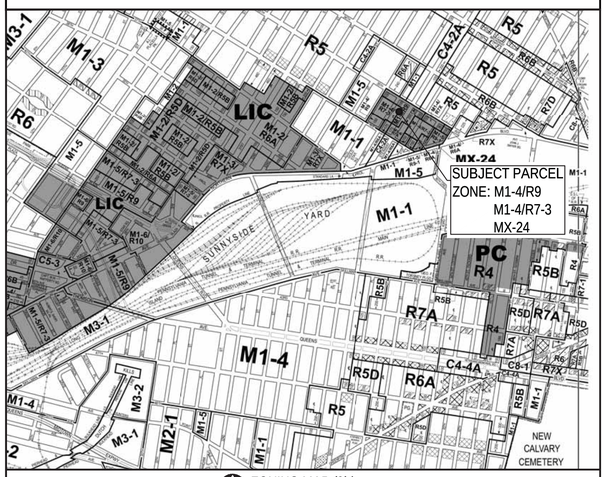
THIS PLAN IS APPROVED BY THE CITY ONLY FOR THE WORK INDICATED ON THE APPLICATION SHEET. ALL OTHER MATTERS ARE NOT TO BE RELIED UPON, OR TO BE CONSIDERED AS EITHER BEING APPROVED OR IN ACCORDANCE WITH APPLICABLE CODES.

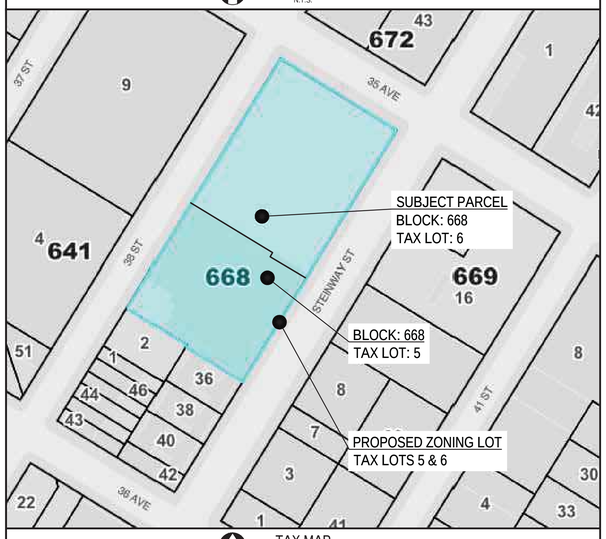
THE SCALE OF THIS DRAWING IS CORRECT WHEN PRINTED ON 24"x36" SIZE PAPER. ALL OTHER PAPER SIZES WILL NOT SHOW THE CORRECT SCALE.

DOT APPROVAL OF DESIGN ELEMENTS
For self-certified projects only

Item requiring DOT approval	Approved by	Date



ZONING MAP (9b)
N.T.S.



TAX MAP
N.T.S.

REQUIRED SPECIAL INSPECTIONS

NO SPECIAL INSPECTION REQUIRED FOR THIS APPLICATION.

ITEMS UNDER SEPARATE APPLICATION

1. NEW BUILDING.....DOB NB APP. #Q01275800-I1
2. SOUTHERN CURB CUT.....DOB APP. #_____
3. NORTHERN CURB CUT.....DOB APP. #_____

WORK SCOPE

FILING FOR REPLACEMENT OF 533 LINEAR FEET OF CONCRETE SIDEWALK, STEEL-FACED CURB, PEDESTRIAN RAMPS AT SUBJECT CORNERS & RECEIVING CORNERS, AND ASPHALT PAVEMENT ALONG 38TH STREET, 35TH AVENUE, AND STEINWAY STREET PROPERTY FRONTAGES. WORK FILED UNDER THE LATEST NYC DOT STANDARDS AND 2022 NYC BUILDING CODE.

LIST OF NYC DOT STANDARD

ITEM	NUMBER
STEEL FACED CURB	H-1010
DROP CURB	H-1015
4" THICK CONCRETE SIDEWALK	H-1045 TYPE-I
7" THICK CONCRETE SIDEWALK	H-1045 TYPE-II
ASPHALT PAVEMENT REPLACEMENT (TYPE B-2)	H-1055
PEDESTRIAN RAMP	H-1011
BUS STOP IN EXISTING ROADWAY	H-1005A
NEW TREE PIT	H-1046

ALL EXISTING TREE PITS FRONTING THE ZONING LOT TO BE EXPANDED TO 5' X 10'

LIST OF ESTIMATED QUANTITIES

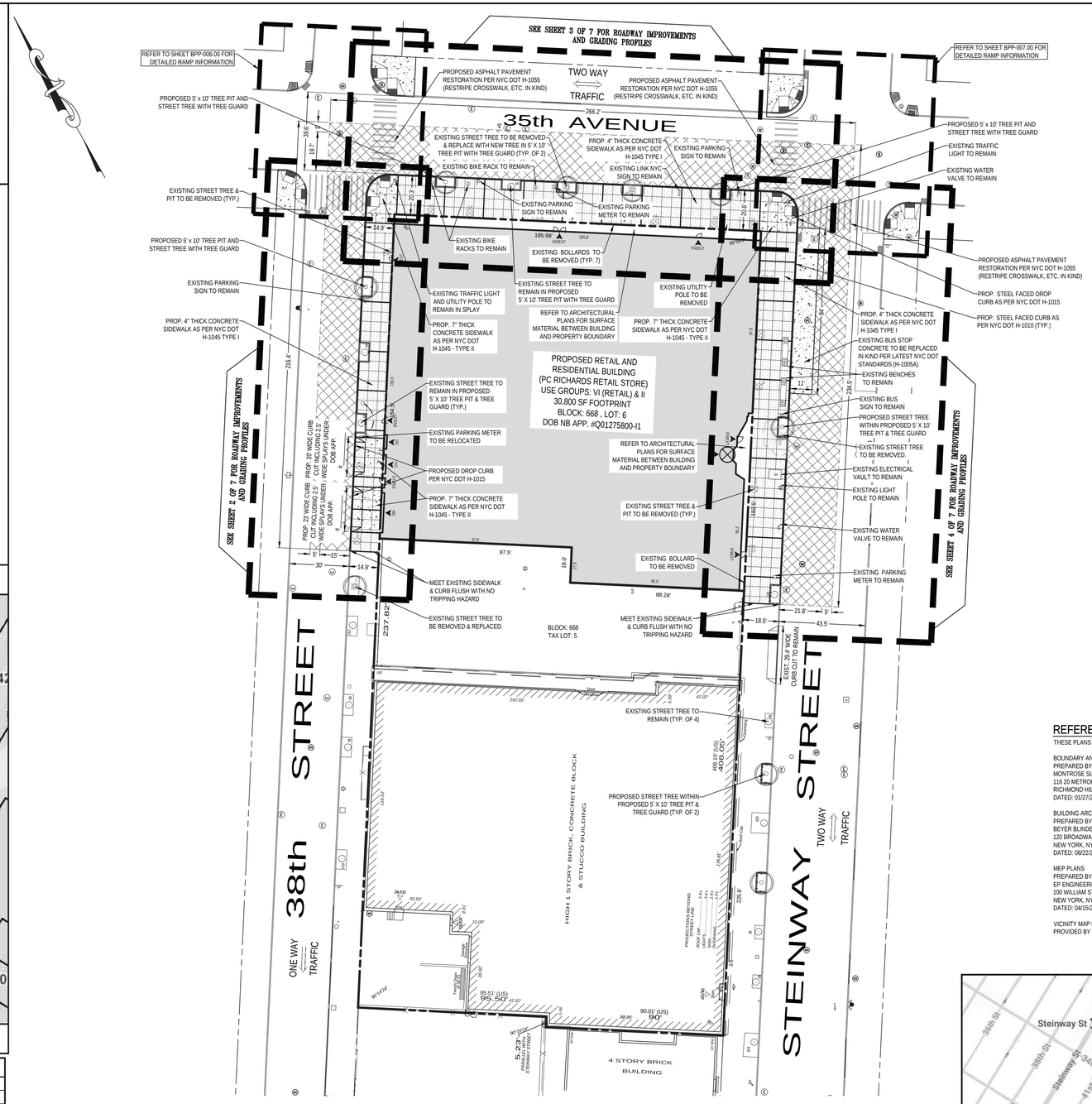
New Concrete Curb	0	Lin ft.
New Steel Face Curb	533	Lin ft.
New Sidewalk	9,770	Sq.ft
New Roadway	1,780	Sq.yds
New Trees	9	Each
New CBs	–	Each
New DIP	–	Lin ft.
New Manholes	–	Each

ROADWAY / SIDEWALK REPAIR LEGEND

PROPOSED 4" THICK CONCRETE SIDEWALK PER NYC DOT H-1045 TYPE-I

PROPOSED 7" THICK CONCRETE SIDEWALK PER NYC DOT H-1045 TYPE-II

PROPOSED ASPHALT PVMT. IN R.O.W.-3" A.C. WEARING SURFACE AND 6"-9" THICK CONC. BASE (IF DAMAGED DURING CURB INSTALLATION) TO BE EXTENDED AS DIRECTED BY EXAMINER IF REQUIRED.



BUILDERS PAVEMENT PLAN

SCALE: 1" = 30'

GRAPHIC SCALE

30 0 15 30 60 120

(IN FEET)
1 inch = 30 ft.

DATUM NOTE:
ELEVATIONS AND ESTABLISHED GRADES SHOWN HEREON REFER TO NAVD 1988 WHICH IS 1.63 FEET HIGHER THAN QUEENS SEWER DATUM.

ZONING LOT STREET TREE CALCULATIONS

REQUIREMENTS	CALCULATIONS (REQ./PROP.)	COMPLIANCE
NYC PARKS: STREET TREES: ONE STREET TREE FOR EVERY 25 FT. OF ROAD FRONTAGE	FRONTAGE: 237.82' + 164.5' + 185.98' + 182.5' + 225.6'= 996.4' 996.4' / 25' = 39.86 = 40 TREES REQ.	EX. TREES TO PROTECT:.....12 EX. TREES TO REMOVE:.....18 PR. TREES TO PLANT:.....9 TREES TO PLANT OFF-SITE:.....0 TREES TO PAY INTO TREE FUND:.....19

NYC OFF-SITE STREET TREE PLANTING NOTES:

THE EXACT LOCATION AND NUMBER OF OFF-SITE STREET TREE PLANTINGS WILL BE DETERMINED BY NYC DEPARTMENT OF PARKS FOLLOWING FIELD INSPECTION OF THE FINISHED ON-SITE SIDEWALK WORK. THE CONTRACTORS BID PRICE SHOULD REFLECT THE ADDITIONAL TREE PLANTING AND/OR A FEE PAID TO THE NYC DEPARTMENT OF PARKS IN LIEU OF TREE PLANTINGS AS WELL AS THE POSSIBILITY OF CHANGES IN PLANT SPECIES.

NYC DEPARTMENT OF PARKS RESTRICTS STREET TREE PLANTING TO THE FOLLOW SEASONS:
FALL PLANTING - OCTOBER 1 TO DECEMBER 31
SPRING PLANTING - MARCH 1 TO MAY 31

REFERENCES

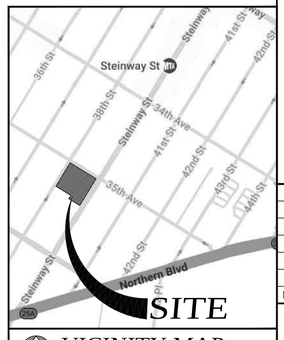
THESE PLANS REFERENCE:

BOUNDARY AND TOPOGRAPHIC SURVEY
PREPARED BY:
MONTROSE SURVEYING CO., LLP
116 20 METROPOLITAN AVE
RICHMOND HILL, NY 11418-1090
DATED: 01/27/2025

BUILDING ARCHITECTURAL LAYOUT
PREPARED BY:
BEYER BLINDER BELLE
120 BROADWAY, 20TH FL
NEW YORK, NY 10271
DATED: 08/22/2025

MEP PLANS
PREPARED BY:
EP ENGINEERING
100 WILLIAM STREET, SUITE 1205
NEW YORK, NY 10038
DATED: 04/15/2025

VICINITY MAP BACKGROUND DATA
PROVIDED BY MAPS.GOOGLE.COM



VICINITY MAP
N.T.S

No.	DATE	REVISION
5	10/23/2025	REV. PER UPDATED STREET TREES
4	10/14/2025	50% CD
3	08/22/2025	DOB / HPD SUBMISSION
2	08/01/2025	100% DD SET
1	06/04/2025	ISSUED FOR COORDINATION

Borough: QUEENS	DOT Ref. No.: DOB BPP No.: -------
DOB Ref. No.: Q01275800-I1	SHEET No.: 1 OF 9

NEW YORK CITY
DEPARTMENT OF TRANSPORTATION

BUILDERS PAVEMENT PLAN

PROJECT DATA

Block: 668 Lot(s): 6
Zoning: M1-4/R9,M1-4/R7-3,MX-24 Zoning Map No.: 9b
Street Address: 35-10 STEINWAY STREET
ASTORIA, NEW YORK 11101

Owner: STEINWAY 1 OWNER LLC
Address: 1865 PALMER AVENUE, SUITE 201
LARCHMONT, NY 10538

WAIVERS

DOT requirement waived	As per/Date
1)	
2)	
3)	
4)	

NOTES

GENERAL REQUIREMENTS
1. ALL DESIGNS, MATERIALS, CONSTRUCTION METHODS AND WORKMANSHIP SHALL COMPLY WITH THE FOLLOWING PUBLICATIONS OF THE NEW YORK CITY DEPARTMENT OF TRANSPORTATION (NYCDOT): STANDARD SPECIFICATIONS, STANDARD DETAILS OF CONSTRUCTION; RULES OF THE NEW YORK CITY DEPARTMENT OF TRANSPORTATION (NYCDOT); GUIDELINES FOR THE DESIGN OF INFRASTRUCTURE COMPONENTS.
2. ALL NON STANDARD MATERIALS AND CONSTRUCTION PROCEDURES SHALL BE SPECIFICALLY APPROVED IN WRITING BY THE DOT.
3. ANY WORK NOT COMPLYING WITH THE REQUIREMENTS OF THE DOT SHALL BE REMOVED AND REPLACED.
4. THIS PLAN SHALL BE VALID FOR THE ISSUANCE OF CONSTRUCTION PERMITS FOR A PERIOD OF ONE YEAR FROM THE DATE OF APPROVAL OR SELF–CERTIFICATION, AS APPLICABLE.
5. ALL SIDEWALK AND STREET AREAS CONSTRUCTED UNDER THIS PLAN SHALL REMAIN OPEN TO THE PUBLIC AT ALL TIMES.
6. ALL PROPOSED CURB TO BE STEEL FACED CURB.
7. TRANSVERSE EXPANSION JOINTS SHALL BE ONE–QUARTER (1/4) INCH IN WIDTH MIN TO (1/2) INCH MAX, AND SHALL BE FILLED WITH PREFORMED JOINT FILLER TO WITHIN ONE (1) INCH OF THE SIDEWALK SURFACE. THE TOP ONE (1) INCH SHALL BE SEALED WITH POURED JOINT FILLER.
8. CONCRETE SHOULD BE CONSTRUCTED OF 5'x5' FLAGS. FLAG LINES SHOULD BE STRAIGHT. ROUGH SURFACED, CRACKED, DEPRESSED AND OTHER TYPES OF DEFLECTED FLAGS, MUST BE CORRECTED TO CONFORM TO DOT STANDARDS. (HWY RULE, SECTION 4, GENERAL SIDEWALK REQUIREMENTS viii).
9. SEE NYC R.O.W. DETAILS SHEET FOR REQUIRED CURB AND RAMP DETAILS.

ISSUANCE OF PERMITS
10. NO SIDEWALK, CURB OR ROADWAY WORK SHALL BE DONE WITHOUT A PERMIT FROM THE BOROUGH HIGHWAY SUPERINTENDENT. APPLICATION SHALL BE MADE THREE DAYS BEFORE STARTING CONSTRUCTION. THE CONTRACTOR SHALL HAVE ALL REQUIRED INSURANCE COVERAGE ON FILE.
11. NO WORK ON DRAINAGE STRUCTURES SHALL BE DONE WITHOUT A PERMIT FROM THE BOROUGH OFFICE OF THE DEPARTMENT OF ENVIRONMENTAL PROTECTION.
12. ANY VAULT WORK AT THE SITE SHALL BE DONE AS PER THE APPLICABLE RULES OF THE DOT AND THE DEPT. OF BUILDINGS.

CONSTRUCTION ACTIVITY
13. A CONSTRUCTION PLAN SHOWING MAINTENANCE AND PROTECTION OF TRAFFIC, INCLUDING PLACEMENT OF SIDEWALK BRIDGES, BARRIERS AND SIGNAGE, SHALL BE SUBMITTED TO THE BOROUGH HIGHWAY OFFICE BEFORE CONSTRUCTION BEGINS.
14. NO SIDEWALK SHALL BE CLOSED WITHOUT A PERMIT. PEDESTRIAN AND TRAFFIC SAFETY SHALL BE PROTECTED AT ALL TIMES. ROADWAY CLOSINGS SHALL BE AS DIRECTED.
15. THE SITE SHALL BE MAINTAINED IN A CLEAN AND SAFE CONDITION.

FINAL SIGN–OFF
16. PERMITS SHALL BE PRESENTED FROM ALL PUBLIC AGENCIES AND UTILITIES HAVING OWNERSHIP OF STRUCTURES RELOCATED OR REMOVED DURING CONSTRUCTION.
17. ALL PAVEMENT MARKINGS INCLUDING THERMOPLASTIC LANE DIVIDERS, REMOVED DURING CONSTRUCTION SHALL BE REPLACED IN KIND TO THE BUREAU OF TRAFFIC STDS.
18. ALL EXISTING CATCH BASINS ON SITE SHALL BE CLEANED AND MADE OPERABLE.
19. ALL DAMAGE CAUSED BY CONSTRUCTION ON THIS PROJECT OUTSIDE THE PROJECT LIMITS SHALL BE REPAIRED AS DIRECTED.
20. THE ROADWAY SHALL BE PAVED TO THE REQUIREMENTS OF THE DOT AND AS DIRECTED.
21. CONTRACTOR SHALL HAVE ALL CATCH BASINS IN RIGHT OF WAY CLEANED BY NYCDEP AND OBTAIN LETTER FROM NYCDEP AS CONFIRMATION.
22. CONTRACTOR SHALL OBTAIN CONCRETE CORE REPORTS PER NYCDOT SPECIFICATIONS AND AS REQUIRED FOR SIGN OFF.
23. CONTRACTOR SHALL OBTAIN FINAL SURVEY PER NYCDOT SPECIFICATIONS AND AS REQUIRED FOR SIGN OFF.
24. REFURBISH ALL PAVEMENT MARKINGS THAT HAVE BEEN REMOVED/DAMAGED DURING CONSTRUCTION. (INCLUDING BUT NOT LIMITED TO EDGE LINES, HATCHING, ETC.) ACCORDING TO APPLICABLE STANDARDS AND SPECIFICATIONS.

PROFESSIONAL CERTIFICATION

I am submitting this plan under professional certification in compliance with all applicable requirements.

_____ / _____ / _____
Signature Date

DOT APPROVAL NOT REQUIRED

DOT ACCEPTANCE

Proposed and existing work shown here reviewed for compliance with all applicable rules and requirements by:

_____
Plan Examiner

Acceptance for issuance of work permits granted by:

_____ / _____ / _____
Chief/Builders Pavement Section Date

KEY CIVIL ENGINEERING
664 BLUE POINT ROAD, UNIT B
HOLTSVILLE, NEW YORK 11742
(631) 961-0506
www.KeyCivilEngineering.com

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35-10 STEINWAY STREET
35-10 STEINWAY STREET, ASTORIA, NEW YORK 11101
BOROUGH & COUNTY OF QUEENS
BLOCK: 668, TAX LOT: 6, ZONING LOTS 5 & 6 MAP: 9b,
ZONE: M1-4/R9, M1-4/R7-3, MX-24
USE GROUP VI (RETAIL) , II

BUILDERS PAVEMENT PLAN COVER SHEET

SEAL & SIGNATURE
STATE OF NEW YORK · YURIY TUPYCHAK · LICENSED PROFESSIONAL ENGINEER · 101425

DATE:	04/15/2025
PROJECT No:	24245
DRAWING BY:	MM
CHK BY:	YT
DWG No:	

BPP-001.00

SHEET No: 1 OF 9

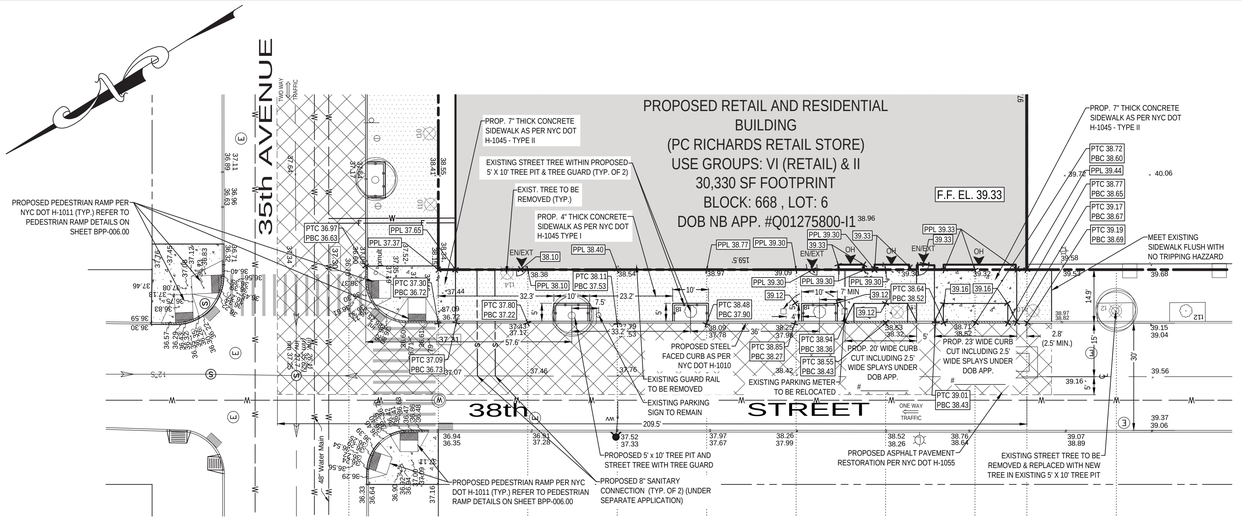
STICKER LOCATION

N:\24245_L+M Development Partners_35-18 Steinway Street_Astoria\Drawings\Key Civil\24245_2025.10.23_BPP6_SESC1_CC3_PK3.dwg

Borough: QUEENS	DOT Ref. No.: DOB BPP No.: -------
DOB Ref. No.: Q01275800-I1	SHEET No.: 2 OF 9

LEGEND

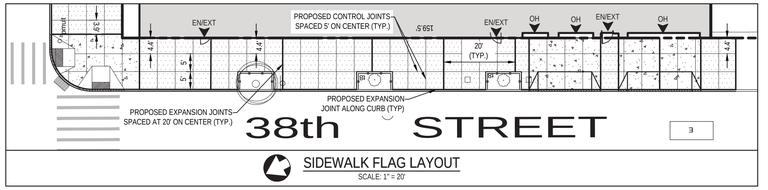
EXISTING	ITEM	PROPOSED
	PROPERTY LINE	
	BUILDING	
	STEEL FACED CONCRETE CURB	
	SIGN	
	PARKING METER	
(E)	ELECTRIC MANHOLE COVER	
E	ELECTRIC VAULT COVER	
(W)	WATER MANHOLE COVER	
	CATCH BASIN	
(S)	SEWER MANHOLE COVER	
	UTILITY POLE MULTIPLE USES	
	FIRE HYDRANT	
W	WATER SERVICE	W
	CITY COMBINED SEWER SERVICE	S
	TREE	
37.78 38.09	TOP/ BOTTOM OF CURB ELEVATION	PTC 37.78 PBC 37.20
39.53	GRADE ELEVATION	38.03
	PROPERTY LINE ELEVATION	PPL 38.30
	4" THICK CONCRETE SIDEWALK IN RIGHT-OF-WAY	
	7" THICK CONCRETE SIDEWALK IN RIGHT-OF-WAY	
	ASPHALT PAVEMENT REPLACEMENT IN RIGHT-OF-WAY	



GRAPHIC SCALE
20 0 10 20 40 80
(IN FEET)
1 inch = 20 ft.

PLAN VIEW OF 38TH STREET

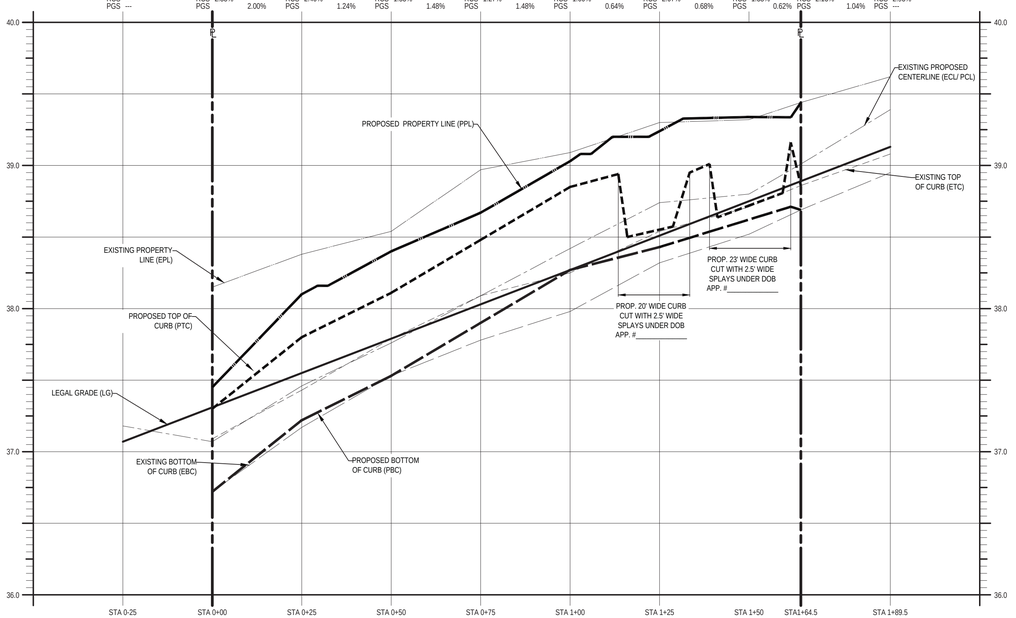
SCALE: 1" = 20'



SIDEWALK FLAG LAYOUT
SCALE: 1" = 20'

NOTES
1. CONCRETE SIDEWALKS SHOULD BE CONSTRUCTED OF 5' X 5' FLAGS WHERE FEASIBLE. FLAG LINES SHOULD BE STRAIGHT. RUFF SURFACED, CRACKED, DEPRESSED AND OTHER TYPES OF DEFECTED FLAGS MUST BE CORRECTED TO CONFORM TO DOT STANDARDS. HWY RULE, SECTION 4, GENERAL SIDEWALK REQUIREMENTS VIII
2. TRANSVERSE EXPANSION JOINTS SHALL BE ONE-QUARTER (1/4) INCH IN WIDTH MIN. TO (1/2) INCH MAX. AND SHALL BE FILLED WITH PREFORMED JOINT FILLER TO WITHIN ONE (1) INCH OF THE SIDEWALK SURFACE. THE TOP ONE (1) INCH SHALL BE SEALED WITH POURED JOINT FILLER. EXPANSION JOINTS TO BE 20 FEET ON CENTER.
3. EXPANSION JOINTS IN CURB MUST ALIGN WITH EXPANSION JOINTS IN SIDEWALK.

STA	LG	EPL	ETC	EBC	ECL	PPL	PTC	PBC	PCL	CR	SCS	RCS	PGS
0-25	37.07	---	---	---	37.18	---	---	---	37.18	---	---	---	---
0+00	37.31	38.15	37.09	36.72	37.07	37.37	37.09	36.73	37.07	0.58 (7.00")	1.88%	2.33%	2.00%
0+25	37.55	38.38	37.43	37.17	37.46	38.10	37.80	37.22	37.46	0.58 (7.00")	1.60%	2.40%	1.24%
0+50	37.79	38.54	37.53	37.53	37.76	38.40	38.11	37.53	37.76	0.58 (7.00")	1.93%	1.53%	1.48%
0+75	38.03	38.97	38.09	37.78	38.09	38.77	38.48	37.90	38.09	0.58 (7.00")	1.93%	1.27%	1.48%
1+00	38.27	39.09	38.25	37.98	38.42	39.30	38.85	38.27	38.42	0.58 (7.00")	1.89%	1.00%	0.64%
1+25	38.51	39.30	38.53	38.32	38.74	39.80	38.55	38.43	38.74	0.12 (1.50")	1.89%	2.07%	0.68%
1+50	38.75	39.32	38.71	38.52	38.80	39.33	38.72	38.60	38.80	0.12 (1.5")	1.79%	1.33%	0.62%
1+64.5	38.89	39.44	38.86	38.69	39.01	39.44	39.19	38.69	39.01	0.50 (6.00")	1.67%	2.13%	1.04%
1+89.5	39.13	39.62	39.06	38.95	39.39	---	---	---	39.39	0.13 (1.56")	3.62%	2.93%	---



PROFILE OF SOUTHWEST CURBLINE OF 38TH STREET

SCALE: HORIZONTAL: 1" = 20' / VERTICAL: 1" = 1/2'

ABBREVIATION TABLE

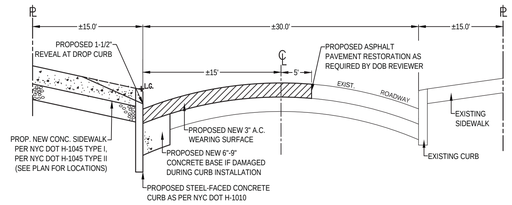
STA	STATION LOCATION
LG	LEGAL GRADE
EPL	EXISTING PROPERTY LINE
ETC	EXISTING TOP OF CURB
EBC	EXISTING BOTTOM OF CURB
ECL	EXISTING CENTERLINE
PPL	PROPOSED PROPERTY LINE
PTC	PROPOSED TOP OF CURB
PBC	PROPOSED BOTTOM OF CURB
PCL	PROPOSED CENTERLINE
CR	CURB REVEAL (IN FT)
RCS	ROADWAY CROSS SLOPE
SCS	SIDEWALK CROSS SLOPE
PGS	PROPOSED GUTTER SLOPE

PROFILE LEGEND

- EXISTING PROPERTY LINE (EPL)
- PROPOSED PROPERTY LINE (PPL)
- EXISTING/PROPOSED CENTER LINE (ECL/PCL)
- LEGAL GRADE (LG)
- EXISTING TOP OF CURB (ETC)
- EXISTING BOTTOM OF CURB (EBC)
- PROPOSED TOP OF CURB (PTC)
- PROPOSED BOTTOM OF CURB (PBC)

ROADWAY/SIDEWALK REPAIR LEGEND

- PROPOSED 4" THICK CONCRETE SIDEWALK PER NYC DOT H-1045 TYPE-I
- PROPOSED 7" THICK CONCRETE SIDEWALK PER NYC DOT H-1045 TYPE-II
- PROPOSED ASPHALT PVMT. IN R.O.W.-3" A.C. WEARING SURFACE AND 6"-9" THICK CONC. BASE (IF DAMAGED DURING CURB INSTALLATION) TO BE EXTENDED AS DIRECTED BY EXAMINER IF REQUIRED.



TYPICAL ROADWAY CROSS SECTION
NYCDOT STANDARD H-1055
N.T.S.

No.	DATE	REVISION
5	10/23/2025	REV. PER UPDATED STREET TREES
4	10/14/2025	50% CD
3	08/22/2025	DOB / HPD SUBMISSION
2	08/01/2025	100% DD SET
1	06/04/2025	ISSUED FOR COORDINATION

KEY CIVIL ENGINEERING
664 BLUE POINT ROAD, UNIT B
HOLTSVILLE, NEW YORK 11742
(631) 961-0506
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35-10 STEINWAY STREET

35-10 STEINWAY STREET, ASTORIA, NEW YORK 11101
BOROUGH & COUNTY OF QUEENS
BLOCK: 668, TAX LOT: 6, ZONING LOTS 5 & 6 MAP: 9b,
ZONE: M1-4/R9, M1-4/R7-3, MX-24
USE GROUP VI (RETAIL) , II

BUILDERS PAVEMENT PLAN
38TH STREET PROFILE

SEAL & SIGNATURE

STATE OF NEW YORK · YURIY TUPYCHAK · 101425 · LICENSED PROFESSIONAL ENGINEER

YURIY TUPYCHAK, P.E.
NYS PROFESSIONAL ENGINEER [STATE] - EXPIRES ON 06/30/2027

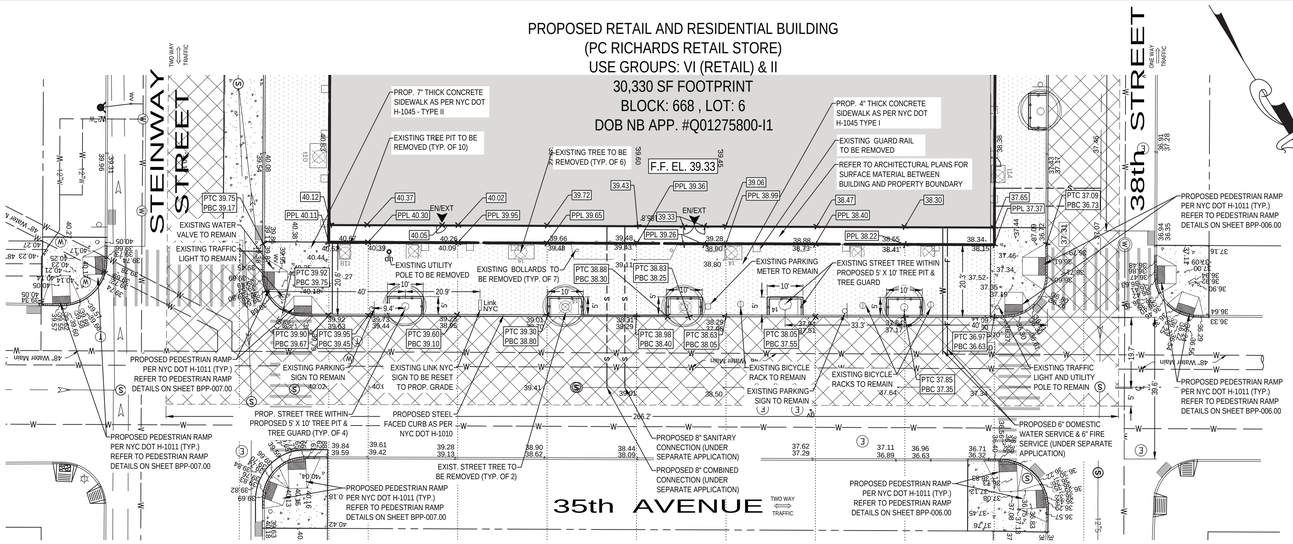
DATE:	04/15/2025
PROJECT No:	24245
DRAWING BY:	MM
CHK BY:	YT
DWG No:	BPP-002.00
SHEET No:	2 OF 9

STICKER LOCATION

Borough: QUEENS	DOT Ref. No.: DOB BPP No.: -------
DOB Ref. No.: Q01275800-I1	SHEET No.: 3 OF 9

LEGEND

EXISTING	ITEM	PROPOSED
	PROPERTY LINE	
	BUILDING	
	STEEL FACED CONCRETE CURB	
	SIGN	
	PARKING METER	
	TRAFFIC LIGHT	
	BICYCLE RACK	
(E)	ELECTRIC MANHOLE COVER	
(T)	TELEPHONE MANHOLE COVER	
(W)	WATER MANHOLE COVER	
	CATCH BASIN	
(S)	SEWER MANHOLE COVER	
	LINK NYC SIGN	
	UTILITY POLE	
	BOLLARD	
GV	GAS VALVE	
W	WATER SERVICE	W
S	CITY COMBINED SEWER SERVICE	S
	TREE	
37.78 / 38.09	TOP/ BOTTOM OF CURB ELEVATION	PTC 37.78 / PBC 37.20
39.53	GRADE ELEVATION	38.03
	PROPERTY LINE ELEVATION	PPL 38.30
	4" THICK CONCRETE SIDEWALK IN RIGHT-OF-WAY	
	7" THICK CONCRETE SIDEWALK IN RIGHT-OF-WAY	
	ASPHALT PAVEMENT REPLACEMENT IN RIGHT-OF-WAY	



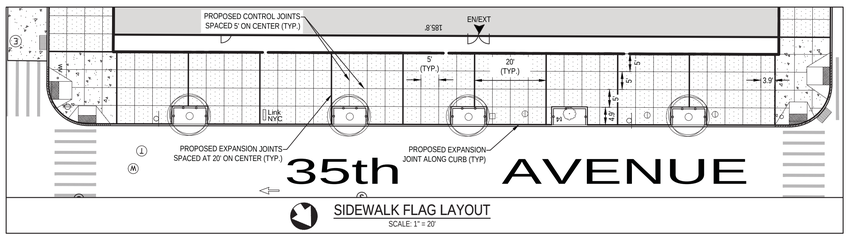
PLAN VIEW OF 35TH AVENUE

SCALE: 1" = 20'

GRAPHIC SCALE

20 0 10 20 40 80

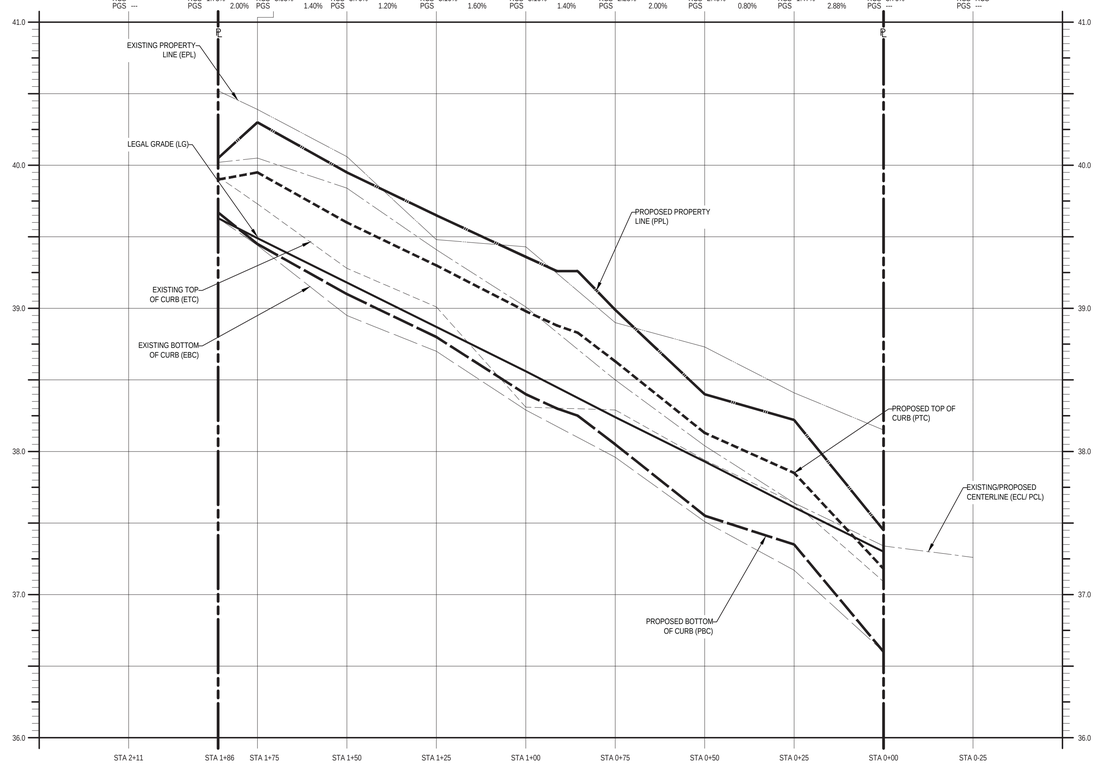
(IN FEET)
1 inch = 20 ft.



SIDEWALK FLAG LAYOUT

SCALE: 1" = 20'

STA	2+11	1+86	1+75	1+50	1+25	1+00	0+75	0+50	0+25	0+00	0-25
LG	---	39.63	39.49	39.18	38.87	38.56	38.24	37.93	37.61	37.30	---
EPL	---	40.52	40.39	40.09	39.48	39.43	38.90	38.73	38.41	38.15	---
ETC	---	39.92	39.73	39.28	39.01	38.31	38.29	37.94	37.64	37.09	---
EBC	---	39.63	39.44	38.95	38.70	38.29	37.96	37.51	37.17	36.60	---
ECL	40.77	40.02	40.05	39.84	39.41	39.01	38.50	38.04	37.64	37.34	37.26
PPL	---	40.11	40.30	39.95	39.65	39.36	38.99	38.40	38.22	37.37	---
PTC	---	39.90	39.95	39.60	39.30	38.98	38.63	38.05	37.85	36.97	---
PBC	---	39.67	39.45	39.10	38.80	38.40	38.05	37.55	37.35	36.63	---
PCL	40.77	40.02	40.05	39.84	39.41	39.01	38.50	38.04	37.64	37.34	37.26
CR	---	0.23 (2.00")	0.50 (6.00")	0.50 (6.00")	0.50 (6.00")	0.58 (7.00")	0.58 (7.00")	0.50 (6.00")	0.50 (6.00")	0.34 (4.08")	---
SCS	---	1.02%	1.70%	1.70%	1.70%	1.85%	1.75%	1.70%	1.80%	1.97%	---
RCS	---	1.78%	3.05%	3.76%	3.10%	3.10%	2.28%	2.49%	1.47%	3.76%	RCS
PGS	---	2.00%	1.40%	1.20%	1.60%	1.40%	2.00%	0.80%	2.88%	---	PGS



PROFILE OF SOUTHERN CURBLINE OF 35TH AVENUE

SCALE: HORIZONTAL: 1" = 20' / VERTICAL: 1" = 1/2'

ABBREVIATION TABLE

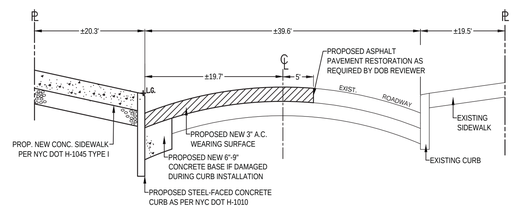
STA	STATION LOCATION
LG	LEGAL GRADE
EPL	EXISTING PROPERTY LINE
ETC	EXISTING TOP OF CURB
EBC	EXISTING BOTTOM OF CURB
ECL	EXISTING CENTERLINE
PPL	PROPOSED PROPERTY LINE
PTC	PROPOSED TOP OF CURB
PBC	PROPOSED BOTTOM OF CURB
PCL	PROPOSED CENTERLINE
CR	CURB REVEAL (IN FT)
RCS	ROADWAY CROSS SLOPE
SCS	SIDEWALK CROSS SLOPE
PGS	PROPOSED GUTTER SLOPE

PROFILE LEGEND

- EXISTING PROPERTY LINE (EPL)
- PROPOSED PROPERTY LINE (PPL)
- EXISTING/PROPOSED CENTER LINE (ECL/PCL)
- LEGAL GRADE (LG)
- EXISTING TOP OF CURB (ETC)
- EXISTING BOTTOM OF CURB (EBC)
- PROPOSED TOP OF CURB (PTC)
- PROPOSED BOTTOM OF CURB (PBC)

ROADWAY/SIDEWALK REPAIR LEGEND

- PROPOSED 4" THICK CONCRETE SIDEWALK PER NYC DOT H-1045 TYPE-I
- PROPOSED 7" THICK CONCRETE SIDEWALK PER NYC DOT H-1045 TYPE-II
- PROPOSED ASPHALT PVMT. IN R.O.W.-3" A.C. WEARING SURFACE AND 6"-9" THICK CONC. BASE (IF DAMAGED DURING CURB INSTALLATION) TO BE EXTENDED AS DIRECTED BY EXAMINER IF REQUIRED.



TYPICAL ROADWAY CROSS SECTION

NYCDOT STANDARD H-1055
N.T.S.

NOTES

1. CONCRETE SIDEWALKS SHOULD BE CONSTRUCTED OF 5' X 5' FLAGS WHERE FEASIBLE. FLAG LINES SHOULD BE STRAIGHT. RUFF SURFACED, CRACKED, DEPRESSED AND OTHER TYPES OF DEFECTED FLAGS MUST BE CORRECTED TO CONFORM TO DOT STANDARDS. HWY RULE, SECTION 4, GENERAL SIDEWALK REQUIREMENTS VIII
2. TRANSVERSE EXPANSION JOINTS SHALL BE ONE-QUARTER (1/4) INCH IN WIDTH MIN. TO (1/2) INCH MAX. AND SHALL BE FILLED WITH PREFORMED JOINT FILLER TO WITHIN ONE (1) INCH OF THE SIDEWALK SURFACE. THE TOP ONE (1) INCH SHALL BE SEALED WITH POURED JOINT FILLER. EXPANSION JOINTS TO BE 20 FEET ON CENTER.
3. EXPANSION JOINTS IN CURB MUST ALIGN WITH EXPANSION JOINTS IN SIDEWALK.

No.	DATE	REVISION
5	10/23/2025	REV. PER UPDATED STREET TREES
4	10/14/2025	50% CD
3	08/22/2025	DOB / HPD SUBMISSION
2	08/01/2025	100% DD SET
1	06/04/2025	ISSUED FOR COORDINATION

KEY CIVIL ENGINEERING
664 BLUE POINT ROAD, UNIT B
HOLTSVILLE, NEW YORK 11742
(631) 961-0506
www.KeyCivilEngineering.com

ALTERATION OR ADDITION TO THIS DOCUMENT EXCEPT BY A LICENSED PROFESSIONAL ENGINEER IS A VIOLATION OF SECTION 7209, SUB-DIVISION 2, OF THE NEW YORK STATE EDUCATION LAW.

35-10 STEINWAY STREET

35-10 STEINWAY STREET, ASTORIA, NEW YORK 11101
BOROUGH & COUNTY OF QUEENS
BLOCK: 668, TAX LOT: 6, ZONING LOTS 5 & 6 MAP: 9b,
ZONE: M1-4/R9, M1-4/R7-3, MX-24
USE GROUP VI (RETAIL) , II

BUILDERS PAVEMENT PLAN
35TH AVENUE PROFILE

SEAL & SIGNATURE:

STATE OF NEW YORK — YURIY TUPYCHAK — 101425 — LICENSED PROFESSIONAL ENGINEER

YURIY TUPYCHAK, P.E.
NYS PROFESSIONAL ENGINEER #101425 - EXPIRES ON 06/30/2027

DATE:	04/15/2025
PROJECT No:	24245
DRAWING BY:	MM
CHK BY:	YT
DWG No:	BPP-003.00
SHEET No:	3 OF 9

STICKER LOCATION

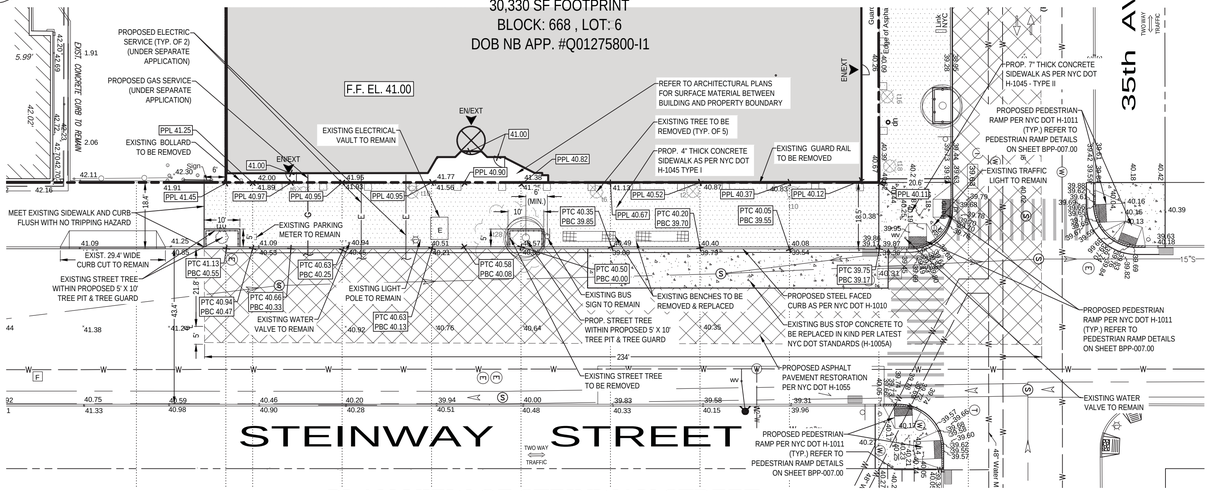
N:\24245_L+M Development Partners_35-18 Steinway Street_Astoria\Drawings\Key Civil\24245_2025.10.23_BPP6_SESC1_CC3_PK3.dwg

Borough: QUEENS	DOT Ref. No.: DOB BPP No.: -------
DOB Ref. No.: Q01275800-I1	SHEET No.: 4 OF 9

LEGEND

EXISTING	ITEM	PROPOSED
	PROPERTY LINE	
	BUILDING	
	STEEL FACED CONCRETE CURB	
	SIGN	
	PARKING METER	
	TRAFFIC LIGHT	
E	ELECTRIC MANHOLE VAULT	
(E)	ELECTRIC MANHOLE COVER	
(T)	TELEPHONE MANHOLE COVER	
(W)	WATER MANHOLE COVER	
	CATCH BASIN	
	BENCHES	
(S)	SEWER MANHOLE COVER	
WV	WATER VALVE	
	UTILITY POLE	
	BOLLARD	
	LIGHT POLE	
	WATER SERVICE	
	GAS SERVICE	G
	ELECTRIC SERVICE	E
	CITY COMBINED SEWER SERVICE	
	TREE	
37.78 / 38.09	TOP/ BOTTOM OF CURB ELEVATION	PTC 37.78 / PBC 37.20
39.53	GRADE ELEVATION	38.03
	PROPERTY LINE ELEVATION	PPL 38.30
	4" THICK CONCRETE SIDEWALK IN RIGHT-OF-WAY	
	7" THICK CONCRETE SIDEWALK IN RIGHT-OF-WAY	
	ASPHALT PAVEMENT REPLACEMENT IN RIGHT-OF-WAY	

PROPOSED RETAIL AND RESIDENTIAL BUILDING
(PC RICHARDS RETAIL STORE)
USE GROUPS: VI (RETAIL) & II
30,330 SF FOOTPRINT
BLOCK: 668 , LOT: 6
DOB NB APP. #Q01275800-I1



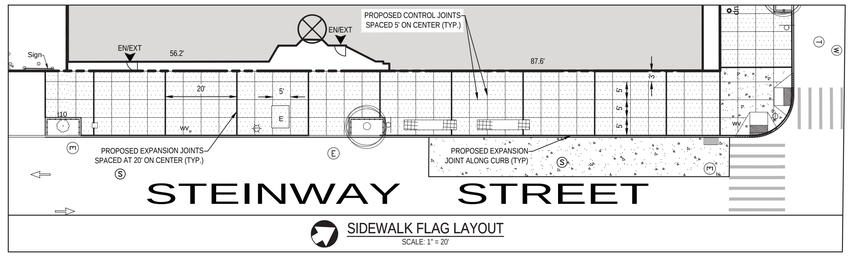
PLAN VIEW OF STEINWAY STREET

SCALE: 1" = 20'

GRAPHIC SCALE

20 0 10 20 40 80

(IN FEET)
1 inch = 20 ft.



SIDEWALK FLAG LAYOUT
SCALE: 1" = 20'

NOTES
1. CONCRETE SIDEWALKS SHOULD BE CONSTRUCTED OF 5' X 5' FLAGS WHERE FEASIBLE. FLAG LINES SHOULD BE STRAIGHT. RUFF SURFACED, CRACKED, DEPRESSED AND OTHER TYPES OF DEFECTED FLAGS MUST BE CORRECTED TO CONFORM TO DOT STANDARDS. HWY RULE, SECTION 4, GENERAL SIDEWALK REQUIREMENTS VIII
2. TRANSVERSE EXPANSION JOINTS SHALL BE ONE-QUARTER (1/4) INCH N WIDTH MIN. TO (1/2) INCH MAX. AND SHALL BE FILLED WITH PREFORMED JOINT FILLER TO WITHIN ONE (1) INCH OF THE SIDEWALK SURFACE. THE TOP ONE (1) INCH SHALL BE SEALED WITH POURED JOINT FILLER. EXPANSION JOINTS TO BE 20 FEET ON CENTER.
3. EXPANSION JOINTS IN CURB MUST ALIGN WITH EXPANSION JOINTS IN SIDEWALK.

ABBREVIATION TABLE

STA	STATION LOCATION
LG	LEGAL GRADE
EPL	EXISTING PROPERTY LINE
ETC	EXISTING TOP OF CURB
EBC	EXISTING BOTTOM OF CURB
ECL	EXISTING CENTERLINE
PPL	PROPOSED PROPERTY LINE
PTC	PROPOSED TOP OF CURB
PBC	PROPOSED BOTTOM OF CURB
PCL	PROPOSED CENTERLINE
CR	CURB REVEAL (IN FT)
RCS	ROADWAY CROSS SLOPE
SCS	SIDEWALK CROSS SLOPE
PGS	PROPOSED GUTTER SLOPE

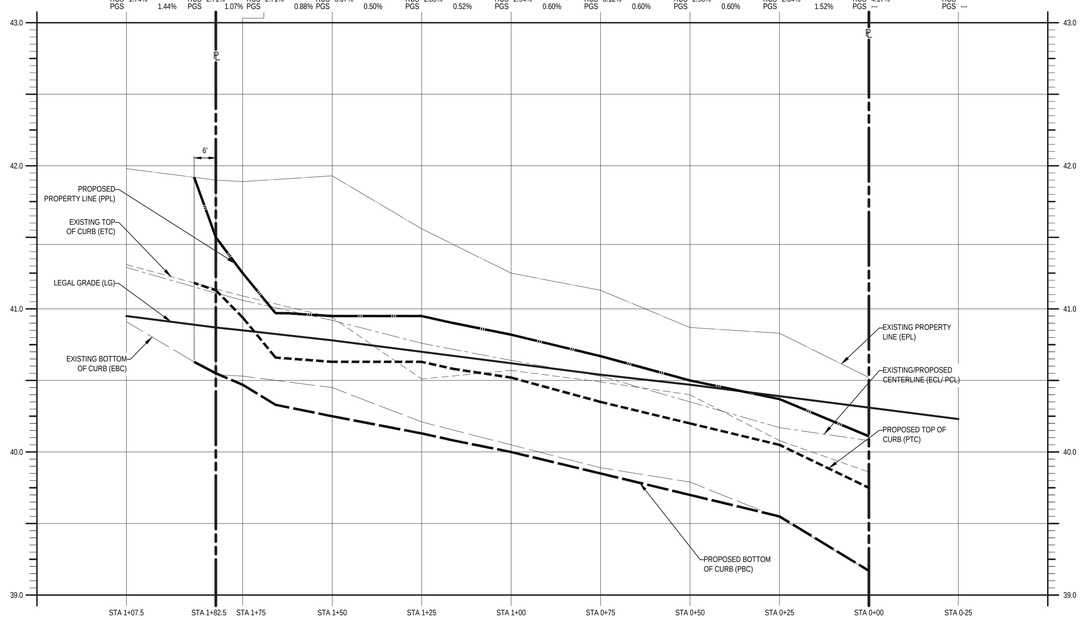
PROFILE LEGEND

- EXISTING PROPERTY LINE (EPL)
- PROPOSED PROPERTY LINE (PPL)
- EXISTING/PROPOSED CENTER LINE (ECL/PCL)
- LEGAL GRADE (LG)
- EXISTING TOP OF CURB (ETC)
- EXISTING BOTTOM OF CURB (EBC)
- PROPOSED TOP OF CURB (PTC)
- PROPOSED BOTTOM OF CURB (PBC)

ROADWAY/SIDEWALK REPAIR LEGEND

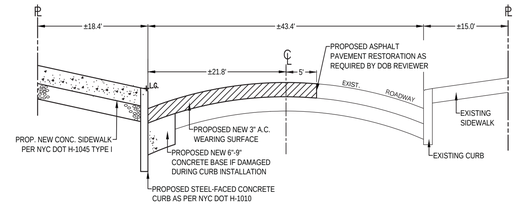
- PROPOSED 4" THICK CONCRETE SIDEWALK PER NYC DOT H-1045 TYPE-I
- PROPOSED 7" THICK CONCRETE SIDEWALK PER NYC DOT H-1045 TYPE-II
- PROPOSED ASPHALT PVMT. IN R.O.W.-3" A.C. WEARING SURFACE AND 6"-9" THICK CONC. BASE (IF DAMAGED DURING CURB INSTALLATION) TO BE EXTENDED AS DIRECTED BY EXAMINER IF REQUIRED.

	STA 2+07.5	STA 1+82.5	STA 1+75	STA 1+50	STA 1+25	STA 1+00	STA 0+75	STA 0+50	STA 0+25	STA 0+00	STA 0-25
LG	40.95	40.87	40.85	40.78	40.70	40.62	40.54	40.47	40.39	40.31	40.23
EPL	41.98	41.90	41.89	41.93	41.56	41.25	41.13	40.87	40.83	40.52	---
ETC	41.31	41.14	41.09	40.94	40.51	40.57	40.49	40.40	40.08	39.86	---
EBC	40.91	40.54	40.53	40.45	40.21	40.06	39.89	39.79	39.54	39.17	---
ECL	41.29	41.14	41.06	40.92	40.76	40.64	40.53	40.35	40.17	40.08	---
PPL	---	41.45	41.25	40.95	40.95	40.82	40.67	40.52	40.37	40.11	---
PTC	---	41.13	40.94	40.63	40.63	40.50	40.35	40.20	40.05	39.75	---
PBC	---	40.55	40.47	40.25	40.13	40.00	39.85	39.70	39.55	39.17	---
PCL	41.29	41.14	41.06	40.92	40.76	40.64	40.53	40.35	40.17	40.08	---
CR	0.40 (4.80")	0.58 (7.00")	0.47 (5.64")	0.38 (4.56")	0.50 (6.00")	0.50 (6.00")	0.50 (6.00")	0.50 (6.00")	0.50 (6.00")	0.58 (7.00")	---
SCS	3.64%	1.74%	1.68%	1.74%	1.75%	1.75%	1.74%	1.74%	1.74%	1.95%	---
RCS	1.74%	2.71%	2.71%	3.07%	2.89%	2.94%	3.12%	2.98%	2.84%	4.17%	---
PGS	1.44%	1.07%	0.88%	0.50%	0.52%	0.60%	0.60%	0.60%	1.52%	---	---



PROFILE OF NORTHWEST CURBLINE OF STEINWAY STREET

SCALE: HORIZONTAL: 1" = 20' / VERTICAL: 1" = 1/2'



TYPICAL ROADWAY CROSS SECTION
NYCDOT STANDARD H-1055
N.T.S.

No.	DATE	REVISION
5	10/23/2025	REV. PER UPDATED STREET TREES
4	10/14/2025	50% CD
3	08/22/2025	DOB / HPD SUBMISSION
2	08/01/2025	100% DD SET
1	06/04/2025	ISSUED FOR COORDINATION

35-10 STEINWAY STREET
35-10 STEINWAY STREET, ASTORIA, NEW YORK 11101
BOROUGH & COUNTY OF QUEENS
BLOCK: 668, TAX LOT: 6, ZONING LOTS 5 & 6 MAP: 9b,
ZONE: M1-4/R9, M1-4/R7-3, MX-24
USE GROUP VI (RETAIL), II

BUILDERS PAVEMENT PLAN
STEINWAY STREET PROFILE

KEY CIVIL ENGINEERING
664 BLUE POINT ROAD, UNIT B
HOLTSVILLE, NEW YORK 11742
(631) 961-0506
www.KeyCivilEngineering.com

ALTERATION OR ADDITION TO THIS DOCUMENT EXCEPT BY A LICENSED PROFESSIONAL ENGINEER IS A VIOLATION OF SECTION 7209, SUB-DIVISION 2, OF THE NEW YORK STATE EDUCATION LAW.

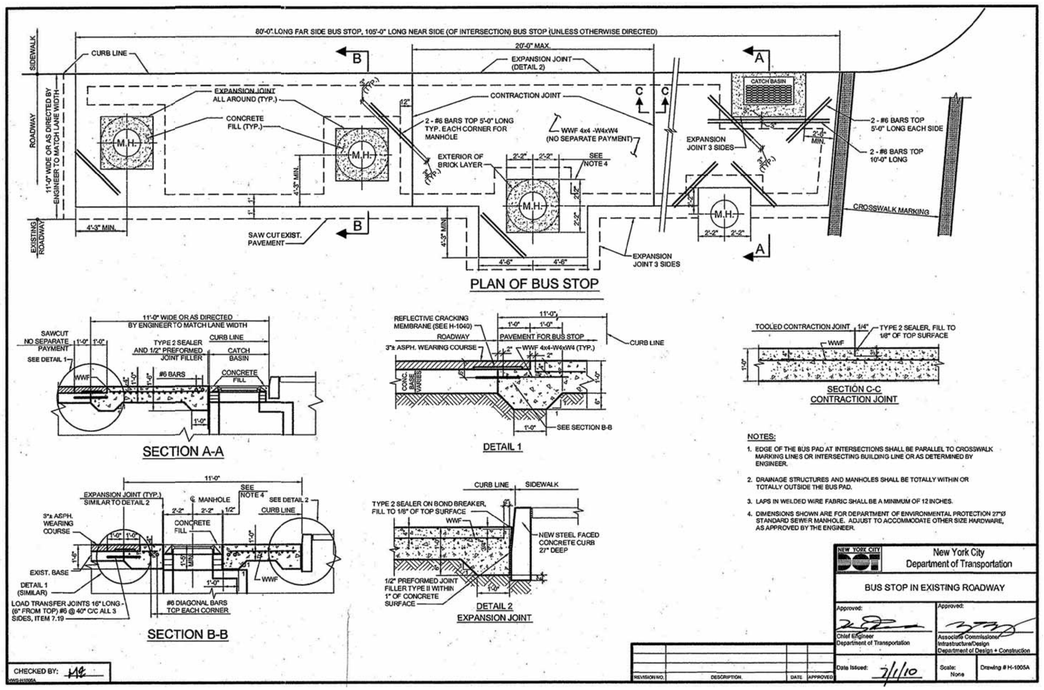
SEAL & SIGNATURE
STATE OF NEW YORK · YURIY TUPYCHAK · 101425 · LICENSED PROFESSIONAL ENGINEER
YURIY TUPYCHAK, P.E.
NYS PROFESSIONAL ENGINEER #101425 - EXPIRES ON 06/30/2027

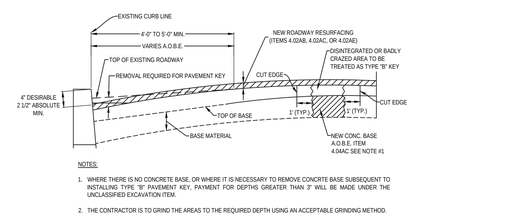
DATE:	04/15/2025
PROJECT No:	24245
DRAWING BY:	MM
CHK BY:	YT
DWG No:	BPP-004.00
SHEET No:	4 OF 9

STICKER LOCATION

N:\24245_L+M Development Partners_35-18 Steinway Street_Astoria\Drawings\Key Civil\24245_2025.10.23_BPP6_SESC1_CC3_PK3.dwg

Borough: QUEENS	DOT Ref. No.: DOB BPP No.: -------
DOB Ref. No.: Q01275800-I1	SHEET No.: 5 OF 9

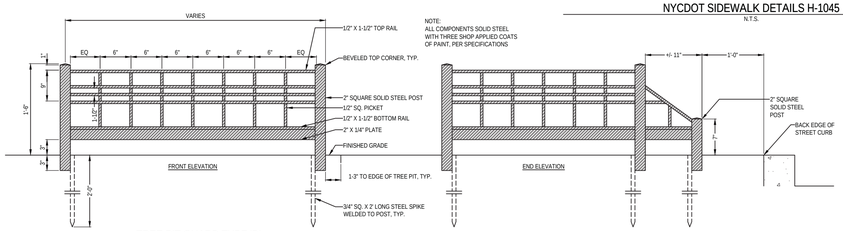




NOTES:

1. WHERE THERE IS NO CONCRETE BASE, OR WHERE IT IS NECESSARY TO REMOVE CONCRTE BASE SUBSEQUENT TO INSTALLING TYPE "B" PAVEMENT KEY, PAYMENT FOR DEPTHS GREATER THAN 2" WILL BE MADE UNDER THE UNCLASSIFIED EXCAVATION ITEM.
2. THE CONTRACTOR IS TO GRIND THE AREAS TO THE REQUIRED DEPTH USING AN ACCEPTABLE GRINDING METHOD.
3. THIS ITEM WHEN ORDERED BY THE ENGINEER WILL BE USED TO ELIMINATE HIGH POINTS IN THE EXISTING PAVEMENT PRIOR TO RESURFACING.
4. (A.O.B.E.) AS ORDERED BY ENGINEER.

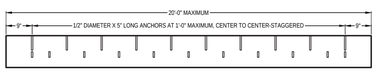
NYCDOT PAVEMENT KEY - TYPE B-2 H-1055
ITEM 4.53, B-2
N.T.S.



TREE PIT GUARD TYPE 'D'
N.T.S.

TYPE 'D' THREE-SIDED DESIGN
N.T.S.

NYC PARKS TREE PIT GUARD TYPE 'D'
N.T.S.

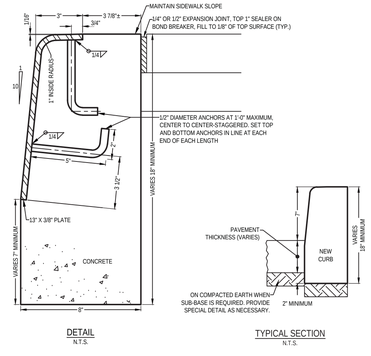


ELEVATION-STEEL FACING
N.T.S.

NOTES:

1. EXPANSION JOINTS IN THE STEEL CURB FACING AND CONCRETE BACKING SHALL BE AT A MAXIMUM SPACING OF 20 FEET.
2. THE EXPANSION JOINTS OF THE CURB AND STEEL CURB FACING SHALL LINE UP WITH THE EXPANSION JOINTS OF THE CONCRETE SIDEWALKS. THE STEEL FACING SHOULD BE SPACED TO MATCH WIDTH OF EXPANSION JOINT.
3. NO PIECE OF STEEL CURB FACING HAVING LESS THAN TWO (2) WELDED DOWELS MAY BE INSTALLED UNLESS IT IS WELDED TO THE ADJACENT STEEL CURB FACING.
4. 1/2" DIAMETER X 5" HEADED ANCHOR STUDS (GRANULAR OR SOLID FLUX FILLED) MAY BE SUBSTITUTED.
5. STRUCTURAL STEEL AS PER ASTM DESIGNATION A-36.
6. SURFACE TO BE CLEANED AND PAINTED AS PER NYCDOT STANDARD HIGHWAY SPECIFICATIONS, SECTION 2.13. COLOR OF TOP COAT SHALL BE GRAY AS APPROVED BY THE ENGINEER.
7. WHERE TWO (2) PIECES OF STEEL CURB FACING ARE JOINED BUT NOT WELDED, TWO (2) ONE-HALF (1/2) INCH RODS, TWENTY FOUR (24) INCHES LONG SHALL BE INSERTED INTO THE CONCRETE BACKING, ONE-HALF (1/2) THE LENGTH AT EACH SIDE OF THE JOINT.
8. CONCRETE TO BE CLASS B-32, AIR-ENTRAINED.
9. CORNER CURB: VERTICAL FACE WILL BE ACCEPTABLE FOR CORNER CURBS PROVIDING THE ENDS ARE WARPED TO FORM A TRANSITION WITH THE ADJACENT BATTERED FACE CURBS.

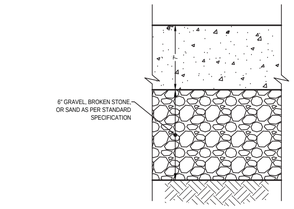
NYCDOT STEEL FACED CURB H-1010
N.T.S.



DETAIL
N.T.S.

TYPICAL SECTION
N.T.S.

NYCDOT STEEL FACED CURB H-1010
N.T.S.

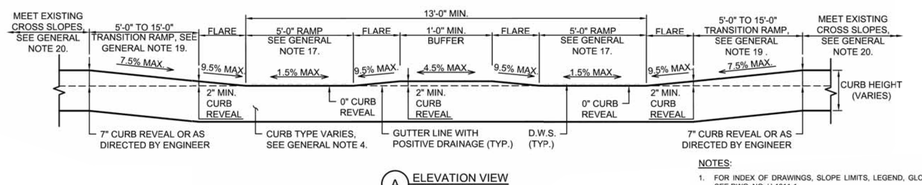


TYPE II - SIDEWALK, IN DRIVEWAYS AND IN CORNER QUADRANTS
N.T.S.

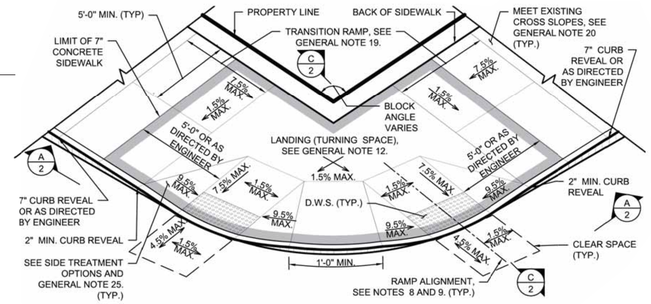
NOTES:

1. ALL MATERIALS AND CONSTRUCTION METHODS USED ARE TO CONFORM TO SECTION #4.13 OF THE NYC DEPARTMENT OF TRANSPORTATION (DOT) STANDARD HIGHWAY SPECIFICATIONS.
2. CONCRETE SIDEWALKS SHOULD BE CONSTRUCTED OF 5' X 5' FLAGS WHERE FEASIBLE. FLAG LINES SHOULD BE STRAIGHT. RUFF SURFACED, CRACKED, DEPRESSED AND OTHER TYPES OF DEFECTED FLAGS MUST BE CORRECTED TO CONFORM TO DOT STANDARDS. HWY RULE, SECTION 4, GENERAL SIDEWALK REQUIREMENTS VIII.

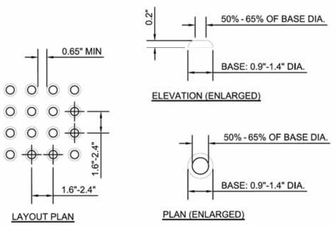
NYCDOT SIDEWALK DETAILS H-1045
N.T.S.



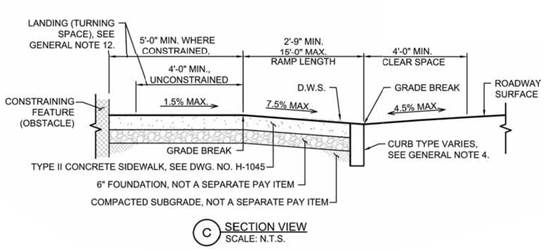
A ELEVATION VIEW
SCALE: N.T.S.



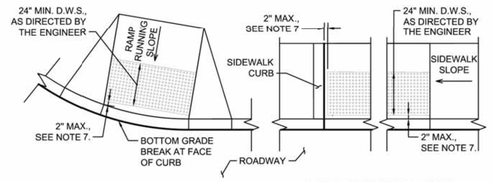
C1 CASE C1 - PERPENDICULAR - ISOMETRIC VIEW
SCALE: N.T.S.



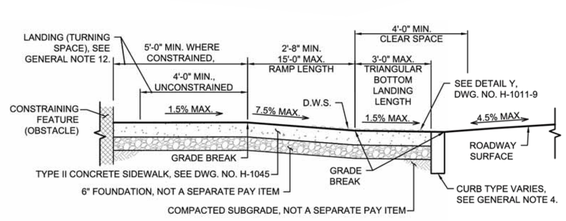
Z DETECTABLE WARNING DOMES - DETAIL
SCALE: N.T.S.



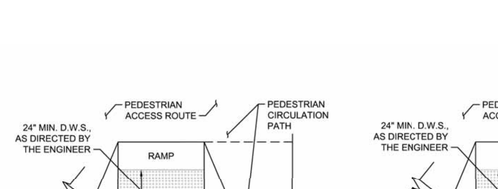
C SECTION VIEW
SCALE: N.T.S.



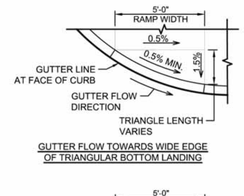
W D.W.S. PLACEMENT - PLAN DETAIL
SCALE: N.T.S.



D SECTION VIEW
SCALE:N.T.S.



Y D.W.S. PLACEMENT AT DIRECTIONAL RAMP - PLAN DETAIL
SCALE: N.T.S.



B TRIANGULAR BOTTOM LANDING GRADING DETAILS - PLAN
SCALE: N.T.S.

NOTES:

1. FOR INDEX OF DRAWINGS, SLOPE LIMITS, LEGEND, GLOSSARY, GENERAL NOTES, SEE DWG. NO. H-1011-1.

DETECTABLE WARNING SURFACE (D.W.S.) NOTES:

2. D.W.S. MUST BE INSTALLED AT ALL FLUSH CURB LOCATIONS, WHERE THE PEDESTRIAN CIRCULATION PATH CROSSES A ROADWAY, RAILWAY, OR TRAFFIC CONTROLLED DRIVEWAY.
3. D.W.S. MUST BE INSTALLED ACROSS THE FULL WIDTH OF FLUSH CURB, INCLUDING FULL RAMP WIDTH, FULL BOTTOM LANDING WIDTH, FULL BLENDED TRANSITION WIDTH, AND FULL CUT-THROUGH WIDTH (WHERE APPLICABLE).
4. D.W.S. MUST BE INSTALLED ACROSS THE FULL WIDTH OF THE PEDESTRIAN CIRCULATION PATH, AT ANY STOP, YIELD CONTROLLED, OR SIGNALIZED DRIVEWAY. D.W.S. MUST NOT BE INSTALLED AT UNCONTROLLED DRIVEWAYS.
5. D.W.S. MUST BE INSTALLED FOR A MINIMUM LENGTH OF 24 INCHES IN THE DIRECTION OF PEDESTRIAN TRAVEL. D.W.S. MUST BE INSTALLED OR OMITTED AT ISLAND AND MEDIAN CUT THROUGHS IN ACCORDANCE WITH NOTE 12 ON DWG. NO. H-1011-6, AS DIRECTED BY THE ENGINEER.
6. TO PROVIDE A CONTINUOUS DETECTABLE EDGE BETWEEN THE PEDESTRIAN CIRCULATION PATH AND THE ROADWAY AT THE FLUSH CURB OF A DIRECTIONAL RAMP, THE D.W.S. MUST BE INSTALLED AS FOLLOWS, AS DIRECTED BY THE ENGINEER.
   6.1. WHEN THE TRIANGULAR BOTTOM LANDING OF A DIRECTIONAL RAMP ADJOINS A PEDESTRIAN CIRCULATION PATH ON THE SIDEWALK, THE D.W.S. MUST BE INSTALLED ON THE RAMP AND THE TRIANGULAR BOTTOM LANDING WITH THE FOLLOWING EXCEPTION: D.W.S. MAY BE OMITTED FROM THE TRIANGULAR BOTTOM LANDING AT LOCATIONS WHERE VERTICAL OBSTRUCTIONS TO PEDESTRIAN TRAVEL ARE LOCATED NO MORE THAN 18 INCHES (18") FROM THE WIDE EDGE OF THE TRIANGULAR BOTTOM LANDING.
   6.2. WHEN THE TRIANGULAR BOTTOM LANDING OF A DIRECTIONAL RAMP ADJOINS A NON-WALKABLE AREA ON THE SIDEWALK, THE D.W.S. MAY BE OMITTED FROM THE TRIANGULAR BOTTOM LANDING.
7. WHERE PROPOSED AT THE BACK OF CURB, D.W.S. MUST BE INSTALLED WITH A TWO INCH (2") MAXIMUM OFFSET FROM THE EXPANSION JOINT OR TOOLED RADIUS.
8. D.W.S. MUST BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDED PROCEDURES AS DIRECTED BY THE ENGINEER. D.W.S. MAY BE CUT OR TRIMMED TO MEET THE REQUIREMENTS OF THIS DETAIL, AS DIRECTED AND APPROVED BY THE ENGINEER.
9. THE DETAILS PROVIDED ARE NOT DRAWN TO SCALE. THE QUANTITY OF TRUNCATED DOMES DEPICTED ON THE D.W.S. IS FOR ILLUSTRATION ONLY.
10. D.W.S. MUST PROVIDE COLOR CONTRAST WITH THE ADJOINING SIDEWALK. FOR D.W.S. REQUIREMENTS INCLUDING COLOR CONTRAST, SEE NYC DOT STANDARD HIGHWAY SPECIFICATION ITEM NO. 4.13 DE.
11. ON SLOPES OF FIVE PERCENT (5%) OR GREATER, TRUNCATED DOMES MUST BE ALIGNED WITH THE LOWER GRADE BREAK OF THE RAMP. ON SLOPES LESS THAN FIVE PERCENT (5%), TRUNCATED DOMES DO NOT NEED TO BE ALIGNED WITH THE LOWER GRADE BREAK OF THE RAMP.
12. D.W.S. MUST BE PROVIDED AT RAILROAD CROSSING IN ACCORDANCE WITH NEW YORK STATE AND FEDERAL RAILROAD ADMINISTRATION REQUIREMENTS. D.W.S. LAYOUT AT RAILROAD CROSSINGS MUST BE SUBMITTED TO NYSDOT FOR REVIEW AND APPROVAL PRIOR TO ITS CONSTRUCTION.
13. EMBEDDED D.W.S. MUST BE INSTALLED ON A PLANAR SURFACE TO PREVENT WARPING. ANY CROSS SLOPE TRANSITIONS (WARPING) WITHIN A RAMP OR TURNING SPACE MUST BE EXCLUSIVE OF THE D.W.S., AT A MAXIMUM RATE OF ONE PERCENT (1.0%) PER LINEAR FOOT.
14. PRE-FABRICATED RADIAL D.W.S. MAY BE USED FOR RADIAL D.W.S. PLACEMENT. WHERE PROCUREMENT OF PRE-FABRICATED RADIAL D.W.S. IS NOT FEASIBLE, RECTANGULAR TILE ARRAYS MAY BE USED TO PROVIDE RADIAL D.W.S. PLACEMENT, AS DIRECTED BY THE ENGINEER, WHERE USED. RADIAL D.W.S. OF ANY TYPE MUST MEET ALL APPLICABLE REQUIREMENTS ON THIS SHEET, INCLUDING DOME SPACING.
15. DETECTABLE WARNING DOMES (TRUNCATED DOMES) MUST MEET THE REQUIREMENTS OF DETAIL Z.
16. WHERE AN EXISTING UTILITY CASTING IS LOCATED WITHIN THE PROPOSED LOCATION OF A D.W.S., THE CONTRACTOR MAY CUT THE D.W.S. TO ACCOMMODATE THE UTILITY CASTING; SEE NOTE 5.

NOTES:

1. FOR INDEX OF DRAWINGS, SLOPE LIMITS, LEGEND, GLOSSARY, GENERAL NOTES, SEE DWG. NO. H-1011-1.
2. FOR DETECTABLE WARNING SURFACES (D.W.S.), SEE DWG. NO. H-1011-9.
3. FOR OBJECTS IN THE FLARE, EXAMPLE SCORING PATTERNS, EXAMPLE SIDEWALK CURBS AT RAMPS, AND MEETING NON-COMPLIANT SLOPES SEE DWG. NO. H-1011-8.
4. CASE C1 AND C2 MAY BE USED WHERE ARC LENGTH BETWEEN EDGE OF OUTSIDE RAMPS, EXCLUDING FLARES, IS 13 FEET *OR GREATER*.
5. FOR LOCATIONS WHERE PEDESTRIAN CIRCULATION PATH IS EIGHT FEET (8') OR GREATER BUT SITE CONSTRAINTS PROHIBIT CONSTRUCTION OF CASE C1 OR CASE C2, CASE C5 MAY BE USED.
6. FOR CASE C1 AND C2, IF ONE SIDE OF A CORNER DOES NOT LEAD TO A MARKED OR UNMARKED CROSSWALK, THE RAMP AT THAT SIDE MAY BE OMITTED AS DIRECTED BY THE ENGINEER.

CASE C1 - PERPENDICULAR NOTES:

7. CASE C1 MAY BE USED WHERE THE PEDESTRIAN CIRCULATION PATH WIDTH IS EQUAL TO OR GREATER THAN EIGHT FEET (8').
8. CASE C1 SHOULD BE ALIGNED PARALLEL TO THE CROSSWALK DIRECTION TO THE MAXIMUM EXTENT FEASIBLE. TO ACHIEVE THIS, CASE C1 MAY BE PLACED OUTSIDE OF THE CURB RETURN RADIUS.
9. CASE C1 SHOULD NOT BE USED WHERE PLACEMENT WOULD RESULT IN RAMP ALIGNMENT GREATER THAN 45 DEGREES (45°) FROM THE DIRECTION OF THE CROSSWALK.

CASE C2 - DIRECTIONAL NOTES:

10. CASE C2 RAMPS SHOULD BE ALIGNED PARALLEL WITH THEIR RESPECTIVE CROSSWALKS.
11. CASE C2 SHOULD BE CONSIDERED FOR DESIGN AND LAYOUT IF THE SELECTION CRITERIA IN TABLE 2 BELOW ARE APPLICABLE. FOR A FIVE FOOT (5') WIDE RAMP AT A CORNER WITH A TWELVE FOOT (12') CURB RETURN RADIUS.
12. TRIANGULAR BOTTOM LANDING GRADING SHOWN IN DETAIL B, SHOULD BE USED WITH CASE C2.
13. DETECTABLE WARNING SURFACES ON CASE C2 MUST BE INSTALLED IN ACCORDANCE WITH REQUIREMENTS FOR DIRECTIONAL RAMPS SHOWN IN DETAIL Y, SHEET H-1011-9.

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1	06/04/2025	ISSUED FOR COORDINATION

35-10 STEINWAY STREET
35-10 STEINWAY STREET, ASTORIA, NEW YORK 11101
BOROUGH & COUNTY OF QUEENS
BLOCK: 668, TAX LOT: 6, ZONING LOTS 5 & 6 MAP: 9b,
ZONE: M1-4/R9, M1-4/R7-3, MX-24
USE GROUP VI (RETAIL) , II

BUILDERS PAVEMENT PLAN DETAILS

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SEAL & SIGNATURE
STATE OF NEW YORK YURIY TUPYCHAK 101425 LICENSED PROFESSIONAL ENGINEER

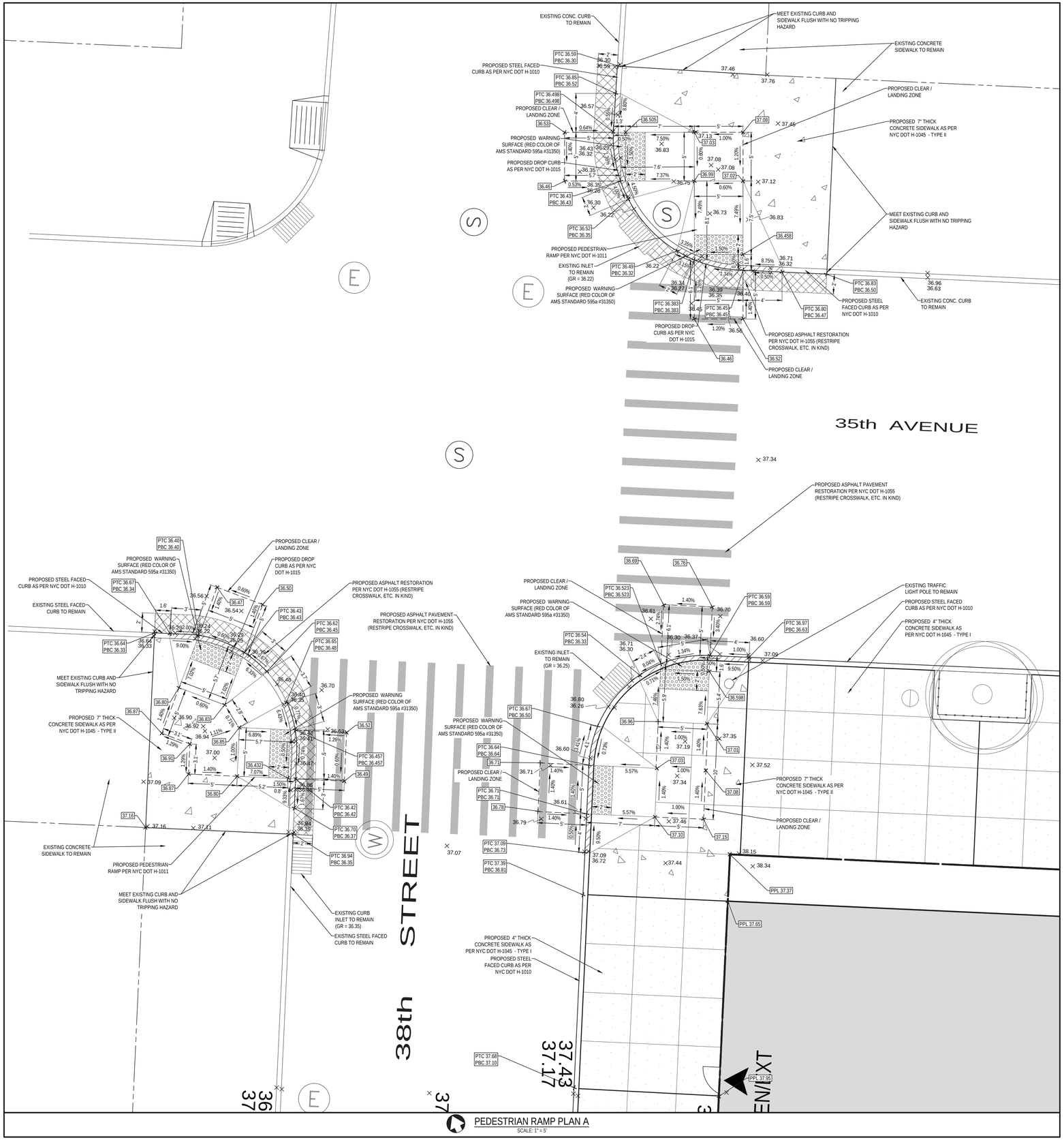
YURIY TUPYCHAK, P.E.
NYS PROFESSIONAL ENGINEER #101425 : EXPIRES ON 06/30/2027

DATE:	04/15/2025
PROJECT No:	24245
DRAWING BY:	MM
CHK BY:	YT
DWG No:	BPP-005.00
SHEET No:	5 OF 9

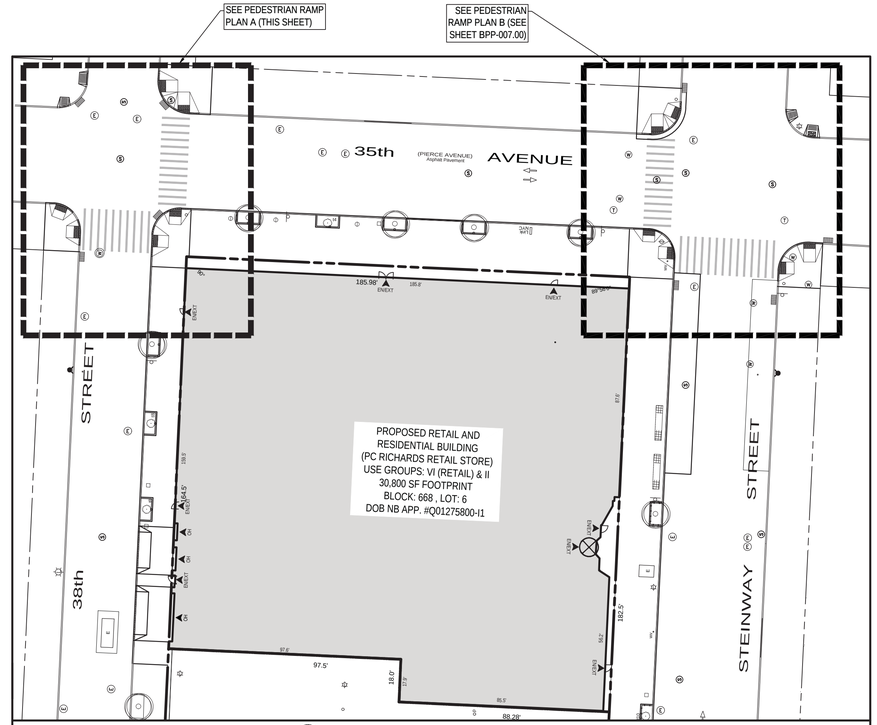
STICKER LOCATION

N:\24245_L+M Development Partners_35-18 Steinway Street_Astoria\Drawings\Key Civil\24245_2025.10.23_BPP6_SESC1_CC3_PK3.dwg

Borough: QUEENS	DOT Ref. No.: DOB BPP No.: --------
DOB Ref. No.: Q01275800-I1	SHEET No.: 6 OF 9



PEDESTRIAN RAMP PLAN A
SCALE: 1" = 5'



PEDESTRIAN RAMP PLAN LOCATION
SCALE: 1" = 30'

GENERAL GUIDELINES:

- MINIMUM PEDESTRIAN RAMP WIDTH IS FIVE FEET (5'). NARROWER RAMPS CANNOT BE PROPOSED WITHOUT NYC DOT APPROVAL.
- DOT STANDARD IS MINIMUM 5'X5' CLEAR SPACE AT TOP OF PEDESTRIAN RAMP WITH MAXIMUM RUNNING AND CROSS SLOPES OF 2.0%. HOWEVER CLEAR SPACE CAN BE REDUCED TO FOUR FEET (4') IF LANDING IS UNCONSTRAINED ON ALL SIDES.
- CLEAR SPACE AT BOTTOM OF PEDESTRIAN RAMP MUST EXTEND MINIMUM FOUR FEET (4') AND MUST BE ENTIRELY WITHIN THE CROSSWALK (OR STRIPING WHERE PRESENT). INDICATE ALL REQUIRED CLEARANCES ON BPP DRAWINGS.
- TRANSITION MUST BE FLUSH AT ALL GRADE BREAKS (NO LIP AT BOTTOM OF RAMP). DESIGN CURB REVEAL SHOULD BE 0 INCHES ALTHOUGH ALLOWABLE CONSTRUCTION TOLERANCE IS ½" MAXIMUM.
- WHERE THE SIDE OF A PEDESTRIAN RAMP ADJOINS A PEDESTRIAN CIRCULATION PATH, A SIDE FLARE MUST BE CONSTRUCTED WITH A SLOPE NO GREATER THAN 9.5%. WHERE THE SIDE OF A PEDESTRIAN RAMP ADJOINS A NON-WALKABLE AREA, A SIDE FLARE MAY BE CONSTRUCTED WITH A SLOPE NO GREATER THAN 24.5%, OR A SIDEWALK CURB MAY BE CONSTRUCTED, AS DIRECTED BY THE ENGINEER.
- DETECTABLE WARNING SURFACES PLACEMENT SHOULD BE PLACED AS CLOSE TO THE BACK OF CURB OR BOTTOM GRADE BREAK AS FEASIBLE.
- PER NYC DOT HIGHWAY SPECIFICATIONS 2022. SECTION 4.13 DWS, DETECTABLE WARNING SURFACE SHALL BE AN APPROXIMATE VISUAL MATCH TO RED COLOR OF SAE STANDARD AMS-STD-595 #31350. WHEN ADJOINING LIGHT-COLORED SIDEWALKS, SUCH AS UNPIGMENTED CONCRETE. DETECTABLE WARNING SURFACE SHALL BE AN APPROXIMATE VISUAL MATCH TO THE BRIGHT WHITE OF SAE STANDARD AMS-STD-595 #27925, WHEN ADJOINING DARK COLORED SURFACES, SUCH AS PIGMENTED CONCRETE IN LANDMARK DISTRICTS, ASPHALT PAVERS, OR BLUESTONE.

No.	DATE	REVISION
5	10/23/2025	REV. PER UPDATED STREET TREES
4	10/14/2025	50% CD
3	08/22/2025	DOB / HPD SUBMISSION
2	08/01/2025	100% DD SET
1	06/04/2025	ISSUED FOR COORDINATION

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35-10 STEINWAY STREET

35-10 STEINWAY STREET, ASTORIA, NEW YORK 11101
BOROUGH & COUNTY OF QUEENS
BLOCK: 668, TAX LOT: 6, ZONING LOTS 5 & 6 MAP: 9b,
ZONE: M1-4/R9, M1-4/R7-3, MX-24
USE GROUP VI (RETAIL) , II

PEDESTRIAN RAMPS PLAN I

SEAL & SIGNATURE

STATE OF NEW YORK · YURIY TUPYCHAK · 101425 · LICENSED PROFESSIONAL ENGINEER

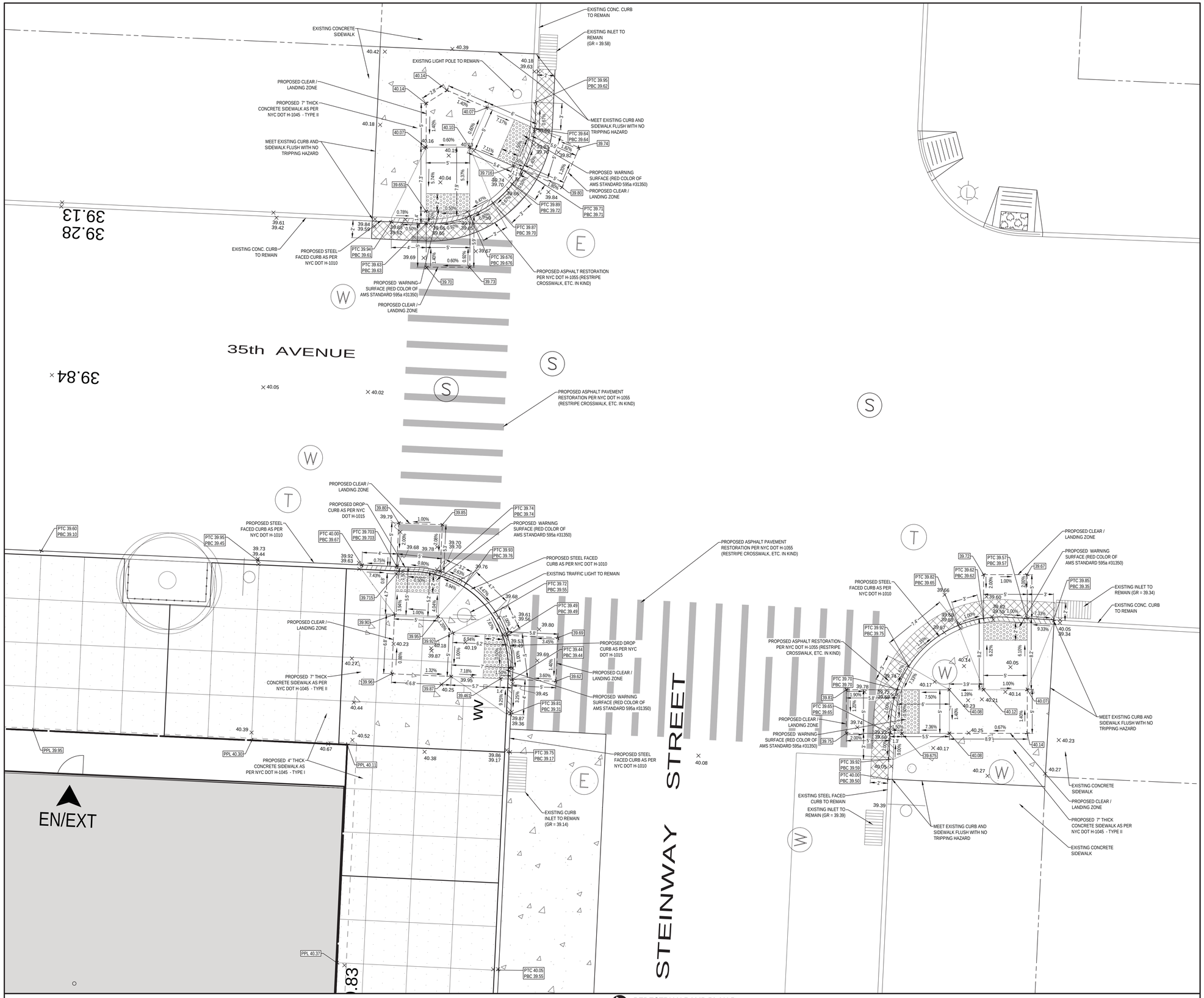
YURIY TUPYCHAK, P.E.
NYS PROFESSIONAL ENGINEER #101425 - EXPIRES ON 06/30/2027

DATE:	04/15/2025
PROJECT No:	24245
DRAWING BY:	MM
CHK BY:	YT
DWG No:	BPP-006.00
SHEET No:	6 OF 9

STICKER LOCATION

N:\24245_L+M Development Partners_35-10 Steinway Street_Astoria\Drawings\Key Civil\24245_2025.10.23_BPP6_SESC1_CC3_PK3.dwg

Borough: QUEENS	DOT Ref. No.: DOB BPP No.: -------
DOB Ref. No.: Q01275800-I1	SHEET No.: 7 OF 9



PEDESTRIAN RAMP PLAN B
SCALE: 1" = 5'

No.	DATE	REVISION
5	10/23/2025	REV. PER UPDATED STREET TREES
4	10/14/2025	50% CD
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35-10 STEINWAY STREET

35-10 STEINWAY STREET, ASTORIA, NEW YORK 11101
BOROUGH & COUNTY OF QUEENS
BLOCK: 668, TAX LOT: 6, ZONING LOTS 5 & 6 MAP: 9b,
ZONE: M1-4/R9, M1-4/R7-3, MX-24
USE GROUP VI (RETAIL) , II

PEDESTRIAN RAMPS PLAN II

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YURIY TUPYCHAK, P.E.
NYS PROFESSIONAL ENGINEER #101425 : EXPIRES ON 08/31/2027

DATE:	04/15/2025
PROJECT No:	24245
DRAWING BY:	MM
CHK BY:	YT
DWG No:	BPP-007.00
SHEET No:	7 OF 9

STICKER LOCATION

Borough: QUEENS	DOT Ref. No.: DOB BPP No.: -------
DOB Ref. No.: Q01275800-I1	SHEET No.: 8 OF 9

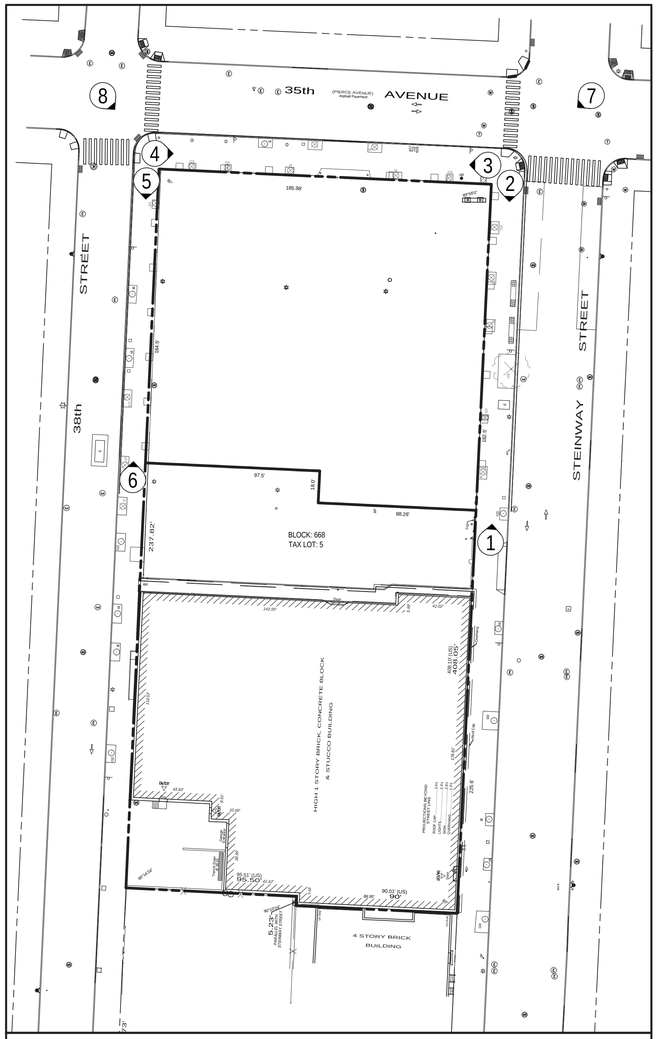

PHOTO LOCATION MAP
SCALE: 1" = 40'

PHOTO 1

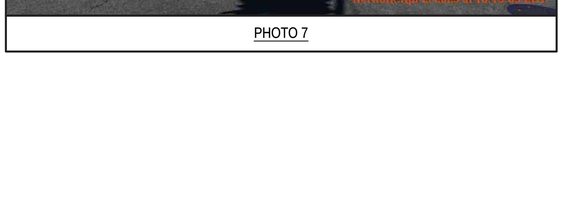

PHOTO 2

PHOTO 7

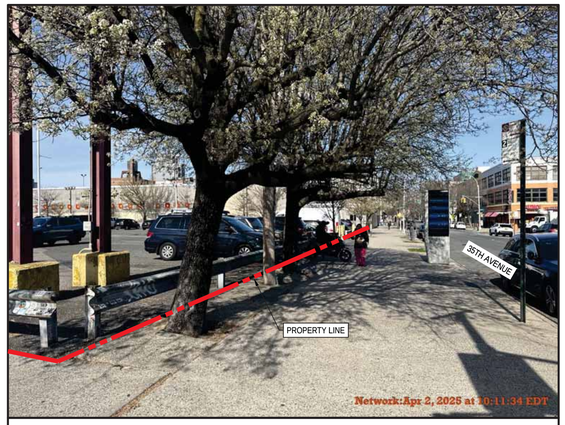

PHOTO 3

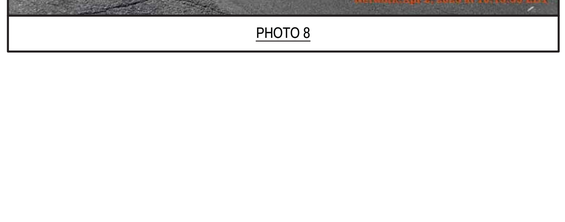

PHOTO 4

PHOTO 8

PHOTO 5

PHOTO 6

No.	DATE	REVISION
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BPP PHOTOS I

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SEAL & SIGNATURE
STATE OF NEW YORK · YURIY TUPYCHAK · 101425 · LICENSED PROFESSIONAL ENGINEER
YURIY TUPYCHAK, P.E.
NYS PROFESSIONAL ENGINEER | STATUS - EXPIRES ON 06/30/2027

DATE:	04/15/2025
PROJECT No:	24245
DRAWING BY:	MM
CHK BY:	YT
DWG No:	BPP-008.00
SHEET No:	8 OF 9

STICKER LOCATION

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Borough: QUEENS	DOT Ref. No.: DOB BPP No.: -------
DOB Ref. No.: Q01275800-I1	SHEET No.: 9 OF 9

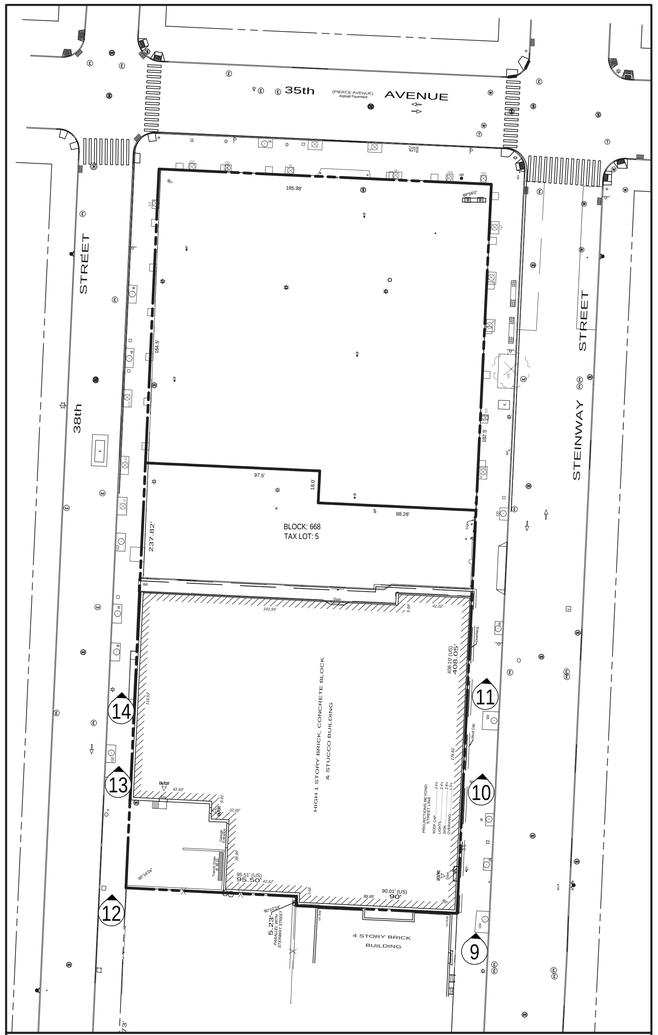

PHOTO LOCATION MAP
SCALE: 1" = 40'

PHOTO 9

PHOTO 10

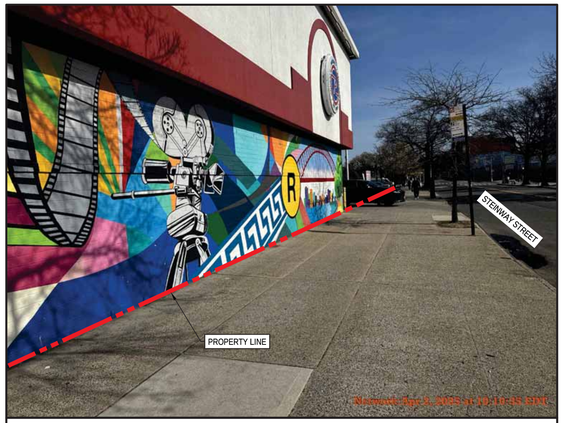

PHOTO 11

PHOTO 12

PHOTO 13

PHOTO 14

No.	DATE	REVISION
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35-10 STEINWAY STREET

35-10 STEINWAY STREET, ASTORIA, NEW YORK 11101
BOROUGH & COUNTY OF QUEENS
BLOCK: 668, TAX LOT: 6, ZONING LOTS 5 & 6 MAP: 9b,
ZONE: M1-4/R9, M1-4/R7-3, MX-24
USE GROUP VI (RETAIL) , II

BPP PHOTOS II

SEAL & SIGNATURE

STATE OF NEW YORK · YURIY TUPYCHAK · 101425 · LICENSED PROFESSIONAL ENGINEER

YURIY TUPYCHAK, P.E.
NYS PROFESSIONAL ENGINEER #101425 - EXPIRES ON 06/30/2027

DATE:	04/15/2025
PROJECT No:	24245
DRAWING BY:	MM
CHK BY:	YT
DWG No:	BPP-009.00
SHEET No:	9 OF 9

STICKER LOCATION

Appendix B: Calculations

Documents included:

☐ Erosion and Sediment Control Practice Calculations, showing that the project meets ESC requirements and that practices have been sized in accordance with the NYS DEC Standards and Specifications for Erosion and Sediment Control

☒ Design Calculation Sheet, including:

- Required Site WQ_v
- Required Practice WQ_v for each practice
- Target Site RR_v
- Minimum site RR_v
- Site V_v, Q_{DRR}, Cp_v, Q_f, Q_p, if applicable
- Practice storage volume V_{SMP}
- Performance of practice to meet WQ_v, RR_v, V_V, and Q_{DRR}
- Summary table showing the project meets requirements at the site and practice levels.

☐ NYC MS4 No-Net-Increase Calculator for Nitrogen (NYC SWM Appendix B), if applicable.

☐ Detention in Series Workbook (NYC SWM Appendix G), if applicable.

☐ Hydrologic and hydraulic analyses

If any of the above documents are not included, explain why below:

Erosion and Sediment Control Practice Calculations: Not applicable for this project. The project only proposes standard Erosion & Sediment Control measures.

NYC MS4 No-Net-Increase Calculator for Nitrogen: Not applicable for this project. The project is not located within an MS4 area.

Detention in Series Workbook: Not applicable for this project. No Detention in Series proposed.

Hydrologic and hydraulic analyses: Not applicable for this project. The design calculation sheet is already sufficient.

Design Calculations Sheet

AREA BREAKDOWN

Total Site Area = 0.738 Acres (32,167 sf)

Total Area of Disturbance = 1.347 Acres (58,655 sf) (includes R.O.W. area)

EXISTING CONDITIONS

Building Area = 0.0 Acres (0 sf)

Impervious Area = 0.738 Acres (32,167 sf)

Pervious Area = 0.0 Acres (0 sf)

PROPOSED CONDITIONS

Standard Roof = 0.633 Acres (27,593 sf)

Green Roof = 0.080 Acres (3,481 sf)

Impervious Area = 0.025 Acres (1,093 sf)

TIER I SMP GREEN ROOF CALCULATIONS (SMP ID NO.:)

Green Roof Area: 0.080 Acres (3,481 sf)

Design of Stormwater Management Practice:

Step 1: Calculate the WQv:

I = 3,481 / 3,481 = 1.00 * 100 = 100

RV = 0.05 + 0.009 (I) = 0.05 + (0.009*100) = 0.95

$$WQv = \frac{1.5" * Rv * A}{12}$$

$$WQv = \frac{1.5" * 0.95 * 3{,}481}{12}$$

- $WQv = 413.37$ cf

The WQv for the site is being treated by the green roof.

Step 2: Calculate the volume of surface ponding:

Green roofs are fast draining and typically do not pond water. Any ponding that does occur would not be stored long enough for evapotranspiration. Therefore, the volume of surface ponding is zero.

- $V_p = 0$ cf

Step 3: Calculate the volume of voids in the soil media layer:

$V_s = A_{SMP} * D_s * n_s$ [Eqn. 4.4 from NYC Stormwater Manual]

where:

V_s = volume of voids in the soil media layer

A_{SMP} = area of the green roof = 3,481 SF

D_s = depth of soil media layer = 0.667 ft

n_s = available porosity of soil media = 0.2 cf/cf

- V_s = 3,481 SF * 0.667 ft * 0.2 cf/cf = 464.37 cf

Step 4: Calculate the volume of voids created by internal structures:

Assume there are no internal structures in this green roof practice, so the volume is 0.

- $V_I = 0$ cf

Step 5: Calculate the volume of voids in the drainage layer:

The active storage zone for a green roof is considered from the base of the soil media up, so the storage volume of the drainage layer is zero.

- $V_D = 0$ cf

Step 6: Calculate the total SMP volume from the individual component volumes and compare to WQv:

$V_{SMP} = V_P + V_S + V_I + V_D$

$V_{SMP} = 0$ cf + 464.37 cf + 0 cf + 0 cf

- $V_{SMP} = 464.37$ cf $> WQv = 413.37$ cf

The WQv for the portion of the green roof area is being treated by the green roof.

TIER III - DETENTION SYSTEM CALCULATIONS (SMP ID NO.:)

Design detention system that will fully detain the WQ event for CSS area.

Step 1: Calculate the WQv and RRv for the Detention System

I = 32,167 / 32,167 = 1.00 * 100 = 100

RV = 0.05 + 0.009 (I) = 0.05 + (0.009 * 100) = 0.95

$$WQv = \frac{1.5" * Rv * A}{12}$$

$$WQv = \frac{1.5" * 0.95 * 32{,}167}{12}$$

- $WQv = 3{,}819.83$ cf

Post-development total impervious area is less than pre-development total impervious area; therefore

- $RRv\ Min. = 0$

Step 2: Calculate the Sewer Operations Volume.

Cw = [(27,593 SF * 0.95) + (1,093 SF * 0.85) + (3,481 SF * 0.70)] / 32,167 SF = 0.920

$$Vv = \frac{R_D}{12} * A * Cw = \frac{1.85}{12} * 32{,}167 * 0.920$$

- $Vv = 4{,}562.35\ cf$

Total Detention Volume Required = $4{,}562.35\ cf$

Step 3: Calculate the volume of surface ponding:

There is no surface ponding associated with detention tank since the SMP is below ground level, so the volume is zero.

- $V_p = 0$ cf

Step 4: Calculate the volume of voids in the soil media layer.

There is no soil media associated with a detention tank, so the volume is zero.

- $V_s = 0$ cf

Step 5: Calculate the volume of voids created by internal structures.

V_I = 1,128 sf * 4.07 ft = 4,590.96 cf

Step 6: Calculate the volume of voids in the drainage layer using a drainage media depth.

There is no drainage layer associated with detention tank, so the volume of voids in the drainage layer is zero.

- $V_D = 0$ cf

Step 7: Calculate the total SMP volume from the individual component volumes and compare to WQv:

$V_{SMP} = V_p + V_s + V_I + V_D$

V_{SMP} = 0 cf + 0 cf + 4,590.96 cf + 0 cf

- V_{SMP} = 4,590.96 cf > $Vv\ Required = 4{,}562.35\ cf > WQv = 3{,}819.83$ cf

Step 8: Check the detention tank drawdown time does not exceed the requirement time of 72 hours:

Drawdown Time Calculation:

$$dt_{SMP} = \frac{V_{SMP}}{0.5 C_D A_O \sqrt{2gH}} * \frac{1}{3600}$$

where:

dt_{SMP} = drawdown time of detention SMP (hr)

V_{SMP} = volume of detention SMP (cf)

C_D = coefficient of discharge; 0.52 (re-entrant)

A_O = area of the orifice (ft^2)

g = acceleration due to gravity, 32.2 (ft/s^2)

H = maximum hydraulic head above the centerline of the orifice (ft)

$A_O = \pi r^2 = \pi * (\frac{0.5}{12})^2$ = 0.0055 ft^2

H = 4.07 ft

$$dt_{SMP} = \frac{4{,}590.96}{0.5*0.52*0.0055*\sqrt{2*32.2*4.07}} * \frac{1}{3600}$$

dt_{SMP} = 55.37 hours < Max. Drawdown Time = 72 hours

Orifice Sizing Calculation:

$Q_O = C_D * A_O * \sqrt{2gH}$

where:

Q_O = maximum release rate of orifice (cfs)

C_D = coefficient of discharge; 0.61 (flush), 0.52 (re-entrant), or 0.73 (long re-entrant)

A_O = area of the orifice (ft^2)

g = acceleration due to gravity, 32.2 (ft/s^2)

H = maximum hydraulic head above the centerline of the orifice (ft)

Q_O = 0.52 * 0.0055 ft^2 * $\sqrt{2 * 32.2 * 4.07}$

Q_O = 0.046 cfs = Q_{DRR} = 0.046 cfs

The WQv for the entire site is being controlled by the detention tank and green roof

TOTAL CHANNEL PROTECTION STORAGE VOLUME (CPV, 1-YEAR STORM VOLUME):

The need to provide channel protection has been waived since the site discharges are detained on-site via a detention system and combined sewers front the subject site.

TOTAL OVERBANK FLOOD CONTROL CRITERIA (QP, 10-YEAR RUNOFF VOLUME), TOTAL EXTREME FLOOD CONTROL CRITERIA (QF, 100-YEAR RUNOFF VOLUME):

The need to meet Qp and Qf criteria has been waived since the site discharges are detained on-site via a detention system and combined sewers front the subject site.

SITE WIDE REQUIRED WQV:

WQv = 3,819.83 cf

- WQv = 3,819.83 cf

MINIMUM SITE REQUIRED RUNOFF REDUCTION VOLUME (RRV):

Post-development total impervious area is less than pre-development total impervious area; therefore

- $RRv\ Min. = 0$

TOTAL PROVIDED VOLUME OF SMP:

V_{SMP} = 464.37 + 4,590.96

- V_{SMP} = 5,055.33 cf

Appendix C: Technical Documentation

Documents included:

☐ Manufacturer Product Data

☐ Material specifications

☐ Installation details

☐ Technical documentation to demonstrate equivalence of non-conforming practices to requirements

☐ In cases where manufactured treatment devices are proposed, verification letters from established, third-party stormwater management practice evaluation and verification systems approved by NYS DEC for the use of Proprietary Practices, as outlined by **NYS SWMDM Section 9.4.1**.

☐ In cases where a request for disturbance of 5 acres or more at one time, a request for authorization that includes:

- An acknowledgement and implementation plan to meet the additional inspection and soil stabilization requirements associated with disturbing 5 acres or more at one time
- A phasing place that defined maximum disturbed area per phase and shows required cuts and fills
- A description of any additional site-specific practices or measures needed to protect water quality

If any of the above documents are not included, explain why below:

The details for items specified are included on the drawings.

Appendix D: Geotechnical Investigation Reports

Documents included:

☒ Custom Soils Report downloaded from USDA Web Soil Survey.

- Note: A geotechnical investigation report may be submitted in place of the Custom Soils Report but must include a site plan showing the location of soil types, delineated separately by lines to show boundaries, and supporting documentation to determine the hydrologic soil group.

☒ Geotechnical Investigation Report, including but not limited to:

- Summary of key findings, constraints, and impacts on projects
- Soil investigation data, including:
  - Sampling and analysis methods used
  - Site plan showing labeled soil sampling locations
  - Soil profile log, including all data required by NYS SWMDM Appendix D
  - Sieve analysis data and soil classification results
- Infiltration investigation data, including:
  - Test and analysis methods
  - Site plan showing labeled permeability testing locations
  - Permeability test log
- Soil remediation data summary, if applicable

☒ Geotechnical Investigation Data Summary, outlining in tabular format:

- Summary of soil investigation data for each boring/test pit
- Summary of infiltration testing data for each infiltration test

If any of the above documents are not included, explain why below:

Click or tap here to enter text.

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Queens County, New York

35-18 Steinway Avenue, Astoria, Queens, NY

April 25, 2025

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

Map Scale: 1:560 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 5 10 20 30

Feet
0 25 50 100 150

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Queens County, New York
Survey Area Data: Version 15, Aug 29, 2024

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Mar 1, 2023—Sep 1, 2023

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
UoA	Urban land, outwash substratum, 0 to 3 percent slopes	0.7	100.0%
Totals for Area of Interest		**0.7**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however,

onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Queens County, New York

UoA—Urban land, outwash substratum, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2pbdp
Elevation: 0 to 160 feet
Mean annual precipitation: 40 to 52 inches
Mean annual air temperature: 47 to 62 degrees F
Frost-free period: 216 to 234 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land, outwash substratum: 92 percent
Minor components: 8 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land, Outwash Substratum

Setting

Landform position (two-dimensional): Summit
Landform position (three-dimensional): Talf
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Asphalt over human-transported material

Typical profile

M1 - 0 to 6 inches: cemented material
M2 - 6 to 20 inches: cemented material
2^C - 20 to 72 inches: gravelly sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 0 inches to manufactured layer
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Calcium carbonate, maximum content: 10 percent
Available water supply, 0 to 60 inches: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: Unranked

Minor Components

Greenbelt

Percent of map unit: 3 percent
Landform position (two-dimensional): Summit, backslope, footslope
Landform position (three-dimensional): Crest, side slope, base slope, talf
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Hydric soil rating: No

Flatbush

Percent of map unit: 2 percent
Landform position (two-dimensional): Summit, backslope, footslope, toeslope
Landform position (three-dimensional): Side slope, base slope, crest, talf, rise
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Hydric soil rating: No

Ebbets

Percent of map unit: 1 percent
Landform position (two-dimensional): Summit, backslope, footslope
Landform position (three-dimensional): Side slope, crest, base slope, talf
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear
Hydric soil rating: No

Laguardia

Percent of map unit: 1 percent
Landform position (two-dimensional): Summit, shoulder, backslope, footslope, toeslope
Landform position (three-dimensional): Base slope, side slope, crest, rise, dip, talf
Down-slope shape: Concave, convex, linear
Across-slope shape: Concave, linear, convex
Hydric soil rating: No

Centralpark

Percent of map unit: 1 percent
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Talf
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

References

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REPORT OF GEOTECHNICAL INVESTIGATION

PROPOSED INNOVATION QNS - BUILDING B1
35-18 STEINWAY STREET
ASTORIA, BOROUGH OF QUEENS
CITY & STATE OF NEW YORK

BY

JZN ENGINEERING, PC.
SPRINGFIELD, NEW JERSEY

PREPARED FOR

KEY CIVIL ENGINEERING, P.C.
HOLTSVILLE, NEW YOR

File No. 24190-000 **March 2025**

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March 24, 2025
File No. 24190-900

KEY CIVIL ENGINEERING, P.C.
664 Blue Point Rd. Unit B
Holtsville, New York 11742

Attention: Ms. Jaclyn Peranteau, PE
President

REGARDING: REPORT OF GEOTECHNICAL INVESTIGATION
Innovation QNS
Building B1
35-18 Steinway Street
Astoria, Borough of Queens, City & State of New York

Dear Ms. Peranteau:

The enclosed report summarizes the results of our geotechnical investigation and recommendations conducted on behalf of Key Civil Engineering, P.C.in support of the Proposed Innovation QNS - Building B1 to be located at the above-referenced site. Our services were undertaken in accordance with our proposal dated December 16, 2024 and your subsequent authorization on February 6, 2025.

We appreciate the opportunity to assist you with this project. Please contact us if you wish to discuss this report or any aspect of the project.

Sincerely,
JZN ENGINEERING, PC.

Nejm E. Jundi, P.E.
President

Enclosures

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EXECUTIVE SUMMARY

This report summarizes our geotechnical study and provides our geotechnical engineering recommendations for the Proposed Innovation QNS - Building B1 to be located at 35-18 Steinway Street Astoria, Borough of Queens, City & State of New York.

The field investigation for this project included a total of 11 exploration borings identified as (B-1 through B-12), two (2) infiltration testing locations (identified as I-1, & I-2), and two (2) groundwater monitoring wells (identified as MW-1, & MW-2). The exploration borings were drilled within the footprint of the proposed development. The exploration borings were drilled to depths that ranged approximately between 52 feet and 101.2 feet below the existing ground surface. Analyses were performed to evaluate foundation system for the structure and to develop recommendations for foundation design and construction, utility support and earthwork. Inferred subsurface sections based on the borings are presented in Section 2. A description of site conditions and our evaluation is presented in the following report. The principal conclusions are described below:

- The exploration borings were drilled within the existing paved parking lot and revealed the presence of up to approximately four (4) inches of asphalt pavement at the surface. Underlying the surface cover, existing fill materials were encountered and extended to depths that ranged between approximately five (5) feet and 11 feet below the existing ground surface. These materials generally consisted of medium to fine sand with varying amounts of silt, gravel, and debris (brick, and concrete fragments). The existing fill materials were followed by natural sand deposits that extended to the soil exploration termination depths of between approximately 52 feet and 101.2 feet below the existing ground surface. The natural sands generally consisted of medium dense to very dense, medium to fine sand with varying amounts of silt and gravel. Sporadic loose pockets of sand were encountered within the natural sands and extended to depths up to approximately 15 feet below the existing ground surface. These naturally deposited soils generally increased in relative densities as depth increased. Groundwater conditions were encountered at depths that ranged approximately between 18 feet and 25 feet below the existing ground surface; corresponding to elevations of approximately between +/-Elev. 21.6 ft. and +/-Elev. 16.3 ft. Further groundwater discussion is provided in Section 2.2.2.

- Based on the subsurface conditions encountered at the site and our understanding of the proposed development, we recommend that the proposed development may be supported on a shallow foundation system bearing in the medium dense to dense natural alluvial deposits (Stratum II) or compacted granular fill (CGF) provided that our subgrade preparation recommendations of Section 3 are implemented. Building foundations should be designed and constructed in accordance with the New

York City Building Code of 2022 (NYCBC 2022) and the applicable ACI-318 guidelines. The use of a shallow foundation system should only be utilized provided that analysis to confirm new foundations do not bear within the NYCT influence zone. If such analysis determines the use of a shallow foundation to bear within the NYCT structures influence zone, the proposed development should be supported on deep foundation elements as to surpass such influence line. If deep foundation elements are ultimately proposed, we should be contacted to provide such recommendations accordingly.

- If the proposed development's anticipated superimposed loads are too excessive for the allowable bearing pressures provided with the utilization of shallow foundation, the proposed development may also be supported on deep foundation elements consisted of drilled full displacement piles (FDP), or continuous flight auger (CFA) piles. If deep foundation systems are ultimately elected in support of the proposed development, we should be notified to provide such recommendations accordingly.

- We understand that a single below-grade basement level is proposed within the footprint of the building. As such, a support of excavation system (SOE) may be required to allow for the construction of such below-grade cellar level. The SOE contractor should demonstrate to the owner the completion of five recent successful similar SOE projects and have comprehensive experience with SOE and underpinning construction. The SOE design is outside the scope of this report, and it should be designed by a professional licensed engineer in the state of New York.

- The site of the proposed development is located on a well-developed area, which consists of existing residential and commercial multi-story buildings, utilities, public roads, and in proximity with NYCT subway lines run directly adjacent to the site under Steinway Street. As such, due to the proximity of neighboring structures, every effort to protect these structures during and after construction should be taken. A geotechnical instrumentation and monitoring program should be implemented prior to and during construction due to the excavation proximity to surrounding properties and anticipated vibrations caused by the installation of SOE elements. The program should include at minimum: monitoring settlement of adjacent structures; and monitoring of vibrations caused by SOE elements installation operations.

Detailed recommendations are presented in the following report.

JZN ENGINEERING

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Appendix D – Monitoring Well Groundwater Elevation Graphs and Data Tables

1. INTRODUCTION

1.1 General

This report summarizes our geotechnical study and provides our geotechnical engineering recommendations for the Proposed Innovation QNS - Building B1 to be located at 35-18 Steinway Street Astoria, Borough of Queens, City & State of New York. This report was prepared based on the limited information provided to us by your office, including the following documents:

- An April 23, 2024 *Innovation QNS – Project Update* document set;
- A July 14, 2023 B1 Conceptual Plan prepared by Dattner Architects;
- A January 27, 2025 Topographical Survey Plan prepared by Montrose Surveying Co., LLP.; and
- A September 18, 2017 ALTA/NSPS Land Title Surveys plan prepared by N.Y. Surveyor, P.C.

1.2 Scope of Services

This geotechnical investigation was undertaken to obtain information on subsurface soil and groundwater conditions, and to provide recommendations for the Proposed Innovation QNS - Building B1 foundation and related earthwork. The scope of this geotechnical engineering services included:

- Explore the subsurface conditions at the site by means of drilling 11 exploration borings;
- Installation of two (2) monitoring wells;
- Perform two in-situ (2) infiltration tests;
- Estimate the engineering characteristics of the subsurface soils;
- Provide geotechnical criteria for use by the design engineers in preparing the foundation design; and,
- Provide recommendations for earthwork and construction.

1.3 Existing Site Conditions

The site of the proposed development is currently an existing paved parking lot with sporadic light piles and underground utilities. The paved parking lot is part of a one-story brick and concrete block & stucco building. The site is bordered by 35th Avenue by paved parking areas and in vicinity with a one-story commercial building to the south; by Steinway Street to the east; and by 38th Street to the west. The location of the project site is shown on the *Project Locus Map* included as Figure 1 in this report.

1.4 Report Datum

Topographic information presented in this report is approximate and the elevations are based off information given to us on the above referenced January 27, 2025 Topographical Survey Plan prepared by Montrose Surveying Co., LLP. The elevations on the drawing are from the North American Vertical Datum of 1988 (NAVD 88). All depths in the report are referenced from top of the existing ground surface at the time of the field investigation

1.5 Proposed Development

We understand that the proposed development will include the construction of a high-rise tower in the range of 17 to 22 stories. The building will have a footprint of approximately 22,000 square feet with one below grade cellar level.

2. GEOTECHNICAL INVESTIGATION

2.1 Regional Geology Review

The subject site is situated within the New England Physiographic Province of New York. Specifically, the site is found in the Quaternary geologic age. The primary formation consists of alluvium and glacial drift.

The information presented above was based on the review of published geological data as reported in the Bedrock Geologic Map of New York prepared by United States Geological Survey (USGS).

2.2 Field Exploration

The field investigation for this project included a total of 11 exploration borings identified as (B-1 through B-11), two (2) monitoring wells (identified as MW-1, & MW-2), and two (2) in-situ infiltration tests (identified as I-1, & I-2). The exploration borings were drilled within the site of the proposed development to depths ranging between approximately 52 feet and 101.2 feet below the existing ground surface at the time of exploration. The locations of the exploration borings are shown on the accompanying *Exploration Location Plan* included as Figure 2. Records of the exploration boring logs are provided in Appendix A.

The field exploration borings were drilled with a truck-mounted drill rig utilizing mud-rotary drilling techniques and four-inch diameter flush jointed casing in general accordance with ASTM D5783. Soil samples were obtained by the Standard Penetration Test (SPT) method in general accordance with ASTM D1586 with a 1-3/8-inch inside diameter (I.D.) split spoon sampler driven by a 140-pound hammer free-falling 30 inches. Blows for each six-inches of penetration were recorded on the boring exploration boring logs. Depth to groundwater was estimated from visual observation of moisture content of split spoon soil samples. The soil matrix was classified in accordance with Unified Soil Classification System (USCS).

Upon drilling refusal encountering within boring location B-1, the boring was further advanced using a double wall core barrel of NQ-size diamond bit, recovering a nominal 1.87-inch diameter core (ASTM D2113). No substantial recovery amounts pertaining to bedrock were encountered, instead, continuous stacked boulders were obtained during retrieval of the core barrel.

The field exploration program was monitored, planned, and logged by a JZN Engineer. The boring exploration locations were determined in the field by a JZN Engineer using normal taping procedures and estimated right angles from existing site features and are presumed to be accurate within a few feet.

Boring explorations were drilled by Diamond Drilling of Port Jervis, New York in the presence of a JZN Engineer between February 20, 2025 and March 6, 2025.

The boring exploration logs, and related information depict subsurface conditions only at the specific exploration locations and at the particular time designated on the logs. Subsurface conditions at other locations may differ from conditions occurring at the boring exploration locations. Also, the passage of time may result in a change in the subsurface conditions at these boring exploration locations.

2.2.1 Subsurface Conditions

Details of the subsurface materials encountered are presented on the Boring Exploration Records presented in Appendix A of this report. The stratification lines designating the interface between soil types on the boring log represent approximate boundaries. The transition between materials may be gradual, and one or more strata may be absent at specific locations. In general, the subsurface soils conditions are consistent with the regional geology of the area. The boring exploration borings revealed the following generalized strata in order of increasing depth below ground surface:

Surface Cover: The exploration borings encountered asphalt pavement at the surface with thickness of approximately between three (3) inches and four (4) inches.

Stratum I – Existing Fill Materials (NYC Class 7): Underlying the surface cover, existing fill materials were encountered and extended to depths that ranged between approximately five (5) feet and 11 feet below the existing ground surface. The existing fill materials generally consisted of medium to fine sand with varying amounts of gravel, silt, and debris (brick, and concrete fragments). We anticipate that deeper fill materials may be present within locations not explored as part of this investigation, especially near underground utilities and neighboring public structures due to the site's proximity to the NYCT subway lines.

Stratum II – Natural Alluvial Deposits (NYC Class 6, 3b & 3a): Underlying the existing fill materials, generally medium dense to very dense natural alluvial deposits were encountered and extended to the boring termination depths that ranged approximately between 52 feet and 101.2 feet below the existing ground surface. These deposits generally consisted of sand with varying amounts of silt and gravel. Loose pockets of sand were encountered within the upper portions of the alluvial deposits and were encountered to depths up to approximately 15 feet below the existing ground surface. In addition, the natural alluvial deposits generally increased in relative densities as depth increased. No bedrock was encountered within the upper 100 foot of our deeper boring locations; however, the presence of sporadic boulders and very dense gravely deposits were encountered within the Stratum II deposits.

2.2.2 Groundwater Conditions

Groundwater conditions were encountered at depths that ranged approximately between 20 feet and 25 feet below the existing ground surface; corresponding to elevations of approximately between +/-Elev. 21.6 ft. and +/-Elev. 16.3 ft.

Two (2) groundwater monitoring wells (identified as MW-1 and MW-2) were installed on site to depths of ranging between approximately 30 feet below the existing ground surface. A piezometer was mounted inside each groundwater monitoring well to measure the groundwater depth at the well locations. Two (2) Onset HOBO U20 piezometers were installed by JZN Engineering, PC on March 6, 2025 in monitoring wells MW-1 MW-2 and continuously recorded water level data between March 6, 2025 and March 12, 2025 as follows:

Table 1: Water Logger Summary Table

Well Location	Logger Serial No.	Highest Groundwater Elevation Recorded	Lowest Groundwater Elevation Recorded
MW-1	20715060	+20.6 ft.	+19.8 ft.
MW-2	20715059	+21.3 ft	+20.4 ft

It should be noted that fluctuations in the level of groundwater may occur due to variations in season, rainfall, snow melt, surface infiltration, temperature, construction activities, pumping of dewatering systems, leakage from utilities and other factors not evident at the time measurements were made and reported herein. As a result, water levels observed during and after construction may vary from those observed in the test borings during drilling.

Please refer to Appendix C for Monitoring Well Installation Logs and Appendix D for Monitoring Well Groundwater Elevation Graphs and Data Tables.

2.2.3 In Situ Permeability Test Results

A total of two (2) in-situ permeability tests were performed within the proposed development at locations IB-1 and IB-2 at depths of approximately 10 feet and 15 feet below the existing ground surface as specified by the project's civil engineer Key Civil Engineering. The field Infiltration tests were performed in accordance to the procedures outlined in Appendix B of the New York State Stormwater Management Design Manual. The results of the field infiltration tests are included in Table 2.

Table 2: Field Infiltration Test Results				
Infiltration Test	**Test Depth (ft)**	**Test Elevation (ft)**	**Percolation Test**	
			Stratum	**Average Field infiltration Test (in/hr.)**
IB-1	± 10	± 31.25	Stratum II	22 in/hr.
IB-1	± 10	± 31.25	Stratum II	21 in/hr.
IB-1	± 15	± 26.25	Stratum II	21 in/hr.
IB-2	± 10	± 28.5	Stratum II	11.5 in/hr.
IB-2	±15	± 23.5	Stratum II	67 in/hr.

3. SITE PREPARATION, EARTHWORK, AND CONSTRUCTION CONSIDERATION

3.1 General

The following sections of the report include comments on items related to excavation, dewatering, earthwork, and related geotechnical engineering aspects of the proposed construction. This section is written primarily for the engineer responsible for preparation of plans and specifications. Since this section identifies potential construction problems related to foundations and earthwork, it will also aid personnel who monitor the construction activity and contractors performing the earthwork.

The exploration borings were drilled within the existing paved parking lot and revealed the presence of up to approximately four (4) inches of asphalt pavement at the surface. Underlying the surface cover, existing fill materials were encountered and extended to depths that ranged between approximately five (5) feet and 11 feet below the existing ground surface. These materials generally consisted of medium to fine sand with varying amounts of silt, gravel, and debris (brick, and concrete fragments). The existing fill materials were followed by natural sand deposits that extended to the soil exploration termination depths of between approximately 52 feet and 101.2 feet below the existing ground surface. The natural sands generally consisted of medium dense to very dense, medium to fine sand with varying amounts of silt and gravel. Sporadic loose pockets of sand were encountered within the natural sands and extended to depths up to approximately 15 feet below the existing ground surface. These naturally deposited soils generally increased in relative densities as depth increased. Groundwater conditions were encountered at depths that ranged approximately between 18 feet and 25 feet below the existing ground surface; corresponding to elevations of approximately between +/-Elev. 21.6 ft. and +/-Elev. 16.3 ft. Further groundwater discussion is provided in Section 2.2.2.

Based on the subsurface conditions encountered at the site and our understanding of the proposed development, we recommend that the proposed development may be supported on a shallow foundation system bearing in the medium dense to dense natural alluvial deposits (Stratum II) or compacted granular fill (CGF) provided that our subgrade preparation recommendations of Section 3 are implemented. Building foundations should be designed and constructed in accordance with the New York City Building Code of 2022 (NYCBC 2022) and the applicable ACI-318 guidelines. The use of a shallow foundation system should only be utilized provided that analysis to confirm new foundations do not bear within the NYCT influence zone. If such analysis determines the use of a shallow foundation to bear within the NYCT structures influence zone, the proposed development should be supported on deep foundation elements as to surpass such influence line. If deep foundation elements are ultimately proposed, we should be contacted to provide such recommendations accordingly.

If the proposed development's anticipated superimposed loads are too excessive for the allowable bearing pressures provided with the utilization of shallow foundation, the proposed development may also be supported on deep foundation elements consisted of drilled full displacement piles (FDP), or continuous flight auger (CFA) piles. If deep foundation systems are ultimately elected in support of the proposed development, we should be notified to provide such recommendations accordingly.

We understand that a single below-grade basement level is proposed within the footprint of the building. As such, a support of excavation system (SOE) may be required to allow for the construction of such below-grade cellar level. The SOE contractor should demonstrate to the owner the completion of five recent successful similar SOE projects and have comprehensive experience with SOE and underpinning construction. The SOE design is outside the scope of this report, and it should be designed by a professional licensed engineer in the state of New York.

The site of the proposed development is located on a well-developed area, which consists of existing residential and commercial multi-story buildings, utilities, public roads, and in proximity with NYCT subway lines run directly adjacent to the site under Steinway Street. As such, due to the proximity of neighboring structures, every effort to protect these structures during and after construction should be taken. A geotechnical instrumentation and monitoring program should be implemented prior to and during construction due to the excavation proximity to surrounding properties and anticipated vibrations caused by the installation of SOE elements. The program should include at minimum: monitoring settlement of adjacent structures; and monitoring of vibrations caused by SOE elements installation operations.

3.2 Earthwork

The subsurface materials that will be encountered during construction will include: surficial cover materials, fill materials, and natural alluvial deposits. As such, we anticipate that soil excavation can be accomplished using conventional earth-moving equipment. Remnant foundation elements may be encountered during earthwork operations. If encountered, these concrete elements may require crushing prior to off-site disposal. Temporary excavation slopes should be constructed to comply with all OSHA and other applicable regulations.

Care must be exercised during excavations within 15 feet next to adjacent existing structures (roads, and utilities) and neighboring buildings foundations zone of influence (ZOI). These excavations must be conducted in such a manner not to undermine these existing buildings foundation elements and disturb the bearing services and under the direction and system design of a professional engineer licensed in the State of New York.

The site should be sealed on a daily basis using a smooth drum roller at the completion of each workday or if rainfall is imminent, work areas should be graded & smooth-wheel rolled to permit runoff of rainfall.

3.3 Earthwork During Freezing Weather

The moisture within the soil matrix may freeze when temperatures fall below freezing. Frozen soil or soil containing snow or ice should not be used for fill. Placement of fills should not be conducted when air temperatures are low enough to cause freezing of the moisture in the fill during or before placement.

Fill materials should not be placed on water, snow, ice or frozen soil. No fill should be allowed to freeze prior to compaction. At the end of each workday, the last lift of fill, after compaction, should be rolled by a smooth-wheeled roller to eliminate ridges of un-compacted soil. Soils with high fine content with high moisture content are susceptible to disturbance by freezing, especially in the presence of water and construction traffic.

Soil bearing surfaces below completed foundations and slab and behind walls must be protected against freezing before and after foundation construction. Placement and compaction of fill materials should be conducted only when ambient air temperatures are above 30 degrees Fahrenheit.

3.4 Bearing Surfaces Preparation

3.4.1 General

Prior to placing any fill materials to raise or restore grades, all existing remnant structures should be removed and replaced with Compacted Granular Fill (CGF). The exposed soils should be compacted to a firm and unyielding surface with several passes with a minimum 10-ton vibratory drum roller. In confined areas, hand-guided equipment such as a trench roller or jumping jack imparting a dynamic force of at least 5,000 lbs. should be used. If the exposed surface has high fines content, the equipment should be operated in static mode. The surface should be proofrolled in the presence of the Geotechnical Engineer to help identify soft or loose pockets, which may require removal and replacement.

3.4.2 Shallow Foundations Subgrade

All unsuitable materials (all existing fill materials of Stratum I, remnant foundation elements, loose pockets of sand encountered to depths up to 15 feet below grades, and any encountered site utilities, and any disturbed natural sand deposits) should be removed from within the entire proposed building footprint and its foundations zone of influence (ZOI) defined in Section 4 of this report. It should be noted that the existing fill materials may be encountered to greater depths in isolated locations. The contractor

should be prepared to overexcavate these areas and replace them with compacted granular fill in a controlled manner if encountered.

The exposed subgrade should be observed in the field by the Geotechnical Engineer's representative to confirm the assumed foundation bearing conditions. Use of the allowable bearing pressures recommended in this report is contingent upon such observation and documentation that the field conditions are consistent with the assumptions made within this report.

As noted, it may be necessary to overexcavate and replace disturbed or otherwise unacceptable foundation bearing materials. Following overexcavation to a suitable subgrade material, the exposed surfaces should be re-compacted prior to placing Compacted Granular Fill (CGF) or constructing foundations with a minimum of two passes with a heavy vibratory plate compactor or vibratory roller. If weaving or other disturbance is noticed during re-compaction, vibratory re-compaction should be discontinued, and compaction equipment shall be operated in static mode.

Care should be taken to prevent surface water from collecting on exposed soil bearing surfaces. Worker and equipment traffic over bearing surfaces should be minimized. When exposed, it may be difficult to prepare soil subgrades in cold and wet weather.

Soil bearing surfaces below completed foundations must be protected against freezing before and after foundation construction. If construction is performed during freezing weather, foundations should be backfilled to a sufficient depth (up to three feet) as soon as possible after they are constructed. Alternatively, insulating blankets, heating or other means may be used for protection against freezing.

3.5 Backfilling

Compacted Granular Fill (CGF) should be used for filling within the building and all structural areas. Fill materials should be placed in lifts not to exceed 12-inches in loose thickness. Compaction equipment in open areas should consist of self-propelled minimum 10-tons vibratory drum rollers. As an alternative a minimum 2.5 tons walk behind vibratory roller with increased number of passes can be used. In confined areas, hand-guided equipment such as a jumping jack or trench compactor should be used and the loose lift thickness should not exceed six inches.

A minimum of four perpendicular passes of the compaction equipment should be used to compact each lift. Cobbles or boulders having a size exceeding three inches in size should be removed prior to compaction. The minimum recommended compaction requirements are summarized in Table 3.

Table 3: Minimum Recommended Compaction Requirements	
Location	Compaction Requirement[1]
Building Footprint/ Other Structural Elements	95%
Landscape and Non-Structural Areas	90%

Notes:
1 As determined in accordance with ASTM D1557

Prior to earthwork operations, existing fill materials and remnant concrete foundations and slabs should be removed from within the limits of the proposed structural areas, as well as any other areas supporting structural elements.

Prior to placing any fill materials to raise or restore grades, the exposed soils should be compacted to a firm and unyielding surface with several passes with a minimum 10-ton drum roller. The surface should be proofrolled in the presence of the Geotechnical Engineer to help identify soft or loose pockets, which may require removal and replacement.

A sample of any material scheduled for use as backfill, Compacted Granular Fill (CGF) should be submitted to the geotechnical laboratory for testing and analysis and approval prior to its use as specified in Section 3.7 of this report. The placement of all fill and backfill should be monitored by a qualified Geotechnical Engineer to ensure that the specified material compaction effort and procedures, and lift thicknesses are properly implemented.

3.6 Backfill Materials

3.6.1 Compacted Granular Fill (CGF)

Compacted Granular Fill (CGF) should consist of clean, well-graded sand and gravel, free of organic material, clay clumps, snow, ice, or other deleterious materials and should meet the criteria in Table 4.

Table 4: Compacted Granular Fill Gradation	
Sieve Size	Percent Finer by Weight
3-in.	100
No. 4	30 – 90
No. 40	10 – 50
No. 200	0 – 5

3.6.2 Common Fill

Common Fill may be used to raise grades in sidewalk and landscape areas, subject to design and drainage requirements and is suitable for general landscape grading. Common Fill should be granular soil free from organic material, clay clumps, snow, ice, or other deleterious materials. Common Fill should not contain stones larger than 3-in and have a maximum of 80 percent passing the No. 40 sieve and a maximum of five percent passing the No. 200 sieve.

Additionally, inorganic soil including soils with higher percentages of fine material may be considered during favorable weather periods subject to the Geotechnical Engineer's approval, provided that the required moisture content and compaction controls are met.

3.6.3 Onsite Soil

The existing on-site materials may be considered for use as CGF and/or Common Fill subject to environmental constraints. Final determination of suitability of onsite soils for reuse as CGF/Common Fill will have to be made during construction when the materials are exposed during excavation. Reuse of onsite materials should be observed and documented in the field by the Geotechnical Engineer.

Similar soils have been successfully reused as CGF/Common Fill at other construction sites contingent on strict monitoring of placement, moisture content, and compaction controls. Moisture conditioning (drying), particularly during periods of wet weather, and removal of any oversized and deleterious materials may be required to permit placement in lifts to the required compaction.

Rainfall or melting snow can readily saturate stockpiled soils. Providing drainage from or covering a stockpile can help limit this potential problem. However, it has been our experience that these soils will probably require considerable drying if left in an unprotected stockpile for an extended period of time, especially over winter and spring seasons.

3.6.4 Geotextile Fabric

A filtration-type geotextile is recommended between submerged fill/crushed clean stone and surrounding soil. It should consist of Mirafi RS280i, or equivalent in structural areas and Mirafi 140N or equivalent in non-structural areas. The filtration fabric should be placed on all sides (top, bottom, and side) of all excavations, or any fill areas being backfilled with submerged fill and/or where ever groundwater is present to help reduce the amount of fines infiltrating into the crushed clean stone due to groundwater fluctuation/ movement.

3.6.5 Geogrid

If the soil softens due to weather conditions or construction traffic, a reinforcing geogrid (such as Tensar TX130s, or engineering equivalent) may be used to distribute loads and reinforce the soil/backfill matrix subject to further design and construction considerations. If the contractor elects to use geogrid to stabilize disturbed site soils, we request notifications to provide further recommendations.

3.6.6 Submerged Fill Material

If any excavation at the site extends below the groundwater table, submerged fill will be required. The initial 15 inches to 24 inches of backfill in excavations may be filled with an open graded, crushed stone placed in the wet to assist with dewatering (if required) and to establish a firm base on which to place subsequent lifts of backfill. Prior to placing the stone, free water and disturbed materials should be removed from the excavation to the extent directed by the Geotechnical Engineer. A fines barrier geotextile fabric (as specified in Section 3.6.6) should be placed at the base of the excavation and between submerged fill and surrounding soils (i.e. all sides).

3.6.7 Crushed Stone Fill

Crushed stone is recommended within the building slab and foundation drainage systems. It should consist of 3/4-inch size crushed stone in accordance with AASHTO No. 57.

3.7 Fill and Backfill Testing

A sample of any material scheduled for use as backfill should be submitted to the geotechnical laboratory for testing and analysis and approval prior to its use. The placement of all backfill should be monitored by a qualified Geotechnical Engineer to ensure that the specified material and lift thicknesses are properly installed.

The samples should be tested to determine the maximum dry density and optimum moisture content (ASTM D1557), natural moisture content (ASTM D2216), gradation (ASTM D422), organic content (ASTM D2974), and plasticity of the soil (ASTM D4318) prior to construction in order to avoid construction delays. These tests are needed for quality control during compaction and also to determine if the fill material is acceptable as CGF. The minimum frequency of in-place density tests indicated in Table 5 should be performed to ensure that the specified compaction is achieved throughout the height of the fill or backfill:

Table 5: Compaction Frequency Testing	
Structural Elements	One test per 500 square feet per lift (minimum five tests per lift)
Non-Structural Areas	One test per each 2,500 square feet per lift (minimum five tests per lift)

3.8 Groundwater Control/ Dewatering

Groundwater conditions were encountered at depths that ranged approximately between 18 feet and 25 feet below the existing ground surface; corresponding to elevations of approximately between +/-Elev. 21.6 ft. and +/-Elev. 16.3 ft.

Based on our understanding that the proposed development will include a one below-grade cellar level, we anticipate that construction dewatering requirements are anticipated to be low, consisting primarily of control of surface water runoff and water seepage into excavations. It is anticipated that dewatering can typically be accomplished by open pumping from sumps, temporary ditches, and trenches within and around excavations. However, depending on proposed final elevations in relation to the groundwater table, more proactive dewatering systems may be required.

Surface water runoff during construction should be controlled and directed away from excavations, as on-site soils are highly erodible and susceptible to disturbance due to water and frost action. When exposed, it may be difficult to prepare and maintain soil subgrades in cold and wet weather.

Regardless, dewatering systems should be designed and operated as not to undermine the existing and neighboring structures (i.e. drawdown the water table below adjacent structures and wash soil fines out). The design of such system is beyond the scope of our services and should be designed by a professional engineer licensed in the State of New York.

3.9 Excavation and Shoring

We understand that the proposed development will include the construction of one below grade cellar level. As such, based on the above, and considering the existing site conditions and neighboring structures, a support of excavation (SOE) support system is anticipated to be required to allow for the construction of the proposed cellar level. All excavation, excavation support, and backfilling must be performed in accordance with OSHA and all other applicable local, state, and federal regulatory requirements.

The SOE contractor should demonstrate to the owner the completion of five recent successful similar SOE projects and have comprehensive experience with SOE and underpinning construction (if required). All

excavation, excavation support, and backfilling must be performed in accordance with OSHA and all other applicable local, state, and federal regulatory requirements.

Generally, the site near surface soils encountered during the investigation (fill materials, natural sand deposits) are consistent with Type C Soil Conditions as defined by 29 CFR Part 1926 (OSHA) which require a maximum unbraced excavation angle of 1.5H:1V for soil above the groundwater table. However, if this safe angle requires slopes that extend beyond the property line, considerations for temporary shoring system should be implemented. In addition, it should be noted that this safe excavation angle assumes that there is no surcharge load on top of the excavation slope (existing and neighboring buildings, construction materials & equipment, utilities, etc.). If such conditions exist, the safe excavation angle should be evaluated by a professional engineer licensed in the State of New York considering these conditions prior to commencement of excavation. There is no safe excavation angle for soils below the groundwater table. If excavations extends below the groundwater table, the use of temporary shoring system that acts as water cutoff system would be needed. Actual conditions encountered during construction should be evaluated by a competent person (as defined by OSHA) to ensure that safe excavation methods and/or shoring and bracing requirements are implemented.

Deep excavations adjacent to public street/sidewalks, existing buildings, and public utilities may require temporary excavation support. Any excavation support installed will need to be designed and constructed to accomplish the following:

- Retain the excavation & minimize the effects of excavation movements beyond the limits of the site;
- Allow for the excavation at the site; and,
- Permit foundation construction to proceed in the “dry”, given the groundwater table may fall near the proposed bottom of excavation.

Care must be exercised during excavations within 15 feet next to adjacent existing developments (roads, building, and utilities), neighboring buildings foundations zone of influence (ZOI), and NYCT Subway lines in proximity to the subject site. These excavations must be conducted in such a manner not to undermine these existing buildings foundation elements and disturb the bearing services and under the direction and system design of a professional engineer licensed in the State of New York.

3.10 Excavated Soil Management

We expect excavations during construction will generate excess soils requiring handling and possible off-site disposal by the Contractor. Off-site disposal of soils may require testing in accordance with applicable New York Department of Environmental Conservation (NYDEC) Regulations and disposal facility

acceptance criteria. Balancing the amount of cuts and fills required for the project could preclude the need for such testing. We recommend that this issue be addressed prior to construction or preparation of contract documents.

3.11 Vibrations Induced During SOE Elements Installation

The subject site is situated in a well-developed mixed-use area. The surrounding developments include commercial structures, public roads, below ground utilities, and NYCT subway lines that run directly adjacent to the site under Steinway Street. As such, care should be maintained during SOE system installation, and general foundation operations.

During SOE elements installation, the construction equipment may induce vibrations which will be transmitted to varying distances from the point of impact. When such construction operations are conducted within the interior of a large site, the offsite effects of the ground vibrations are usually negligible. However, when such construction operations are carried out near the edges of the property in a developed area, ground vibrations can be transmitted into the adjacent facilities and in some instances may cause annoyance or structural damage.

Based on the site layout in relation to the adjacent structures, and our understanding of the proposed construction, we anticipate that vibrations can be properly controlled to prevent structural damage to the adjacent structures. However, due to the proximity of the adjacent structures, we recommend monitoring vibrations during construction, especially during SOE elements installation, and excavation operations, to demonstrate that vibrations do not affect the adjacent sensitive structures.

We recommend that a vibration monitoring plan should be formulated prior to construction to protect the neighboring structures. The vibration monitoring plan should also include an optical survey monitoring plan.

3.12 Adjacent Structures

Due to the proximity of structures such as surrounding developments include structures such as commercial developments, public roads, below ground utilities, and NYCT subway lines that run directly adjacent to the site under Steinway Street, every effort to protect these structures during and after construction should be taken. As previously discussed, the use of a shallow foundation system is contingent upon further analysis to determine the proposed building loads will not bear within the NYCT influence lines and vice-versa.

We have provided a NYCT Subway structures influence line estimation in regards to the existing subject site along Steinway Street, in Figure 3. When final design elevations become available, a more robust analysis should be carried out so that the new foundation elements loads do not fall within the existing NYCT Subway influence line and vice-versa.

We recommend that a pre/post construction conditions surveys, vibration-monitoring program, and optical monitoring programs be undertaken to document possible effects of the construction. These monitoring program shall be designed by a qualified professional engineer licensed in the State of New York. Optical monitoring shall be undertaken by a licensed professional surveyor in the State of New York. The design of such protection systems is beyond the scope of this report.

4. GEOTECHNICAL DESIGN RECOMMENDATIONS

4.1 General

This section of the report provides recommendations for design of the building foundations and lowest building slab. Based on the subsurface conditions encountered at the site and our understanding of the proposed development, we recommend that the proposed development may be supported on shallow foundations and a slab-on grade bearing on the natural medium dense to dense alluvial deposits of Stratum II or CGF following the removal of all unsuitable foundation bearing materials, and the subgrade preparation recommendations provided in Section 3 of this report.

If the provided allowable pressures with the utilization of a shallow foundation system are not suitable for the proposed development superimposed loads, the proposed development may additionally be supported on deep foundation elements. Such deep foundations may consist of drilled full displacement piles (FDP), or continuous flight auger (CFA) piles. If deep foundation systems are ultimately elected in support of the proposed development, we should be notified to provide such recommendations accordingly.

Building foundations should be designed and constructed in accordance with applicable NYCBC-2022, applicable ACI-318 code, and the recommendations provided herein.

This geotechnical investigation has been prepared for the Proposed Innovation QNS - Building B1 taking into consideration the property limits, assumed site grading, and assumed column loadings as understood at the time this report was prepared. When further information is developed by the project team concerning final design column loadings, building configuration, etc., for the structure, the recommendations and design criteria presented herein should be reviewed by JZN. If any changes to our recommendations should result from this review, we will confirm these changes in writing.

4.2 Suggested Soil Parameters for Analysis and Design

Soil properties for engineering evaluation have been developed based on visual soil classification, penetration test data, published data, laboratory test results, and our experience with similar formations in the area of the project. The suggested soil properties are provided in Table 6. These properties have been used to develop the analysis and recommendations contained in this report.

Table 6: Suggested Density and Strength Parameters for Design						
Soil Stratum	Unit Weight (pcf[1])		Strength Parameters			
	Total	Submerged	Drained Strength		Undrained Strength	
			c (psf)[2]	ϕ^o	S_u (psf)	ϕ^o
Compacted Granular Fill (CGF)[3]	125	63	0	34	0	34
Controlled Existing Fill Materials	115	53	0	29	0	29
Loose Pockets of Alluvial Soils	118	56	0	30	0	30
Med. Dense Alluvial Deposits	125	63	0	34	0	34

Notes:
1- Pounds per cubic feet (pcf)
2- Pounds per square foot (psf)
3- Based on attaining the minimum required compaction as recommended requirements recommended in Section 3.5

4.3 Suggested Soil Parameters for Seismic Load Evaluation

The subject site area is considered to be an area of low to moderate seismic risk. The applicable design standard selected for seismic load evaluation is based on the NYCBC-2022.

Published data for the USGS Seismic Hazard Website provides seismic acceleration criteria for Site Class "B" or soft rock with shear wave velocity of 2,500 feet per second. The seismic site characteristics are based on average blow counts and undrained shear strength in the upper 100 feet of the profile and under. In our opinion, the conditions at the site subsurface profile indicate that the site characteristics correspond to Site Class "D" as indicated in Table 7 below. The parameters have been modified for Site Class "D" characteristics which are representative of the appropriate design class using procedures contained in the NYCBC-2022. Code loadings are generally based on the two percent probability of exceedance event with modifying factors.

Table 7: Seismic Response Criteria for Site Class "D" Based on the NYCBC-2022	
Spectral Response Acceleration at 0.2 Sec. Period	Spectral Response Acceleration at 1.0 Sec. Period
S_s= 0.296g	S_1= 0.061g
F_a= 1.57	F_v= 2.40

Due to the presence of groundwater, we have conducted a liquefaction assessment analysis which concluded that no further liquefaction evaluation is required. The results of our liquefaction assessment, per the NYCBC 2022 is provided in Figure 4.

A value of maximum considered earthquake mean (MCEG) peak ground accelerations adjusted for site class effects, PGAM of 0.26 can be used for design purposes.

4.4 Design Groundwater Level

Groundwater conditions were encountered at depths that ranged approximately between 18 feet and 25 feet below the existing ground surface; corresponding to elevations of approximately between +/-Elev. 21.6 ft. and +/-Elev. 16.3 ft. As such, for the purposes of design and construction, we recommend that the design groundwater table be considered as +/-Elev. 23.0 ft. The design should also be based on the flood elevation if the site is located within the flood zone.

4.5 Hydrostatic Pressure

Depending on the final design elevation of the proposed cellar in relationship to the Groundwater Elevation of Elev. 23 feet, the building foundations, cellar slab, ejector pits, elevator pits, etc., may have to be designed to resist hydrostatic pressure. A value of 63 pounds per square feet per foot (psf/ft) below the groundwater table and a factor of 1.2 should be applied to the final acting uplift force. For evaluating flood conditions, use the Base Flood Elevation (BFE) for the project area.

4.6 Foundations

4.6.1 General Discussion

As previously discussed, based on our understanding of the proposed development and the results of our subsurface investigation, we recommend that the proposed development should be supported on shallow foundations bearing in the medium dense to dense alluvial deposits of stratum II, or on CGF, provided that our subgrade preparation recommendations outlined in Section 3.4 are implemented.

Alternatively, the proposed building may be supported on deep foundation elements to consist of drilled full displacement piles (FDP), or continuous flight auger (CFA) piles.

4.6.2 Shallow Foundations

The existing subsurface conditions indicate the presence of fill materials followed by medium dense to dense natural alluvial deposits with sporadic pockets of loose sand encountered to depths up to approximately 15 feet below the existing ground surface. As such, we recommend that the Proposed Innovation QNS - Building B1 be supported on a shallow foundation system bearing on the medium dense to dense natural alluvial deposits of Stratum II or CGF following the removal of all unsuitable

foundation bearing materials (existing fill materials of Stratum I, loose pockets of sand encountered up to approximately 15 feet below the existing ground surface, remnant foundations, other identified unsuitable materials), within the building's and the subgrade preparation recommendations provided in Section 3.4.

The ZOI is defined as the area below the footings and below imaginary lines that extend two (2) feet laterally beyond the footing outer bottom edges and down on a one (1) horizontal to one (1) vertical (1H:1V) slope to the naturally deposited bearing soils.

We recommend that foundations be designed using an allowable bearing pressure of six (6) kips per square foot (ksf) for axial loading conditions. A maximum footing contact pressure of eight (8) ksf is acceptable for eccentric loading conditions as long as the maximum contact pressure acts over less than 33 percent of the footing contact area and the average contact pressure over the entire footing does not exceed six (6) ksf. We recommend that the continuous wall footings should be sized no less than minimum dimensions of 24 inches and isolated foundations be sized no less than 36 inches.

Footings subject to frost action (i.e. adjacent to exterior grades) should be embedded a minimum of 48 inches below the lowest adjacent exterior grade, while interior footings not subject to frost action should be embedded a minimum of 24 inches below the lowest adjacent grade.

Lateral loads can be resisted by a combination of friction along the base of the footings and passive pressure on the vertical faces of footings. Frictional resistance should be computed using an ultimate base friction coefficient (tan δ) between the footing concrete and 50 psi soil mix equal to 0.4.

The passive resistance provided by the fill surrounding footings from the top of the footing to the bottom should be ignored unless it is confined by a slab or bituminous concrete. If the horizontal distance between adjacent footings or walls is less than twice the height of the subject structural element (measured from bottom of element to bottom of slab/ground surface), the passive pressure must be discounted proportionately to the distance (full pressure at twice the height away) to accommodate for interaction of the elements.

4.6.3 Mat Foundation System

The existing subsurface conditions indicate the presence of fill materials followed by medium dense to dense natural alluvial deposits with sporadic pockets of loose sand encountered to depths up to approximately 15 feet below the existing ground surface. As such, we recommend that the Proposed Innovation QNS - Building B1 may be supported by a mat foundation system bearing on the medium dense to dense natural alluvial deposits of Stratum II or CGF following the removal of all unsuitable

foundation bearing materials (existing fill materials of Stratum I, loose pockets of sand encountered up to approximately 15 feet below the existing ground surface, remnant foundations, other identified unsuitable materials), and the subgrade preparation recommendations provided in Section 3.4.

The mat foundation should be designed as a soil-supported, concrete structural mat. The design of the mat foundation should be based on distributing the structural element loads evenly across the footprint of the mat foundation. Typically, this is achieved by thickening the mat and providing adequate layers reinforcement. The reinforcement should be designed to distribute the concentrated column loads evenly across the mat footprint. Bottoms of the mat foundation should be found a minimum of four feet (48 inches) below the lowest adjacent ground surface for frost protection purposes.

A mat foundation bearing on the medium dense to dense alluvial deposits of Stratum II constructed in accordance with the recommendations of this report may be designed using an allowable bearing pressure of three (3) tons per square foot (tsf) for axial loading conditions. Allowable bearing capacities recommended in this paragraph are maximum allowable capacities and tolerable deflections/settlements should be considered by the structural engineer utilizing the below recommended modulus of subgrade reaction.

It is recommended that the mat foundation be placed on a minimum nine (9) inches thick layer of compacted crushed stone. The resulting excavations below mat foundation, such as those for utilities, should be backfilled with CGF below the crushed stone as per Section 3.6.1.

For mat foundation design typically requires a modulus of subgrade reaction (Winkler spring) or a similar elastic analysis method to determine thickness and reinforcing requirements for the concrete. For purposes of this report, JZN has created a preliminary loading model utilizing an applied average load of two (2) tsf for the mat foundation in order to determine the most suitable subgrade reaction modulus to be utilized for design purposes. The provided subgrade modulus is anticipated for short- and long-term load conditions as we do not expect significantly variable moduli due to the non-presence of cohesive deposits. As such, we recommend that a modulus of subgrade reaction (ks) value as indicated in Table 8 be used for the mat foundation following the implementation of the subgrade preparation per Section 3.4.

Table 8: Recommended Modulus of Subgrade Reaction (k_s) Values	
Subgrade Layer	ks (pounds per square inch per inch (psi/in)
Natural Medium dense to Dense Alluvial Deposits (Stratum II) (NYC 3b or better)	40 psi/in

Modulus of Subgrade Reaction is not fundamentally a soil property and is dependent on a number of parameters including: geometry of loading area, load magnitude, soil stiffness, loading duration, and structural mat/slab stiffness. As such, the recommended values above should be utilized carefully with consideration for what specific input an analysis method is requesting.

Lateral loads can be resisted by the friction along the base of the mat. Frictional resistance should be computed using an ultimate base friction coefficient (tan δ) between the mat concrete and the naturally deposited soils and/or CGF equal to 0.35.

Post-construction settlements of mat foundation designed and constructed in accordance with the recommendations outlined in this report are estimated to be on the order of up to one (1)-inch under static loading conditions. We anticipate that the total settlement will be observed shortly after structure dead loads are placed on the mat foundations and during initial loading of the proposed tower.

This settlement estimate is based on an assumed applied average load of three (3) tsf. If a lower or higher applied load for the proposed building is ultimately utilized, JZN requests notification in order to provide further recommendations regarding the modulus of subgrade reaction and estimated settlement values.

4.6.4 Deep Foundations

If the proposed development's anticipated superimposed loads are in excess of the allowable bearing capacity of shallow footings, the proposed development may also be supported on deep foundation elements consisted of drilled full displacement piles (FDP), or continuous flight auger (CFA) piles. If deep foundation systems are ultimately elected in support of the proposed development, we should be notified to provide such recommendations accordingly.

We preliminarily estimate that the use of FDP or CFA piles consisting of drilled pile with diameters of between approximately 13 inches and 18 inches may provide allowable compressive capacities in the range of approximately 100 tons and 150 tons.

4.7 NYCT Influence Lines

Due to the site's vicinity to the NYCT subway lines that run directly adjacent to the site under Steinway Street, we recommend that when final design elevations are available, further analysis should be carried out to ensure that the proposed development loads will not bear within the existing NYCT structure influence line and vice-versa. Shallow foundations should be designed to bear a minimum of five feet below the NYCT Line of influence as shown Figure 3. The use of a shallow foundation system is contingent upon

such analysis. Otherwise, the proposed development shall be supported utilizing deep foundation elements to bypass such influence lines.

4.8 Lowest Building Slab

Depending on the type of foundation elected in support of the proposed development, we recommend that the lowest building slab should consist of either a slab-on grade, or a deep foundation element supported structural slab, as recommended herein:

4.8.1 Slab-on-Grade For Shallow foundations Utilization

Following the preparation of the slab subgrade as recommended in Section 3, the proposed lowest building slab should be designed as concrete slab-on-grade designed in accordance with the following:

The lowest floor slab should be designed as a soil (Stratum II) supported, concrete slab-on-grade. It is recommended that the lowest building slab be placed on a minimum nine (9) inches thick layer of compacted crushed stone. The resulting excavations below slab-on-grade, such as those for foundations and utilities, should be backfilled with CGF below the crushed stone.

Designs of slabs typically require a modulus of subgrade reaction (Winkler Spring) or a similar elastic analysis method to determine thickness and reinforcing requirements for the concrete slab-on-grade. We recommend that a modulus of subgrade reaction (ks) of 200 pounds per square inch per inch (psi/in) be used for slab-on-grade constructed on soil mix and 6-inches of gravel. The recommended modulus value provided is for a one-foot square plate and must be corrected for slab size. Post-construction settlements of slab-on-grade designed and installed in accordance with the recommendations outlined in this report are estimated to be on the order of 1/2-inch.

4.8.2 Structural Slab – For Deep Foundation Elements

If deep foundation elements are ultimately utilized in support of the proposed development, the lowest building floor slab can be designed and constructed to be supported on a deep foundation system. Typically, this can be achieved either directly by thickening and structurally reinforcing the slab at deep foundation element locations, or indirectly by supporting a structurally reinforced slab on a network of deep foundation element supported grade beams.

We recommend that the lowest building slab be placed on a minimum 6 in. thick layer of compacted crushed stone underlain by geotextile fabric confirming to Sections 3.6.7 and 3.6.5. The resulting

excavations below the slab, such as those for foundations and utilities, should be backfilled with CGF below the crushed stone.

4.9 Foundation Drainage and Waterproofing

At this time, we do not anticipate that the proposed building will extend below the recommended design groundwater table elevation of +23.0 feet. However, based on our understanding, the proposed lowest building slab may be placed within a few feet of the groundwater table elevation. A such, we recommend that regardless of final design elevations, any below grade spaces should be water-proofed. Waterproofing design is beyond the scope of the report; however, a membrane-type waterproofing system is typically recommended for this type of development.

Additionally, we a recommend that a drainage board and foundation drain system be installed along the foundation walls and foundation system. If the proposed building ultimately extends below or within the design groundwater table elevation, hydrostatic pressures would need to be considered and a pressure slab and/or underslab drainage system would be required.

Waterproofing and damp proofing should be designed and constructed in accordance with NYCBC-2022 Section 1805.3 requirements.

4.10 Lateral Earth Pressures

Design below grade walls, temporary retaining/shoring walls, loading docks walls and/or any wall that will act as a retaining wall using recommendations for restrained or unrestrained walls as appropriate. Earth pressures for restrained walls should be computed considering at rest conditions, and unrestrained walls should be designed considering active conditions. Typically, restrained walls are braced at the top, and unrestrained below-grade walls are not braced at the top. The following recommendations assume grades are level to a distance equal to the wall height behind the wall, the walls are backfilled with Compacted Granular Fill. The parameter values presented in Table 9 below can be used to calculate earth pressures.

The effect of surcharge pressure should be included in earth pressure calculations, including the loads imposed by adjacent foundations, structures, and traffic. Hydrostatic pressures are not considered if the walls will be drained. If the drainage system is not installed, hydrostatic pressures should be included in the design with a design groundwater depth at existing ground surface elevation. Hydrostatic pressures should be finalized when the final design elevations are available. Retaining structures should be designed for a minimum factor of safety against sliding and overturning of 1.5.

For seismic loading conditions, walls should be designed to resist static plus seismic earth pressures. Surcharge loading does not need to be considered for seismic design unless the surcharge will be applied over an extended time. It is recommended that the lateral loads and base shear forces developed by the structure during a seismic event be resisted by earth pressures against foundation walls. During an earthquake occurrence, additional transient pressures will develop against the exterior retaining structures such below ground walls of the structure due to the inertia effect of the surrounding soil strata. Since the basement walls are braced with the floor slabs, they are relatively rigid and non-yielding. This condition should be considered in determining the seismically induced component of the lateral earth pressure.

Table 9: Lateral Earth Pressure Parameters

Material	Internal Friction Angle (deg)	Undrained Shear Strength (psf)	Moist Unit Weight (pcf)	Active Earth Pressure Coefficient K_a	Passive Earth Pressure Coefficient K_p	At-Rest Earth Pressure Coefficient K_o	Earthquake Induced Active Pressure K_{ae}
Compacted Granular Fill (CGF)[3]	34	0	125	0.283	3.537	0.441	0.441
Existing Fill Materials	29	0	115	0.347	2.882	0.515	0.491
Loose Pockets of Alluvial Soils	30	0	118	0.333	3.000	0.500	0.480
Med. Dense Alluvial Deposits	34	0	125	0.283	3.537	0.441	0.441

Notes:
1- Lateral Earth Pressure Parameters are Based on Coulomb Theory
2- Based on attaining the minimum required compaction as recommended requirements recommended in Section 3.5

4.11 Utilities

Generally, site utilities should be founded on bedding materials and should be constructed after the deep foundation installation operation if utilized. Utilities should be located above foundation bearing levels or the foundation influence zones.

Buried site utilities may be soil-supported (with suitable bedding), bearing existing site fill soils that are stable under proof-compaction, or on compacted Common Fill placed following the removal of exposed unsuitable bearing materials. Flexible and mechanical utility connections should be used with utilities outside the building area.

5. ADDITIONAL CONSIDERATIONS

5.1 Specification and Plan Review

It is recommended that JZN be provided the opportunity for a general review of final plans and specifications in order that earthwork and foundation recommendations may be properly interpreted and implemented in the design and specifications. The recommendations presented herein are contingent on the assumed grading and foundation layouts. We request notification upon completion of a final grading plan.

5.2 NYCT Influence Lines

Due to the site's vicinity to the NYCT subway lines that run directly adjacent to the site under Steinway Street, we recommend that when final design elevations are available, further analysis should be carried out to ensure that the proposed development loads will not bear within the existing NYCT structure influence line and vice-versa. The use of a shallow foundation system is contingent upon such analysis. Otherwise, the proposed development shall be supported utilizing deep foundation elements to bypass such influence lines.

5.3 Pre and Post Construction Conditions Surveys

Due to the proximity of the adjacent structures (existing buildings, utilities, public roadways, and the NYCT subway lines that run directly adjacent to the site under Steinway Street), we recommend that a pre-construction and post construction survey of adjacent structures and right-of ways be conducted to document conditions relevant to potential damage claims prior to commencement of construction.

5.4 Construction Testing and Monitoring

The recommendations contained in this report are based on known and reasonably predictable behavior of properly engineered and constructed foundations and other facilities. A Geotechnical Engineer should perform quality control, testing, and consultation during construction as described in previous sections of this report. Monitoring and testing should also be performed to verify that the recommendations contained in this report are implemented. Geotechnical construction monitoring should include:

- preparation of shallow foundations subgrades prior to concrete placement;
- installation of temporary excavation support systems;
- adjacent structure monitoring program, and,
- suitability and placement of backfill materials as Controlled Fill.

6. LIMITATION

The recommendations contained in this report represent our best professional judgment based on preliminary soils conditions encountered in the limited number of test borings performed for this study, and the structural and grading design criteria described in the report. Variations in the types of structures and design grading may change from the criteria assumed in preparation of the report. JZN should be advised of changes in the design criteria so that an evaluation can be made to determine if design recommendations should be revised. The nature and extent of variations in subsurface conditions between explorations may not become evident until construction. If variations appear, it may be necessary to reevaluate the information presented in this report. Conditions may be encountered during construction beyond and between borings that vary from the conditions reported herein. We recommend that foundation construction, earthwork and subgrade preparation be observed by a qualified Geotechnical Engineer familiar with the anticipated conditions and the basis of the foundation design recommendations. Any variations encountered should be brought to our attention so that their effect on the recommendations presented herein can be reevaluated and modified if necessary. Our services have been performed in accordance with current standards of practice for geotechnical engineering for buildings based on the conditions encountered in the explorations. No other warranty is made, either expressed or implied.

FIGURES

FIGURE 1: PROJECT SITE LOCUS
FIGURE 2: EXPLORATION LOCATION PLAN
FIGURE 3: NYCT SUBWAY INFLUENCE LINE PLAN
FIGURE 4: LIQUEFACTION ASSESSMENT

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GOOGLE MAPS 2025

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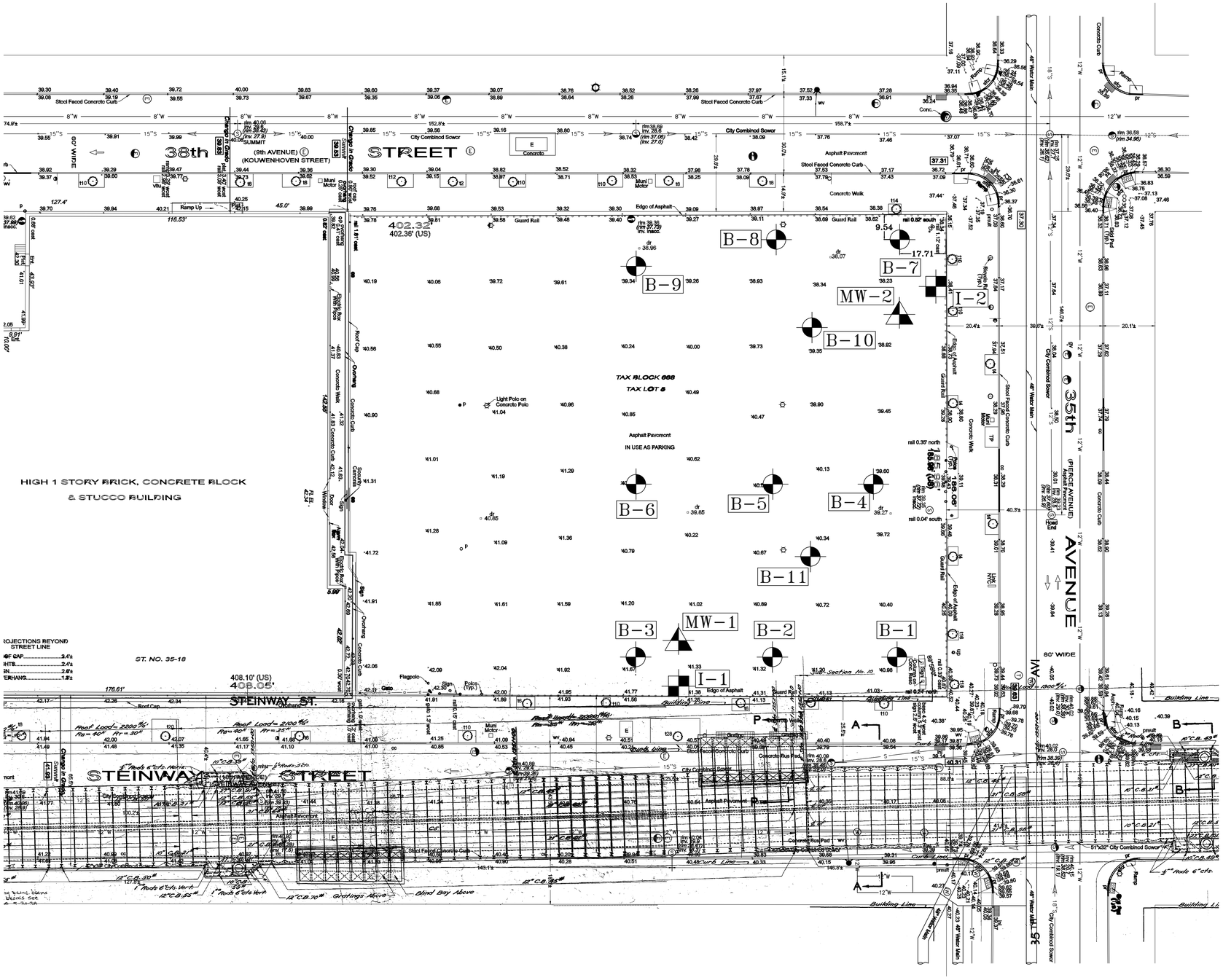
ASTORIA, BOROUGH OF QUEENS, CITY & STATE OF NY
24190-000

PROJECT SITE LOCUS

FIGURE 1



1 EXPLORATION LOCATION PLAN
SCALE: 1":20'

LEGEND:

⊕	B-1:	APPROXIMATE LOCATION OF EXPLORATION BORING
⊞	I-1:	APPEOXIMATE LOCATION OF SOIL INFILTRATION TEST
△	MW-1	APPROXIMATE LOCATION OF MONITORING WELL

NOTES:

BASE PLAN OBTAINED FROM A JANUARY 27, 2025 TOPOGRAPHIC SURVEY PREPARED BY MONTROSE SURVEYING CO., LLP.

SOIL EXPLORATIONS WERE LOCATED IN THE FIELD BY A REPRESENTATIVE OF JZN ENGINEERING, PC. USING NORMAL TAPING PROCEDURES AND ESTIMATED RIGHT ANGLES FROM EXISTING SITE FEATURES AND ARE PRESUMED ACCURATE WITHIN FEW FEET.

THE EXPLORATION BORINGS, MONITORING WELLS, AND INFILTRATION TESTS WERE DRILLED BY DIAMOND DRILLING, INC. OF PORT JERVIS, NEW YORK IN THE PRESENCE OF A JZN ENGINEER BETWEEN FEBRUARY 20, 2025 AND MARCH 7, 2025

PREPARED BY:
JZN ENGINEERING
959 S. SPRINGFIELD AVENUE, SUITE 100
SPRINGFIELD P: (973) 218-6561
NEW JERSEY 07081

NO.	DATE	BY	DESCRIPTION	APPROVED

REVISIONS

PROJECT NAME:

INNOVATION QNS BUILDING 1
35-18 STEINWAY STREET
ASTORIA, BOROUGH OF QUEENS,
CITY AND STATE OF NEW YORK

DRAWING TITLE:

EXPLORATION LOCATION PLAN

SEAL & SIGNATURE

NOT VALID UNTIL SEALED

NEJM E. JUNDI DATE
NEW YORK STATE PROFESSIONAL ENGINEER #083095

ALTERATION OR ADDITION TO THIS DOCUMENT EXCEPT BY A LICENSED PROFESSIONAL ENGINEER IS A VIOLATION OF SECTION 7209, SUB-DIVISION 2, OF THE NEW YORK STATE EDUCATION LAW.

DATE:	03/17/25
SCALE:	1":20'
PROJECT No:	24190-000
DRAWING BY:	GR
CHK BY:	GR
APPROVED BY:	NEJ
DWG No:	BLP-001.00
CAD FILE No:	24190000
PAGE No:	1 of 1

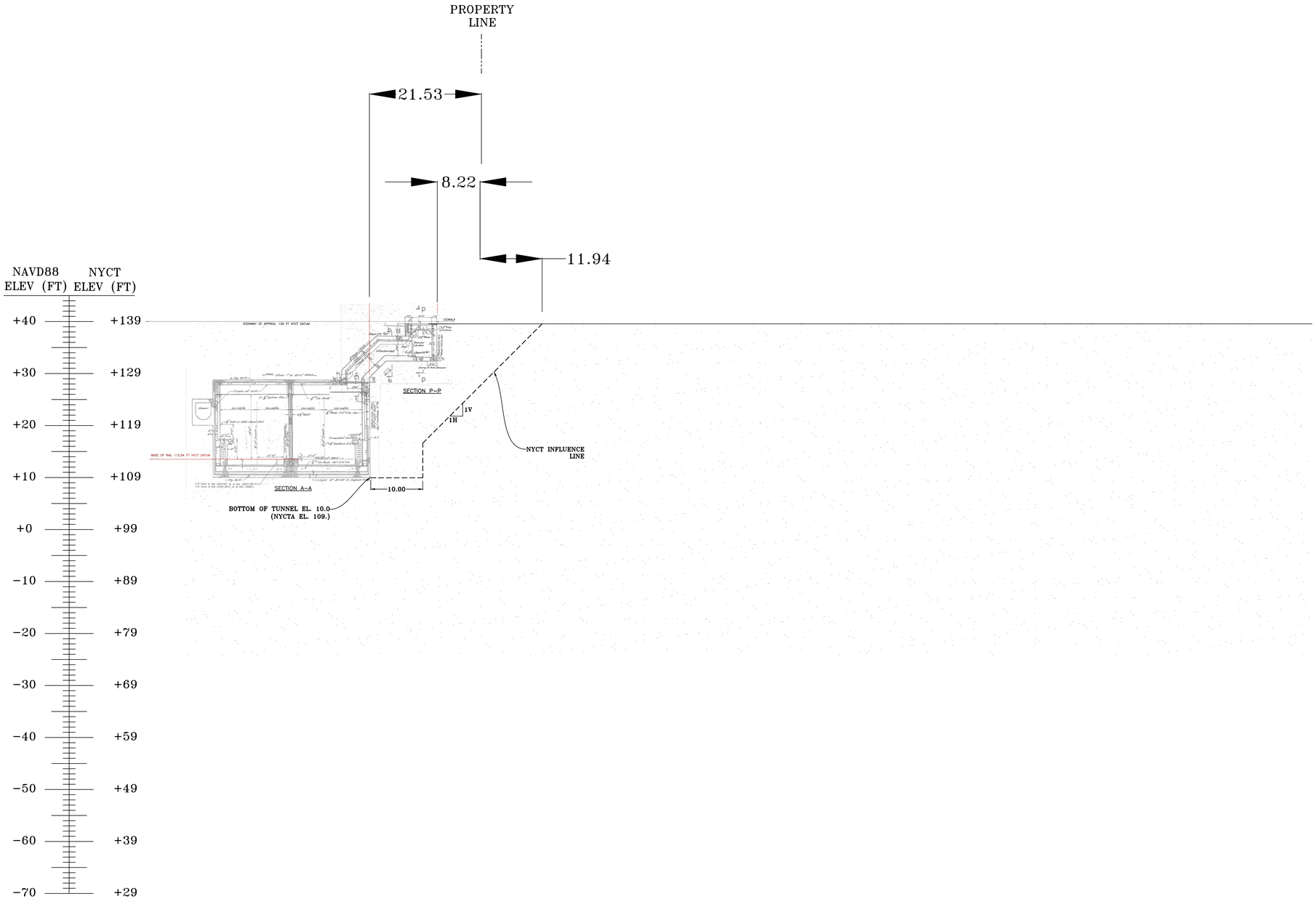


FIGURE 3 – APPROXIMATE NYCT SUBWAY INFLUENCE LINE (VARIES)

1 SCALE: 1":10'

PREPARED BY:

JZN ENGINEERING

959 S. SPRINGFIELD AVENUE, SUITE 100
SPRINGFIELD P: (973) 218-6561
NEW JERSEY 07081

NO.	DATE	BY	DESCRIPTION	APPROVED

REVISIONS

PROJECT NAME:

INNOVATION QNS BUILDING 1
35-18 STEINWAY STREET
ASTORIA, BOROUGH OF QUEENS,
CITY AND STATE OF NEW YORK

DRAWING TITLE:

FIGURE 3 – NYCT SUBWAY INFLUENCE LINE

SEAL & SIGNATURE

NOT VALID UNTIL SEALED

NEJM E. JUNDI DATE
NEW YORK STATE PROFESSIONAL ENGINEER #083095

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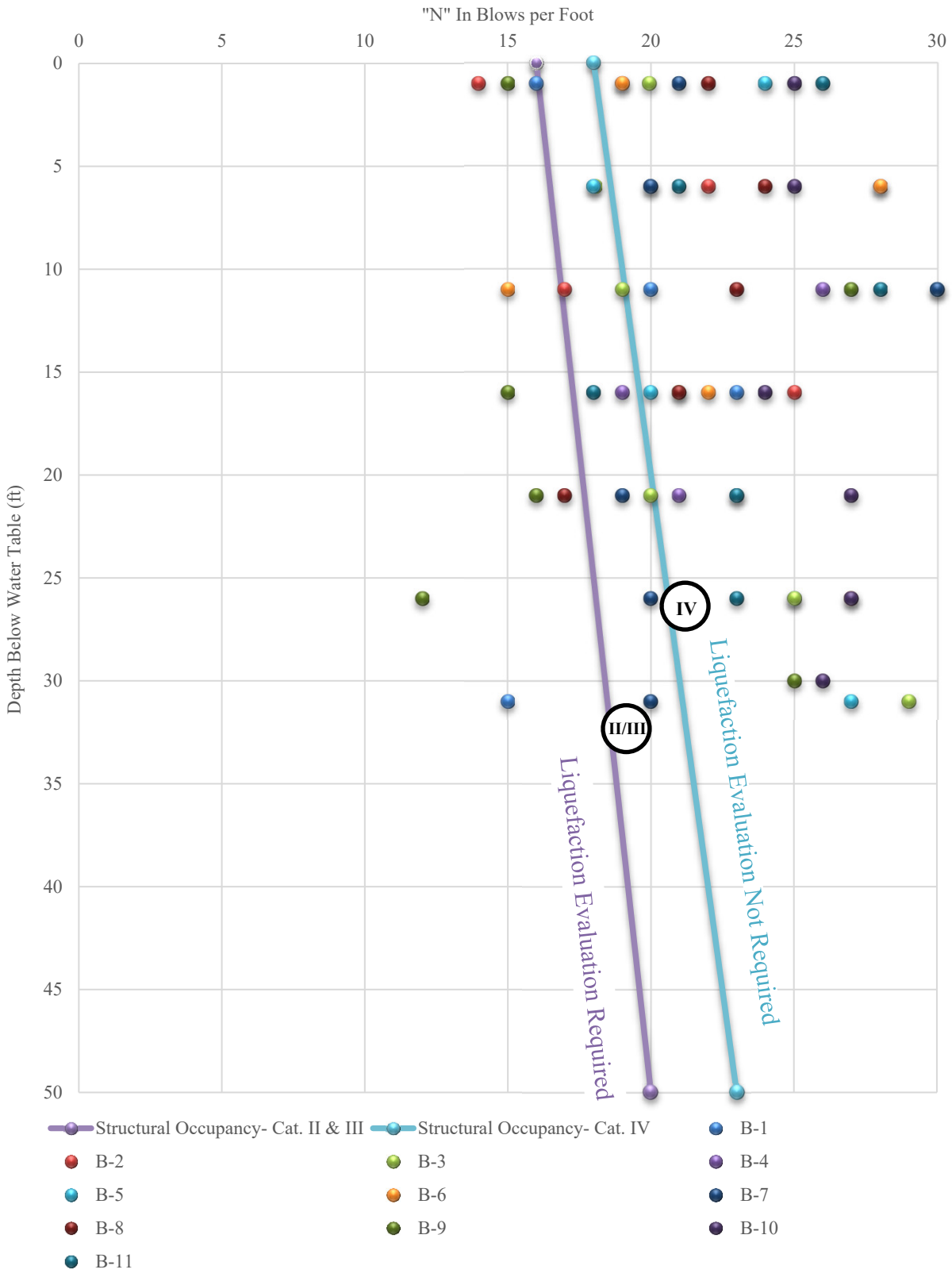
DATE:	03/17/25
SCALE:	1":10'
PROJECT No:	24190-000
DRAWING BY:	GR
CHK BY:	GR
APPROVED BY:	NEJ
DWG No:	FIGURE 3
CAD FILE No:	24190000
PAGE No:	2 of 1

Figure4: Liquefaction Assessment
NYCBC 2022



APPENDIX A

BORING EXPLORATION RECORDS
B-1 THROUGH B-11

JZN Engineering, PC.

TEST BORING LOG

Boring No. B-1 **Page** 1 of 3

Project Name	Innovation QNS Building - Building B1	**Project No.**	24190-000
Client	Key Civil Engineering, P.C.	**Representative**	A. More
Project Location	35-18 Steinway Street	**Contractor**	Diamond Drilling, Inc.
	Astoria, Borough of Queens, City & State of New York	**Driller**	V. Albanez
Boring Location	See Plan	**Date Started**	02/20/2025
Ground Surface Elev.	41.0 Feet **Datum** NAVD 88	**Date Finished**	02/21/2025

Item	Casing	Sampler	Core Barrel	Rig Type
Type	F.J.	S.S.	--	Truck-Mounted
Inside Diameter (in)	4.00	1.4	--	CME 75
Hammer Weight (lb.)	--	140		**Drill Mud**
Hammer Fall (in)	--	30		Water
Hammer Type	--	Donut		EZ-Mud

Water Level Data

Date	Time	Bottom of Casing (ft)	Bottom of Boring (ft)	Water (ft)	Cave In (ft)
02/20/25	11:48 AM	--	22.0	20.0	

Depth (ft)	Sample No. & Rec. (in)	Sample Depth (ft)	Sampler Blows per 6 inches	USCS Symbol	Visual Classification	Remarks
0				A.P.	Approx. 4-inch of Asphalt Pavement +/-0.3'	
	S-1 10 in.	1- 3 ft	25 27 24 30	Fill NYC Class 7	Fill: Brown medium to fine sand, little gravel, little silt, moist	
	S-2 6 in.	3- 5 ft	15 30 10 8	Fill NYC Class 7	Fill: Brown medium to fine sand, some gravel, little silt, wet	
5	S-3 3 in.	5- 7 ft	5 2 5 4	Fill NYC Class 7	Fill: Grayish brown medium to fine sand, some gravel, little silt, wet	
	S-4 2 in.	7- 9 ft	3 2 2 4	Fill NYC Class 7	Fill: Gray medium to fine sand, some gravel, trace of silt, wet +/-9.0'	
10	S-5 8 in.	9- 11 ft	17 19 9 10	SP NYC Class 3b	Yellowish brown SAND, little Gravel, medium dense, wet	-Added 15 feet of casing after sampling S-5
15	S-6 4 in.	15- 17 ft	9 8 7 9	SP NYC Class 3b	Brown medium to fine SAND, trace of Gravel, medium dense, wet	
20	S-7 8 in.	20- 22 ft	7 7 9 10	SP NYC Class 3b	Brown medium to fine SAND, trace of Gravel, medium dense, wet	
25						

Summary	Overburden (Linear ft)	80	Rock Cored (Linear ft)	--	No. of Samples	17

JZN Engineering, PC.	TEST BORING LOG	Boring No. B-1
		Page 2 of 3
Project Name Innovation QNS Building - Building B1		**Project No.** 24190-000

Depth (ft)	Sample No. & Rec. (in)	Sample Depth (ft)	Sampler Blows per 6 inches	USCS Symbol	Visual Classification	Remarks
25	S-8 8 in.	25- 27 ft	10 8 12 11	SP NYC Class 3b	Browm medium to fine SAND, medium dense, wet	
30	S-9 18 in.	30- 32 ft	5 8 12 20	SM NYC Class 3b	Brown medium to fine (varved) SAND, some Silt, little Clay, trace gravel, medium dense, wet	
35	S-10 14 in.	35- 37 ft	10 10 13 17	SM NYC Class 3b	Brown medium to fine SAND, some Silt, medium dense, wet	
40	S-11 10 in.	40- 42 ft	18 17 17 19	SP NYC Class 3a	Brown medium to fine SAND, some Gravel, trace of Silt, dense, wet	
45	S-12 6 in.	45- 47ft	9 11 14 14	SM NYC Class 3b	Brown medium to fine SAND, some Silt, medium dense, wet	
50	S-13 8 in.	50- 52 ft	6 8 7 6	SP NYC Class 3b	Brown medium to fine SAND, some Gravel, medium dense, wet	
55						

Summary	Overburden (Linear ft) 80	Rock Cored (Linear ft) --	No. of Samples 17

JZN Engineering, PC.	TEST BORING LOG	Boring No. B-1
		Page 3 of 4
Project Name Innovation QNS Building - Building B1		**Project No.** 24190-000

Depth (ft)	Sample No. & Rec. (in)	Sample Depth (ft)	Sampler Blows per 6 inches	USCS Symbol	Visual Classification	Remarks
55	S-14 8 in.	55- 57 ft	11 15 17 26	SP NYC Class 3a	Brown medium to fine SAND, some Gravel, dense, wet	
60	S-15 12 in.	60- 62 ft	15 14 19 23	SM NYC Class 3a	Brown medium to fine SAND, some Silt, little Clay, dense, wet	
65						-Hard drilling from 65 to 67 feet
70	S-16 12 in.	70- 72 ft	21 31 26 25	SM NYC Class 3a	Brown medium to fine SAND, some Gravel, trace of Silt, very dense, wet	
					+/-73.0'	
75		73-78 ft	7.87 min/ft 3.2 min/ft 4.07 min/ft 1.72 min/ft 3.2 min/ft		Advanced through stacked boulders, rock fragments, cobbles, intermixed with sand utilizing a rock core barrel due to drilling refusal conditions encountered	
					+/-78.0'	
80	S-17 16 in.	78- 80 ft	45 58 70 79	SM NYC Class 3a	Grayish brown medium to fine SAND, little Silt, trace of Gravel, very dense, wet	
					+/-80.0'	
					Exploration Boring B-1 Terminated Approximately 80 Feet Below Existing Ground Surface Due to Repeated Collapsing of Borehole	
85						

Summary	Overburden (Linear ft) 80	Rock Cored (Linear ft) --	No. of Samples 17

JZN Engineering, PC.	TEST BORING LOG	Boring No. B-2 Page 1 of 2

Project Name	Innovation QNS- Building B1	**Project No.**	24190-000
Client	Key Civil Engineering, P.C.	**Representative**	A. More
Project Location	35-18 Steinway Street	**Contractor**	Diamond Drilling, Inc.
	Astoria, Borough of Queens, City & State of New York	**Driller**	V. Albanez
Boring Location	See Plan	**Date Started**	02/27/2025
Ground Surface Elev.	41.3 Feet **Datum** NAVD 88	**Date Finished**	02/28/2025

Item	Casing	Sampler	Core Barrel	Rig Type
Type	F.J.	S.S.	--	Truck-Mounted
Inside Diameter (in)	4.00	1.4	--	CME 75
Hammer Weight (lb)	--	140		**Drill Mud**
Hammer Fall (in)	--	30		Water
Hammer Type	--	Donut		EZ-Mud

Water Level Data					
Date	**Time**	**Bottom of Casing (ft)**	**Bottom of Boring (ft)**	**Water (ft)**	**Cave In (ft)**
02/27/25	2:39 PM	4.0	27.0	25.0	--

Depth (ft)	Sample No. & Rec. (in)	Sample Depth (ft)	Sampler Blows per 6 inches	USCS Symbol	Visual Classification	Remarks
0				A.P.	Approx. 3-inches of Asphalt Pavement +/-0.3'	
	S-1 6 in.	1- 1.83 ft	18 50/4"	Fill NYC Class 7	Fill: Yellowish brown medium to fine sand, little gravel, trace silt, moist Debris: Brick	
					+/-3.0'	
	S-2 6 in.	3- 5 ft	7 4 4 7	SP NYC Class 6	Yellowish brown medium to fine SAND, trace Gravel, loose, moist	
5	S-3 8 in.	5- 7 ft	9 9 7 4	SP NYC Class 3b	Yellowish brown medium to fine SAND, trace Gravel, medium dense, moist	
	S-4 6 in.	7- 9 ft	7 7 6 5	SP NYC Class 3b	Yellowish brown medium to fine SAND, trace Gravel, medium dense, moist	-Added 5 ft of casing after sampling S-4
10	S-5 10 in.	9- 11 ft	4 4 5 4	SP NYC Class 6	Yellowish brown medium to fine SAND, little Silt, loose, moist	
15	S-6 6 in.	15- 17 ft	5 7 6 6	SP NYC Class 3b	Light brown fine SAND, medium dense, moist	
20	S-7 6 in.	20- 22 ft	6 6 8 6	SP NYC Class 3b	Brown medium to fine SAND, trace of Silt, medium dense, moist	
25						

Summary	Overburden (Linear ft)	52	Rock Cored (Linear ft)	--	No. of Samples	11

JZN Engineering, PC.	TEST BORING LOG	Boring No. B-2
		Page 2 of 2
Project Name Innovation QNS Building - Building B1		**Project No.** 24190-000

Depth (ft)	Sample No. & Rec. (in)	Sample Depth (ft)	Sampler Blows per 6 inches	USCS Symbol	Visual Classification	Remarks
25	S-8 10 in.	25- 27 ft	8 9 10 11	SM NYC Class 3b	Brown medium to fine SAND, little Silt, medium dense, wet	
30	S-9 14 in.	30- 32 ft	7 8 9 12	SM NYC Class 3b	Brown medium to fine SAND, some Silt, medium dense, wet	
35						
40	S-10 10 in.	40- 42 ft	6 16 15 16	SM NYC Class 3a	Brown medium to fine SAND, some Silt, dense, wet	
45						
50	S-11 12 in.	50- 52 ft	15 23 38 30	SP NYC Class 3a	Light brown medium to fine SAND, very dense, wet +/-52.0'	
55					Exploration Boring B-2 Terminated Approximately 52 Feet Below Existing Ground Surface	

Summary	Overburden (Linear ft) 52	Rock Cored (Linear ft) --	No. of Samples 11

JZN Engineering, PC.

TEST BORING LOG

Boring No. B-3 **Page** 1 of 2

Project Name	Innovation QNS- Building B1	**Project No.**	24190-000
Client	Key Civil Engineering, P.C.	**Representative**	A. More
Project Location	35-18 Steinway Street	**Contractor**	Diamond Drilling, Inc.
	Astoria, Borough of Queens, City & State of New York	**Driller**	V. Albanez
Boring Location	See Plan	**Date Started**	02/24/2025
Ground Surface Elev.	41.6 Feet **Datum** NAVD 88	**Date Finished**	02/24/2025

Item	Casing	Sampler	Core Barrel	Rig Type
Type	F.J.	S.S.	--	Truck-Mounted
Inside Diameter (in)	4.00	1.4	--	CME 75
Hammer Weight (lb)	--	140		**Drill Mud**
Hammer Fall (in)	--	30		Water
Hammer Type	--	Donut		EZ-Mud

Water Level Data

Date	Time	Bottom of Casing (ft)	Bottom of Boring (ft)	Water (ft)	Cave In (ft)
02/24/25	8:30 AM	4.0	22.0	20.0	--

Depth (ft)	Sample No. & Rec. (in)	Sample Depth (ft)	Sampler Blows per 6 inches	USCS Symbol	Visual Classification	Remarks
0				A.P.	Approx. 3.5-inches of Asphalt Pavement +/-0.4'	
	S-1 14 in.	1- 3 ft	25 28 19 15	Fill NYC Class 7	Fill: Brown medium to fine sand, some gravel, trace of silt, moist	
	S-2 8 in.	3- 5 ft	13 14 7 5	Fill NYC Class 7	Fil: Yellowish brown medium to fine sand, trace of fine gravel, moist	
5	S-3 16 in.	5- 7 ft	5 5 4 3	Fill NYC Class 7	Fill: Brown medium to fine sand, moist	
	S-4 16 in.	7- 9 ft	3 3 4 4	Fill NYC Class 7	Fill: Brown medium to fine sand, moist +/-9.0'	
10	S-5 14 in.	9- 11 ft	3 2 2 2	SP NYC Class 6	Brown medium to fine SAND, loose, moist	-Added 5 feet of casing after sampling sample S-5
15	S-6 10 in.	15- 17 ft	6 7 11 12	SM NYC Class 3b	Brown medium to fine (varved) SAND, trace of Silt, medium dense, moist	
20	S-7 12 in.	20- 22 ft	9 9 12 13	SM NYC Class 3b	Brown medium to fine SAND, some Silt, medium dense, wet	
25						

Summary	Overburden (Linear ft)	52	Rock Cored (Linear ft)	--	No. of Samples	13

JZN Engineering, PC.	TEST BORING LOG	Boring No. B-3 Page 2 of 2
Project Name Innovation QNS Building - Building B1		**Project No.** 24190-000

Depth (ft)	Sample No. & Rec. (in)	Sample Depth (ft)	Sampler Blows per 6 inches	USCS Symbol	Visual Classification	Remarks
25	S-8 10 in.	25- 27 ft	8 9 10 9	SM NYC Class 3b	Brown medium to fine SAND, some Silt, medium dense, wet	
30	S-9 12 in.	30- 32 ft	7 8 11 12	SM NYC Class 3b	Brown medium to fine SAND, some Silt, medium dense, wet	
35	S-10 6 in.	35- 37 ft	9 11 10 14	SP NYC Class 3b	Brown medium to fine SAND, medium dense, wet	
40	S-11 8 in.	40- 42 ft	10 9 11 15	SP NYC Class 3b	Brown medium to fine SAND, trace of Silt, medium dense, wet	
45	S-12 8 in.	45- 47 ft	12 11 14 12	SM NYC Class 3b	Brown medium to fine SAND, little Silt, medium dense, wet	
50	S-13 6 in.	50- 52 ft	13 14 15 18	SP NYC Class 3b	Brown medium to fine SAND, medium dense, wet +/-52.0'	
55					Exploration Boring B-3 Terminated Approximately 52 Feet Below Existing Ground Surface	

Summary	Overburden (Linear ft) 52	Rock Cored (Linear ft) --	No. of Samples 13

JZN Engineering, PC.

TEST BORING LOG

Boring No. B-4 **Page** 1 of 2

Project Name	Innovation QNS - Building B1	**Project No.**	24190-000
Client	Key Civil Engineering, P.C.	**Representative**	A. More
Project Location	35-18 Steinway Street	**Contractor**	Diamond Drilling, Inc.
	Astoria, Borough of Queens, City & State of New York	**Driller**	V. Albanez
Boring Location	See Plan	**Date Started**	02/27/2025
Ground Surface Elev.	39.4 Feet **Datum** NAVD 88	**Date Finished**	02/27/2025

Item	Casing	Sampler	Core Barrel	Rig Type
Type	F.J.	S.S.	--	Truck-Mounted
Inside Diameter (in)	4.00	1.4	--	CME 75
Hammer Weight (lb)	--	140		**Drill Mud**
Hammer Fall (in)	--	30		Water
Hammer Type	--	Donut		EZ-Mud

Water Level Data

Date	Time	Bottom of Casing (ft)	Bottom of Boring (ft)	Water (ft)	Cave In (ft)
02/27/25	9:50 AM	9.0	22.0	20.0	--

Depth (ft)	Sample No. & Rec. (in)	Sample Depth (ft)	Sampler Blows per 6 inches	USCS Symbol	Visual Classification	Remarks
0				A.P	Approx. 4-inch of Asphalt Pavement +/-0.3'	
	S-1 4 in.	1-2.1 ft	40 42 50/1"	Fill NYC Class 7	Fill: Grayish brown medium to fine sand, some gravel, little debris, moist Debris: Brick	
	S-2 3 in.	3-5 ft	12 13 7 3	Fill NYC Class 7	Fill: Brown coarse to medium sand, some gravel, moist	
5	S-3 3 in.	5-7 ft	13 18 6 5	Fill NYC Class 7	Fill: Brown medium to fine sand, some gravel, moist	
	S-4 4 in.	7-9 ft	5 5 8 8	Fill NYC Class 7	Fill: Brown medium to fine sand, little gravel, moist +/-9.0'	
10	S-5 8 in.	9-11 ft	13 9 9 6	SP NYC Class 3b	Yellowish brown medium to fine SAND, little Gravel, medium dense, moist	
15	S-6 6 in.	15-17 ft	5 6 7 8	SP NYC Class 3b	Brown medium to fine SAND, trace of Gravel, medium dense, moist	
20	S-7 12 in.	20-22 ft	8 8 11 10	SM NYC Class 3b	Brown medium to fine SAND, little Silt, medium dense, wet	
25						

Summary	Overburden (Linear ft) 52	Rock Cored (Linear ft) --	No. of Samples 13

JZN Engineering, PC.	TEST BORING LOG	Boring No. B-4 Page 2 of 2
Project Name Innovation QNS Building - Building B1		**Project No.** 24190-000

Depth (ft)	Sample No. & Rec. (in)	Sample Depth (ft)	Sampler Blows per 6 inches	USCS Symbol	Visual Classification	Remarks
25	S-8 14 in.	25-27 ft	9 14 14 19	SP NYC Class 3b	Brown medium to fine SAND, little Silt, medium dense, wet	
30	S-9 16 in.	30-32 ft	9 13 13 17	SP NYC Class 3b	Brown medium to fine SAND, little Silt, medium dense, wet	
35	S-10 8 in.	35-37 ft	11 8 11 17	SP NYC Class 3b	Brown medium to fine SAND, little Gravel, medium dense, wet	
40	S-11 12 in.	40-42 ft	6 9 12 13	SM NYC Class 3b	Brown medium to fine SAND, some Silt, medium dense, wet	
45	S-12 8 in.	45-47 ft	17 23 18 15	SP NYC Class 3a	Brown medium to fine SAND, little Silt, little Gravel, dense, wet	
50	S-13 12 in.	50-52 ft	14 17 17 19	SP NYC Class 3a	Brown medium to fine SAND, little Gravel, medium dense, wet +/-52.0' Exploration Boring B-4 Terminated Approximately 52 Feet Below Existing Ground Surface	
55						

Summary	Overburden (Linear ft) 52	Rock Cored (Linear ft) --	No. of Samples 13

JZN Engineering, PC.	TEST BORING LOG	Boring No. B-5 Page 1 of 4

Project Name	Innovation QNS - Building B1	**Project No.**	24190-000
Client	Key Civil Engineering, P.C.	**Representative**	A. More
Project Location	35-18 Steinway Street	**Contractor**	Diamond Drilling, Inc.
	Astoria, Borough of Queens, City & State of New York	**Driller**	V. Albanez
Boring Location	See Plan	**Date Started**	02/28/2025
Ground Surface Elev.	40.5 Feet **Datum** NAVD 88	**Date Finished**	03/03/2025

Item	Casing	Sampler	Core Barrel	Rig Type
Type	F.J.	S.S.	--	Truck-Mounted
Inside Diameter (in)	4.00	1.4	--	CME 75
Hammer Weight (lb)	--	140		**Drill Mud**
Hammer Fall (in)	--	30		Water
Hammer Type	--	Donut		EZ-Mud

Water Level Data					
Date	**Time**	**Bottom of Casing (ft)**	**Bottom of Boring (ft)**	**Water (ft)**	**Cave In (ft)**
02/28/25	10:35 AM	4.0	22.0	20.0	--

Depth (ft)	Sample No. & Rec. (in)	Sample Depth (ft)	Sampler Blows per 6 inches	USCS Symbol	Visual Classification	Remarks
0				A.P.	Approx. 3-inches of Asphalt Pavement +/-0.3'	
	S-1 10 in.	1-3 ft	10 8 4 3	Fill NYC Class 7	Fill: Yellowish brown medium to fine sand, trace of silt, moist	
	S-2 6 in.	3-5 ft	3 3 3 5	Fill NYC Class 7	Fill: Yellowish brown medium to fine sand, trace of silt, moist	
5	S-3 12 in.	5-7 ft	4 4 5 5	Fill NYC Class 7	Fill: Yellowish brown medium to fine sand, trace of silt, moist	
	S-4 16 in.	7-9 ft	3 2 3 4	Fill NYC Class 7	Fill: Light brown fine sand, little silt, moist +/-9'	
10	S-5 12 in.	9-11 ft	4 5 5 6	SP NYC Class 3b	Light brown fine SAND, trace of Silt, medium dense, moist	-Added 5 feet of casing after S-6
15	S-6 12 in.	15-17 ft	6 12 13 13	SP NYC Class 3b	Light brown fine SAND, trace of Silt, medium dense, moist	
20	S-7 10 in.	20-22 ft	7 11 13 12	SM NYC Class 3b	Brown fine SAND, some Silt, medium dense, wet	
25						

Summary	Overburden (Linear ft) 101.2	Rock Cored (Linear ft) --	No. of Samples 19

JZN Engineering, PC.	TEST BORING LOG	Boring No. B-5
		Page 2 of 4
Project Name Innovation QNS Building - Building B1		**Project No.** 24190-000

Depth (ft)	Sample No. & Rec. (in)	Sample Depth (ft)	Sampler Blows per 6 inches	USCS Symbol	Visual Classification	Remarks
25	S-8 16 in.	25-27 ft	10 10 8 11	SP NYC Class 3b	Light brown fine SAND, medium dense, wet	
30	S-9 8 in.	30-32 ft	15 14 16 17	SP NYC Class 3a	Light brown medium to fine SAND, trace of Silt, medium dense, wet	
35	S-10 10 in.	35-37 ft	8 9 11 15	SP NYC Class 3b	Light brown medium to fine SAND, trace of Silt, medium dense, wet	
40	S-11 16 in.	40-42 ft	8 10 13 12	SP NYC Class 3b	Light brown medium to fine SAND, trace of Silt, medium dense, wet	
45	S-12 12 in.	45-47 ft	15 18 20 20	SP NYC Class 3a	Brown medium to fine SAND, little Gravel, dense, wet	
						-Hard drilling at approximately 48 feet
50	S-13 12 in.	50-52 ft	11 13 16 14	SP NYC Class 3b	Brown medium to fine SAND, trace of Silt, trace of Gravel, medium dense wet	
55						

Summary	Overburden (Linear ft) 101.2	Rock Cored (Linear ft) --	No. of Samples 19

JZN Engineering, PC.	TEST BORING LOG	Boring No. B-5 Page 3 of 4
Project Name Innovation QNS Building - Building B1		Project No. 24190-000

Depth (ft)	Sample No. & Rec. (in)	Sample Depth (ft)	Sampler Blows per 6 inches	USCS Symbol	Visual Classification	Remarks
55	S-14 8 in.	55-57 ft	14 20 18 14	SP NYC Class 3a	Brown medium to fine SAND, little Gravel, trace of Silt, dense, wet	
60	S-15 10 in.	60-62 ft	54 40 36 18	SP NYC Class 3a	Brown medium to fine SAND, some Gravel, trace of Silt, dense, wet	-Hard drilling at approximately 59 feet
65						
70	S-16 8 in.	70-72 ft	71 68 58 67	SP NYC Class 3a	Brown medium to fine SAND, some Gravel, trace of Silt, dense, moist	
75						-Hard drilling at approximately 75 feet
80	S-17 12 in.	80-81.3 ft	19 33 50/3"	SM NYC Class 3b	Gray medium to fine SAND, some Silt, trace of Gravel, very dense, wet	
85						

Summary	Overburden (Linear ft) 101.2	Rock Cored (Linear ft) --	No. of Samples 19

JZN Engineering, PC.	TEST BORING LOG	Boring No. B-5	Page 4 of 4
Project Name Innovation QNS Building - Building B1		**Project No.** 24190-000	

Depth (ft)	Sample No. & Rec. (in)	Sample Depth (ft)	Sampler Blows per 6 inches	USCS Symbol	Visual Classification	Remarks
85						
90	S-18 12 in.	90-92 ft	30 55 54 70	SP NYC Class 3a	Light gray medium to fine SAND, trace of Gravel, very dense, wet	
95						
100	S-19 8 in.	100-101.7 ft	40 55 70/2"	SM NYC Class 3a	Gray medium to fine SAND, some Silt, very dense, wet +/-101.2'	
105					Exploration Boring B-5 Terminated Approximately 101.2 Feet Below Existing Ground Surface	
110						
115						

Summary	Overburden (Linear ft) 101.2	Rock Cored (Linear ft) --	No. of Samples 19

JZN Engineering, PC.

TEST BORING LOG

Boring No. B-6 **Page** 1 of 2

Project Name	Innovation QNS - Building B1	**Project No.**	24190-000
Client	Key Civil Engineering, P.C.	**Representative**	A. More
Project Location	35-18 Steinway Street	**Contractor**	Diamond Drilling, Inc.
	Astoria, Borough of Queens, City & State of New York	**Driller**	V. Albanez
Boring Location	See Plan	**Date Started**	02/24/2025
Ground Surface Elev.	40.8 Feet **Datum** NAVD 88	**Date Finished**	02/24/2025

Item	Casing	Sampler	Core Barrel	Rig Type
Type	F.J.	S.S.	--	Truck-Mounted
Inside Diameter (in)	4.00	1.4	--	CME 75
Hammer Weight (lb)	--	140		**Drill Mud**
Hammer Fall (in)	--	30		Water
Hammer Type	--	Donut		EZ-Mud

Water Level Data

Date	Time	Bottom of Casing (ft)	Bottom of Boring (ft)	Water (ft)	Cave In (ft)
02/24/25	12:45 PM	4.0	22.0	20.0	--

Depth (ft)	Sample No. & Rec. (in)	Sample Depth (ft)	Sampler Blows per 6 inches	USCS Symbol	Visual Classification	Remarks
0				A.P.	Approx. 3-inches of Asphalt Pavement +/-0.3'	
	S-1 10 in.	1-3 ft	73 12 8 5	Fill NYC Class 7	Fill: Brown medium to fine sand, little gravel, little debris, trace of silt, moist Debris: Concrete	
	S-2 6 in.	3-5 ft	8 9 8 5	Fill NYC Class 7	Fill: Brown medium to fine sand, trace of silt, trace of gravel, moist +/-5.0'	
5	S-3 18 in.	5-7 ft	4 3 2 2	SP NYC Class 6	Yellowish brown medium to fine SAND, loose, moist	
	S-4 14 in.	7-9 ft	4 2 2 3	SP NYC Class 6	Yellowish brown medium to fine SAND, loose, moist	
10	S-5 10 in.	9-11 ft	4 3 4 7	SP NYC Class 6	Yellowish brown medium to fine SAND, loose, moist	-Added 5 feet of casing after S-5
15	S-6 6 in.	15-17 ft	7 10 12 14	SP NYC Class 3b	Pale brown medium to fine SAND, medium dense, moist	
20	S-7 8 in.	20-22 ft	10 10 9 20	SM NYC Class 3b	Brown medium to fine SAND, little Silt, medium dense, wet	
25						

Summary	Overburden (Linear ft)	52	Rock Cored (Linear ft)	--	No. of Samples	13

JZN Engineering, PC.	TEST BORING LOG	Boring No. B-6 Page 2 of 4
Project Name Innovation QNS Building - Building B1		**Project No.** 24190-000

Depth (ft)	Sample No. & Rec. (in)	Sample Depth (ft)	Sampler Blows per 6 inches	USCS Symbol	Visual Classification	Remarks
25	S-8 6 in.	25-27 ft	14 15 13 12	SP NYC Class 3b	Brown medium to fine SAND, little Gravel, medium dense, wet	
30	S-9 6 in.	30-32 ft	9 8 7 8	SP NYC Class 3b	Brown medium to fine SAND, little Gravel, medium dense, wet	
35	S-10 8 in.	35-37 ft	12 10 12 14	SP NYC Class 3b	Brown medium to fine SAND, little Gravel, little Silt, medium dense, wet	
40	S-11 2 in.	40-42 ft	14 24 16 14	SP NYC Class 3a	Brown medium to fine SAND, trace of Gravel, dense, wet	
45	S-12 4 in.	45-47 ft	13 12 15 11	SP NYC Class 3b	Brown medium to fine SAND, trace of Gravel, medium dense wet	
50	S-13 3 in.	50-52 ft	14 21 30 28	SP NYC Class 3a	Brown medium fine SAND, trace of Gravel, very dense, wet +/-52.0'	
55					Exploration Boring B-6 Terminated Approximately 52 Feet Below Existing Ground Surface	

Summary	Overburden (Linear ft) 52	Rock Cored (Linear ft) --	No. of Samples 13

JZN Engineering, PC.

TEST BORING LOG

Boring No. B-7 **Page** 1 of 2

Project Name	Innovation QNS - Building B1	**Project No.**	24190-000
Client	Key Civil Engineering, P.C.	**Representative**	A. More
Project Location	35-18 Steinway Street	**Contractor**	Diamond Drilling, Inc.
	Astoria, Borough of Queens, City & State of New York	**Driller**	V. Albanez
Boring Location	See Plan	**Date Started**	02/26/2025
Ground Surface Elev.	38.1 Feet **Datum** NAVD 88	**Date Finished**	02/26/2025

Item	Casing	Sampler	Core Barrel	Rig Type
Type	F.J.	S.S.	--	Truck-Mounted
Inside Diameter (in)	4.00	1.4	--	CME 75
Hammer Weight (lb)	--	140		**Drill Mud**
Hammer Fall (in)	--	30		Water
Hammer Type	--	Donut		EZ-Mud

Water Level Data

Date	Time	Bottom of Casing (ft)	Bottom of Boring (ft)	Water (ft)	Cave In (ft)
02/26/25	9:30 AM	9.0	22.0	20.0	--

Depth (ft)	Sample No. & Rec. (in)	Sample Depth (ft)	Sampler Blows per 6 inches	USCS Symbol	Visual Classification	Remarks
0				A.P.	Approx. 3-inches of Asphalt Pavement +/-0.3'	
	S-1 10 in.	1-3 ft	42 25 13 9	Fill NYC Class 7	Fill: Yellowish brown medium to fine sand, little gravel, moist	
	S-2 8 in.	3-5 ft	9 8 7 4	Fill NYC Class 7	Fill: Yellowish brown medium to fine SAND, trace of Gravel, moist	
5	S-3 4 in.	5-7 ft	5 6 2 1	Fill NYC Class 7	Fill: Yellowish brown medium to fine SAND, trace of Gravel, moist +/-7.0'	
	S-4 16 in.	7-9 ft	4 5 5 5	SP NYC Class 3b	Yellowish brown fine SAND, trace of Gravel, medium dense, moist	
10	S-5 12 in.	9-11 ft	5 6 5 6	SP NYC Class 3b	Yellowish brown fine SAND, medium dense, moist	-Added 5 feet of casing after S-5
15	S-6 14 in.	15-17 ft	10 16 19 17	SP NYC Class 3a	Pale brown fine SAND, dense, moist	
20	S-7 8 in.	20-22 ft	7 10 11 11	SP NYC Class 3b	Light brown fine SAND, medium dense, wet	
25						

Summary	Overburden (Linear ft)	52	Rock Cored (Linear ft)	--	No. of Samples	13

JZN Engineering, PC.	TEST BORING LOG	Boring No. B-7
		Page 2 of 2
Project Name Innovation QNS Building - Building B1		**Project No.** 24190-000

Depth (ft)	Sample No. & Rec. (in)	Sample Depth (ft)	Sampler Blows per 6 inches	USCS Symbol	Visual Classification	Remarks
25	S-8 2 in.	25-27 ft	17 12 8 9	SP NYC Class 3b	Light brown medium to fine SAND, trace of Gravel, medium dense, wet	
30	S-9 6 in.	30-32 ft	13 17 13 13	SP NYC Class 3a	Light brown medium to fine SAND, little Gravel, dense, wet	
35	S-10 5 in.	35-37 ft	21 27 16 18	SP NYC Class 3a	Light brown coarse to medium SAND, some Gravel, dense, wet	-Hard drilling from approximately 35 to 37 feet
40	S-11 6 in.	40-42 ft	11 9 10 9	SP NYC Class 3b	Light brown coarse to medium SAND, some Gravel, medium dense, wet	
45	S-12 8 in.	45-47 ft	13 10 10 13	SP NYC Class 3b	Brown medium to fine SAND, little Gravel, medium dense, wet	
50	S-13 10 in.	50-52 ft	8 9 11 12	SP NYC Class 3b	Brown medium to fine SAND, little Gravel, medium dense, wet +/-52.0'	
55					Exploration Boring B-7 Terminated Approximately 52 Feet Below Existing Ground Surface	

Summary	Overburden (Linear ft) 52	Rock Cored (Linear ft) --	No. of Samples 13

JZN Engineering, PC.

TEST BORING LOG

Boring No. B-8 **Page** 1 of 2

Project Name	Innovation QNS - Building B1	**Project No.**	24190-000
Client	Key Civil Engineering, P.C.	**Representative**	A. More
Project Location	35-18 Steinway Street	**Contractor**	Diamond Drilling, Inc.
	Astoria, Borough of Queens, City & State of New York	**Driller**	V. Albanez
Boring Location	See Plan	**Date Started**	02/25/2025
Ground Surface Elev.	38.8 Feet **Datum** NAVD 88	**Date Finished**	02/25/2025

Item	Casing	Sampler	Core Barrel	Rig Type
Type	F.J.	S.S.	--	Truck-Mounted
Inside Diameter (in)	4.00	1.4	--	CME 75
Hammer Weight (lb)	--	140		**Drill Mud**
Hammer Fall (in)	--	30		Water
Hammer Type	--	Donut		EZ-Mud

Water Level Data

Date	Time	Bottom of Casing (ft)	Bottom of Boring (ft)	Water (ft)	Cave In (ft)
02/25/25	9:15 AM	9.0	22.0	20.0	--

Depth (ft)	Sample No. & Rec. (in)	Sample Depth (ft)	Sampler Blows per 6 inches	USCS Symbol	Visual Classification	Remarks
0				A.P.	Approx. 3-inches of Asphalt Pavement +/-0.3'	
	S-1 8 in.	1-3 ft	49 18 12 10	Fill NYC Class 7	Fill: Grayish brown medium to fine sand, some gravel, trace of silt, trace of debris, moist Debris: Concrete	
	S-2 4 in.	3-5 ft	22 10 6 6	Fill NYC Class 7	Fill: Grayish brown medium to fine sand, some gravel, trace of silt, trace of debris, moist Debris: Concrete	
5	S-3 4 in.	5-7 ft	5 3 4 4	Fill NYC Class 7	Fill: Yellowish brown medium to fine SAND, little Silt, little fine gravel, moist +/-7.0'	
	S-4 8 in.	7-9 ft	6 5 7 6	SP NYC Class 3b	Yellowish brown medium to fine SAND, medium dense, moist	
10	S-5 12 in.	9-11 ft	8 8 8 4	SP NYC Class 3b	Yellowish brown medium to fine SAND, medium dense, moist	-Added 10 feet of casing after S-5
15	S-6 4 in.	15-17 ft	7 8 7 5	SP NYC Class 3b	Yellowish brown medium to fine SAND, some Gravel, medium dense, moist	
20	S-7 2 in.	20-22 ft	6 9 13 12	SP NYC Class 3b	Yellowish brown medium to fine SAND, little Gravel, medium dense, moist	
25						

Summary	Overburden (Linear ft)	52	Rock Cored (Linear ft)	--	No. of Samples 13

JZN Engineering, PC.	TEST BORING LOG	Boring No. B-8 Page 2 of 2
Project Name Innovation QNS Building - Building B1		**Project No.** 24190-000

Depth (ft)	Sample No. & Rec. (in)	Sample Depth (ft)	Sampler Blows per 6 inches	USCS Symbol	Visual Classification	Remarks
25	S-8 8 in.	25-27 ft	15 10 12 12	SM NYC Class 3b	Brown medium to fine SAND, little Silt, trace of Gravel, medium dense, wet	
30	S-9 6 in.	30-32 ft	11 12 12 9	SM NYC Class 3b	Brown medium to fine SAND, little Gravel, medium dense, wet	
35	S-10 8 in.	35-37 ft	13 14 9 11	SM NYC Class 3b	Brown medium to fine SAND, some Gravel, medium dense, wet	
40	S-11 12 in.	40-42 ft	14 11 10 9	SM NYC Class 3b	Brown medium to fine SAND, little Gravel, medium dense, wet	
45	S-12 8 in.	45-47 ft	10 8 9 7	SM NYC Class 3b	Brown medium to fine SAND, little Gravel, medium dense, wet	
50	S-13 2 in.	50-52 ft	16 20 16 26	SM NYC Class 3a	Brown medium to fine SAND, little Gravel, dense, wet +/-52.0'	
55					Exploration Boring B-8 Terminated Approximately 52 Feet Below Existing Ground Surface	

Summary	Overburden (Linear ft) 52	Rock Cored (Linear ft) --	No. of Samples 13

JZN Engineering, PC.

TEST BORING LOG

Boring No. B-9 **Page** 1 of 3

Project Name	Innovation QNS - Building B1	**Project No.**	24190-000
Client	Key Civil Engineering, P.C.	**Representative**	A. More
Project Location	35-18 Steinway Street	**Contractor**	Diamond Drilling, Inc.
	Astoria, Borough of Queens, City & State of New York	**Driller**	V. Albanez
Boring Location	See Plan	**Date Started**	03/03/2025
Ground Surface Elev.	39.2 Feet **Datum** NAVD 88	**Date Finished**	03/04/2025

Item	Casing	Sampler	Core Barrel	Rig Type
Type	F.J.	S.S.	--	Truck-Mounted
Inside Diameter (in)	4.00	1.4	--	CME 75
Hammer Weight (lb.)	--	140		**Drill Mud**
Hammer Fall (in)	--	30		Water
Hammer Type	--	Donut		EZ-Mud

Water Level Data

Date	Time	Bottom of Casing (ft)	Bottom of Boring (ft)	Water (ft)	Cave In (ft)
03/03/25	2:40 PM	15.0	22.0	20.0	--

Depth (ft)	Sample No. & Rec. (in)	Sample Depth (ft)	Sampler Blows per 6 inches	USCS Symbol	Visual Classification	Remarks
0				A.P.	Approx. 3-inches of Asphalt Pavement +/-0.3'	
	S-1 6 in.	1-3 ft	19 11 6 5	Fill NYC Class 7	Fill: Grayish brown medium to fine sand, little gravel, trace of silt, trace of debris, moist Debris: Brick	
	S-2 3 in.	3-5 ft	5 6 10 3	Fill NYC Class 7	Fill: Grayish brown medium to fine sand, little gravel, trace of silt, trace of debris, moist Debris: Brick	
5	S-3 2 in.	5-7 ft	3 4 9 5	Fill NYC Class 7	Fill: Grayish brown medium to fine sand, little gravel, trace of silt, trace of debris, moist Debris: Brick	
	S-4 3 in.	7-9 ft	7 21 15 4	Fill NYC Class 7	Fill: Light grayish brown medium to fine sand, some gravel, trace of silt, moist	
10	S-5 0 in.	9-11 ft	11 3 20 37	N.R.	No Recovery +/-11'	-Added 10 feet of casing after S-5
15	S-6 0 in.	15-17 ft	4 7 8 9	SP NYC Class 3b	Brown medium to fine SAND, little fine gravel, trace of silt, medium dense, moist	-Added 10 feet of casing after S-5
20	S-7 3 in.	20-22 ft	13 6 9 12	SP NYC Class 3b	Gray medium to fine SAND, little fine gravel, trace of silt, medium dense, wet	
25						

Summary	Overburden (Linear ft)	65	Rock Cored (Linear ft)	--	No. of Samples	14

JZN Engineering, PC.	TEST BORING LOG	Boring No. B-9 Page 2 of 3
Project Name Innovation QNS Building - Building B1		**Project No.** 24190-000

Depth (ft)	Sample No. & Rec. (in)	Sample Depth (ft)	Sampler Blows per 6 inches	USCS Symbol	Visual Classification	Remarks
25	S-8 0 in.	25-27 ft	6 26 8 5	N.R.	No Recovery (likely pushing through gravely materials)	-Added 5 feet of casing after S-7
30	S-9 10 in.	30-32 ft	28 18 9 10	SP NYC Class 3b	Light brown medium to fine SAND, medium dense, wet	
35	S-10 3 in.	35-37 ft	14 7 8 8	SP NYC Class 3b	Light brown coarse SAND, trace of Gravel, medium dense, wet	
40	S-11 0 in.	40-42 ft	8 8 8 11	N.R.	No Recovery	
45	S-12 6 in.	45-47 ft	6 6 6 6	SP NYC Class 3b	Light brown medium to fine SAND, trace of Gravel, medium dense, wet	-Added 15 feet of casing, totaling 40 feet of casing, due to loss of water
50	S-13 6 in.	50-52 ft	8 15 10 11	SP NYC Class 6	Brown medium to fine SAND, medium dense, wet	-Hard drilling at 52 feet
55						

Summary	Overburden (Linear ft) 65	Rock Cored (Linear ft) --	No. of Samples 14

JZN Engineering, PC.	TEST BORING LOG	Boring No. B-9
		Page 3 of 3
Project Name Innovation QNS Building - Building B1		**Project No.** 24190-000

Depth (ft)	Sample No. & Rec. (in)	Sample Depth (ft)	Sampler Blows per 6 inches	USCS Symbol	Visual Classification	Remarks
55						-Added 5 feet of casing
60	S-14 3 in.	30-61.2 ft	73 73 75/2"	SP NYC Class 3a	Grayish brown medium to fine SAND, some Gravel, wet	
					+/-65.0'	
65					Exploration Boring B-9 Terminated Approximately 65 Feet Below Existing Ground Surface	

Summary	Overburden (Linear ft) 65	Rock Cored (Linear ft) --	No. of Samples 14

JZN Engineering, PC.	TEST BORING LOG	Boring No. B-10 Page 1 of 2

Project Name	Innovation QNS - Building B1	**Project No.**	24190-000
Client	Key Civil Engineering, P.C.	**Representative**	A. More
Project Location	35-18 Steinway Street	**Contractor**	Diamond Drilling, Inc.
	Astoria, Borough of Queens, City & State of New York	**Driller**	V. Albanez
Boring Location	See Plan	**Date Started**	02/25/2025
Ground Surface Elev.	38.8 Feet **Datum** NAVD 88	**Date Finished**	02/25/2025

Item	Casing	Sampler	Core Barrel	Rig Type
Type	F.J.	S.S.	--	Truck-Mounted
Inside Diameter (in)	4.00	1.4	--	CME 75
Hammer Weight (lb.)	--	140		**Drill Mud**
Hammer Fall (in)	--	30		Water
Hammer Type	--	Donut		EZ-Mud

Water Level Data					
Date	**Time**	**Bottom of Casing (ft)**	**Bottom of Boring (ft)**	**Water (ft)**	**Cave In (ft)**
02/25/25	1:00 PM	9.0	22.0	20.0	--

Depth (ft)	Sample No. & Rec. (in)	Sample Depth (ft)	Sampler Blows per 6 inches	USCS Symbol	Visual Classification	Remarks
0				A.P.	Approx. 3-inches of Asphalt Pavement +/-0.3'	
	S-1 12 in.	1-3 ft	31 12 10 6	Fill NYC Class 7	Fill: Grayish yellow medium to fine sand, little gravel, trace of silt, moist	
	S-2 1 in.	3-5 ft	6 4 3 3	Fill NYC Class 7	Fill: Grayish yellow medium to fine sand, little gravel, moist	
5	S-3 6 in.	5-7 ft	5 6 4 2	Fill NYC Class 7	Fill: Yellowish brown medium to fine sand, little fine gravel, moist +/-5.0'	
	S-4 12 in.	7-9 ft	4 5 5 4	SP NYC Class 3b	Yellowish brown medium to fine SAND, trace of Gravel, medium dense, moist	
10	S-5 18 in.	9-11 ft	7 6 5 4	SP NYC Class 3b	Yellowish brown medium to fine SAND, trace of silt, medium dense, moist	-Added 10 feet of casing after S-5
15	S-6 8 in.	15-17 ft	5 6 6 6	SP NYC Class 3b	Brown medium to fine SAND, medium dense, moist	
20	S-7 10 in.	20-22 ft	9 11 14 11	SM NYC Class 3b	Brown medium to fine SAND, little Silt, medium dense, wet	
25						

Summary	Overburden (Linear ft)	52	Rock Cored (Linear ft)	--	No. of Samples	13

JZN Engineering, PC.	TEST BORING LOG	Boring No. B-10
		Page 2 of 2
Project Name Innovation QNS Building - Building B1		**Project No.** 24190-000

Depth (ft)	Sample No. & Rec. (in)	Sample Depth (ft)	Sampler Blows per 6 inches	USCS Symbol	Visual Classification	Remarks
25	S-8 8 in.	25-27 ft	9 13 12 12	SM NYC Class 3b	Brown medium to fine SAND, little Silt, medium dense, wet	
30	S-9 10 in.	30-32 ft	11 16 18 11	SM NYC Class 3a	Brown medium to fine SAND, little Silt, little Gravel, dense, wet	-Hard drilling at 34 feet
35	S-10 8 in.	35-37 ft	28 14 10 12	SP NYC Class 3b	Brown medium SAND, little Gravel, medium dense, wet	
40	S-11 0 in.	40-42 ft	12 12 15 15	N.R.	No Recovery	
45	S-12 0 in.	45-47 ft	18 15 12 12	N.R.	No Recovery	
50	S-13 1 in.	50-52 ft	13 13 13 21	SP NYC Class 3b	Brown medium to fine SAND, trace of Gravel, medium dense, wet +/-52.0'	
55					Exploration Boring B-10 Terminated Approximately 52 Feet Below Existing Ground Surface	

Summary	Overburden (Linear ft) 52	Rock Cored (Linear ft) --	No. of Samples 13

JZN Engineering, PC.	TEST BORING LOG	Boring No. B-11 Page 1 of 2

Project Name	Innovation QNS - Building B1	**Project No.**	24190-000
Client	Key Civil Engineering, P.C.	**Representative**	A. More
Project Location	35-18 Steinway Street	**Contractor**	Diamond Drilling, Inc.
	Astoria, Borough of Queens, City & State of New York	**Driller**	V. Albanez
Boring Location	See Plan	**Date Started**	02/26/2025
Ground Surface Elev.	40.5 Feet **Datum** NAVD 88	**Date Finished**	02/26/2025

Item	Casing	Sampler	Core Barrel	Rig Type
Type	F.J.	S.S.	--	Truck-Mounted
Inside Diameter (in)	4.00	1.4	--	CME 75
Hammer Weight (lb.)	--	140		**Drill Mud**
Hammer Fall (in)	--	30		Water
Hammer Type	--	Donut		EZ-Mud

Water Level Data					
Date	**Time**	**Bottom of Casing (ft)**	**Bottom of Boring (ft)**	**Water (ft)**	**Cave In (ft)**
02/26/25	1:37 PM	--	9.0	20.0	--

Depth (ft)	Sample No. & Rec. (in)	Sample Depth (ft)	Sampler Blows per 6 inches	USCS Symbol	Visual Classification	Remarks
0				A.P.	Approx. 3-inches of Asphalt Pavement +/-0.3'	
	S-1 6 in.	1-3 ft	14 9 8 6	SP NYC Class 6	Yellowish brown medium to fine SAND, trace of Gravel, medium dense, moist	
	S-2 4 in.	3-5 ft	11 10 9 8	SP NYC Class 3b	Grayish yellow medium to fine SAND, little Gravel, medium dense, moist	
5	S-3 8 in.	5-7 ft	6 7 6 3	SP NYC Class 3b	Yellowish brown medium to fine SAND, trace of Gravel, medium dense, moist	
	S-4 8 in.	7-9 ft	7 4 4 4	SP NYC Class 6	Yellowish brown fine SAND, loose, wet	
10	S-5 14 in.	9-11 ft	3 4 4 4	SP NYC Class 6	Yellowish brown fine SAND, loose, wet	-Added 10 feet of casing after S-5
15	S-6 6 in.	15-17 ft	5 7 10 11	SP NYC Class 3b	Yellowish brown fine SAND, medium dense, wet	
20	S-7 8 in.	20-22 ft	9 12 14 13	SP NYC Class 3b	Yellowish brown fine SAND, medium dense, wet	
25						

Summary	Overburden (Linear ft)	52	Rock Cored (Linear ft)	--	No. of Samples	13

JZN Engineering, PC.	TEST BORING LOG	Boring No. B-11
		Page 2 of 2
Project Name Innovation QNS Building - Building B1		**Project No.** 24190-000

Depth (ft)	Sample No. & Rec. (in)	Sample Depth (ft)	Sampler Blows per 6 inches	USCS Symbol	Visual Classification	Remarks
25	S-8 8 in.	25-27 ft	9 9 13 17	SP NYC Class 3b	Light brown medium to fine SAND, medium dense, wet	
30	S-9 16 in.	30-32 ft	15 15 13 14	SP NYC Class 3b	Brown medium to fine SAND, medium dense, wet	
35	S-10 12 in.	35-37 ft	9 9 9 7	SP NYC Class 3b	Brown medium to fine SAND, trace of Gravel, medium dense, wet	
40	S-11 12 in.	40-42 ft	10 12 11 14	SP NYC Class 3b	Brown medium to fine SAND, little Gravel, medium dense, wet	
45	S-12 16 in.	45-47 ft	12 11 12 13	SP NYC Class 3b	Brown medium to fine SAND, medium dense, wet	
50	S-13 10 in.	50-52 ft	14 18 20 23	SP NYC Class 3a	Brown medium to fine SAND, dense, wet +/-52.0'	
55					Exploration Boring B-11 Terminated Approximately 52 Feet Below Existing Ground Surface	

Summary	Overburden (Linear ft) 52	Rock Cored (Linear ft) --	No. of Samples 13

APPENDIX B

INFILTRATION TESTING RESULTS LOGS & GRAPHS

JZN Engineering, PC.	Permeability Field Test Log	Test No. I-1
		Page 1 of 1

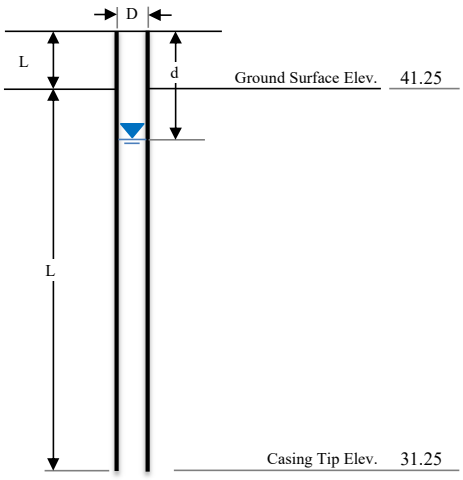
Project Name	Innovation QNS, Building B1	**Project No.**	24190-000
Client	Key Civil Engineering, P.C.	**Representative**	A. More
Project Location	35-18 Steinway Street	**Contractor**	Diamond Drilling
	Astoria, Borough of Queens, City & State of New York	**Driller**	V. Albanez
Test Location	See Plan	**Date Started**	03/06/25
Ground Surface Elev.	+/- 41.25 Feet **Datum** NAVD 88	**Date Finished**	03/06/25

Test Information

Depth to Bottom of Casing from GS (Test Depth), L1:	126	inches
Casing Diameter (Inside), D:	4	inches
Depth to Groundwater (If Encountered):	20	feet
Casing Stickup from GS, L2:	6	inches

Saturation Period

Depth to Water from Top of Casing at Start of Saturation Period, d:	0	inches
Depth to Water from Top of Casing at End of Saturation Period, d:	24	inches
Duration of Saturation Period:	1440	minutes



Test Data

Test #1	
Water Temp., T (ºF):	Depth to Water from Top of Casing at Start, d
10	0
Time, t (min)	Depth to Water from Top of Casing, d (in.)
0	0
1	1
2	1.5
3	2
4	2.5
5	2.9
10	5.5
15	7.5
30	13
45	18
60	22

Test #2	
Water Temp., T (ºF):	Depth to Water from Top of Casing at Start, d
10	0
Time, t (min)	Depth to Water from Top of Casing, d (in.)
0	0
1	0.5
2	1
3	1.25
4	1.5
5	2
10	4
15	6
30	11
45	17
60	21

Remarks:

JZN Engineering, PC.	**Permeability Field Test Log**	**Test No.** I-1
		Page 1 of 1

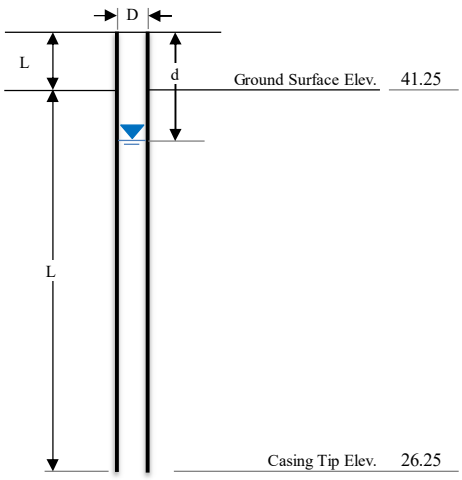
Project Name	Innovation QNS, Building B1	**Project No.**	24190-000
Client	Key Civil Engineering, P.C.	**Representative**	A. More
Project Location	35-18 Steinway Street	**Contractor**	Diamond Drilling
	Astoria, Borough of Queens, City & State of New York	**Driller**	V. Albanez
Test Location	See Plan	**Date Started**	03/06/25
Ground Surface Elev.	+/- 41.25 Feet **Datum** NAVD 88	**Date Finished**	03/06/25

Test Information

Depth to Bottom of Casing from GS (Test Depth), L1:	192	inches
Casing Diameter (Inside), D:	4	inches
Depth to Groundwater (If Encountered):	20	feet
Casing Stickup from GS, L2:	6	inches

Saturation Period

Depth to Water from Top of Casing at Start of Saturation Period, d:	0	inches
Depth to Water from Top of Casing at End of Saturation Period, d:	24	inches
Duration of Saturation Period:	60	minutes



Test Data

Test #1	
Water Temp., T (ºF):	Depth to Water from Top of Casing at Start, d
10	0
Time, t (min)	Depth to Water from Top of Casing, d (in.)
0	0
1	1
2	1.5
3	2
4	2.5
5	3
10	4
15	5.5
30	11.5
45	14
60	17

Remarks:

JZN Engineering, PC.	**Permeability Field Test Log**	**Test No.** I-2
		Page 1 of 1

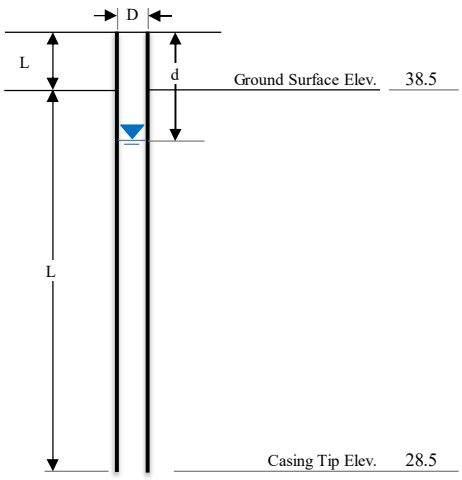
Project Name	Innovation QNS, Building B1	**Project No.**	24190-000
Client	Key Civil Engineering, P.C.	**Representative**	A. More
Project Location	35-18 Steinway Street	**Contractor**	Diamond Drilling
	Astoria, Borough of Queens, City & State of New York	**Driller**	V. Albanez
Test Location	See Plan	**Date Started**	03/06/25
Ground Surface Elev.	+/- 38.5 Feet **Datum** NAVD 88	**Date Finished**	03/06/25

Test Information

Depth to Bottom of Casing from GS (Test Depth), L1:	126	inches
Casing Diameter (Inside), D:	4	inches
Depth to Groundwater (If Encountered):	20	feet
Casing Stickup from GS, L2:	6	inches

Saturation Period

Depth to Water from Top of Casing at Start of Saturation Period, d:	0	inches
Depth to Water from Top of Casing at End of Saturation Period, d:	24	inches
Duration of Saturation Period:	1440	minutes



Test Data

Test #1	
Water Temp., T (ºF):	Depth to Water from Top of Casing at Start, d
10	0
Time, t (min)	Depth to Water from Top of Casing, d (in.)
0	0
1	1.5
2	2.5
3	3.5
4	4
5	4.5
10	6
15	7
30	9
45	10.5
60	11.5

Remarks:

JZN Engineering, PC.	**Permeability Field Test Log**	**Test No.** I-2
		Page 1 of 1

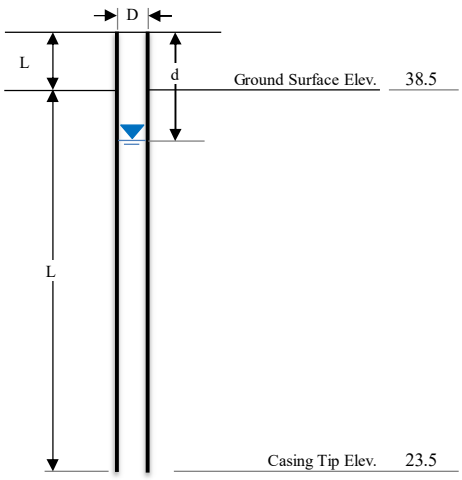
Project Name	Innovation QNS, Building B1	**Project No.**	24190-000
Client	Key Civil Engineering, P.C.	**Representative**	A. More
Project Location	35-18 Steinway Street	**Contractor**	Diamond Drilling
	Astoria, Borough of Queens, City & State of New York	**Driller**	V. Albanez
Test Location	See Plan	**Date Started**	03/06/25
Ground Surface Elev.	+/- 38.5 Feet **Datum** NAVD 88	**Date Finished**	03/06/25

Test Information

Depth to Bottom of Casing from GS (Test Depth), L1:	180	inches
Casing Diameter (Inside), D:	4	inches
Depth to Groundwater (If Encountered):	20	feet
Casing Stickup from GS, L2:	6	inches

Saturation Period

Depth to Water from Top of Casing at Start of Saturation Period, d:	0	inches
Depth to Water from Top of Casing at End of Saturation Period, d:	0	inches
Duration of Saturation Period:	60	minutes



Test Data

Test #1	
Water Temp., T (ºF):	Depth to Water from Top of Casing at Start, d
10	0
Time, t (min)	Depth to Water from Top of Casing, d (in.)
0	0
1	3.5
2	7.5
3	10.5
4	13.5
5	16.5
10	26.5
15	33
30	48
45	53
60	67

Remarks:

JZN Engineering, PC.

PT ID No. 24190-000 I-1
Sheet 1 of 4

Prepared for:
Key Civil Engineering, PC.

PROJECT: Innovation QNS - Building B1
LOCATION / BOROUGH : 35-18 Steinway Street
Astoria, Borough of Queens, City & State of New York

INSPECTOR: A. More
DRILL CO.: Diamond Drilling, Inc.
P.E./REP.: N. Jundi

DRILLER: V. Albanez
HELPER: --

Start Date: 3/6/25
Start Time: 8:45 AM

48°, Clear

Depth of PT: 3.0 ft
Rig Type: CME 75

Drill Bit Type: Tricone Roller
Casing Internal Diameter: 4.0 in
Casing Length: 120 in

Weight of Hammer for casing: 140 lbs.
Type of Hammer: Donut

ASTM D-6391-11

PERMEABILITY COEFFICIENT (Km) FORMULA:

General Formula:

$$K_m = \pi R_t \times \frac{[D\{\ln(\frac{h_1}{h_2})\}]}{11 \times (t_2 - t_1)}$$

$$R_t = 2.2902(0.9842^T)/T^{0.1702}$$

I-1

TEST 1 FINAL RESULTS **Depth: 120 in** **H_o: 120.0 in**

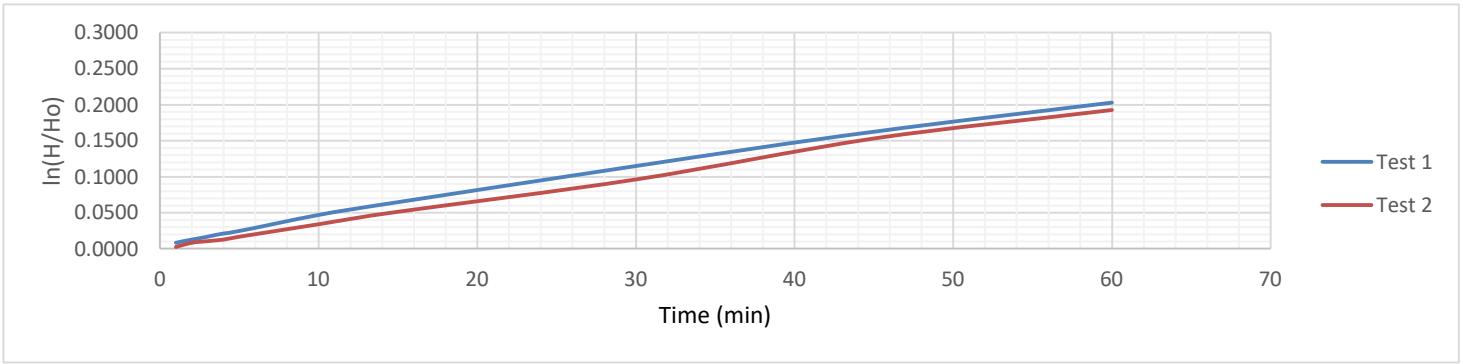
Water temperature (°C), T: 20 Rt= 1.00

FIELD DATA		CALCULATED DATA			
Time (min)	Depth (in)	Height (in)	Ln (H/Ho)	(t_1-t_2)	*Km (in/hr.)
1	1.00	119.0	0.0084	0.017	0.574
2	1.50	118.5	0.0126	0.033	0.431
3	2.00	118.0	0.0168	0.050	0.384
4	2.50	117.5	0.0211	0.067	0.361
5	2.90	117.1	0.0245	0.083	0.335
10	5.50	114.5	0.0469	0.167	0.322
15	7.50	112.5	0.0645	0.250	0.295
30	13.00	107.0	0.1147	0.500	0.262
45	18.00	102.0	0.1625	0.750	0.248
60	22.00	98.0	0.2025	1.000	0.231

TEST 2 FINAL RESULTS **Depth: 120 in** **H_o: 120.0 in**

Water temperature (°C), T: 20 Rt= 1.00

FIELD DATA		CALCULATED DATA			
Time (min)	Depth (in)	Height (in)	Ln (H/Ho)	(t_1-t_2)	*Km (in/hr.)
1	0.30	119.7	0.0025	0.017	0.172
2	1.00	119.0	0.0084	0.033	0.287
3	1.25	118.8	0.0105	0.050	0.239
4	1.50	118.5	0.0126	0.067	0.216
5	2.00	118.0	0.0168	0.083	0.230
10	4.00	116.0	0.0339	0.167	0.232
15	6.00	114.0	0.0513	0.250	0.234
30	11.00	109.0	0.0961	0.500	0.220
45	17.00	103.0	0.1528	0.750	0.233
60	21.00	99.0	0.1924	1.000	0.220



TEST 1 FINAL RESULTS

Permeability Coefficient Km= 0.231 in/hr

TEST 2 FINAL RESULTS

Permeability Coefficient Km= 0.220 in/hr

AVERAGE I-1 @ 10 FT

Average Permeability Coefficient Km= 0.226 in/hr

DEFINITION OF VARIABLES

*Km= Mean permeability
T = Temperature of permeant (water), in °C Ln = Natural Logarithmic
t1 = Time at the start of the test in the same units selected for Km
t2= Time at the end of the test in the units selected for Km
h1= Height of the water above the bottom of the casing at the start of the test in the same units selected for Km
h2= Height of the water above the bottom of the casing at the end of the test in the same units selected for Km

Rt = Ratio of viscosity of water at test temperature to the viscosity of water at 20°C

JZN Engineering, PC.

PT ID No. 24190-000 I-1
Sheet 2 of 4

Prepared for:
Key Civil Engineering, PC.

PROJECT: Innovation QNS - Building B1
LOCATION / BOROUGH : 35-18 Steinway Street
Astoria, Borough of Queens, City & State of New York

INSPECTOR:	A.More	DRILLER:	V. Albanez	Start Date: 3/6/25	48°, Clear
DRILL CO.:	Diamond Drilling, Inc.	HELPER:	--	Start Time: 11:35 AM	
P.E./REP.:	N. Jundi				

Depth of PT:	3.0 ft	Drill Bit Type:	Tricone Roller	Weight of Hammer for casing:	140 lbs.
Rig Type:	CME 75	Casing Internal Diameter:	4.0 in	Type of Hammer:	Donut
		Casing Length:	180 in		

ASTM D-6391-11 General Formula:

PERMEABILITY COEFFICIENT (Km) FORMULA:

$$K_m = \pi R_t \times \frac{[D\{\ln(\frac{h_1}{h_2})\}]}{11 \times (t_2 - t_1)}$$

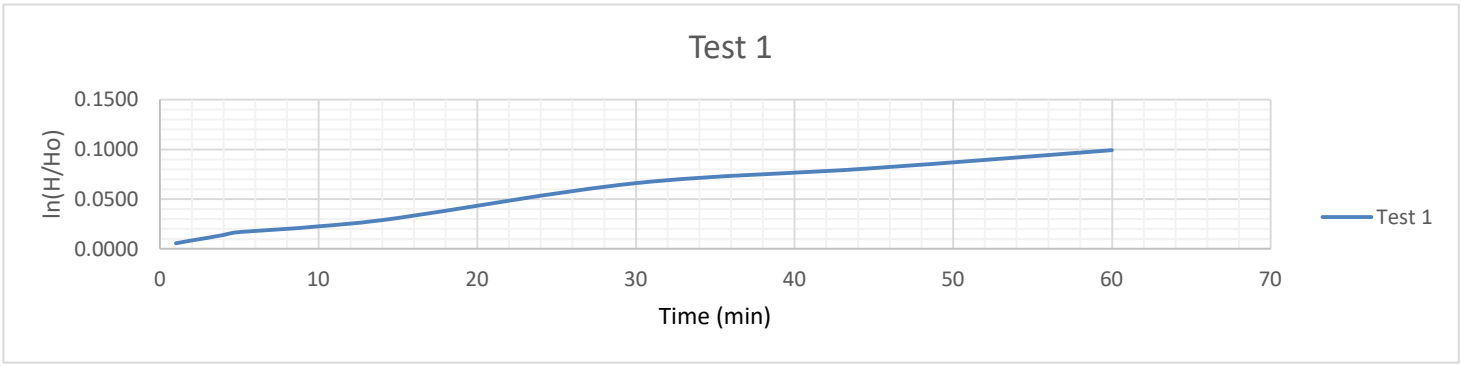
$$R_t = 2.2902(0.9842^T)/T^{0.1702}$$

I-1

TEST 1 FINAL RESULTS **Depth: 180 in** **H_o: 180.0 in**

Water temperature (°C), T: 20 Rt= 1.00

FIELD DATA		CALCULATED DATA			
Time (min)	Depth (in)	Height (in)	Ln (H/Ho)	(t_1-t_2)	*Km (in/hr.)
1	1.00	179.0	0.0056	0.017	0.382
2	1.50	178.5	0.0084	0.033	0.287
3	2.00	178.0	0.0112	0.050	0.255
4	2.50	177.5	0.0140	0.067	0.240
5	3.00	177.0	0.0168	0.083	0.230
10	4.00	176.0	0.0225	0.167	0.154
15	5.50	174.5	0.0310	0.250	0.142
30	11.50	168.5	0.0660	0.500	0.151
45	14.00	166.0	0.0810	0.750	0.123
60	17.00	163.0	0.0992	1.000	0.113



AVERAGE I-1 @ 15 FT

Average Permeability Coefficient Km= 0.113 in/hr

DEFINITION OF VARIABLES

*Km= Mean permeability
T = Temperature of permeant (water), in °C Ln = Natural Logarithmic
t1 = Time at the start of the test in the same units selected for Km
t2= Time at the end of the test in the units selected for Km
h1= Height of the water above the bottom of the casing at the start of the test in the same units selected for Km
h2= Height of the water above the bottom of the casing at the end of the test in the same units selected for Km

Rt = Ratio of viscosity of water at test temperature to the viscosity of water at 20°C

JZN Engineering, PC.

PT ID No. 24190-000 I-2
Sheet 3 of 4

Prepared for:
Key Civil Engineering, PC.

PROJECT: Innovation QNS - Building B1
LOCATION / BOROUGH : 35-18 Steinway Street
Astoria, Borough of Queens, City & State of New York

INSPECTOR:	A.More	DRILLER:	V. Albanez	Start Date: 3/6/25	48°, Clear
DRILL CO.:	Diamond Drilling, Inc.	HELPER:	--	Start Time: 9:45 AM	
P.E./REP.:	N. Jundi				

Depth of PT:	3.0 ft	Drill Bit Type:	Tricone Roller	Weight of Hammer for casing:	140 lbs.
Rig Type:	CME 75	Casing Internal Diameter:	4.0 in	Type of Hammer:	Donut
		Casing Length:	120 in		

ASTM D-6391-11 General Formula:

PERMEABILITY COEFFICIENT (Km) FORMULA:

$$K_m = \pi R_t \times \frac{[D\{\ln(\frac{h_1}{h_2})\}]}{11 \times (t_2 - t_1)}$$

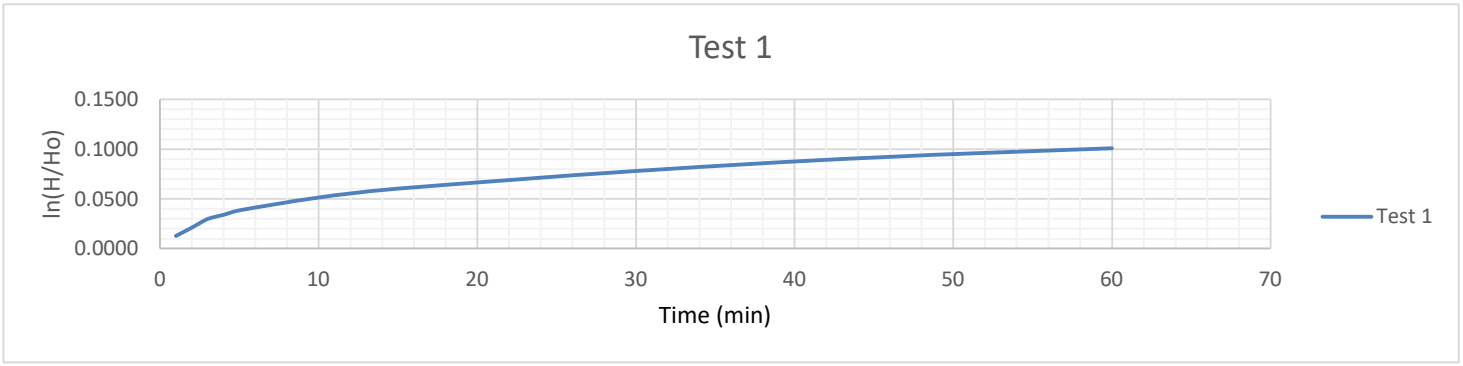
$$R_t = 2.2902(0.9842^T)/T^{0.1702}$$

I-2

TEST 1 FINAL RESULTS **Depth: 120 in** **H_o: 120.0 in**

Water temperature (°C), T: 20 Rt= 1.00

FIELD DATA		CALCULATED DATA			
Time (min)	Depth (in)	Height (in)	Ln (H/Ho)	(t_1-t_2)	*Km (in/hr.)
1	1.50	118.5	0.0126	0.017	0.862
2	2.50	117.5	0.0211	0.033	0.722
3	3.50	116.5	0.0296	0.050	0.676
4	4.00	116.0	0.0339	0.067	0.581
5	4.50	115.5	0.0382	0.083	0.524
10	6.00	114.0	0.0513	0.167	0.352
15	7.00	113.0	0.0601	0.250	0.275
30	9.00	111.0	0.0780	0.500	0.178
45	10.50	109.5	0.0916	0.750	0.140
60	11.50	108.5	0.1007	1.000	0.115



AVERAGE I-2 @ 10 FT

Average Permeability Coefficient Km= 0.115 in/hr

DEFINITION OF VARIABLES

*Km= Mean permeability
T = Temperature of permeant (water), in °C Ln = Natural Logarithmic
t1 = Time at the start of the test in the same units selected for Km
t2= Time at the end of the test in the units selected for Km
h1= Height of the water above the bottom of the casing at the start of the test in the same units selected for Km
h2= Height of the water above the bottom of the casing at the end of the test in the same units selected for Km

Rt = Ratio of viscosity of water at test temperature to the viscosity of water at 20°C

JZN Engineering, PC.

PT ID No. 24190-000 I-2
Sheet 4 of 4

Prepared for:
Key Civil Engineering, PC.

PROJECT: Innovation QNS - Building B1
LOCATION / BOROUGH : 35-18 Steinway Street
Astoria, Borough of Queens, City & State of New York

INSPECTOR:	A. More	DRILLER:	V. Albanez	Start Date: 3/6/25	48°, Clear
DRILL CO.:	Diamond Drilling, Inc.	HELPER:	--	Start Time: 1:15 PM	
P.E./REP.:	N. Jundi				

Depth of PT:	3 ft	Drill Bit Type:	Tricone Roller	Weight of Hammer for casing:	140 lbs.
Rig Type:	CME 75	Casing Internal Diameter:	4.0 in	Type of Hammer:	Donut
		Casing Length:	180 in		

ASTM D-6391-11 General Formula:

PERMEABILITY COEFFICIENT (Km) FORMULA:

$$K_m = \pi R_t \times \frac{[D\{\ln(\frac{h_1}{h_2})\}]}{11 \times (t_2 - t_1)}$$

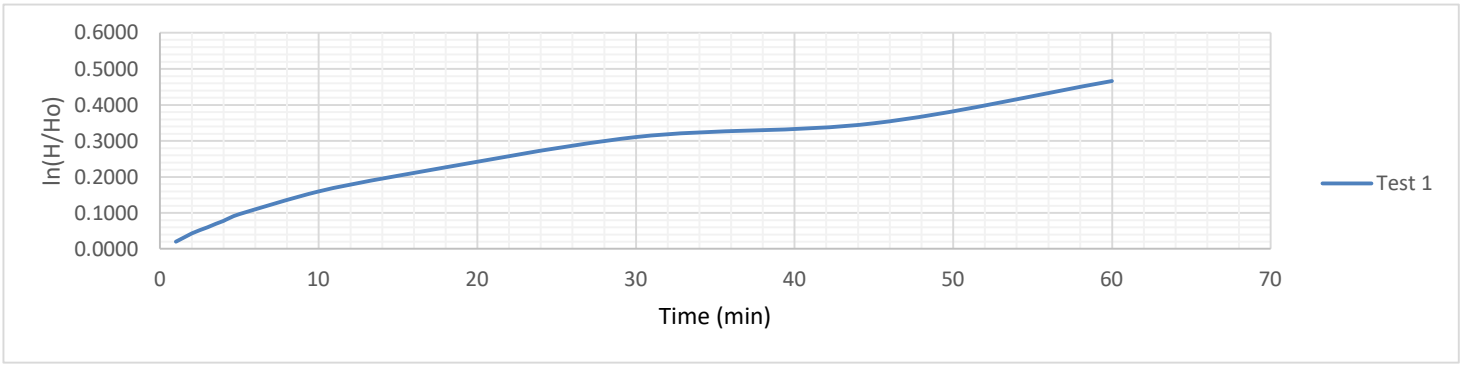
$$R_t = 2.2902(0.9842^T)/T^{0.1702}$$

I-2

TEST 1 FINAL RESULTS **Depth: 180 in** **H_o: 180.0 in**

Water temperature (°C), T: 20 Rt= 1.00

FIELD DATA		CALCULATED DATA			
Time (min)	Depth (in)	Height (in)	Ln (H/Ho)	(t_1-t_2)	*Km (in/hr.)
1	3.50	176.5	0.0196	0.017	1.346
2	7.50	172.5	0.0426	0.033	1.459
3	10.50	169.5	0.0601	0.050	1.374
4	13.50	166.5	0.0780	0.067	1.336
5	16.50	163.5	0.0961	0.083	1.318
10	26.50	153.5	0.1593	0.167	1.092
15	33.00	147.0	0.2025	0.250	0.926
30	48.00	132.0	0.3102	0.500	0.709
45	53.00	127.0	0.3488	0.750	0.531
60	67.00	113.0	0.4656	1.000	0.532



AVERAGE I-2 @ 15 FT

Average Permeability Coefficient Km= 0.532 in/hr

DEFINITION OF VARIABLES

*Km= Mean permeability
T = Temperature of permeant (water), in °C Ln = Natural Logarithmic
t1 = Time at the start of the test in the same units selected for Km
t2= Time at the end of the test in the units selected for Km
h1= Height of the water above the bottom of the casing at the start of the test in the same units selected for Km
h2= Height of the water above the bottom of the casing at the end of the test in the same units selected for Km

Rt = Ratio of viscosity of water at test temperature to the viscosity of water at 20°C

APPENDIX C

MONITORING WELL INSTALLATION LOGS

JZN Engineering, PC.

MONITORING WELL LOG

Well No. MW-1

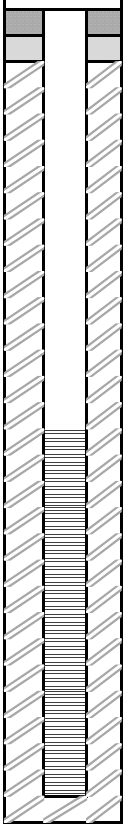
Page 1 of 1

Project Name	Innovation QNS Building - Building B1	**Project No.**	24190-000
Client	Key Civil Engineering, P.C.	**Representative**	A. More
Project Location	35-18 Steinway Street	**Contractor**	Diamond Drilling, Inc.
	Astoria, Borough of Queens, City & State of New York	**Driller**	V. Albanez
Boring Location	See Plan	**Date Started**	03/06/2025
Ground Surface Elev.	± 41.2 feet **Datum** NAVD 88	**Date Finished**	03/06/2025

Item	Casing	Sampler	Core Barrel	Rig Type
Type	F. J.	SS	--	Truck Mounted
Inside Diameter (in)	4.00	1.4	--	CME 75
Hammer Weight (lb)	--	140		**Drill Mud**
Hammer Fall (in)	--	30		Water
Hammer Type	--	Donut		EZ-Mud

Water Level Data					
Date	**Time**	**Bottom of Casing (ft)**	**Bottom of Boring (ft)**	**Water (ft)**	**Cave In (ft)**
03/13/25	7:30 AM	--	30.0	18.0	--

Depth (ft)	Sample No. & Rec. (in)	Sample Depth (ft)	Sampler Blows per 6 inches	USCS Symbol	Visual Classification	Well Diagram	Remarks
0					+/- 4.5 inch Concrete Pavement +/- 6 inch Bentonite		
					Samples Not Obtained During the Installation of Monitoring Well		
					Continuously Drilled to 30.0 Feet Below Existing Ground Surface		
10							
20							
					Water observed at 18'-0" on 3/13/25		
30							



Well Diagram
Riser Pipe
Screen
Filter Sand
Cuttings
Grout
Concrete
Bentonite Seal

Summary	Overburden (Linear ft)	30	Rock Cored (Linear ft)	--	No. of Samples 0

JZN Engineering, PC.

MONITORING WELL LOG

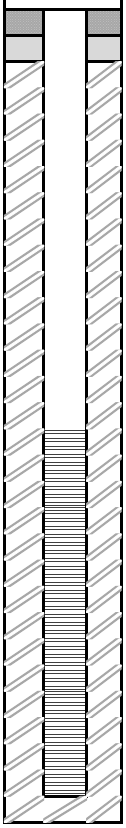
Well No. MW-2

Project Name	Innovation QNS Building - Building B1	**Project No.**	24190-000
Client	Key Civil Engineering, P.C.	**Representative**	A. More
Project Location	35-18 Steinway Street	**Contractor**	Diamond Drilling, Inc.
	Astoria, Borough of Queens, City & State of New York	**Driller**	V. Albanez
Boring Location	See Plan	**Date Started**	03/06/2025
Ground Surface Elev.	± 38.6 feet **Datum** NAVD 88	**Date Finished**	03/06/2025

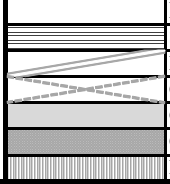
Item	Casing	Sampler	Core Barrel	Rig Type
Type	F. J.	SS	--	Truck Mounted
Inside Diameter (in)	4.00	1.4	--	CME 75
Hammer Weight (lb)	--	140		**Drill Mud**
Hammer Fall (in)	--	30		Water
Hammer Type	--	Donut		EZ-Mud

Water Level Data

Date	Time	Bottom of Casing (ft)	Bottom of Boring (ft)	Water (ft)	Cave In (ft)
03/13/25	8:00 AM	--	30.0	20.0	--

Depth (ft)	Sample No. & Rec. (in)	Sample Depth (ft)	Sampler Blows per 6 inches	USCS Symbol	Visual Classification	Well Diagram	Remarks
0					+/- 4.5 inch Concrete Pavement +/- 6 inch Bentonite Samples Not Obtained During the Installation of Monitoring Well Continuously Drilled to 30 Feet Below Existing Ground Surface		
10							
20					Water observed at 20'-0" on 3/13/25		
30							

Well Diagram



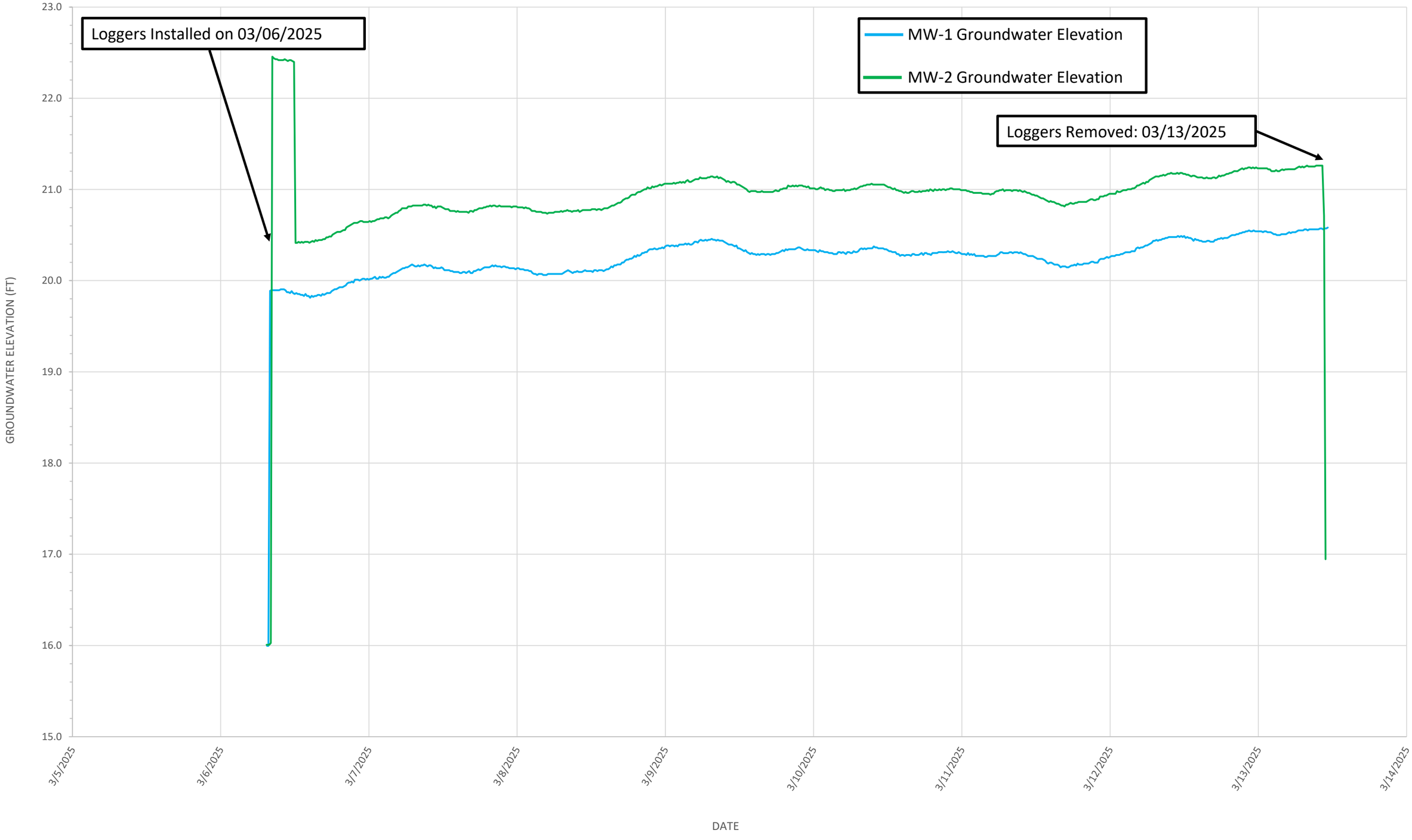
- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

Summary	Overburden (Linear ft) 30	Rock Cored (Linear ft) --	No. of Samples 0

APPENDIX D

MONITORING WELL GROUNDWATER ELEVATION GRAPHS AND DATA TABLES

Monitoring Well Groundwater Elevations - MW-1 & MW-2



JZN Project No.: 24190-000
Project: Innovation QNS - Buillding B1
Location: 35-18 Steinway St., Queens, NY
JZN Rep: A. More
Client: Key Civil Engineering, P.C
Contractor: Diamond Drilling, Inc.
Installation Date 3/6/2025
Removal Date: 03/13/2025

Monitoring Well Data Tables

Monitoring Well	Logger Serial Number	Logger Elevation (ft)	Zero Reading (psi)
MW-1	20715060	18.92	15.5852
MW-2	20715059	19.58	15.8931

MW-1 - Logger Serial No. 20715060							MW-2 - Logger Serial No. 20715059						
Date & Time	Absolute Pressure (psi)	Temperature (°F)	Gauge Pressure (psi)	Depth Below Water (ft)	Groundwater Elevation (ft)	Remarks	Date & Time	Absolute Pressure (psi)	Temperature (°F)	Gauge Pressure (psi)	Depth Below Water (ft)	Groundwater Elevation (ft)	Remarks
3/6/2025 7:30	14.3187	70.3	-1.2665	-2.9	16.0	Logger Started Logging	3/6/2025 7:25	14.3458	70.1	-1.5473	-3.6	16.0	Logger Started Logging
3/6/2025 7:44	14.3187	70.3	-1.2665	-2.9	16.0		3/6/2025 7:37	14.3458	70.1	-1.5473	-3.6	16.0	
3/6/2025 7:59	16.0051	66.5	0.4199	1.0	19.9		3/6/2025 7:52	14.3458	68.2	-1.5473	-3.6	16.0	
3/6/2025 8:14	16.0081	65.9	0.4229	1.0	19.9		3/6/2025 8:07	14.3534	65.9	-1.5397	-3.6	16.0	
3/6/2025 8:29	16.0078	65.7	0.4226	1.0	19.9		3/6/2025 8:22	17.1398	64.8	1.2467	2.9	22.5	
3/6/2025 8:44	16.0078	65.7	0.4226	1.0	19.9		3/6/2025 8:37	17.1313	64.8	1.2382	2.9	22.4	
3/6/2025 8:59	16.0078	65.7	0.4226	1.0	19.9		3/6/2025 8:52	17.1269	64.8	1.2338	2.8	22.4	
3/6/2025 9:14	16.0078	65.7	0.4226	1.0	19.9		3/6/2025 9:07	17.1269	64.8	1.2338	2.8	22.4	
3/6/2025 9:29	16.0078	65.7	0.4226	1.0	19.9		3/6/2025 9:22	17.1226	64.8	1.2295	2.8	22.4	
3/6/2025 9:44	16.0123	65.7	0.4271	1.0	19.9		3/6/2025 9:37	17.1226	64.8	1.2295	2.8	22.4	
3/6/2025 9:59	16.0123	65.7	0.4271	1.0	19.9		3/6/2025 9:52	17.1226	64.8	1.2295	2.8	22.4	
3/6/2025 10:14	16.0123	65.7	0.4271	1.0	19.9		3/6/2025 10:07	17.1226	64.8	1.2295	2.8	22.4	
3/6/2025 10:29	16.0078	65.7	0.4226	1.0	19.9		3/6/2025 10:22	17.1269	64.8	1.2338	2.8	22.4	
3/6/2025 10:44	15.9987	65.7	0.4135	1.0	19.9		3/6/2025 10:37	17.1226	64.8	1.2295	2.8	22.4	
3/6/2025 10:59	15.9987	65.7	0.4135	1.0	19.9		3/6/2025 10:52	17.1182	64.8	1.2251	2.8	22.4	
3/6/2025 11:14	15.9942	65.7	0.4090	0.9	19.9		3/6/2025 11:07	17.1226	64.8	1.2295	2.8	22.4	
3/6/2025 11:29	16.0032	65.7	0.4180	1.0	19.9		3/6/2025 11:22	17.1226	64.8	1.2295	2.8	22.4	
3/6/2025 11:44	15.9942	65.7	0.4090	0.9	19.9		3/6/2025 11:37	17.1182	64.8	1.2251	2.8	22.4	
3/6/2025 11:59	15.9897	65.7	0.4045	0.9	19.9		3/6/2025 11:52	17.1140	64.8	1.2209	2.8	22.4	
3/6/2025 12:14	15.9942	65.7	0.4090	0.9	19.9		3/6/2025 12:07	16.2544	64.7	0.3613	0.8	20.4	
3/6/2025 12:29	15.9897	65.7	0.4045	0.9	19.9		3/6/2025 12:22	16.2544	64.7	0.3613	0.8	20.4	
3/6/2025 12:44	15.9897	65.7	0.4045	0.9	19.9		3/6/2025 12:37	16.2592	64.8	0.3661	0.8	20.4	
3/6/2025 12:59	15.9852	65.7	0.4000	0.9	19.8		3/6/2025 12:52	16.2548	64.8	0.3617	0.8	20.4	
3/6/2025 13:14	15.9852	65.7	0.4000	0.9	19.8		3/6/2025 13:07	16.2592	64.8	0.3661	0.8	20.4	
3/6/2025 13:29	15.9807	65.7	0.3955	0.9	19.8		3/6/2025 13:22	16.2548	64.8	0.3617	0.8	20.4	
3/6/2025 13:44	15.9897	65.7	0.4045	0.9	19.9		3/6/2025 13:37	16.2592	64.8	0.3661	0.8	20.4	
3/6/2025 13:59	15.9807	65.7	0.3955	0.9	19.8		3/6/2025 13:52	16.2592	64.8	0.3661	0.8	20.4	
3/6/2025 14:14	15.9807	65.7	0.3955	0.9	19.8		3/6/2025 14:07	16.2592	64.8	0.3661	0.8	20.4	
3/6/2025 14:29	15.9716	65.7	0.3864	0.9	19.8		3/6/2025 14:22	16.2548	64.8	0.3617	0.8	20.4	
3/6/2025 14:44	15.9810	65.9	0.3958	0.9	19.8		3/6/2025 14:37	16.2592	64.8	0.3661	0.8	20.4	
3/6/2025 14:59	15.9762	65.7	0.3910	0.9	19.8		3/6/2025 14:52	16.2635	64.8	0.3704	0.9	20.4	
3/6/2025 15:14	15.9807	65.7	0.3955	0.9	19.8		3/6/2025 15:07	16.2592	64.8	0.3661	0.8	20.4	
3/6/2025 15:29	15.9807	65.7	0.3955	0.9	19.8		3/6/2025 15:22	16.2679	64.8	0.3748	0.9	20.4	
3/6/2025 15:44	15.9852	65.7	0.4000	0.9	19.8		3/6/2025 15:37	16.2635	64.8	0.3704	0.9	20.4	
3/6/2025 15:59	15.9852	65.7	0.4000	0.9	19.8		3/6/2025 15:52	16.2679	64.8	0.3748	0.9	20.4	
3/6/2025 16:14	15.9810	65.9	0.3958	0.9	19.8		3/6/2025 16:07	16.2679	64.8	0.3748	0.9	20.4	
3/6/2025 16:29	15.9901	65.9	0.4049	0.9	19.9		3/6/2025 16:22	16.2679	64.8	0.3748	0.9	20.4	
3/6/2025 16:44	15.9855	65.9	0.4003	0.9	19.8		3/6/2025 16:37	16.2721	64.8	0.3790	0.9	20.5	
3/6/2025 16:59	15.9901	65.9	0.4049	0.9	19.9		3/6/2025 16:52	16.2721	64.8	0.3790	0.9	20.5	
3/6/2025 17:14	15.9946	65.9	0.4094	0.9	19.9		3/6/2025 17:07	16.2808	64.8	0.3877	0.9	20.5	
3/6/2025 17:29	15.9942	65.7	0.4090	0.9	19.9		3/6/2025 17:22	16.2808	64.8	0.3877	0.9	20.5	
3/6/2025 17:44	15.9946	65.9	0.4094	0.9	19.9		3/6/2025 17:37	16.2851	64.8	0.3920	0.9	20.5	
3/6/2025 17:59	16.0036	65.9	0.4184	1.0	19.9		3/6/2025 17:52	16.2847	64.7	0.3916	0.9	20.5	
3/6/2025 18:14	16.0081	65.9	0.4229	1.0	19.9		3/6/2025 18:07	16.2937	64.8	0.4006	0.9	20.5	
3/6/2025 18:29	16.0126	65.9	0.4274	1.0	19.9		3/6/2025 18:22	16.2980	64.8	0.4049	0.9	20.5	
3/6/2025 18:44	16.0126	65.9	0.4274	1.0	19.9		3/6/2025 18:37	16.3024	64.8	0.4093	0.9	20.5	
3/6/2025 18:59	16.0171	65.9	0.4319	1.0	19.9		3/6/2025 18:52	16.3066	64.8	0.4135	1.0	20.5	
3/6/2025 19:14	16.0217	65.9	0.4365	1.0	19.9		3/6/2025 19:07	16.3066	64.8	0.4135	1.0	20.5	
3/6/2025 19:29	16.0217	65.9	0.4365	1.0	19.9		3/6/2025 19:22	16.3066	64.8	0.4135	1.0	20.5	
3/6/2025 19:44	16.0217	65.9	0.4365	1.0	19.9		3/6/2025 19:37	16.3109	64.8	0.4178	1.0	20.5	
3/6/2025 19:59	16.0262	65.9	0.4410	1.0	19.9		3/6/2025 19:52	16.3153	64.8	0.4222	1.0	20.6	
3/6/2025 20:14	16.0307	65.9	0.4455	1.0	19.9		3/6/2025 20:07	16.3153	64.8	0.4222	1.0	20.6	
3/6/2025 20:29	16.0397	65.9	0.4545	1.0	20.0		3/6/2025 20:22	16.3282	64.8	0.4351	1.0	20.6	
3/6/2025 20:44	16.0442	65.9	0.4590	1.1	20.0		3/6/2025 20:37	16.3326	64.8	0.4395	1.0	20.6	

JZN Project No.: 24190-000
Project: Innovation QNS - Buillding B1
Location: 35-18 Steinway St., Queens, NY
JZN Rep: A. More
Client: Key Civil Engineering, P.C
Contractor: Diamond Drilling, Inc.
Installation Date 3/6/2025
Removal Date: 03/13/2025

Monitoring Well Data Tables

Monitoring Well	Logger Serial Number	Logger Elevation (ft)	Zero Reading (psi)
MW-1	20715060	18.92	15.5852
MW-2	20715059	19.58	15.8931

JZN ENGINEERING

MW-1 - Logger Serial No. 20715060							MW-2 - Logger Serial No. 20715059						
Date & Time	Absolute Pressure (psi)	Temperature (°F)	Gauge Pressure (psi)	Depth Below Water (ft)	Groundwater Elevation (ft)	Remarks	Date & Time	Absolute Pressure (psi)	Temperature (°F)	Gauge Pressure (psi)	Depth Below Water (ft)	Groundwater Elevation (ft)	Remarks
3/6/2025 20:59	16.0442	65.9	0.4590	1.1	20.0		3/6/2025 20:52	16.3369	64.8	0.4438	1.0	20.6	
3/6/2025 21:14	16.0487	65.9	0.4635	1.1	20.0		3/6/2025 21:07	16.3413	64.8	0.4482	1.0	20.6	
3/6/2025 21:29	16.0442	65.9	0.4590	1.1	20.0		3/6/2025 21:22	16.3455	64.8	0.4524	1.0	20.6	
3/6/2025 21:44	16.0579	65.9	0.4727	1.1	20.0		3/6/2025 21:37	16.3498	64.8	0.4567	1.1	20.6	
3/6/2025 21:59	16.0579	65.9	0.4727	1.1	20.0		3/6/2025 21:52	16.3498	64.8	0.4567	1.1	20.6	
3/6/2025 22:14	16.0579	65.9	0.4727	1.1	20.0		3/6/2025 22:07	16.3498	64.8	0.4567	1.1	20.6	
3/6/2025 22:29	16.0534	65.9	0.4682	1.1	20.0		3/6/2025 22:22	16.3542	64.8	0.4611	1.1	20.6	
3/6/2025 22:44	16.0579	65.9	0.4727	1.1	20.0		3/6/2025 22:37	16.3585	64.8	0.4654	1.1	20.7	
3/6/2025 22:59	16.0623	65.9	0.4771	1.1	20.0		3/6/2025 22:52	16.3585	64.8	0.4654	1.1	20.7	
3/6/2025 23:14	16.0623	65.9	0.4771	1.1	20.0		3/6/2025 23:07	16.3542	64.8	0.4611	1.1	20.6	
3/6/2025 23:29	16.0579	65.9	0.4727	1.1	20.0		3/6/2025 23:22	16.3542	64.8	0.4611	1.1	20.6	
3/6/2025 23:44	16.0623	65.9	0.4771	1.1	20.0		3/6/2025 23:37	16.3542	64.8	0.4611	1.1	20.6	
3/6/2025 23:59	16.0579	65.9	0.4727	1.1	20.0		3/6/2025 23:52	16.3542	64.8	0.4611	1.1	20.6	
3/7/2025 0:14	16.0623	65.9	0.4771	1.1	20.0		3/7/2025 0:07	16.3585	64.8	0.4654	1.1	20.7	
3/7/2025 0:29	16.0623	65.9	0.4771	1.1	20.0		3/7/2025 0:22	16.3542	64.8	0.4611	1.1	20.6	
3/7/2025 0:44	16.0668	65.9	0.4816	1.1	20.0		3/7/2025 0:37	16.3585	64.8	0.4654	1.1	20.7	
3/7/2025 0:59	16.0713	65.9	0.4861	1.1	20.0		3/7/2025 0:52	16.3585	64.8	0.4654	1.1	20.7	
3/7/2025 1:14	16.0623	65.9	0.4771	1.1	20.0		3/7/2025 1:07	16.3627	64.8	0.4696	1.1	20.7	
3/7/2025 1:29	16.0623	65.9	0.4771	1.1	20.0		3/7/2025 1:22	16.3671	64.8	0.4740	1.1	20.7	
3/7/2025 1:44	16.0713	65.9	0.4861	1.1	20.0		3/7/2025 1:37	16.3671	64.8	0.4740	1.1	20.7	
3/7/2025 1:59	16.0668	65.9	0.4816	1.1	20.0		3/7/2025 1:52	16.3714	64.8	0.4783	1.1	20.7	
3/7/2025 2:14	16.0713	65.9	0.4861	1.1	20.0		3/7/2025 2:07	16.3714	64.8	0.4783	1.1	20.7	
3/7/2025 2:29	16.0668	65.9	0.4816	1.1	20.0		3/7/2025 2:22	16.3714	64.8	0.4783	1.1	20.7	
3/7/2025 2:44	16.0668	65.9	0.4816	1.1	20.0		3/7/2025 2:37	16.3758	64.8	0.4827	1.1	20.7	
3/7/2025 2:59	16.0713	65.9	0.4861	1.1	20.0		3/7/2025 2:52	16.3758	64.8	0.4827	1.1	20.7	
3/7/2025 3:14	16.0713	65.9	0.4861	1.1	20.0		3/7/2025 3:07	16.3714	64.8	0.4783	1.1	20.7	
3/7/2025 3:29	16.0803	65.9	0.4951	1.1	20.1		3/7/2025 3:22	16.3758	64.8	0.4827	1.1	20.7	
3/7/2025 3:44	16.0850	65.9	0.4998	1.2	20.1		3/7/2025 3:37	16.3843	64.8	0.4912	1.1	20.7	
3/7/2025 3:59	16.0895	65.9	0.5043	1.2	20.1		3/7/2025 3:52	16.3887	64.8	0.4956	1.1	20.7	
3/7/2025 4:14	16.0895	65.9	0.5043	1.2	20.1		3/7/2025 4:07	16.3930	64.8	0.4999	1.2	20.7	
3/7/2025 4:29	16.0940	65.9	0.5088	1.2	20.1		3/7/2025 4:22	16.3974	64.8	0.5043	1.2	20.7	
3/7/2025 4:44	16.0985	65.9	0.5133	1.2	20.1		3/7/2025 4:37	16.3974	64.8	0.5043	1.2	20.7	
3/7/2025 4:59	16.1030	65.9	0.5178	1.2	20.1		3/7/2025 4:52	16.4059	64.8	0.5128	1.2	20.8	
3/7/2025 5:14	16.1075	65.9	0.5223	1.2	20.1		3/7/2025 5:07	16.4103	64.8	0.5172	1.2	20.8	
3/7/2025 5:29	16.1120	65.9	0.5268	1.2	20.1		3/7/2025 5:22	16.4189	64.8	0.5258	1.2	20.8	
3/7/2025 5:44	16.1120	65.9	0.5268	1.2	20.1		3/7/2025 5:37	16.4189	64.8	0.5258	1.2	20.8	
3/7/2025 5:59	16.1164	65.9	0.5312	1.2	20.1		3/7/2025 5:52	16.4189	64.8	0.5258	1.2	20.8	
3/7/2025 6:14	16.1164	65.9	0.5312	1.2	20.1		3/7/2025 6:07	16.4189	64.8	0.5258	1.2	20.8	
3/7/2025 6:29	16.1211	65.9	0.5359	1.2	20.2		3/7/2025 6:22	16.4276	64.8	0.5345	1.2	20.8	
3/7/2025 6:44	16.1256	65.9	0.5404	1.2	20.2		3/7/2025 6:37	16.4276	64.8	0.5345	1.2	20.8	
3/7/2025 6:59	16.1301	65.9	0.5449	1.3	20.2		3/7/2025 6:52	16.4276	64.8	0.5345	1.2	20.8	
3/7/2025 7:14	16.1256	65.9	0.5404	1.2	20.2		3/7/2025 7:07	16.4319	64.8	0.5388	1.2	20.8	
3/7/2025 7:29	16.1211	65.9	0.5359	1.2	20.2		3/7/2025 7:22	16.4319	64.8	0.5388	1.2	20.8	
3/7/2025 7:44	16.1211	65.9	0.5359	1.2	20.2		3/7/2025 7:37	16.4319	64.8	0.5388	1.2	20.8	
3/7/2025 7:59	16.1256	65.9	0.5404	1.2	20.2		3/7/2025 7:52	16.4319	64.8	0.5388	1.2	20.8	
3/7/2025 8:14	16.1211	65.9	0.5359	1.2	20.2		3/7/2025 8:07	16.4319	64.8	0.5388	1.2	20.8	
3/7/2025 8:29	16.1256	65.9	0.5404	1.2	20.2		3/7/2025 8:22	16.4319	64.8	0.5388	1.2	20.8	
3/7/2025 8:44	16.1256	65.9	0.5404	1.2	20.2		3/7/2025 8:37	16.4319	64.8	0.5388	1.2	20.8	
3/7/2025 8:59	16.1301	65.9	0.5449	1.3	20.2		3/7/2025 8:52	16.4361	64.8	0.5430	1.3	20.8	
3/7/2025 9:14	16.1256	65.9	0.5404	1.2	20.2		3/7/2025 9:07	16.4361	64.8	0.5430	1.3	20.8	
3/7/2025 9:29	16.1211	65.9	0.5359	1.2	20.2		3/7/2025 9:22	16.4319	64.8	0.5388	1.2	20.8	
3/7/2025 9:44	16.1256	65.9	0.5404	1.2	20.2		3/7/2025 9:37	16.4361	64.8	0.5430	1.3	20.8	
3/7/2025 9:59	16.1256	65.9	0.5404	1.2	20.2		3/7/2025 9:52	16.4319	64.8	0.5388	1.2	20.8	
3/7/2025 10:14	16.1211	65.9	0.5359	1.2	20.2		3/7/2025 10:07	16.4319	64.8	0.5388	1.2	20.8	

JZN Project No.: 24190-000
Project: Innovation QNS - Buillding B1
Location: 35-18 Steinway St., Queens, NY
JZN Rep: A. More
Client: Key Civil Engineering, P.C
Contractor: Diamond Drilling, Inc.
Installation Date 3/6/2025
Removal Date: 03/13/2025

Monitoring Well Data Tables

Monitoring Well	Logger Serial Number	Logger Elevation (ft)	Zero Reading (psi)
MW-1	20715060	18.92	15.5852
MW-2	20715059	19.58	15.8931

MW-1 - Logger Serial No. 20715060							MW-2 - Logger Serial No. 20715059						
Date & Time	Absolute Pressure (psi)	Temperature (°F)	Gauge Pressure (psi)	Depth Below Water (ft)	Groundwater Elevation (ft)	Remarks	Date & Time	Absolute Pressure (psi)	Temperature (°F)	Gauge Pressure (psi)	Depth Below Water (ft)	Groundwater Elevation (ft)	Remarks
3/7/2025 10:29	16.1120	65.9	0.5268	1.2	20.1		3/7/2025 10:22	16.4232	64.8	0.5301	1.2	20.8	
3/7/2025 10:44	16.1164	65.9	0.5312	1.2	20.1		3/7/2025 10:37	16.4276	64.8	0.5345	1.2	20.8	
3/7/2025 10:59	16.1120	65.9	0.5268	1.2	20.1		3/7/2025 10:52	16.4189	64.8	0.5258	1.2	20.8	
3/7/2025 11:14	16.1120	65.9	0.5268	1.2	20.1		3/7/2025 11:07	16.4276	64.8	0.5345	1.2	20.8	
3/7/2025 11:29	16.1120	65.9	0.5268	1.2	20.1		3/7/2025 11:22	16.4276	64.8	0.5345	1.2	20.8	
3/7/2025 11:44	16.1164	65.9	0.5312	1.2	20.1		3/7/2025 11:37	16.4276	64.8	0.5345	1.2	20.8	
3/7/2025 11:59	16.1120	65.9	0.5268	1.2	20.1		3/7/2025 11:52	16.4232	64.8	0.5301	1.2	20.8	
3/7/2025 12:14	16.1030	65.9	0.5178	1.2	20.1		3/7/2025 12:07	16.4189	64.8	0.5258	1.2	20.8	
3/7/2025 12:29	16.1030	65.9	0.5178	1.2	20.1		3/7/2025 12:22	16.4146	64.8	0.5215	1.2	20.8	
3/7/2025 12:44	16.1030	65.9	0.5178	1.2	20.1		3/7/2025 12:37	16.4146	64.8	0.5215	1.2	20.8	
3/7/2025 12:59	16.1030	65.9	0.5178	1.2	20.1		3/7/2025 12:52	16.4146	64.8	0.5215	1.2	20.8	
3/7/2025 13:14	16.0985	65.9	0.5133	1.2	20.1		3/7/2025 13:07	16.4059	64.8	0.5128	1.2	20.8	
3/7/2025 13:29	16.0985	65.9	0.5133	1.2	20.1		3/7/2025 13:22	16.4059	64.8	0.5128	1.2	20.8	
3/7/2025 13:44	16.0940	65.9	0.5088	1.2	20.1		3/7/2025 13:37	16.4059	64.8	0.5128	1.2	20.8	
3/7/2025 13:59	16.0940	65.9	0.5088	1.2	20.1		3/7/2025 13:52	16.4059	64.8	0.5128	1.2	20.8	
3/7/2025 14:14	16.0940	65.9	0.5088	1.2	20.1		3/7/2025 14:07	16.4016	64.8	0.5085	1.2	20.8	
3/7/2025 14:29	16.0940	65.9	0.5088	1.2	20.1		3/7/2025 14:22	16.4059	64.8	0.5128	1.2	20.8	
3/7/2025 14:44	16.0895	65.9	0.5043	1.2	20.1		3/7/2025 14:37	16.4016	64.8	0.5085	1.2	20.8	
3/7/2025 14:59	16.0895	65.9	0.5043	1.2	20.1		3/7/2025 14:52	16.4016	64.8	0.5085	1.2	20.8	
3/7/2025 15:14	16.0940	65.9	0.5088	1.2	20.1		3/7/2025 15:07	16.4016	64.8	0.5085	1.2	20.8	
3/7/2025 15:29	16.0940	65.9	0.5088	1.2	20.1		3/7/2025 15:22	16.4016	64.8	0.5085	1.2	20.8	
3/7/2025 15:44	16.0895	65.9	0.5043	1.2	20.1		3/7/2025 15:37	16.4016	64.8	0.5085	1.2	20.8	
3/7/2025 15:59	16.0940	65.9	0.5088	1.2	20.1		3/7/2025 15:52	16.4016	64.8	0.5085	1.2	20.8	
3/7/2025 16:14	16.0985	65.9	0.5133	1.2	20.1		3/7/2025 16:07	16.3974	64.8	0.5043	1.2	20.7	
3/7/2025 16:29	16.0895	65.9	0.5043	1.2	20.1		3/7/2025 16:22	16.4059	64.8	0.5128	1.2	20.8	
3/7/2025 16:44	16.0895	65.9	0.5043	1.2	20.1		3/7/2025 16:37	16.4059	64.8	0.5128	1.2	20.8	
3/7/2025 16:59	16.0985	65.9	0.5133	1.2	20.1		3/7/2025 16:52	16.4016	64.8	0.5085	1.2	20.8	
3/7/2025 17:14	16.0985	65.9	0.5133	1.2	20.1		3/7/2025 17:07	16.4103	64.8	0.5172	1.2	20.8	
3/7/2025 17:29	16.1030	65.9	0.5178	1.2	20.1		3/7/2025 17:22	16.4103	64.8	0.5172	1.2	20.8	
3/7/2025 17:44	16.1075	65.9	0.5223	1.2	20.1		3/7/2025 17:37	16.4146	64.8	0.5215	1.2	20.8	
3/7/2025 17:59	16.1030	65.9	0.5178	1.2	20.1		3/7/2025 17:52	16.4189	64.8	0.5258	1.2	20.8	
3/7/2025 18:14	16.1075	65.9	0.5223	1.2	20.1		3/7/2025 18:07	16.4189	64.8	0.5258	1.2	20.8	
3/7/2025 18:29	16.1120	65.9	0.5268	1.2	20.1		3/7/2025 18:22	16.4189	64.8	0.5258	1.2	20.8	
3/7/2025 18:44	16.1164	65.9	0.5312	1.2	20.1		3/7/2025 18:37	16.4232	64.8	0.5301	1.2	20.8	
3/7/2025 18:59	16.1164	65.9	0.5312	1.2	20.1		3/7/2025 18:52	16.4232	64.8	0.5301	1.2	20.8	
3/7/2025 19:14	16.1164	65.9	0.5312	1.2	20.1		3/7/2025 19:07	16.4276	64.8	0.5345	1.2	20.8	
3/7/2025 19:29	16.1164	65.9	0.5312	1.2	20.1		3/7/2025 19:22	16.4276	64.8	0.5345	1.2	20.8	
3/7/2025 19:44	16.1211	65.9	0.5359	1.2	20.2		3/7/2025 19:37	16.4319	64.8	0.5388	1.2	20.8	
3/7/2025 19:59	16.1256	65.9	0.5404	1.2	20.2		3/7/2025 19:52	16.4276	64.8	0.5345	1.2	20.8	
3/7/2025 20:14	16.1211	65.9	0.5359	1.2	20.2		3/7/2025 20:07	16.4319	64.8	0.5388	1.2	20.8	
3/7/2025 20:29	16.1256	65.9	0.5404	1.2	20.2		3/7/2025 20:22	16.4319	64.8	0.5388	1.2	20.8	
3/7/2025 20:44	16.1211	65.9	0.5359	1.2	20.2		3/7/2025 20:37	16.4276	64.8	0.5345	1.2	20.8	
3/7/2025 20:59	16.1211	65.9	0.5359	1.2	20.2		3/7/2025 20:52	16.4276	64.8	0.5345	1.2	20.8	
3/7/2025 21:14	16.1211	65.9	0.5359	1.2	20.2		3/7/2025 21:07	16.4319	64.8	0.5388	1.2	20.8	
3/7/2025 21:29	16.1164	65.9	0.5312	1.2	20.1		3/7/2025 21:22	16.4276	64.8	0.5345	1.2	20.8	
3/7/2025 21:44	16.1211	65.9	0.5359	1.2	20.2		3/7/2025 21:37	16.4276	64.8	0.5345	1.2	20.8	
3/7/2025 21:59	16.1211	65.9	0.5359	1.2	20.2		3/7/2025 21:52	16.4276	64.8	0.5345	1.2	20.8	
3/7/2025 22:14	16.1164	65.9	0.5312	1.2	20.1		3/7/2025 22:07	16.4276	64.8	0.5345	1.2	20.8	
3/7/2025 22:29	16.1164	65.9	0.5312	1.2	20.1		3/7/2025 22:22	16.4276	64.8	0.5345	1.2	20.8	
3/7/2025 22:44	16.1120	65.9	0.5268	1.2	20.1		3/7/2025 22:37	16.4276	64.8	0.5345	1.2	20.8	
3/7/2025 22:59	16.1120	65.9	0.5268	1.2	20.1		3/7/2025 22:52	16.4276	64.8	0.5345	1.2	20.8	
3/7/2025 23:14	16.1120	65.9	0.5268	1.2	20.1		3/7/2025 23:07	16.4232	64.8	0.5301	1.2	20.8	
3/7/2025 23:29	16.1120	65.9	0.5268	1.2	20.1		3/7/2025 23:22	16.4276	64.8	0.5345	1.2	20.8	
3/7/2025 23:44	16.1075	65.9	0.5223	1.2	20.1		3/7/2025 23:37	16.4276	64.8	0.5345	1.2	20.8	

JZN Project No.: 24190-000
Project: Innovation QNS - Buillding B1
Location: 35-18 Steinway St., Queens, NY
JZN Rep: A. More
Client: Key Civil Engineering, P.C
Contractor: Diamond Drilling, Inc.
Installation Date 3/6/2025
Removal Date: 03/13/2025

Monitoring Well Data Tables

Monitoring Well	Logger Serial Number	Logger Elevation (ft)	Zero Reading (psi)
MW-1	20715060	18.92	15.5852
MW-2	20715059	19.58	15.8931

JZN ENGINEERING

MW-1 - Logger Serial No. 20715060							MW-2 - Logger Serial No. 20715059						
Date & Time	Absolute Pressure (psi)	Temperature (°F)	Gauge Pressure (psi)	Depth Below Water (ft)	Groundwater Elevation (ft)	Remarks	Date & Time	Absolute Pressure (psi)	Temperature (°F)	Gauge Pressure (psi)	Depth Below Water (ft)	Groundwater Elevation (ft)	Remarks
3/7/2025 23:59	16.1120	65.9	0.5268	1.2	20.1		3/7/2025 23:52	16.4276	64.8	0.5345	1.2	20.8	
3/8/2025 0:14	16.1120	65.9	0.5268	1.2	20.1		3/8/2025 0:07	16.4232	64.8	0.5301	1.2	20.8	
3/8/2025 0:29	16.1075	65.9	0.5223	1.2	20.1		3/8/2025 0:22	16.4232	64.8	0.5301	1.2	20.8	
3/8/2025 0:44	16.1075	65.9	0.5223	1.2	20.1		3/8/2025 0:37	16.4232	64.8	0.5301	1.2	20.8	
3/8/2025 0:59	16.1075	65.9	0.5223	1.2	20.1		3/8/2025 0:52	16.4232	64.8	0.5301	1.2	20.8	
3/8/2025 1:14	16.1030	65.9	0.5178	1.2	20.1		3/8/2025 1:07	16.4189	64.8	0.5258	1.2	20.8	
3/8/2025 1:29	16.1030	65.9	0.5178	1.2	20.1		3/8/2025 1:22	16.4232	64.8	0.5301	1.2	20.8	
3/8/2025 1:44	16.1030	65.9	0.5178	1.2	20.1		3/8/2025 1:37	16.4189	64.8	0.5258	1.2	20.8	
3/8/2025 1:59	16.0985	65.9	0.5133	1.2	20.1		3/8/2025 1:52	16.4189	64.8	0.5258	1.2	20.8	
3/8/2025 2:14	16.0985	65.9	0.5133	1.2	20.1		3/8/2025 2:07	16.4146	64.8	0.5215	1.2	20.8	
3/8/2025 2:29	16.0895	65.9	0.5043	1.2	20.1		3/8/2025 2:22	16.4059	64.8	0.5128	1.2	20.8	
3/8/2025 2:44	16.0850	65.9	0.4998	1.2	20.1		3/8/2025 2:37	16.4059	64.8	0.5128	1.2	20.8	
3/8/2025 2:59	16.0850	65.9	0.4998	1.2	20.1		3/8/2025 2:52	16.4059	64.8	0.5128	1.2	20.8	
3/8/2025 3:14	16.0803	65.9	0.4951	1.1	20.1		3/8/2025 3:07	16.4016	64.8	0.5085	1.2	20.8	
3/8/2025 3:29	16.0850	65.9	0.4998	1.2	20.1		3/8/2025 3:22	16.4016	64.8	0.5085	1.2	20.8	
3/8/2025 3:44	16.0850	65.9	0.4998	1.2	20.1		3/8/2025 3:37	16.4016	64.8	0.5085	1.2	20.8	
3/8/2025 3:59	16.0850	65.9	0.4998	1.2	20.1		3/8/2025 3:52	16.4016	64.8	0.5085	1.2	20.8	
3/8/2025 4:14	16.0803	65.9	0.4951	1.1	20.1		3/8/2025 4:07	16.3974	64.8	0.5043	1.2	20.7	
3/8/2025 4:29	16.0803	65.9	0.4951	1.1	20.1		3/8/2025 4:22	16.3974	64.8	0.5043	1.2	20.7	
3/8/2025 4:44	16.0803	65.9	0.4951	1.1	20.1		3/8/2025 4:37	16.3974	64.8	0.5043	1.2	20.7	
3/8/2025 4:59	16.0850	65.9	0.4998	1.2	20.1		3/8/2025 4:52	16.3930	64.8	0.4999	1.2	20.7	
3/8/2025 5:14	16.0850	65.9	0.4998	1.2	20.1		3/8/2025 5:07	16.3974	64.8	0.5043	1.2	20.7	
3/8/2025 5:29	16.0850	65.9	0.4998	1.2	20.1		3/8/2025 5:22	16.3974	64.8	0.5043	1.2	20.7	
3/8/2025 5:44	16.0850	65.9	0.4998	1.2	20.1		3/8/2025 5:37	16.3974	64.8	0.5043	1.2	20.7	
3/8/2025 5:59	16.0850	65.9	0.4998	1.2	20.1		3/8/2025 5:52	16.3974	64.8	0.5043	1.2	20.7	
3/8/2025 6:14	16.0850	65.9	0.4998	1.2	20.1		3/8/2025 6:07	16.4016	64.8	0.5085	1.2	20.8	
3/8/2025 6:29	16.0850	65.9	0.4998	1.2	20.1		3/8/2025 6:22	16.4016	64.8	0.5085	1.2	20.8	
3/8/2025 6:44	16.0850	65.9	0.4998	1.2	20.1		3/8/2025 6:37	16.4016	64.8	0.5085	1.2	20.8	
3/8/2025 6:59	16.0850	65.9	0.4998	1.2	20.1		3/8/2025 6:52	16.4016	64.8	0.5085	1.2	20.8	
3/8/2025 7:14	16.0850	65.9	0.4998	1.2	20.1		3/8/2025 7:07	16.4059	64.8	0.5128	1.2	20.8	
3/8/2025 7:29	16.0895	65.9	0.5043	1.2	20.1		3/8/2025 7:22	16.4016	64.8	0.5085	1.2	20.8	
3/8/2025 7:44	16.0940	65.9	0.5088	1.2	20.1		3/8/2025 7:37	16.4059	64.8	0.5128	1.2	20.8	
3/8/2025 7:59	16.0985	65.9	0.5133	1.2	20.1		3/8/2025 7:52	16.4059	64.8	0.5128	1.2	20.8	
3/8/2025 8:14	16.1030	65.9	0.5178	1.2	20.1		3/8/2025 8:07	16.4103	64.8	0.5172	1.2	20.8	
3/8/2025 8:29	16.0985	65.9	0.5133	1.2	20.1		3/8/2025 8:22	16.4059	64.8	0.5128	1.2	20.8	
3/8/2025 8:44	16.0940	65.9	0.5088	1.2	20.1		3/8/2025 8:37	16.4059	64.8	0.5128	1.2	20.8	
3/8/2025 8:59	16.0895	65.9	0.5043	1.2	20.1		3/8/2025 8:52	16.4016	64.8	0.5085	1.2	20.8	
3/8/2025 9:14	16.0940	65.9	0.5088	1.2	20.1		3/8/2025 9:07	16.4059	64.8	0.5128	1.2	20.8	
3/8/2025 9:29	16.0940	65.9	0.5088	1.2	20.1		3/8/2025 9:22	16.4059	64.8	0.5128	1.2	20.8	
3/8/2025 9:44	16.0985	65.9	0.5133	1.2	20.1		3/8/2025 9:37	16.4059	64.8	0.5128	1.2	20.8	
3/8/2025 9:59	16.0940	65.9	0.5088	1.2	20.1		3/8/2025 9:52	16.4103	64.8	0.5172	1.2	20.8	
3/8/2025 10:14	16.0940	65.9	0.5088	1.2	20.1		3/8/2025 10:07	16.4016	64.8	0.5085	1.2	20.8	
3/8/2025 10:29	16.0940	65.9	0.5088	1.2	20.1		3/8/2025 10:22	16.4059	64.8	0.5128	1.2	20.8	
3/8/2025 10:44	16.0985	65.9	0.5133	1.2	20.1		3/8/2025 10:37	16.4103	64.8	0.5172	1.2	20.8	
3/8/2025 10:59	16.1030	65.9	0.5178	1.2	20.1		3/8/2025 10:52	16.4103	64.8	0.5172	1.2	20.8	
3/8/2025 11:14	16.0985	65.9	0.5133	1.2	20.1		3/8/2025 11:07	16.4103	64.8	0.5172	1.2	20.8	
3/8/2025 11:29	16.0985	65.9	0.5133	1.2	20.1		3/8/2025 11:22	16.4103	64.8	0.5172	1.2	20.8	
3/8/2025 11:44	16.0985	65.9	0.5133	1.2	20.1		3/8/2025 11:37	16.4103	64.8	0.5172	1.2	20.8	
3/8/2025 11:59	16.0985	65.9	0.5133	1.2	20.1		3/8/2025 11:52	16.4103	64.8	0.5172	1.2	20.8	
3/8/2025 12:14	16.0940	65.9	0.5088	1.2	20.1		3/8/2025 12:07	16.4146	64.8	0.5215	1.2	20.8	
3/8/2025 12:29	16.1030	65.9	0.5178	1.2	20.1		3/8/2025 12:22	16.4146	64.8	0.5215	1.2	20.8	
3/8/2025 12:44	16.1030	65.9	0.5178	1.2	20.1		3/8/2025 12:37	16.4146	64.8	0.5215	1.2	20.8	
3/8/2025 12:59	16.0985	65.9	0.5133	1.2	20.1		3/8/2025 12:52	16.4103	64.8	0.5172	1.2	20.8	
3/8/2025 13:14	16.1030	65.9	0.5178	1.2	20.1		3/8/2025 13:07	16.4146	64.8	0.5215	1.2	20.8	

JZN Project No.: 24190-000
Project: Innovation QNS - Buillding B1
Location: 35-18 Steinway St., Queens, NY
JZN Rep: A. More
Client: Key Civil Engineering, P.C
Contractor: Diamond Drilling, Inc.
Installation Date 3/6/2025
Removal Date: 03/13/2025

Monitoring Well Data Tables

Monitoring Well	Logger Serial Number	Logger Elevation (ft)	Zero Reading (psi)
MW-1	20715060	18.92	15.5852
MW-2	20715059	19.58	15.8931

MW-1 - Logger Serial No. 20715060							MW-2 - Logger Serial No. 20715059						
Date & Time	Absolute Pressure (psi)	Temperature (°F)	Gauge Pressure (psi)	Depth Below Water (ft)	Groundwater Elevation (ft)	Remarks	Date & Time	Absolute Pressure (psi)	Temperature (°F)	Gauge Pressure (psi)	Depth Below Water (ft)	Groundwater Elevation (ft)	Remarks
3/8/2025 13:29	16.1030	65.9	0.5178	1.2	20.1		3/8/2025 13:22	16.4146	64.8	0.5215	1.2	20.8	
3/8/2025 13:44	16.1030	65.9	0.5178	1.2	20.1		3/8/2025 13:37	16.4103	64.8	0.5172	1.2	20.8	
3/8/2025 13:59	16.0985	65.9	0.5133	1.2	20.1		3/8/2025 13:52	16.4146	64.8	0.5215	1.2	20.8	
3/8/2025 14:14	16.1030	65.9	0.5178	1.2	20.1		3/8/2025 14:07	16.4189	64.8	0.5258	1.2	20.8	
3/8/2025 14:29	16.1075	65.9	0.5223	1.2	20.1		3/8/2025 14:22	16.4189	64.8	0.5258	1.2	20.8	
3/8/2025 14:44	16.1075	65.9	0.5223	1.2	20.1		3/8/2025 14:37	16.4189	64.8	0.5258	1.2	20.8	
3/8/2025 14:59	16.1120	65.9	0.5268	1.2	20.1		3/8/2025 14:52	16.4232	64.8	0.5301	1.2	20.8	
3/8/2025 15:14	16.1211	65.9	0.5359	1.2	20.2		3/8/2025 15:07	16.4276	64.8	0.5345	1.2	20.8	
3/8/2025 15:29	16.1164	65.9	0.5312	1.2	20.1		3/8/2025 15:22	16.4319	64.8	0.5388	1.2	20.8	
3/8/2025 15:44	16.1256	65.9	0.5404	1.2	20.2		3/8/2025 15:37	16.4319	64.8	0.5388	1.2	20.8	
3/8/2025 15:59	16.1256	65.9	0.5404	1.2	20.2		3/8/2025 15:52	16.4361	64.8	0.5430	1.3	20.8	
3/8/2025 16:14	16.1301	65.9	0.5449	1.3	20.2		3/8/2025 16:07	16.4405	64.8	0.5474	1.3	20.8	
3/8/2025 16:29	16.1301	65.9	0.5449	1.3	20.2		3/8/2025 16:22	16.4448	64.8	0.5517	1.3	20.9	
3/8/2025 16:44	16.1301	65.9	0.5449	1.3	20.2		3/8/2025 16:37	16.4448	64.8	0.5517	1.3	20.9	
3/8/2025 16:59	16.1391	65.9	0.5539	1.3	20.2		3/8/2025 16:52	16.4492	64.8	0.5561	1.3	20.9	
3/8/2025 17:14	16.1391	65.9	0.5539	1.3	20.2		3/8/2025 17:07	16.4577	64.8	0.5646	1.3	20.9	
3/8/2025 17:29	16.1481	65.9	0.5629	1.3	20.2		3/8/2025 17:22	16.4621	64.8	0.5690	1.3	20.9	
3/8/2025 17:44	16.1527	65.9	0.5675	1.3	20.2		3/8/2025 17:37	16.4664	64.8	0.5733	1.3	20.9	
3/8/2025 17:59	16.1527	65.9	0.5675	1.3	20.2		3/8/2025 17:52	16.4664	64.8	0.5733	1.3	20.9	
3/8/2025 18:14	16.1572	65.9	0.5720	1.3	20.2		3/8/2025 18:07	16.4708	64.8	0.5777	1.3	20.9	
3/8/2025 18:29	16.1572	65.9	0.5720	1.3	20.2		3/8/2025 18:22	16.4793	64.8	0.5862	1.4	20.9	
3/8/2025 18:44	16.1617	65.9	0.5765	1.3	20.3		3/8/2025 18:37	16.4837	64.8	0.5906	1.4	20.9	
3/8/2025 18:59	16.1707	65.9	0.5855	1.4	20.3		3/8/2025 18:52	16.4837	64.8	0.5906	1.4	20.9	
3/8/2025 19:14	16.1662	65.9	0.5810	1.3	20.3		3/8/2025 19:07	16.4837	64.8	0.5906	1.4	20.9	
3/8/2025 19:29	16.1752	65.9	0.5900	1.4	20.3		3/8/2025 19:22	16.4922	64.8	0.5991	1.4	21.0	
3/8/2025 19:44	16.1707	65.9	0.5855	1.4	20.3		3/8/2025 19:37	16.4966	64.8	0.6035	1.4	21.0	
3/8/2025 19:59	16.1752	65.9	0.5900	1.4	20.3		3/8/2025 19:52	16.4966	64.8	0.6035	1.4	21.0	
3/8/2025 20:14	16.1843	65.9	0.5991	1.4	20.3		3/8/2025 20:07	16.5009	64.8	0.6078	1.4	21.0	
3/8/2025 20:29	16.1843	65.9	0.5991	1.4	20.3		3/8/2025 20:22	16.5053	64.8	0.6122	1.4	21.0	
3/8/2025 20:44	16.1888	65.9	0.6036	1.4	20.3		3/8/2025 20:37	16.5095	64.8	0.6164	1.4	21.0	
3/8/2025 20:59	16.1888	65.9	0.6036	1.4	20.3		3/8/2025 20:52	16.5095	64.8	0.6164	1.4	21.0	
3/8/2025 21:14	16.1978	65.9	0.6126	1.4	20.3		3/8/2025 21:07	16.5182	64.8	0.6251	1.4	21.0	
3/8/2025 21:29	16.2023	65.9	0.6171	1.4	20.3		3/8/2025 21:22	16.5139	64.8	0.6208	1.4	21.0	
3/8/2025 21:44	16.2023	65.9	0.6171	1.4	20.3		3/8/2025 21:37	16.5139	64.8	0.6208	1.4	21.0	
3/8/2025 21:59	16.2023	65.9	0.6171	1.4	20.3		3/8/2025 21:52	16.5226	64.8	0.6295	1.5	21.0	
3/8/2025 22:14	16.2068	65.9	0.6216	1.4	20.4		3/8/2025 22:07	16.5182	64.8	0.6251	1.4	21.0	
3/8/2025 22:29	16.2023	65.9	0.6171	1.4	20.3		3/8/2025 22:22	16.5226	64.8	0.6295	1.5	21.0	
3/8/2025 22:44	16.2023	65.9	0.6171	1.4	20.3		3/8/2025 22:37	16.5226	64.8	0.6295	1.5	21.0	
3/8/2025 22:59	16.2068	65.9	0.6216	1.4	20.4		3/8/2025 22:52	16.5268	64.8	0.6337	1.5	21.0	
3/8/2025 23:14	16.2068	65.9	0.6216	1.4	20.4		3/8/2025 23:07	16.5311	64.8	0.6380	1.5	21.1	
3/8/2025 23:29	16.2113	65.9	0.6261	1.4	20.4		3/8/2025 23:22	16.5268	64.8	0.6337	1.5	21.0	
3/8/2025 23:44	16.2068	65.9	0.6216	1.4	20.4		3/8/2025 23:37	16.5311	64.8	0.6380	1.5	21.1	
3/8/2025 23:59	16.2158	65.9	0.6306	1.5	20.4		3/8/2025 23:52	16.5355	64.8	0.6424	1.5	21.1	
3/9/2025 0:14	16.2204	65.9	0.6352	1.5	20.4		3/9/2025 0:07	16.5355	64.8	0.6424	1.5	21.1	
3/9/2025 0:29	16.2204	65.9	0.6352	1.5	20.4		3/9/2025 0:22	16.5355	64.8	0.6424	1.5	21.1	
3/9/2025 0:44	16.2158	65.9	0.6306	1.5	20.4		3/9/2025 0:37	16.5355	64.8	0.6424	1.5	21.1	
3/9/2025 0:59	16.2204	65.9	0.6352	1.5	20.4		3/9/2025 0:52	16.5355	64.8	0.6424	1.5	21.1	
3/9/2025 1:14	16.2204	65.9	0.6352	1.5	20.4		3/9/2025 1:07	16.5355	64.8	0.6424	1.5	21.1	
3/9/2025 1:29	16.2158	65.9	0.6306	1.5	20.4		3/9/2025 1:22	16.5398	64.8	0.6467	1.5	21.1	
3/9/2025 1:44	16.2204	65.9	0.6352	1.5	20.4		3/9/2025 1:37	16.5355	64.8	0.6424	1.5	21.1	
3/9/2025 1:59	16.2158	65.9	0.6306	1.5	20.4		3/9/2025 1:52	16.5398	64.8	0.6467	1.5	21.1	
3/9/2025 2:14	16.2249	65.9	0.6397	1.5	20.4		3/9/2025 2:07	16.5398	64.8	0.6467	1.5	21.1	
3/9/2025 2:29	16.2249	65.9	0.6397	1.5	20.4		3/9/2025 2:22	16.5442	64.8	0.6511	1.5	21.1	
3/9/2025 2:44	16.2249	65.9	0.6397	1.5	20.4		3/9/2025 2:37	16.5398	64.8	0.6467	1.5	21.1	

JZN Project No.: 24190-000
Project: Innovation QNS - Buillding B1
Location: 35-18 Steinway St., Queens, NY
JZN Rep: A. More
Client: Key Civil Engineering, P.C
Contractor: Diamond Drilling, Inc.
Installation Date 3/6/2025
Removal Date: 03/13/2025

Monitoring Well Data Tables

Monitoring Well	Logger Serial Number	Logger Elevation (ft)	Zero Reading (psi)
MW-1	20715060	18.92	15.5852
MW-2	20715059	19.58	15.8931

MW-1 - Logger Serial No. 20715060							MW-2 - Logger Serial No. 20715059						
Date & Time	Absolute Pressure (psi)	Temperature (°F)	Gauge Pressure (psi)	Depth Below Water (ft)	Groundwater Elevation (ft)	Remarks	Date & Time	Absolute Pressure (psi)	Temperature (°F)	Gauge Pressure (psi)	Depth Below Water (ft)	Groundwater Elevation (ft)	Remarks
3/9/2025 2:59	16.2249	65.9	0.6397	1.5	20.4		3/9/2025 2:52	16.5442	64.8	0.6511	1.5	21.1	
3/9/2025 3:14	16.2294	65.9	0.6442	1.5	20.4		3/9/2025 3:07	16.5398	64.8	0.6467	1.5	21.1	
3/9/2025 3:29	16.2249	65.9	0.6397	1.5	20.4		3/9/2025 3:22	16.5484	64.8	0.6553	1.5	21.1	
3/9/2025 3:44	16.2294	65.9	0.6442	1.5	20.4		3/9/2025 3:37	16.5527	64.8	0.6596	1.5	21.1	
3/9/2025 3:59	16.2249	65.9	0.6397	1.5	20.4		3/9/2025 3:52	16.5442	64.8	0.6511	1.5	21.1	
3/9/2025 4:14	16.2249	65.9	0.6397	1.5	20.4		3/9/2025 4:07	16.5442	64.8	0.6511	1.5	21.1	
3/9/2025 4:29	16.2294	65.9	0.6442	1.5	20.4		3/9/2025 4:22	16.5484	64.8	0.6553	1.5	21.1	
3/9/2025 4:44	16.2384	65.9	0.6532	1.5	20.4		3/9/2025 4:37	16.5527	64.8	0.6596	1.5	21.1	
3/9/2025 4:59	16.2384	65.9	0.6532	1.5	20.4		3/9/2025 4:52	16.5571	64.8	0.6640	1.5	21.1	
3/9/2025 5:14	16.2339	65.9	0.6487	1.5	20.4		3/9/2025 5:07	16.5571	64.8	0.6640	1.5	21.1	
3/9/2025 5:29	16.2429	65.9	0.6577	1.5	20.4		3/9/2025 5:22	16.5571	64.8	0.6640	1.5	21.1	
3/9/2025 5:44	16.2474	65.9	0.6622	1.5	20.4		3/9/2025 5:37	16.5656	64.8	0.6725	1.6	21.1	
3/9/2025 5:59	16.2429	65.9	0.6577	1.5	20.4		3/9/2025 5:52	16.5614	64.8	0.6683	1.5	21.1	
3/9/2025 6:14	16.2429	65.9	0.6577	1.5	20.4		3/9/2025 6:07	16.5614	64.8	0.6683	1.5	21.1	
3/9/2025 6:29	16.2474	65.9	0.6622	1.5	20.4		3/9/2025 6:22	16.5614	64.8	0.6683	1.5	21.1	
3/9/2025 6:44	16.2429	65.9	0.6577	1.5	20.4		3/9/2025 6:37	16.5614	64.8	0.6683	1.5	21.1	
3/9/2025 6:59	16.2474	65.9	0.6622	1.5	20.4		3/9/2025 6:52	16.5656	64.8	0.6725	1.6	21.1	
3/9/2025 7:14	16.2474	65.9	0.6622	1.5	20.4		3/9/2025 7:07	16.5656	64.8	0.6725	1.6	21.1	
3/9/2025 7:29	16.2521	65.9	0.6669	1.5	20.5		3/9/2025 7:22	16.5700	64.8	0.6769	1.6	21.1	
3/9/2025 7:44	16.2474	65.9	0.6622	1.5	20.4		3/9/2025 7:37	16.5700	64.8	0.6769	1.6	21.1	
3/9/2025 7:59	16.2474	65.9	0.6622	1.5	20.4		3/9/2025 7:52	16.5656	64.8	0.6725	1.6	21.1	
3/9/2025 8:14	16.2429	65.9	0.6577	1.5	20.4		3/9/2025 8:07	16.5656	64.8	0.6725	1.6	21.1	
3/9/2025 8:29	16.2474	65.9	0.6622	1.5	20.4		3/9/2025 8:22	16.5700	64.8	0.6769	1.6	21.1	
3/9/2025 8:44	16.2429	65.9	0.6577	1.5	20.4		3/9/2025 8:37	16.5614	64.8	0.6683	1.5	21.1	
3/9/2025 8:59	16.2429	65.9	0.6577	1.5	20.4		3/9/2025 8:52	16.5656	64.8	0.6725	1.6	21.1	
3/9/2025 9:14	16.2429	65.9	0.6577	1.5	20.4		3/9/2025 9:07	16.5614	64.8	0.6683	1.5	21.1	
3/9/2025 9:29	16.2384	65.9	0.6532	1.5	20.4		3/9/2025 9:22	16.5571	64.8	0.6640	1.5	21.1	
3/9/2025 9:44	16.2339	65.9	0.6487	1.5	20.4		3/9/2025 9:37	16.5527	64.8	0.6596	1.5	21.1	
3/9/2025 9:59	16.2294	65.9	0.6442	1.5	20.4		3/9/2025 9:52	16.5442	64.8	0.6511	1.5	21.1	
3/9/2025 10:14	16.2249	65.9	0.6397	1.5	20.4		3/9/2025 10:07	16.5484	64.8	0.6553	1.5	21.1	
3/9/2025 10:29	16.2249	65.9	0.6397	1.5	20.4		3/9/2025 10:22	16.5442	64.8	0.6511	1.5	21.1	
3/9/2025 10:44	16.2249	65.9	0.6397	1.5	20.4		3/9/2025 10:37	16.5398	64.8	0.6467	1.5	21.1	
3/9/2025 10:59	16.2204	65.9	0.6352	1.5	20.4		3/9/2025 10:52	16.5442	64.8	0.6511	1.5	21.1	
3/9/2025 11:14	16.2158	65.9	0.6306	1.5	20.4		3/9/2025 11:07	16.5442	64.8	0.6511	1.5	21.1	
3/9/2025 11:29	16.2204	65.9	0.6352	1.5	20.4		3/9/2025 11:22	16.5398	64.8	0.6467	1.5	21.1	
3/9/2025 11:44	16.2068	65.9	0.6216	1.4	20.4		3/9/2025 11:37	16.5311	64.8	0.6380	1.5	21.1	
3/9/2025 11:59	16.2068	65.9	0.6216	1.4	20.4		3/9/2025 11:52	16.5311	64.8	0.6380	1.5	21.1	
3/9/2025 12:14	16.2023	65.9	0.6171	1.4	20.3		3/9/2025 12:07	16.5268	64.8	0.6337	1.5	21.0	
3/9/2025 12:29	16.1978	65.9	0.6126	1.4	20.3		3/9/2025 12:22	16.5226	64.8	0.6295	1.5	21.0	
3/9/2025 12:44	16.1933	65.9	0.6081	1.4	20.3		3/9/2025 12:37	16.5182	64.8	0.6251	1.4	21.0	
3/9/2025 12:59	16.1978	65.9	0.6126	1.4	20.3		3/9/2025 12:52	16.5139	64.8	0.6208	1.4	21.0	
3/9/2025 13:14	16.1888	65.9	0.6036	1.4	20.3		3/9/2025 13:07	16.5095	64.8	0.6164	1.4	21.0	
3/9/2025 13:29	16.1843	65.9	0.5991	1.4	20.3		3/9/2025 13:22	16.5009	64.8	0.6078	1.4	21.0	
3/9/2025 13:44	16.1797	65.9	0.5945	1.4	20.3		3/9/2025 13:37	16.4966	64.8	0.6035	1.4	21.0	
3/9/2025 13:59	16.1843	65.9	0.5991	1.4	20.3		3/9/2025 13:52	16.5009	64.8	0.6078	1.4	21.0	
3/9/2025 14:14	16.1797	65.9	0.5945	1.4	20.3		3/9/2025 14:07	16.5009	64.8	0.6078	1.4	21.0	
3/9/2025 14:29	16.1797	65.9	0.5945	1.4	20.3		3/9/2025 14:22	16.5009	64.8	0.6078	1.4	21.0	
3/9/2025 14:44	16.1752	65.9	0.5900	1.4	20.3		3/9/2025 14:37	16.5009	64.8	0.6078	1.4	21.0	
3/9/2025 14:59	16.1797	65.9	0.5945	1.4	20.3		3/9/2025 14:52	16.4966	64.8	0.6035	1.4	21.0	
3/9/2025 15:14	16.1752	65.9	0.5900	1.4	20.3		3/9/2025 15:07	16.4966	64.8	0.6035	1.4	21.0	
3/9/2025 15:29	16.1797	65.9	0.5945	1.4	20.3		3/9/2025 15:22	16.4966	64.8	0.6035	1.4	21.0	
3/9/2025 15:44	16.1797	65.9	0.5945	1.4	20.3		3/9/2025 15:37	16.5009	64.8	0.6078	1.4	21.0	
3/9/2025 15:59	16.1797	65.9	0.5945	1.4	20.3		3/9/2025 15:52	16.4966	64.8	0.6035	1.4	21.0	
3/9/2025 16:14	16.1752	65.9	0.5900	1.4	20.3		3/9/2025 16:07	16.4966	64.8	0.6035	1.4	21.0	

JZN Project No.: 24190-000
Project: Innovation QNS - Buillding B1
Location: 35-18 Steinway St., Queens, NY
JZN Rep: A. More
Client: Key Civil Engineering, P.C
Contractor: Diamond Drilling, Inc.
Installation Date 3/6/2025
Removal Date: 03/13/2025

Monitoring Well Data Tables

Monitoring Well	Logger Serial Number	Logger Elevation (ft)	Zero Reading (psi)
MW-1	20715060	18.92	15.5852
MW-2	20715059	19.58	15.8931

JZN ENGINEERING

MW-1 - Logger Serial No. 20715060							MW-2 - Logger Serial No. 20715059						
Date & Time	Absolute Pressure (psi)	Temperature (°F)	Gauge Pressure (psi)	Depth Below Water (ft)	Groundwater Elevation (ft)	Remarks	Date & Time	Absolute Pressure (psi)	Temperature (°F)	Gauge Pressure (psi)	Depth Below Water (ft)	Groundwater Elevation (ft)	Remarks
3/9/2025 16:29	16.1797	65.9	0.5945	1.4	20.3		3/9/2025 16:22	16.4966	64.8	0.6035	1.4	21.0	
3/9/2025 16:44	16.1797	65.9	0.5945	1.4	20.3		3/9/2025 16:37	16.4966	64.8	0.6035	1.4	21.0	
3/9/2025 16:59	16.1752	65.9	0.5900	1.4	20.3		3/9/2025 16:52	16.4966	64.8	0.6035	1.4	21.0	
3/9/2025 17:14	16.1797	65.9	0.5945	1.4	20.3		3/9/2025 17:07	16.4966	64.8	0.6035	1.4	21.0	
3/9/2025 17:29	16.1797	65.9	0.5945	1.4	20.3		3/9/2025 17:22	16.4966	64.8	0.6035	1.4	21.0	
3/9/2025 17:44	16.1797	65.9	0.5945	1.4	20.3		3/9/2025 17:37	16.5009	64.8	0.6078	1.4	21.0	
3/9/2025 17:59	16.1843	65.9	0.5991	1.4	20.3		3/9/2025 17:52	16.5053	64.8	0.6122	1.4	21.0	
3/9/2025 18:14	16.1843	65.9	0.5991	1.4	20.3		3/9/2025 18:07	16.5009	64.8	0.6078	1.4	21.0	
3/9/2025 18:29	16.1888	65.9	0.6036	1.4	20.3		3/9/2025 18:22	16.5009	64.8	0.6078	1.4	21.0	
3/9/2025 18:44	16.1933	65.9	0.6081	1.4	20.3		3/9/2025 18:37	16.5095	64.8	0.6164	1.4	21.0	
3/9/2025 18:59	16.1978	65.9	0.6126	1.4	20.3		3/9/2025 18:52	16.5095	64.8	0.6164	1.4	21.0	
3/9/2025 19:14	16.1933	65.9	0.6081	1.4	20.3		3/9/2025 19:07	16.5139	64.8	0.6208	1.4	21.0	
3/9/2025 19:29	16.2023	65.9	0.6171	1.4	20.3		3/9/2025 19:22	16.5139	64.8	0.6208	1.4	21.0	
3/9/2025 19:44	16.1978	65.9	0.6126	1.4	20.3		3/9/2025 19:37	16.5139	64.8	0.6208	1.4	21.0	
3/9/2025 19:59	16.2023	65.9	0.6171	1.4	20.3		3/9/2025 19:52	16.5268	64.8	0.6337	1.5	21.0	
3/9/2025 20:14	16.2023	65.9	0.6171	1.4	20.3		3/9/2025 20:07	16.5226	64.8	0.6295	1.5	21.0	
3/9/2025 20:29	16.2023	65.9	0.6171	1.4	20.3		3/9/2025 20:22	16.5226	64.8	0.6295	1.5	21.0	
3/9/2025 20:44	16.2023	65.9	0.6171	1.4	20.3		3/9/2025 20:37	16.5268	64.8	0.6337	1.5	21.0	
3/9/2025 20:59	16.2023	65.9	0.6171	1.4	20.3		3/9/2025 20:52	16.5226	64.8	0.6295	1.5	21.0	
3/9/2025 21:14	16.2068	65.9	0.6216	1.4	20.4		3/9/2025 21:07	16.5268	64.8	0.6337	1.5	21.0	
3/9/2025 21:29	16.2113	65.9	0.6261	1.4	20.4		3/9/2025 21:22	16.5226	64.8	0.6295	1.5	21.0	
3/9/2025 21:44	16.2113	65.9	0.6261	1.4	20.4		3/9/2025 21:37	16.5268	64.8	0.6337	1.5	21.0	
3/9/2025 21:59	16.2068	65.9	0.6216	1.4	20.4		3/9/2025 21:52	16.5268	64.8	0.6337	1.5	21.0	
3/9/2025 22:14	16.2023	65.9	0.6171	1.4	20.3		3/9/2025 22:07	16.5268	64.8	0.6337	1.5	21.0	
3/9/2025 22:29	16.1978	65.9	0.6126	1.4	20.3		3/9/2025 22:22	16.5226	64.8	0.6295	1.5	21.0	
3/9/2025 22:44	16.1978	65.9	0.6126	1.4	20.3		3/9/2025 22:37	16.5226	64.8	0.6295	1.5	21.0	
3/9/2025 22:59	16.2023	65.9	0.6171	1.4	20.3		3/9/2025 22:52	16.5182	64.8	0.6251	1.4	21.0	
3/9/2025 23:14	16.1978	65.9	0.6126	1.4	20.3		3/9/2025 23:07	16.5226	64.8	0.6295	1.5	21.0	
3/9/2025 23:29	16.1978	65.9	0.6126	1.4	20.3		3/9/2025 23:22	16.5139	64.8	0.6208	1.4	21.0	
3/9/2025 23:44	16.1978	65.9	0.6126	1.4	20.3		3/9/2025 23:37	16.5139	64.8	0.6208	1.4	21.0	
3/9/2025 23:59	16.1978	65.9	0.6126	1.4	20.3		3/9/2025 23:52	16.5139	64.8	0.6208	1.4	21.0	
3/10/2025 0:14	16.1978	65.9	0.6126	1.4	20.3		3/10/2025 0:07	16.5139	64.8	0.6208	1.4	21.0	
3/10/2025 0:29	16.1933	65.9	0.6081	1.4	20.3		3/10/2025 0:22	16.5095	64.8	0.6164	1.4	21.0	
3/10/2025 0:44	16.1888	65.9	0.6036	1.4	20.3		3/10/2025 0:37	16.5095	64.8	0.6164	1.4	21.0	
3/10/2025 0:59	16.1978	65.9	0.6126	1.4	20.3		3/10/2025 0:52	16.5139	64.8	0.6208	1.4	21.0	
3/10/2025 1:14	16.1933	65.9	0.6081	1.4	20.3		3/10/2025 1:07	16.5182	64.8	0.6251	1.4	21.0	
3/10/2025 1:29	16.1933	65.9	0.6081	1.4	20.3		3/10/2025 1:22	16.5139	64.8	0.6208	1.4	21.0	
3/10/2025 1:44	16.1888	65.9	0.6036	1.4	20.3		3/10/2025 1:37	16.5139	64.8	0.6208	1.4	21.0	
3/10/2025 1:59	16.1888	65.9	0.6036	1.4	20.3		3/10/2025 1:52	16.5053	64.8	0.6122	1.4	21.0	
3/10/2025 2:14	16.1888	65.9	0.6036	1.4	20.3		3/10/2025 2:07	16.5095	64.8	0.6164	1.4	21.0	
3/10/2025 2:29	16.1843	65.9	0.5991	1.4	20.3		3/10/2025 2:22	16.5095	64.8	0.6164	1.4	21.0	
3/10/2025 2:44	16.1843	65.9	0.5991	1.4	20.3		3/10/2025 2:37	16.5053	64.8	0.6122	1.4	21.0	
3/10/2025 2:59	16.1843	65.9	0.5991	1.4	20.3		3/10/2025 2:52	16.5053	64.8	0.6122	1.4	21.0	
3/10/2025 3:14	16.1797	65.9	0.5945	1.4	20.3		3/10/2025 3:07	16.5009	64.8	0.6078	1.4	21.0	
3/10/2025 3:29	16.1797	65.9	0.5945	1.4	20.3		3/10/2025 3:22	16.5009	64.8	0.6078	1.4	21.0	
3/10/2025 3:44	16.1797	65.9	0.5945	1.4	20.3		3/10/2025 3:37	16.5053	64.8	0.6122	1.4	21.0	
3/10/2025 3:59	16.1888	65.9	0.6036	1.4	20.3		3/10/2025 3:52	16.5053	64.8	0.6122	1.4	21.0	
3/10/2025 4:14	16.1888	65.9	0.6036	1.4	20.3		3/10/2025 4:07	16.5053	64.8	0.6122	1.4	21.0	
3/10/2025 4:29	16.1843	65.9	0.5991	1.4	20.3		3/10/2025 4:22	16.5053	64.8	0.6122	1.4	21.0	
3/10/2025 4:44	16.1888	65.9	0.6036	1.4	20.3		3/10/2025 4:37	16.5053	64.8	0.6122	1.4	21.0	
3/10/2025 4:59	16.1843	65.9	0.5991	1.4	20.3		3/10/2025 4:52	16.5095	64.8	0.6164	1.4	21.0	
3/10/2025 5:14	16.1797	65.9	0.5945	1.4	20.3		3/10/2025 5:07	16.5009	64.8	0.6078	1.4	21.0	
3/10/2025 5:29	16.1888	65.9	0.6036	1.4	20.3		3/10/2025 5:22	16.5053	64.8	0.6122	1.4	21.0	
3/10/2025 5:44	16.1888	65.9	0.6036	1.4	20.3		3/10/2025 5:37	16.5053	64.8	0.6122	1.4	21.0	

JZN Project No.: 24190-000
Project: Innovation QNS - Buillding B1
Location: 35-18 Steinway St., Queens, NY
JZN Rep: A. More
Client: Key Civil Engineering, P.C
Contractor: Diamond Drilling, Inc.
Installation Date 3/6/2025
Removal Date: 03/13/2025

Monitoring Well Data Tables

Monitoring Well	Logger Serial Number	Logger Elevation (ft)	Zero Reading (psi)
MW-1	20715060	18.92	15.5852
MW-2	20715059	19.58	15.8931

MW-1 - Logger Serial No. 20715060							MW-2 - Logger Serial No. 20715059						
Date & Time	Absolute Pressure (psi)	Temperature (°F)	Gauge Pressure (psi)	Depth Below Water (ft)	Groundwater Elevation (ft)	Remarks	Date & Time	Absolute Pressure (psi)	Temperature (°F)	Gauge Pressure (psi)	Depth Below Water (ft)	Groundwater Elevation (ft)	Remarks
3/10/2025 5:59	16.1843	65.9	0.5991	1.4	20.3		3/10/2025 5:52	16.5053	64.8	0.6122	1.4	21.0	
3/10/2025 6:14	16.1843	65.9	0.5991	1.4	20.3		3/10/2025 6:07	16.5095	64.8	0.6164	1.4	21.0	
3/10/2025 6:29	16.1933	65.9	0.6081	1.4	20.3		3/10/2025 6:22	16.5095	64.8	0.6164	1.4	21.0	
3/10/2025 6:44	16.1888	65.9	0.6036	1.4	20.3		3/10/2025 6:37	16.5139	64.8	0.6208	1.4	21.0	
3/10/2025 6:59	16.1888	65.9	0.6036	1.4	20.3		3/10/2025 6:52	16.5095	64.8	0.6164	1.4	21.0	
3/10/2025 7:14	16.1933	65.9	0.6081	1.4	20.3		3/10/2025 7:07	16.5139	64.8	0.6208	1.4	21.0	
3/10/2025 7:29	16.2023	65.9	0.6171	1.4	20.3		3/10/2025 7:22	16.5182	64.8	0.6251	1.4	21.0	
3/10/2025 7:44	16.2068	65.9	0.6216	1.4	20.4		3/10/2025 7:37	16.5226	64.8	0.6295	1.5	21.0	
3/10/2025 7:59	16.2023	65.9	0.6171	1.4	20.3		3/10/2025 7:52	16.5226	64.8	0.6295	1.5	21.0	
3/10/2025 8:14	16.2068	65.9	0.6216	1.4	20.4		3/10/2025 8:07	16.5268	64.8	0.6337	1.5	21.0	
3/10/2025 8:29	16.2023	65.9	0.6171	1.4	20.3		3/10/2025 8:22	16.5268	64.8	0.6337	1.5	21.0	
3/10/2025 8:44	16.2068	65.9	0.6216	1.4	20.4		3/10/2025 8:37	16.5311	64.8	0.6380	1.5	21.1	
3/10/2025 8:59	16.2068	65.9	0.6216	1.4	20.4		3/10/2025 8:52	16.5311	64.8	0.6380	1.5	21.1	
3/10/2025 9:14	16.2068	65.9	0.6216	1.4	20.4		3/10/2025 9:07	16.5311	64.8	0.6380	1.5	21.1	
3/10/2025 9:29	16.2068	65.9	0.6216	1.4	20.4		3/10/2025 9:22	16.5355	64.8	0.6424	1.5	21.1	
3/10/2025 9:44	16.2158	65.9	0.6306	1.5	20.4		3/10/2025 9:37	16.5311	64.8	0.6380	1.5	21.1	
3/10/2025 9:59	16.2113	65.9	0.6261	1.4	20.4		3/10/2025 9:52	16.5311	64.8	0.6380	1.5	21.1	
3/10/2025 10:14	16.2113	65.9	0.6261	1.4	20.4		3/10/2025 10:07	16.5311	64.8	0.6380	1.5	21.1	
3/10/2025 10:29	16.2068	65.9	0.6216	1.4	20.4		3/10/2025 10:22	16.5311	64.8	0.6380	1.5	21.1	
3/10/2025 10:44	16.2068	65.9	0.6216	1.4	20.4		3/10/2025 10:37	16.5311	64.8	0.6380	1.5	21.1	
3/10/2025 10:59	16.2068	65.9	0.6216	1.4	20.4		3/10/2025 10:52	16.5311	64.8	0.6380	1.5	21.1	
3/10/2025 11:14	16.2068	65.9	0.6216	1.4	20.4		3/10/2025 11:07	16.5311	64.8	0.6380	1.5	21.1	
3/10/2025 11:29	16.2023	65.9	0.6171	1.4	20.3		3/10/2025 11:22	16.5311	64.8	0.6380	1.5	21.1	
3/10/2025 11:44	16.2023	65.9	0.6171	1.4	20.3		3/10/2025 11:37	16.5268	64.8	0.6337	1.5	21.0	
3/10/2025 11:59	16.1978	65.9	0.6126	1.4	20.3		3/10/2025 11:52	16.5226	64.8	0.6295	1.5	21.0	
3/10/2025 12:14	16.1933	65.9	0.6081	1.4	20.3		3/10/2025 12:07	16.5182	64.8	0.6251	1.4	21.0	
3/10/2025 12:29	16.1933	65.9	0.6081	1.4	20.3		3/10/2025 12:22	16.5182	64.8	0.6251	1.4	21.0	
3/10/2025 12:44	16.1888	65.9	0.6036	1.4	20.3		3/10/2025 12:37	16.5139	64.8	0.6208	1.4	21.0	
3/10/2025 12:59	16.1888	65.9	0.6036	1.4	20.3		3/10/2025 12:52	16.5095	64.8	0.6164	1.4	21.0	
3/10/2025 13:14	16.1888	65.9	0.6036	1.4	20.3		3/10/2025 13:07	16.5139	64.8	0.6208	1.4	21.0	
3/10/2025 13:29	16.1797	65.9	0.5945	1.4	20.3		3/10/2025 13:22	16.5053	64.8	0.6122	1.4	21.0	
3/10/2025 13:44	16.1797	65.9	0.5945	1.4	20.3		3/10/2025 13:37	16.5053	64.8	0.6122	1.4	21.0	
3/10/2025 13:59	16.1707	65.9	0.5855	1.4	20.3		3/10/2025 13:52	16.5009	64.8	0.6078	1.4	21.0	
3/10/2025 14:14	16.1752	65.9	0.5900	1.4	20.3		3/10/2025 14:07	16.5009	64.8	0.6078	1.4	21.0	
3/10/2025 14:29	16.1752	65.9	0.5900	1.4	20.3		3/10/2025 14:22	16.4966	64.8	0.6035	1.4	21.0	
3/10/2025 14:44	16.1707	65.9	0.5855	1.4	20.3		3/10/2025 14:37	16.4922	64.8	0.5991	1.4	21.0	
3/10/2025 14:59	16.1752	65.9	0.5900	1.4	20.3		3/10/2025 14:52	16.4966	64.8	0.6035	1.4	21.0	
3/10/2025 15:14	16.1752	65.9	0.5900	1.4	20.3		3/10/2025 15:07	16.4922	64.8	0.5991	1.4	21.0	
3/10/2025 15:29	16.1752	65.9	0.5900	1.4	20.3		3/10/2025 15:22	16.4922	64.8	0.5991	1.4	21.0	
3/10/2025 15:44	16.1707	65.9	0.5855	1.4	20.3		3/10/2025 15:37	16.4966	64.8	0.6035	1.4	21.0	
3/10/2025 15:59	16.1797	65.9	0.5945	1.4	20.3		3/10/2025 15:52	16.5009	64.8	0.6078	1.4	21.0	
3/10/2025 16:14	16.1797	65.9	0.5945	1.4	20.3		3/10/2025 16:07	16.5009	64.8	0.6078	1.4	21.0	
3/10/2025 16:29	16.1752	65.9	0.5900	1.4	20.3		3/10/2025 16:22	16.4966	64.8	0.6035	1.4	21.0	
3/10/2025 16:44	16.1752	65.9	0.5900	1.4	20.3		3/10/2025 16:37	16.4966	64.8	0.6035	1.4	21.0	
3/10/2025 16:59	16.1752	65.9	0.5900	1.4	20.3		3/10/2025 16:52	16.4966	64.8	0.6035	1.4	21.0	
3/10/2025 17:14	16.1797	65.9	0.5945	1.4	20.3		3/10/2025 17:07	16.5009	64.8	0.6078	1.4	21.0	
3/10/2025 17:29	16.1843	65.9	0.5991	1.4	20.3		3/10/2025 17:22	16.4966	64.8	0.6035	1.4	21.0	
3/10/2025 17:44	16.1752	65.9	0.5900	1.4	20.3		3/10/2025 17:37	16.5009	64.8	0.6078	1.4	21.0	
3/10/2025 17:59	16.1843	65.9	0.5991	1.4	20.3		3/10/2025 17:52	16.5009	64.8	0.6078	1.4	21.0	
3/10/2025 18:14	16.1843	65.9	0.5991	1.4	20.3		3/10/2025 18:07	16.5009	64.8	0.6078	1.4	21.0	
3/10/2025 18:29	16.1797	65.9	0.5945	1.4	20.3		3/10/2025 18:22	16.5053	64.8	0.6122	1.4	21.0	
3/10/2025 18:44	16.1797	65.9	0.5945	1.4	20.3		3/10/2025 18:37	16.5009	64.8	0.6078	1.4	21.0	
3/10/2025 18:59	16.1752	65.9	0.5900	1.4	20.3		3/10/2025 18:52	16.5095	64.8	0.6164	1.4	21.0	
3/10/2025 19:14	16.1843	65.9	0.5991	1.4	20.3		3/10/2025 19:07	16.5053	64.8	0.6122	1.4	21.0	

JZN Project No.: 24190-000
Project: Innovation QNS - Buillding B1
Location: 35-18 Steinway St., Queens, NY
JZN Rep: A. More
Client: Key Civil Engineering, P.C
Contractor: Diamond Drilling, Inc.
Installation Date 3/6/2025
Removal Date: 03/13/2025

Monitoring Well Data Tables

Monitoring Well	Logger Serial Number	Logger Elevation (ft)	Zero Reading (psi)
MW-1	20715060	18.92	15.5852
MW-2	20715059	19.58	15.8931

MW-1 - Logger Serial No. 20715060							MW-2 - Logger Serial No. 20715059						
Date & Time	Absolute Pressure (psi)	Temperature (°F)	Gauge Pressure (psi)	Depth Below Water (ft)	Groundwater Elevation (ft)	Remarks	Date & Time	Absolute Pressure (psi)	Temperature (°F)	Gauge Pressure (psi)	Depth Below Water (ft)	Groundwater Elevation (ft)	Remarks
3/10/2025 19:29	16.1843	65.9	0.5991	1.4	20.3		3/10/2025 19:22	16.5009	64.8	0.6078	1.4	21.0	
3/10/2025 19:44	16.1843	65.9	0.5991	1.4	20.3		3/10/2025 19:37	16.5095	64.8	0.6164	1.4	21.0	
3/10/2025 19:59	16.1843	65.9	0.5991	1.4	20.3		3/10/2025 19:52	16.5053	64.8	0.6122	1.4	21.0	
3/10/2025 20:14	16.1888	65.9	0.6036	1.4	20.3		3/10/2025 20:07	16.5053	64.8	0.6122	1.4	21.0	
3/10/2025 20:29	16.1888	65.9	0.6036	1.4	20.3		3/10/2025 20:22	16.5095	64.8	0.6164	1.4	21.0	
3/10/2025 20:44	16.1888	65.9	0.6036	1.4	20.3		3/10/2025 20:37	16.5053	64.8	0.6122	1.4	21.0	
3/10/2025 20:59	16.1884	65.7	0.6032	1.4	20.3		3/10/2025 20:52	16.5095	64.8	0.6164	1.4	21.0	
3/10/2025 21:14	16.1888	65.9	0.6036	1.4	20.3		3/10/2025 21:07	16.5095	64.8	0.6164	1.4	21.0	
3/10/2025 21:29	16.1888	65.9	0.6036	1.4	20.3		3/10/2025 21:22	16.5053	64.8	0.6122	1.4	21.0	
3/10/2025 21:44	16.1929	65.7	0.6077	1.4	20.3		3/10/2025 21:37	16.5095	64.8	0.6164	1.4	21.0	
3/10/2025 21:59	16.1888	65.9	0.6036	1.4	20.3		3/10/2025 21:52	16.5095	64.8	0.6164	1.4	21.0	
3/10/2025 22:14	16.1888	65.9	0.6036	1.4	20.3		3/10/2025 22:07	16.5139	64.8	0.6208	1.4	21.0	
3/10/2025 22:29	16.1933	65.9	0.6081	1.4	20.3		3/10/2025 22:22	16.5139	64.8	0.6208	1.4	21.0	
3/10/2025 22:44	16.1888	65.9	0.6036	1.4	20.3		3/10/2025 22:37	16.5095	64.8	0.6164	1.4	21.0	
3/10/2025 22:59	16.1843	65.9	0.5991	1.4	20.3		3/10/2025 22:52	16.5095	64.8	0.6164	1.4	21.0	
3/10/2025 23:14	16.1839	65.7	0.5987	1.4	20.3		3/10/2025 23:07	16.5095	64.8	0.6164	1.4	21.0	
3/10/2025 23:29	16.1888	65.9	0.6036	1.4	20.3		3/10/2025 23:22	16.5095	64.8	0.6164	1.4	21.0	
3/10/2025 23:44	16.1843	65.9	0.5991	1.4	20.3		3/10/2025 23:37	16.5095	64.8	0.6164	1.4	21.0	
3/10/2025 23:59	16.1797	65.9	0.5945	1.4	20.3		3/10/2025 23:52	16.5053	64.8	0.6122	1.4	21.0	
3/11/2025 0:14	16.1797	65.9	0.5945	1.4	20.3		3/11/2025 0:07	16.5053	64.8	0.6122	1.4	21.0	
3/11/2025 0:29	16.1797	65.9	0.5945	1.4	20.3		3/11/2025 0:22	16.5053	64.8	0.6122	1.4	21.0	
3/11/2025 0:44	16.1752	65.9	0.5900	1.4	20.3		3/11/2025 0:37	16.5053	64.8	0.6122	1.4	21.0	
3/11/2025 0:59	16.1843	65.9	0.5991	1.4	20.3		3/11/2025 0:52	16.5009	64.8	0.6078	1.4	21.0	
3/11/2025 1:14	16.1749	65.7	0.5897	1.4	20.3		3/11/2025 1:07	16.5009	64.8	0.6078	1.4	21.0	
3/11/2025 1:29	16.1797	65.9	0.5945	1.4	20.3		3/11/2025 1:22	16.4966	64.8	0.6035	1.4	21.0	
3/11/2025 1:44	16.1749	65.7	0.5897	1.4	20.3		3/11/2025 1:37	16.4966	64.8	0.6035	1.4	21.0	
3/11/2025 1:59	16.1794	65.7	0.5942	1.4	20.3		3/11/2025 1:52	16.4922	64.8	0.5991	1.4	21.0	
3/11/2025 2:14	16.1703	65.7	0.5851	1.4	20.3		3/11/2025 2:07	16.4922	64.8	0.5991	1.4	21.0	
3/11/2025 2:29	16.1707	65.9	0.5855	1.4	20.3		3/11/2025 2:22	16.4922	64.8	0.5991	1.4	21.0	
3/11/2025 2:44	16.1707	65.9	0.5855	1.4	20.3		3/11/2025 2:37	16.4922	64.8	0.5991	1.4	21.0	
3/11/2025 2:59	16.1707	65.9	0.5855	1.4	20.3		3/11/2025 2:52	16.4922	64.8	0.5991	1.4	21.0	
3/11/2025 3:14	16.1707	65.9	0.5855	1.4	20.3		3/11/2025 3:07	16.4922	64.8	0.5991	1.4	21.0	
3/11/2025 3:29	16.1707	65.9	0.5855	1.4	20.3		3/11/2025 3:22	16.4880	64.8	0.5949	1.4	21.0	
3/11/2025 3:44	16.1662	65.9	0.5810	1.3	20.3		3/11/2025 3:37	16.4880	64.8	0.5949	1.4	21.0	
3/11/2025 3:59	16.1658	65.7	0.5806	1.3	20.3		3/11/2025 3:52	16.4880	64.8	0.5949	1.4	21.0	
3/11/2025 4:14	16.1703	65.7	0.5851	1.4	20.3		3/11/2025 4:07	16.4880	64.8	0.5949	1.4	21.0	
3/11/2025 4:29	16.1707	65.9	0.5855	1.4	20.3		3/11/2025 4:22	16.4880	64.8	0.5949	1.4	21.0	
3/11/2025 4:44	16.1703	65.7	0.5851	1.4	20.3		3/11/2025 4:37	16.4837	64.8	0.5906	1.4	20.9	
3/11/2025 4:59	16.1703	65.7	0.5851	1.4	20.3		3/11/2025 4:52	16.4880	64.8	0.5949	1.4	21.0	
3/11/2025 5:14	16.1703	65.7	0.5851	1.4	20.3		3/11/2025 5:07	16.4880	64.8	0.5949	1.4	21.0	
3/11/2025 5:29	16.1703	65.7	0.5851	1.4	20.3		3/11/2025 5:22	16.4966	64.8	0.6035	1.4	21.0	
3/11/2025 5:44	16.1752	65.9	0.5900	1.4	20.3		3/11/2025 5:37	16.5009	64.8	0.6078	1.4	21.0	
3/11/2025 5:59	16.1794	65.7	0.5942	1.4	20.3		3/11/2025 5:52	16.5009	64.8	0.6078	1.4	21.0	
3/11/2025 6:14	16.1884	65.7	0.6032	1.4	20.3		3/11/2025 6:07	16.5053	64.8	0.6122	1.4	21.0	
3/11/2025 6:29	16.1884	65.7	0.6032	1.4	20.3		3/11/2025 6:22	16.5053	64.8	0.6122	1.4	21.0	
3/11/2025 6:44	16.1839	65.7	0.5987	1.4	20.3		3/11/2025 6:37	16.5095	64.8	0.6164	1.4	21.0	
3/11/2025 6:59	16.1839	65.7	0.5987	1.4	20.3		3/11/2025 6:52	16.5009	64.8	0.6078	1.4	21.0	
3/11/2025 7:14	16.1839	65.7	0.5987	1.4	20.3		3/11/2025 7:07	16.5053	64.8	0.6122	1.4	21.0	
3/11/2025 7:29	16.1839	65.7	0.5987	1.4	20.3		3/11/2025 7:22	16.5053	64.8	0.6122	1.4	21.0	
3/11/2025 7:44	16.1884	65.7	0.6032	1.4	20.3		3/11/2025 7:37	16.5053	64.8	0.6122	1.4	21.0	
3/11/2025 7:59	16.1884	65.7	0.6032	1.4	20.3		3/11/2025 7:52	16.5053	64.8	0.6122	1.4	21.0	
3/11/2025 8:14	16.1839	65.7	0.5987	1.4	20.3		3/11/2025 8:07	16.5009	64.8	0.6078	1.4	21.0	
3/11/2025 8:29	16.1884	65.7	0.6032	1.4	20.3		3/11/2025 8:22	16.5053	64.8	0.6122	1.4	21.0	
3/11/2025 8:44	16.1884	65.7	0.6032	1.4	20.3		3/11/2025 8:37	16.5053	64.8	0.6122	1.4	21.0	

JZN Project No.: 24190-000
Project: Innovation QNS - Buillding B1
Location: 35-18 Steinway St., Queens, NY
JZN Rep: A. More
Client: Key Civil Engineering, P.C
Contractor: Diamond Drilling, Inc.
Installation Date 3/6/2025
Removal Date: 03/13/2025

Monitoring Well Data Tables

Monitoring Well	Logger Serial Number	Logger Elevation (ft)	Zero Reading (psi)
MW-1	20715060	18.92	15.5852
MW-2	20715059	19.58	15.8931

MW-1 - Logger Serial No. 20715060							MW-2 - Logger Serial No. 20715059						
Date & Time	Absolute Pressure (psi)	Temperature (°F)	Gauge Pressure (psi)	Depth Below Water (ft)	Groundwater Elevation (ft)	Remarks	Date & Time	Absolute Pressure (psi)	Temperature (°F)	Gauge Pressure (psi)	Depth Below Water (ft)	Groundwater Elevation (ft)	Remarks
3/11/2025 8:59	16.1884	65.7	0.6032	1.4	20.3		3/11/2025 8:52	16.5053	64.8	0.6122	1.4	21.0	
3/11/2025 9:14	16.1839	65.7	0.5987	1.4	20.3		3/11/2025 9:07	16.5009	64.8	0.6078	1.4	21.0	
3/11/2025 9:29	16.1884	65.7	0.6032	1.4	20.3		3/11/2025 9:22	16.5053	64.8	0.6122	1.4	21.0	
3/11/2025 9:44	16.1839	65.7	0.5987	1.4	20.3		3/11/2025 9:37	16.5009	64.8	0.6078	1.4	21.0	
3/11/2025 9:59	16.1794	65.7	0.5942	1.4	20.3		3/11/2025 9:52	16.4966	64.8	0.6035	1.4	21.0	
3/11/2025 10:14	16.1794	65.7	0.5942	1.4	20.3		3/11/2025 10:07	16.5009	64.8	0.6078	1.4	21.0	
3/11/2025 10:29	16.1749	65.7	0.5897	1.4	20.3		3/11/2025 10:22	16.4966	64.8	0.6035	1.4	21.0	
3/11/2025 10:44	16.1703	65.7	0.5851	1.4	20.3		3/11/2025 10:37	16.4922	64.8	0.5991	1.4	21.0	
3/11/2025 10:59	16.1703	65.7	0.5851	1.4	20.3		3/11/2025 10:52	16.4922	64.8	0.5991	1.4	21.0	
3/11/2025 11:14	16.1703	65.7	0.5851	1.4	20.3		3/11/2025 11:07	16.4880	64.8	0.5949	1.4	21.0	
3/11/2025 11:29	16.1703	65.7	0.5851	1.4	20.3		3/11/2025 11:22	16.4837	64.8	0.5906	1.4	20.9	
3/11/2025 11:44	16.1658	65.7	0.5806	1.3	20.3		3/11/2025 11:37	16.4837	64.8	0.5906	1.4	20.9	
3/11/2025 11:59	16.1613	65.7	0.5761	1.3	20.2		3/11/2025 11:52	16.4793	64.8	0.5862	1.4	20.9	
3/11/2025 12:14	16.1568	65.7	0.5716	1.3	20.2		3/11/2025 12:07	16.4793	64.8	0.5862	1.4	20.9	
3/11/2025 12:29	16.1568	65.7	0.5716	1.3	20.2		3/11/2025 12:22	16.4750	64.8	0.5819	1.3	20.9	
3/11/2025 12:44	16.1568	65.7	0.5716	1.3	20.2		3/11/2025 12:37	16.4708	64.8	0.5777	1.3	20.9	
3/11/2025 12:59	16.1568	65.7	0.5716	1.3	20.2		3/11/2025 12:52	16.4664	64.8	0.5733	1.3	20.9	
3/11/2025 13:14	16.1523	65.7	0.5671	1.3	20.2		3/11/2025 13:07	16.4664	64.8	0.5733	1.3	20.9	
3/11/2025 13:29	16.1478	65.7	0.5626	1.3	20.2		3/11/2025 13:22	16.4621	64.8	0.5690	1.3	20.9	
3/11/2025 13:44	16.1388	65.7	0.5536	1.3	20.2		3/11/2025 13:37	16.4577	64.8	0.5646	1.3	20.9	
3/11/2025 13:59	16.1341	65.7	0.5489	1.3	20.2		3/11/2025 13:52	16.4534	64.8	0.5603	1.3	20.9	
3/11/2025 14:14	16.1388	65.7	0.5536	1.3	20.2		3/11/2025 14:07	16.4492	64.8	0.5561	1.3	20.9	
3/11/2025 14:29	16.1388	65.7	0.5536	1.3	20.2		3/11/2025 14:22	16.4534	64.8	0.5603	1.3	20.9	
3/11/2025 14:44	16.1341	65.7	0.5489	1.3	20.2		3/11/2025 14:37	16.4492	64.8	0.5561	1.3	20.9	
3/11/2025 14:59	16.1296	65.7	0.5444	1.3	20.2		3/11/2025 14:52	16.4492	64.8	0.5561	1.3	20.9	
3/11/2025 15:14	16.1296	65.7	0.5444	1.3	20.2		3/11/2025 15:07	16.4448	64.8	0.5517	1.3	20.9	
3/11/2025 15:29	16.1296	65.7	0.5444	1.3	20.2		3/11/2025 15:22	16.4405	64.8	0.5474	1.3	20.8	
3/11/2025 15:44	16.1252	65.7	0.5400	1.2	20.2		3/11/2025 15:37	16.4405	64.8	0.5474	1.3	20.8	
3/11/2025 15:59	16.1162	65.7	0.5310	1.2	20.1		3/11/2025 15:52	16.4361	64.8	0.5430	1.3	20.8	
3/11/2025 16:14	16.1207	65.7	0.5355	1.2	20.2		3/11/2025 16:07	16.4319	64.8	0.5388	1.2	20.8	
3/11/2025 16:29	16.1207	65.7	0.5355	1.2	20.2		3/11/2025 16:22	16.4319	64.8	0.5388	1.2	20.8	
3/11/2025 16:44	16.1207	65.7	0.5355	1.2	20.2		3/11/2025 16:37	16.4276	64.8	0.5345	1.2	20.8	
3/11/2025 16:59	16.1162	65.7	0.5310	1.2	20.1		3/11/2025 16:52	16.4361	64.8	0.5430	1.3	20.8	
3/11/2025 17:14	16.1162	65.7	0.5310	1.2	20.1		3/11/2025 17:07	16.4361	64.8	0.5430	1.3	20.8	
3/11/2025 17:29	16.1207	65.7	0.5355	1.2	20.2		3/11/2025 17:22	16.4405	64.8	0.5474	1.3	20.8	
3/11/2025 17:44	16.1252	65.7	0.5400	1.2	20.2		3/11/2025 17:37	16.4448	64.8	0.5517	1.3	20.9	
3/11/2025 17:59	16.1252	65.7	0.5400	1.2	20.2		3/11/2025 17:52	16.4405	64.8	0.5474	1.3	20.8	
3/11/2025 18:14	16.1296	65.7	0.5444	1.3	20.2		3/11/2025 18:07	16.4405	64.8	0.5474	1.3	20.8	
3/11/2025 18:29	16.1252	65.7	0.5400	1.2	20.2		3/11/2025 18:22	16.4448	64.8	0.5517	1.3	20.9	
3/11/2025 18:44	16.1341	65.7	0.5489	1.3	20.2		3/11/2025 18:37	16.4448	64.8	0.5517	1.3	20.9	
3/11/2025 18:59	16.1296	65.7	0.5444	1.3	20.2		3/11/2025 18:52	16.4492	64.8	0.5561	1.3	20.9	
3/11/2025 19:14	16.1296	65.7	0.5444	1.3	20.2		3/11/2025 19:07	16.4492	64.8	0.5561	1.3	20.9	
3/11/2025 19:29	16.1296	65.7	0.5444	1.3	20.2		3/11/2025 19:22	16.4492	64.8	0.5561	1.3	20.9	
3/11/2025 19:44	16.1341	65.7	0.5489	1.3	20.2		3/11/2025 19:37	16.4492	64.8	0.5561	1.3	20.9	
3/11/2025 19:59	16.1341	65.7	0.5489	1.3	20.2		3/11/2025 19:52	16.4492	64.8	0.5561	1.3	20.9	
3/11/2025 20:14	16.1341	65.7	0.5489	1.3	20.2		3/11/2025 20:07	16.4492	64.8	0.5561	1.3	20.9	
3/11/2025 20:29	16.1341	65.7	0.5489	1.3	20.2		3/11/2025 20:22	16.4534	64.8	0.5603	1.3	20.9	
3/11/2025 20:44	16.1388	65.7	0.5536	1.3	20.2		3/11/2025 20:37	16.4577	64.8	0.5646	1.3	20.9	
3/11/2025 20:59	16.1433	65.7	0.5581	1.3	20.2		3/11/2025 20:52	16.4621	64.8	0.5690	1.3	20.9	
3/11/2025 21:14	16.1433	65.7	0.5581	1.3	20.2		3/11/2025 21:07	16.4621	64.8	0.5690	1.3	20.9	
3/11/2025 21:29	16.1388	65.7	0.5536	1.3	20.2		3/11/2025 21:22	16.4577	64.8	0.5646	1.3	20.9	
3/11/2025 21:44	16.1388	65.7	0.5536	1.3	20.2		3/11/2025 21:37	16.4577	64.8	0.5646	1.3	20.9	
3/11/2025 21:59	16.1388	65.7	0.5536	1.3	20.2		3/11/2025 21:52	16.4621	64.8	0.5690	1.3	20.9	
3/11/2025 22:14	16.1523	65.7	0.5671	1.3	20.2		3/11/2025 22:07	16.4621	64.8	0.5690	1.3	20.9	

JZN Project No.: 24190-000
Project: Innovation QNS - Buillding B1
Location: 35-18 Steinway St., Queens, NY
JZN Rep: A. More
Client: Key Civil Engineering, P.C
Contractor: Diamond Drilling, Inc.
Installation Date 3/6/2025
Removal Date: 03/13/2025

Monitoring Well Data Tables

Monitoring Well	Logger Serial Number	Logger Elevation (ft)	Zero Reading (psi)
MW-1	20715060	18.92	15.5852
MW-2	20715059	19.58	15.8931

JZN ENGINEERING

MW-1 - Logger Serial No. 20715060							MW-2 - Logger Serial No. 20715059						
Date & Time	Absolute Pressure (psi)	Temperature (°F)	Gauge Pressure (psi)	Depth Below Water (ft)	Groundwater Elevation (ft)	Remarks	Date & Time	Absolute Pressure (psi)	Temperature (°F)	Gauge Pressure (psi)	Depth Below Water (ft)	Groundwater Elevation (ft)	Remarks
3/11/2025 22:29	16.1568	65.7	0.5716	1.3	20.2		3/11/2025 22:22	16.4750	64.8	0.5819	1.3	20.9	
3/11/2025 22:44	16.1568	65.7	0.5716	1.3	20.2		3/11/2025 22:37	16.4750	64.8	0.5819	1.3	20.9	
3/11/2025 22:59	16.1568	65.7	0.5716	1.3	20.2		3/11/2025 22:52	16.4750	64.8	0.5819	1.3	20.9	
3/11/2025 23:14	16.1613	65.7	0.5761	1.3	20.2		3/11/2025 23:07	16.4793	64.8	0.5862	1.4	20.9	
3/11/2025 23:29	16.1658	65.7	0.5806	1.3	20.3		3/11/2025 23:22	16.4793	64.8	0.5862	1.4	20.9	
3/11/2025 23:44	16.1613	65.7	0.5761	1.3	20.2		3/11/2025 23:37	16.4837	64.8	0.5906	1.4	20.9	
3/11/2025 23:59	16.1658	65.7	0.5806	1.3	20.3		3/11/2025 23:52	16.4880	64.8	0.5949	1.4	21.0	
3/12/2025 0:14	16.1703	65.7	0.5851	1.4	20.3		3/12/2025 0:07	16.4880	64.8	0.5949	1.4	21.0	
3/12/2025 0:29	16.1703	65.7	0.5851	1.4	20.3		3/12/2025 0:22	16.4880	64.8	0.5949	1.4	21.0	
3/12/2025 0:44	16.1703	65.7	0.5851	1.4	20.3		3/12/2025 0:37	16.4880	64.8	0.5949	1.4	21.0	
3/12/2025 0:59	16.1749	65.7	0.5897	1.4	20.3		3/12/2025 0:52	16.4880	64.8	0.5949	1.4	21.0	
3/12/2025 1:14	16.1749	65.7	0.5897	1.4	20.3		3/12/2025 1:07	16.5009	64.8	0.6078	1.4	21.0	
3/12/2025 1:29	16.1749	65.7	0.5897	1.4	20.3		3/12/2025 1:22	16.4966	64.8	0.6035	1.4	21.0	
3/12/2025 1:44	16.1794	65.7	0.5942	1.4	20.3		3/12/2025 1:37	16.4966	64.8	0.6035	1.4	21.0	
3/12/2025 1:59	16.1794	65.7	0.5942	1.4	20.3		3/12/2025 1:52	16.5009	64.8	0.6078	1.4	21.0	
3/12/2025 2:14	16.1839	65.7	0.5987	1.4	20.3		3/12/2025 2:07	16.5049	64.7	0.6118	1.4	21.0	
3/12/2025 2:29	16.1884	65.7	0.6032	1.4	20.3		3/12/2025 2:22	16.5049	64.7	0.6118	1.4	21.0	
3/12/2025 2:44	16.1884	65.7	0.6032	1.4	20.3		3/12/2025 2:37	16.5049	64.7	0.6118	1.4	21.0	
3/12/2025 2:59	16.1884	65.7	0.6032	1.4	20.3		3/12/2025 2:52	16.5095	64.8	0.6164	1.4	21.0	
3/12/2025 3:14	16.1884	65.7	0.6032	1.4	20.3		3/12/2025 3:07	16.5095	64.8	0.6164	1.4	21.0	
3/12/2025 3:29	16.1929	65.7	0.6077	1.4	20.3		3/12/2025 3:22	16.5095	64.8	0.6164	1.4	21.0	
3/12/2025 3:44	16.1929	65.7	0.6077	1.4	20.3		3/12/2025 3:37	16.5134	64.7	0.6203	1.4	21.0	
3/12/2025 3:59	16.1929	65.7	0.6077	1.4	20.3		3/12/2025 3:52	16.5139	64.8	0.6208	1.4	21.0	
3/12/2025 4:14	16.2065	65.7	0.6213	1.4	20.4		3/12/2025 4:07	16.5182	64.8	0.6251	1.4	21.0	
3/12/2025 4:29	16.2110	65.7	0.6258	1.4	20.4		3/12/2025 4:22	16.5268	64.8	0.6337	1.5	21.0	
3/12/2025 4:44	16.2065	65.7	0.6213	1.4	20.4		3/12/2025 4:37	16.5268	64.8	0.6337	1.5	21.0	
3/12/2025 4:59	16.2110	65.7	0.6258	1.4	20.4		3/12/2025 4:52	16.5311	64.8	0.6380	1.5	21.1	
3/12/2025 5:14	16.2110	65.7	0.6258	1.4	20.4		3/12/2025 5:07	16.5355	64.8	0.6424	1.5	21.1	
3/12/2025 5:29	16.2155	65.7	0.6303	1.5	20.4		3/12/2025 5:22	16.5398	64.8	0.6467	1.5	21.1	
3/12/2025 5:44	16.2200	65.7	0.6348	1.5	20.4		3/12/2025 5:37	16.5355	64.8	0.6424	1.5	21.1	
3/12/2025 5:59	16.2200	65.7	0.6348	1.5	20.4		3/12/2025 5:52	16.5442	64.8	0.6511	1.5	21.1	
3/12/2025 6:14	16.2245	65.7	0.6393	1.5	20.4		3/12/2025 6:07	16.5437	64.7	0.6506	1.5	21.1	
3/12/2025 6:29	16.2290	65.7	0.6438	1.5	20.4		3/12/2025 6:22	16.5527	64.8	0.6596	1.5	21.1	
3/12/2025 6:44	16.2335	65.7	0.6483	1.5	20.4		3/12/2025 6:37	16.5571	64.8	0.6640	1.5	21.1	
3/12/2025 6:59	16.2426	65.7	0.6574	1.5	20.4		3/12/2025 6:52	16.5614	64.8	0.6683	1.5	21.1	
3/12/2025 7:14	16.2426	65.7	0.6574	1.5	20.4		3/12/2025 7:07	16.5656	64.8	0.6725	1.6	21.1	
3/12/2025 7:29	16.2471	65.7	0.6619	1.5	20.4		3/12/2025 7:22	16.5700	64.8	0.6769	1.6	21.1	
3/12/2025 7:44	16.2426	65.7	0.6574	1.5	20.4		3/12/2025 7:37	16.5700	64.8	0.6769	1.6	21.1	
3/12/2025 7:59	16.2471	65.7	0.6619	1.5	20.4		3/12/2025 7:52	16.5695	64.7	0.6764	1.6	21.1	
3/12/2025 8:14	16.2471	65.7	0.6619	1.5	20.4		3/12/2025 8:07	16.5739	64.7	0.6808	1.6	21.2	
3/12/2025 8:29	16.2516	65.7	0.6664	1.5	20.5		3/12/2025 8:22	16.5739	64.7	0.6808	1.6	21.2	
3/12/2025 8:44	16.2516	65.7	0.6664	1.5	20.5		3/12/2025 8:37	16.5782	64.7	0.6851	1.6	21.2	
3/12/2025 8:59	16.2561	65.7	0.6709	1.5	20.5		3/12/2025 8:52	16.5743	64.8	0.6812	1.6	21.2	
3/12/2025 9:14	16.2561	65.7	0.6709	1.5	20.5		3/12/2025 9:07	16.5787	64.8	0.6856	1.6	21.2	
3/12/2025 9:29	16.2606	65.7	0.6754	1.6	20.5		3/12/2025 9:22	16.5829	64.8	0.6898	1.6	21.2	
3/12/2025 9:44	16.2606	65.7	0.6754	1.6	20.5		3/12/2025 9:37	16.5829	64.8	0.6898	1.6	21.2	
3/12/2025 9:59	16.2606	65.7	0.6754	1.6	20.5		3/12/2025 9:52	16.5872	64.8	0.6941	1.6	21.2	
3/12/2025 10:14	16.2606	65.7	0.6754	1.6	20.5		3/12/2025 10:07	16.5829	64.8	0.6898	1.6	21.2	
3/12/2025 10:29	16.2606	65.7	0.6754	1.6	20.5		3/12/2025 10:22	16.5829	64.8	0.6898	1.6	21.2	
3/12/2025 10:44	16.2606	65.7	0.6754	1.6	20.5		3/12/2025 10:37	16.5829	64.8	0.6898	1.6	21.2	
3/12/2025 10:59	16.2651	65.7	0.6799	1.6	20.5		3/12/2025 10:52	16.5872	64.8	0.6941	1.6	21.2	
3/12/2025 11:14	16.2606	65.7	0.6754	1.6	20.5		3/12/2025 11:07	16.5826	64.7	0.6895	1.6	21.2	
3/12/2025 11:29	16.2651	65.7	0.6799	1.6	20.5		3/12/2025 11:22	16.5872	64.8	0.6941	1.6	21.2	
3/12/2025 11:44	16.2606	65.7	0.6754	1.6	20.5		3/12/2025 11:37	16.5868	64.7	0.6937	1.6	21.2	

JZN Project No.: 24190-000
Project: Innovation QNS - Buillding B1
Location: 35-18 Steinway St., Queens, NY
JZN Rep: A. More
Client: Key Civil Engineering, P.C
Contractor: Diamond Drilling, Inc.
Installation Date 3/6/2025
Removal Date: 03/13/2025

Monitoring Well Data Tables

Monitoring Well	Logger Serial Number	Logger Elevation (ft)	Zero Reading (psi)
MW-1	20715060	18.92	15.5852
MW-2	20715059	19.58	15.8931

MW-1 - Logger Serial No. 20715060							MW-2 - Logger Serial No. 20715059						
Date & Time	Absolute Pressure (psi)	Temperature (°F)	Gauge Pressure (psi)	Depth Below Water (ft)	Groundwater Elevation (ft)	Remarks	Date & Time	Absolute Pressure (psi)	Temperature (°F)	Gauge Pressure (psi)	Depth Below Water (ft)	Groundwater Elevation (ft)	Remarks
3/12/2025 11:59	16.2651	65.7	0.6799	1.6	20.5		3/12/2025 11:52	16.5826	64.7	0.6895	1.6	21.2	
3/12/2025 12:14	16.2561	65.7	0.6709	1.5	20.5		3/12/2025 12:07	16.5826	64.7	0.6895	1.6	21.2	
3/12/2025 12:29	16.2606	65.7	0.6754	1.6	20.5		3/12/2025 12:22	16.5782	64.7	0.6851	1.6	21.2	
3/12/2025 12:44	16.2561	65.7	0.6709	1.5	20.5		3/12/2025 12:37	16.5787	64.8	0.6856	1.6	21.2	
3/12/2025 12:59	16.2561	65.7	0.6709	1.5	20.5		3/12/2025 12:52	16.5743	64.8	0.6812	1.6	21.2	
3/12/2025 13:14	16.2516	65.7	0.6664	1.5	20.5		3/12/2025 13:07	16.5700	64.8	0.6769	1.6	21.1	
3/12/2025 13:29	16.2426	65.7	0.6574	1.5	20.4		3/12/2025 13:22	16.5739	64.7	0.6808	1.6	21.2	
3/12/2025 13:44	16.2516	65.7	0.6664	1.5	20.5		3/12/2025 13:37	16.5739	64.7	0.6808	1.6	21.2	
3/12/2025 13:59	16.2471	65.7	0.6619	1.5	20.4		3/12/2025 13:52	16.5700	64.8	0.6769	1.6	21.1	
3/12/2025 14:14	16.2471	65.7	0.6619	1.5	20.4		3/12/2025 14:07	16.5656	64.8	0.6725	1.6	21.1	
3/12/2025 14:29	16.2426	65.7	0.6574	1.5	20.4		3/12/2025 14:22	16.5652	64.7	0.6721	1.6	21.1	
3/12/2025 14:44	16.2426	65.7	0.6574	1.5	20.4		3/12/2025 14:37	16.5656	64.8	0.6725	1.6	21.1	
3/12/2025 14:59	16.2381	65.7	0.6529	1.5	20.4		3/12/2025 14:52	16.5656	64.8	0.6725	1.6	21.1	
3/12/2025 15:14	16.2381	65.7	0.6529	1.5	20.4		3/12/2025 15:07	16.5614	64.8	0.6683	1.5	21.1	
3/12/2025 15:29	16.2381	65.7	0.6529	1.5	20.4		3/12/2025 15:22	16.5614	64.8	0.6683	1.5	21.1	
3/12/2025 15:44	16.2426	65.7	0.6574	1.5	20.4		3/12/2025 15:37	16.5656	64.8	0.6725	1.6	21.1	
3/12/2025 15:59	16.2426	65.7	0.6574	1.5	20.4		3/12/2025 15:52	16.5614	64.8	0.6683	1.5	21.1	
3/12/2025 16:14	16.2381	65.7	0.6529	1.5	20.4		3/12/2025 16:07	16.5614	64.8	0.6683	1.5	21.1	
3/12/2025 16:29	16.2381	65.7	0.6529	1.5	20.4		3/12/2025 16:22	16.5610	64.7	0.6679	1.5	21.1	
3/12/2025 16:44	16.2381	65.7	0.6529	1.5	20.4		3/12/2025 16:37	16.5652	64.7	0.6721	1.6	21.1	
3/12/2025 16:59	16.2471	65.7	0.6619	1.5	20.4		3/12/2025 16:52	16.5656	64.8	0.6725	1.6	21.1	
3/12/2025 17:14	16.2471	65.7	0.6619	1.5	20.4		3/12/2025 17:07	16.5614	64.8	0.6683	1.5	21.1	
3/12/2025 17:29	16.2516	65.7	0.6664	1.5	20.5		3/12/2025 17:22	16.5656	64.8	0.6725	1.6	21.1	
3/12/2025 17:44	16.2516	65.7	0.6664	1.5	20.5		3/12/2025 17:37	16.5743	64.8	0.6812	1.6	21.2	
3/12/2025 17:59	16.2561	65.7	0.6709	1.5	20.5		3/12/2025 17:52	16.5700	64.8	0.6769	1.6	21.1	
3/12/2025 18:14	16.2516	65.7	0.6664	1.5	20.5		3/12/2025 18:07	16.5743	64.8	0.6812	1.6	21.2	
3/12/2025 18:29	16.2561	65.7	0.6709	1.5	20.5		3/12/2025 18:22	16.5743	64.8	0.6812	1.6	21.2	
3/12/2025 18:44	16.2561	65.7	0.6709	1.5	20.5		3/12/2025 18:37	16.5782	64.7	0.6851	1.6	21.2	
3/12/2025 18:59	16.2561	65.7	0.6709	1.5	20.5		3/12/2025 18:52	16.5826	64.7	0.6895	1.6	21.2	
3/12/2025 19:14	16.2606	65.7	0.6754	1.6	20.5		3/12/2025 19:07	16.5826	64.7	0.6895	1.6	21.2	
3/12/2025 19:29	16.2651	65.7	0.6799	1.6	20.5		3/12/2025 19:22	16.5868	64.7	0.6937	1.6	21.2	
3/12/2025 19:44	16.2698	65.7	0.6846	1.6	20.5		3/12/2025 19:37	16.5872	64.8	0.6941	1.6	21.2	
3/12/2025 19:59	16.2698	65.7	0.6846	1.6	20.5		3/12/2025 19:52	16.5916	64.8	0.6985	1.6	21.2	
3/12/2025 20:14	16.2698	65.7	0.6846	1.6	20.5		3/12/2025 20:07	16.5959	64.8	0.7028	1.6	21.2	
3/12/2025 20:29	16.2742	65.7	0.6890	1.6	20.5		3/12/2025 20:22	16.5955	64.7	0.7024	1.6	21.2	
3/12/2025 20:44	16.2742	65.7	0.6890	1.6	20.5		3/12/2025 20:37	16.5955	64.7	0.7024	1.6	21.2	
3/12/2025 20:59	16.2787	65.7	0.6935	1.6	20.5		3/12/2025 20:52	16.5999	64.7	0.7068	1.6	21.2	
3/12/2025 21:14	16.2787	65.7	0.6935	1.6	20.5		3/12/2025 21:07	16.6045	64.8	0.7114	1.6	21.2	
3/12/2025 21:29	16.2832	65.7	0.6980	1.6	20.5		3/12/2025 21:22	16.6089	64.8	0.7158	1.7	21.2	
3/12/2025 21:44	16.2832	65.7	0.6980	1.6	20.5		3/12/2025 21:37	16.6041	64.7	0.7110	1.6	21.2	
3/12/2025 21:59	16.2877	65.7	0.7025	1.6	20.5		3/12/2025 21:52	16.6084	64.7	0.7153	1.7	21.2	
3/12/2025 22:14	16.2877	65.7	0.7025	1.6	20.5		3/12/2025 22:07	16.6089	64.8	0.7158	1.7	21.2	
3/12/2025 22:29	16.2922	65.7	0.7070	1.6	20.6		3/12/2025 22:22	16.6128	64.7	0.7197	1.7	21.2	
3/12/2025 22:44	16.2877	65.7	0.7025	1.6	20.5		3/12/2025 22:37	16.6128	64.7	0.7197	1.7	21.2	
3/12/2025 22:59	16.2877	65.7	0.7025	1.6	20.5		3/12/2025 22:52	16.6084	64.7	0.7153	1.7	21.2	
3/12/2025 23:14	16.2922	65.7	0.7070	1.6	20.6		3/12/2025 23:07	16.6128	64.7	0.7197	1.7	21.2	
3/12/2025 23:29	16.2877	65.7	0.7025	1.6	20.5		3/12/2025 23:22	16.6084	64.7	0.7153	1.7	21.2	
3/12/2025 23:44	16.2877	65.7	0.7025	1.6	20.5		3/12/2025 23:37	16.6128	64.7	0.7197	1.7	21.2	
3/12/2025 23:59	16.2877	65.7	0.7025	1.6	20.5		3/12/2025 23:52	16.6084	64.7	0.7153	1.7	21.2	
3/13/2025 0:14	16.2877	65.7	0.7025	1.6	20.5		3/13/2025 0:07	16.6084	64.7	0.7153	1.7	21.2	
3/13/2025 0:29	16.2877	65.7	0.7025	1.6	20.5		3/13/2025 0:22	16.6084	64.7	0.7153	1.7	21.2	
3/13/2025 0:44	16.2832	65.7	0.6980	1.6	20.5		3/13/2025 0:37	16.6089	64.8	0.7158	1.7	21.2	
3/13/2025 0:59	16.2877	65.7	0.7025	1.6	20.5		3/13/2025 0:52	16.6084	64.7	0.7153	1.7	21.2	
3/13/2025 1:14	16.2877	65.7	0.7025	1.6	20.5		3/13/2025 1:07	16.6084	64.7	0.7153	1.7	21.2	

JZN Project No.: 24190-000
Project: Innovation QNS - Buillding B1
Location: 35-18 Steinway St., Queens, NY
JZN Rep: A. More
Client: Key Civil Engineering, P.C
Contractor: Diamond Drilling, Inc.
Installation Date 3/6/2025
Removal Date: 03/13/2025

Monitoring Well Data Tables

Monitoring Well	Logger Serial Number	Logger Elevation (ft)	Zero Reading (psi)
MW-1	20715060	18.92	15.5852
MW-2	20715059	19.58	15.8931

JZN ENGINEERING

MW-1 - Logger Serial No. 20715060							MW-2 - Logger Serial No. 20715059						
Date & Time	Absolute Pressure (psi)	Temperature (°F)	Gauge Pressure (psi)	Depth Below Water (ft)	Groundwater Elevation (ft)	Remarks	Date & Time	Absolute Pressure (psi)	Temperature (°F)	Gauge Pressure (psi)	Depth Below Water (ft)	Groundwater Elevation (ft)	Remarks
3/13/2025 1:29	16.2832	65.7	0.6980	1.6	20.5		3/13/2025 1:22	16.6084	64.7	0.7153	1.7	21.2	
3/13/2025 1:44	16.2832	65.7	0.6980	1.6	20.5		3/13/2025 1:37	16.6041	64.7	0.7110	1.6	21.2	
3/13/2025 1:59	16.2832	65.7	0.6980	1.6	20.5		3/13/2025 1:52	16.6041	64.7	0.7110	1.6	21.2	
3/13/2025 2:14	16.2787	65.7	0.6935	1.6	20.5		3/13/2025 2:07	16.5955	64.7	0.7024	1.6	21.2	
3/13/2025 2:29	16.2742	65.7	0.6890	1.6	20.5		3/13/2025 2:22	16.5955	64.7	0.7024	1.6	21.2	
3/13/2025 2:44	16.2742	65.7	0.6890	1.6	20.5		3/13/2025 2:37	16.5955	64.7	0.7024	1.6	21.2	
3/13/2025 2:59	16.2698	65.7	0.6846	1.6	20.5		3/13/2025 2:52	16.5999	64.7	0.7068	1.6	21.2	
3/13/2025 3:14	16.2698	65.7	0.6846	1.6	20.5		3/13/2025 3:07	16.5955	64.7	0.7024	1.6	21.2	
3/13/2025 3:29	16.2698	65.7	0.6846	1.6	20.5		3/13/2025 3:22	16.5955	64.7	0.7024	1.6	21.2	
3/13/2025 3:44	16.2742	65.7	0.6890	1.6	20.5		3/13/2025 3:37	16.5999	64.7	0.7068	1.6	21.2	
3/13/2025 3:59	16.2742	65.7	0.6890	1.6	20.5		3/13/2025 3:52	16.6041	64.7	0.7110	1.6	21.2	
3/13/2025 4:14	16.2742	65.7	0.6890	1.6	20.5		3/13/2025 4:07	16.5999	64.7	0.7068	1.6	21.2	
3/13/2025 4:29	16.2742	65.7	0.6890	1.6	20.5		3/13/2025 4:22	16.6041	64.7	0.7110	1.6	21.2	
3/13/2025 4:44	16.2787	65.7	0.6935	1.6	20.5		3/13/2025 4:37	16.6041	64.7	0.7110	1.6	21.2	
3/13/2025 4:59	16.2832	65.7	0.6980	1.6	20.5		3/13/2025 4:52	16.6045	64.8	0.7114	1.6	21.2	
3/13/2025 5:14	16.2787	65.7	0.6935	1.6	20.5		3/13/2025 5:07	16.6045	64.8	0.7114	1.6	21.2	
3/13/2025 5:29	16.2832	65.7	0.6980	1.6	20.5		3/13/2025 5:22	16.6045	64.8	0.7114	1.6	21.2	
3/13/2025 5:44	16.2832	65.7	0.6980	1.6	20.5		3/13/2025 5:37	16.6045	64.8	0.7114	1.6	21.2	
3/13/2025 5:59	16.2832	65.7	0.6980	1.6	20.5		3/13/2025 5:52	16.6045	64.8	0.7114	1.6	21.2	
3/13/2025 6:14	16.2877	65.7	0.7025	1.6	20.5		3/13/2025 6:07	16.6084	64.7	0.7153	1.7	21.2	
3/13/2025 6:29	16.2922	65.7	0.7070	1.6	20.6		3/13/2025 6:22	16.6128	64.7	0.7197	1.7	21.2	
3/13/2025 6:44	16.2922	65.7	0.7070	1.6	20.6		3/13/2025 6:37	16.6171	64.7	0.7240	1.7	21.3	
3/13/2025 6:59	16.2922	65.7	0.7070	1.6	20.6		3/13/2025 6:52	16.6128	64.7	0.7197	1.7	21.2	
3/13/2025 7:14	16.2922	65.7	0.7070	1.6	20.6		3/13/2025 7:07	16.6171	64.7	0.7240	1.7	21.3	
3/13/2025 7:29	16.2967	65.7	0.7115	1.6	20.6		3/13/2025 7:22	16.6132	64.8	0.7201	1.7	21.2	
3/13/2025 7:44	16.2967	65.7	0.7115	1.6	20.6		3/13/2025 7:37	16.6176	64.8	0.7245	1.7	21.3	
3/13/2025 7:59	16.2922	65.7	0.7070	1.6	20.6		3/13/2025 7:52	16.6213	64.7	0.7282	1.7	21.3	
3/13/2025 8:14	16.2967	65.7	0.7115	1.6	20.6		3/13/2025 8:07	16.6171	64.7	0.7240	1.7	21.3	
3/13/2025 8:29	16.2967	65.7	0.7115	1.6	20.6		3/13/2025 8:22	16.6171	64.7	0.7240	1.7	21.3	
3/13/2025 8:44	16.2967	65.7	0.7115	1.6	20.6		3/13/2025 8:37	16.6171	64.7	0.7240	1.7	21.3	
3/13/2025 8:59	16.2967	65.7	0.7115	1.6	20.6		3/13/2025 8:52	16.6171	64.7	0.7240	1.7	21.3	
3/13/2025 9:14	16.2967	65.7	0.7115	1.6	20.6		3/13/2025 9:07	16.6171	64.7	0.7240	1.7	21.3	
3/13/2025 9:29	16.2967	65.7	0.7115	1.6	20.6		3/13/2025 9:22	16.6213	64.7	0.7282	1.7	21.3	
3/13/2025 9:44	16.2967	65.7	0.7115	1.6	20.6		3/13/2025 9:37	16.6213	64.7	0.7282	1.7	21.3	
3/13/2025 9:59	16.3012	65.7	0.7160	1.7	20.6		3/13/2025 9:52	16.6213	64.7	0.7282	1.7	21.3	
3/13/2025 10:14	16.3012	65.7	0.7160	1.7	20.6		3/13/2025 10:07	16.6213	64.7	0.7282	1.7	21.3	
3/13/2025 10:29	16.2967	65.7	0.7115	1.6	20.6		3/13/2025 10:22	16.6218	64.8	0.7287	1.7	21.3	
3/13/2025 10:44	16.3012	65.7	0.7160	1.7	20.6		3/13/2025 10:37	16.3839	64.7	0.4908	1.1	20.7	
3/13/2025 10:59	16.3012	65.7	0.7160	1.7	20.6		3/13/2025 10:52	14.7519	52.8	-1.1412	-2.6	16.9	
3/13/2025 11:14	16.3059	65.7	0.7207	1.7	20.6								

Appendix E: Certifications

☒ Stakeholder's Certifications **(must be completed, signed and submitted with the SWPPP in the SWPTS Application)**

- Owner
- Developer
- SWPPP Preparer

☒ Contractor's Certification **(must be submitted with the SWPPP in the SWPTS Application. To be completed, signed and attached to the SWPPP on-site after SWPPP Approval, but before the start of construction)**

☒ Sub-Contractor's Certification **(must be submitted with the SWPPP in the SWPTS Application. To be completed, signed and attached to the SWPPP on-site after SWPPP Approval, but before the start of construction)**

If any of the above documents are not included, explain why below:

Click or tap here to enter text.

E.1 – Stakeholders' Certification

PROJECT
Innovation Queens B1

SWPTS Application ID
S415225

OWNER'S CERTIFICATION:
"I certify that I am aware of the proposed development activity and that the application for the above-listed project is being submitted on my behalf. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of the laws of the City of New York and could subject me to criminal or civil penalties and/or administrative proceedings."

X *Bernie Kennedy, Authorized Signatory*
35-18 Steinway Street LLC

Owner
Print Name, Title, and Company

X 8-11-25

Owner
Sign and Date

DEVELOPER'S CERTIFICATION:
"I have read or been advised of the applicable sections of RCNY Title 15 Chapter 19.1 and believe that I understand them. I also understand that, under the RCNY I am responsible for submitting a fee to initiate review of this application. I hereby certify that this document and the corresponding documents were prepared under my direction or supervision. I understand that certifying false, incorrect or inaccurate information is a violation of the laws of the City of New York and could subject me to criminal or civil penalties and/or administrative proceedings. I also understand that, by submitting this application, I am acknowledging that the SWPPP has been developed and will be implemented as the first element of construction."

X David Dishy, Authorized Signatory
Steinway 1 Owner LLC

Developer
Print Name, Title, and Company

X

Developer
Sign and Date

SWPPP PREPARER'S CERTIFICATION:
"I hereby certify that the Stormwater Pollution Prevention Plan (SWPPP) for this project was prepared by me or under my direct supervision in accordance with the RCNY Title 15 Chapter 19.1 and terms and conditions of the most recent NYSDEC SPDES General Permit for Stormwater Discharges from Construction Sites. Furthermore, I understand that certifying false, incorrect or inaccurate information is a violation of this permit and the laws of the City New York and could subject me to criminal, civil and/or administrative proceedings."

X *Yuriy Tupychak, P.E., Project Manager*
Key Civil Engineering, P.C.

SWPPP Preparer
Print Name, Title, and Company

X 08/08/2025

SWPPP Preparer
Sign and Date

E.2 – Contractor's Certification

PROJECT
35-10 Steinway Street

SWPTS Application ID
Insert SWPTS Application ID

CONTRACTING FIRM NAME
Example Contractor, LLC

CONTRACTING FIRM ADDRESS
456 Example Ave, New York City NY

SITE CONTRACTOR

Name and Title: Joe Doe, Project Manager
Contact Information: 123-567-7899, joe.doe@examplecontractor.com

TRAINED CONTRACTOR(S) WITH SWPPP RESPONSIBILITIES

1) **Name and Title:** Jane Doe, Assistant Project Manager
   Contact Information: 123-456-7899, jane.doe@examplecontractor.com
   NYS DEC ESC Training Certificate Number and Expiration Date: 123456, Exp: 11/24/2026
2) **Name and Title:** John Smith, Project Superintendent
   Contact Information: 321-654-9877, john.smith@examplecontractor.com
   NYS DEC ESC Training Certificate Number and Expiration Date: 654321, Exp: 11/24/2026

STORMWATER MEASURES

Contractor is responsible for all stormwater pollution prevention measures described withing the SWPPP, and relisted below:

1) **Pollution Prevention Measures and Spill Reporting:**
   a. Paving Operations
   b. Concrete, Paint and Stucco Washout
   c. Fuelling and Maintenance of Equipment Vehicles
   d. Washing of Equipment, Vehicles, and Buildings
   e. Storage, Handling, and Disposal of Chemicals
   f. Construction and Domestic Wastes
   g. Detergents
   h. Sanitary Waste
   i. Hazardous and Toxic Materials and Wastes
2) **Erosion and Sediment Control Practice:**
   a. Dust Control
   b. Stabilized Construction Entrance
   c. Storm Drain Inlet Protection
   d. Silt Fence
   e. Protecting Vegetation
   f. Concrete Washout
   g. Material Stockpile
3) **Stormwater Management Practices:**
   a. Green Roof
   b. Detention Tank

E.2 – Contractor's Certification

CERTIFICATION

"I hereby certify under penalty of law that I understand and agree to comply with the terms and conditions of the SWPPP and agree to implement any corrective actions identified by the qualified inspector during a site inspection. I also understand that the developer must comply with the terms and conditions of the NYC Stormwater Construction Permit, the most current version of the New York State Pollutant Discharge Elimination System (SPDES") general permit for stormwater discharges from construction activities and that it is unlawful for any person to cause or contribute to a violation of water quality standards. Furthermore, I am aware that there are significant penalties for submitting false information that I do not believe to be true, including the possibility of fine and imprisonment for knowing violations."

X	**X**
Site Contractor *Print Name, Title, and Company*	*Site Contractor* *Sign and Date*
X	**X**
Trained Contractor *Print Name, Title, and Company*	*Trained Contractor* *Sign and Date*

E.3 – Sub-Contractor's Certification

PROJECT
35-10 Steinway Street

SWPTS Application ID
SWPTS Application ID

CONTRACTING FIRM NAME
Example Sub-Contractor, LLC

CONTRACTING FIRM ADDRESS
456 Example Ave, New York City NY

SUB-CONTRACTOR REPRESENTATIVE

Name and Title: Joe Doe, Project Manager
Contact Information: 123-567-7899, joe.doe@examplecontractor.com

TRAINED CONTRACTOR(S) WITH SWPPP RESPONSIBILITIES

1) **Name and Title:** Jane Doe, Project Manager
   Contact Information: 123-456-7899, jane.doe@examplecontractor.com
   NYS DEC ESC Training Certificate Number and Expiration Date: 123456, Exp: 11/24/2026
2) **Name and Title:** John Smith, Project Superintendent
   Contact Information: 321-654-9877, john.smith@examplecontractor.com
   NYS DEC ESC Training Certificate Number and Expiration Date: 654321, Exp: 11/24/2026

STORMWATER MEASURES

Contractor is responsible for all stormwater pollution prevention measures described withing the SWPPP, and relisted below:

1) **Pollution Prevention Measures and Spill Reporting:**
   a. Paving Operations
   b. Concrete, Paint and Stucco Washout
   c. Fuelling and Maintenance of Equipment Vehicles
   d. Washing of Equipment, Vehicles, and Buildings
   e. Storage, Handling, and Disposal of Chemicals
   f. Construction and Domestic Wastes
   g. Detergents
   h. Sanitary Waste
   i. Hazardous and Toxic Materials and Wastes
2) **Erosion and Sediment Control Practice:**
   a. Dust Control
   b. Stabilized Construction Entrance
   c. Storm Drain Inlet Protection
   d. Silt Fence
   e. Protecting Vegetation
   f. Concrete Washout
   g. Material Stockpile
3) **Stormwater Management Practices:**
   a. Green Roof
   b. Detention Tank

E.3 – Sub-Contractor's Certification

CERTIFICATION

"I hereby certify under penalty of law that I understand and agree to comply with the terms and conditions of the SWPPP and agree to implement any corrective actions identified by the qualified inspector during a site inspection. I also understand that the developer must comply with the terms and conditions of the NYC Stormwater Construction Permit, the most current version of the New York State Pollutant Discharge Elimination System (SPDES") general permit for stormwater discharges from construction activities and that it is unlawful for any person to cause or contribute to a violation of water quality standards. Furthermore, I am aware that there are significant penalties for submitting false information that I do not believe to be true, including the possibility of fine and imprisonment for knowing violations."

X	**X**
Sub-Contractor Representative *Print Name, Title, and Company*	*Sub-Contractor Representative* *Sign and Date*
X	**X**
Trained Contractor *Print Name, Title, and Company*	*Trained Contractor* *Sign and Date*

Appendix F: Inspections

Documents included:

☒ Site-Specific Template for Daily Inspection Report by Trained Contractor, including:

- Project information, including project name, site address, SWPTS application ID, and other SPDES permit IDs.
- Space to enter trained contractor name and signed certification, date of inspections, weather and site conditions at the time of inspections, and any other general notes
- A predetermined list of installation and maintenance checks for all proposed erosion and sediment control practices and pollution prevention measures, including:
    - Name of practice
    - Location of practice and any relevant reference drawings
    - Specific installation and maintenance checks that must be verified daily and corrected if not compliant

☒ Site-Specific Template for Qualified Inspector Report, including

- Project information, including project name, site address, SWPTS application ID, SPDES CGP ID, other SPDES permit IDs, required inspection frequency, and names and titles of the qualified inspector(s) and contractor point of contact for the project.
- Space to enter date of inspections, weather and site conditions at the time of inspections, and any other general notes
- Predetermined lists of:
    - Drainage areas/sub-areas throughout the entire site
    - Points of discharge
    - Receiving waterbodies and waterbodies on/near the site
    - ESC practices, including
        - Name of practice
        - Location of practice and any relevant reference drawings
        - Specific installation and maintenance checks that must be inspected
        - Space for inspection notes and identification of corrective actions
    - Pollution prevention measures, including
        - Name of measure
        - Location of measure and any relevant reference drawings
        - Specific installation and maintenance checks that must be inspected
        - Space for inspection notes and identification of corrective actions
    - Post-Construction Stormwater Management Practices, included
        - Practice ID and name
        - Practice location
        - Construction status & SWPPP compliance
        - Space for inspection notes and identification of corrective actions
- An acknowledgement that the report will be issued to the Developer and Contractor, and kept on site in the log book
- The signature of the licensed and unlicensed Qualified Inspectors.

☒ Template of Monthly Inspection Summary Report by the Qualified Inspector, including:

- Project name and site address
- Names and contact information for Qualified Inspectors who performed inspections during the reporting month
- Reporting month and date of submission

- List of all inspections that occurred on the month in question, including date of inspection, QI, Stage of construction and corrective actions that were identified or resolved
- Qualified Professional's Certification and signature
- Note: This document should be submitted to DEP on a monthly basis. Submission shall be via email to *SWPConstInsp@dep.nyc.gov*, with SWPTS Application ID in Subject Line.

☐ Certificates of Completion of NYSDEC 4-Hour Erosion and Sediment Control Training in the last 3 years for all listed Trained Contractors, Qualified Inspectors, and Qualified Professionals.

If any of the above documents are not included, explain why below:

Certificates of Completion of NYSDEC 4-Hour Erosion and Sediment Control Training: Certificates of Completion for all listed Trained Contractors, Qualified Inspectors and Qualified Professionals to be provided prior to construction.

F.1 – Daily Inspection Report by Trained Contractor

PROJECT NAME
35-10 Steinway Street

SITE ADDRESS
35-10 Steinway Street, Astoria, Queens, NY

SWPTS APPLICATION ID
Insert SWPTS Application ID

STORMWATER CONSTRUCTION PERMIT ID
Insert Stormwater Construction Permit ID

SPDES CGP ID
Insert SPDES CGP ID

OTHER SPDES PERMIT IDS
Insert other permit IDs (if applicable)

DEVELOPER
Insert Name of Developer Entity

CONTRACTOR
Insert Name of Primary Contractor Entity (when known)

SUB-CONTRACTOR
Insert Name of Sub-Contractor Entity for which this inspection is being conducted (when known, and if applicable)

TRAINED CONTRACTOR INFORMATION
(Name, Company, NYS DEC ESC Training Certification Number and Expiration Date)

DATE AND TIME OF INSPECTION
(Date, day of week, and time of day)

SITE CONDITIONS
(Temperature, weather, and soil conditions)

General Inspection Notes:

Certification and acknowledgement of Trained Contractor

By signing below, I acknowledge that all information provided in this report is accurate and complete. The report shall be kept in a logbook on site and be made available to DEP at any time upon request. If deficiencies are identified, the contractor shall begin implementing corrective actions within one business day, and shall complete corrective actions in a reasonable timeframe.

X _____

Trained Contractor Name and Title

X _____

Trained Contractor Signature and Date

F.1 – Daily Inspection Report by Trained Contractor

Table I: Erosion and Sediment Control Practices		
Practice: Dust Control **Location:** Entire Site, Construction Phases I through V, C-101.00 through C-105.00 **Type:** Sediment Control		
Inspection Checklist	**Compliant?** *(Yes, No, N/A[1])*	**Corrective Actions / Maintenance Needs**
Is dust adequately controlled?		
Practice: Stabilized Construction Entrance **Location:** Entrance on 38th Street, Construction Phases I and II, C-101.00 and C-102.00 **Type:** Soil Stabilization		
Inspection Checklist	**Compliant?** *(Yes, No, N/A[1])*	**Corrective Actions / Maintenance Needs**
Stone is clean enough to effectively remove mud from vehicles.		
Installed per standards and specifications?		
Does all traffic use the stabilized entrance to enter and leave site?		
Is adequate drainage provided to prevent ponding at entrance?		
Practice: Storm Drain Inlet Protection **Location:** 35th Avenue, Steinway Street and 38th Street, Construction Phases IV and V, C-104.00 and C-105.00 **Type:** Runoff Control		
Inspection Checklist	**Compliant?** *(Yes, No, N/A[1])*	**Corrective Actions / Maintenance Needs**
Storm drain inlet protection installed on downstream inlet while work is being performed in the street.		

F.1 – Daily Inspection Report by Trained Contractor

Practice: Silt Fence **Location:** Around the subject property, Construction Phases I and II, C-101.00 and C-102.00 **Type:** Sediment Control		
Inspection Checklist	**Compliant?** *(Yes, No, N/A[1])*	**Corrective Actions / Maintenance Needs**
Installed around soil disturbance area.		
Joints are constructed by wrapping the two ends together for continuous support.		
Fabric buried 6 inches minimum.		
Post is stable, fabric is tight and without rips or frayed areas.		
Practice: Protecting Vegetation **Location:** On existing sidewalk trees to remain within 50 feet of property boundary, Construction Phases I through V, C-101.00 through C-105.00 **Type:** Soil Stabilization		
Inspection Checklist	**Compliant?** *(Yes, No, N/A[1])*	**Corrective Actions / Maintenance Needs**
Tree protecting fences installed around all existing trees fronting the subject property and within 50 ft from construction area.		
Tree protecting fence installed per NYC Parks & Recreation standard detail		

F.1 – Daily Inspection Report by Trained Contractor

Practice: Concrete Washout **Location:** Along 38th Street, Construction Phases II through V, C-102.00 through C-105.00 **Type:** Sediment Control		
Inspection Checklist	**Compliant?** *(Yes, No, N/A[1])*	**Corrective Actions / Maintenance Needs**
The concrete washout facility is NOT damaged or leaking		
The concrete washout facility is less than 75% full		
Hardened concrete is disposed off-site in construction / demolition landfill		
No concrete discharges are taking place in non-designated areas		
Practice: Material Stockpile **Location:** Inside the site area, Construction Phases I and II, C-101.00 and C-102.00 **Type:** Sediment Control		
Inspection Checklist	**Compliant?** *(Yes, No, N/A[1])*	**Corrective Actions / Maintenance Needs**
Stockpiles are stabilized with plastic/geotextile cover.		
Sediment control is installed at the toe of the slope.		

Add rows as needed to list all Pollution Prevention Measures and their associated Installation/Maintenance checklists]

[1]For any items marked "N/A", include a note describing why the checklist item could not be inspected.

F.1 – Daily Inspection Report by Trained Contractor

Table II: Pollution Prevention Measures		
Material or Activity to be Mitigated: Paving Operations **Location:** During utility connections and sidewalk & roadway pavement works, C-104.00 and C-105.00		
Pollution Prevention Measures	**Compliant?** *(Yes, No, N/A[1])*	**Corrective Actions / Maintenance Needs**
Products shall be stored in original containers with the original labels in legible condition. If surplus product must be disposed of, the General Contractor must follow the manufacturers or applicable jurisdictional requirements for proper disposal.		
Material or Activity to be Mitigated: Concrete, Paint and Stucco Washout **Location:** During foundation, building, and sidewalk & roadway pavement works, C-102.00, C-103.00 and C-105.00		
Pollution Prevention Measures	**Compliant?** *(Yes, No, N/A[1])*	**Corrective Actions / Maintenance Needs**
Concrete, paint, and stucco washout shall be conducted in an area where the likelihood of the area contributing to stormwater discharges is negligible. If required, additional Best Management Practices must be implemented to prevent concrete, paint and stucco wastes from contributing to stormwater discharges.		
Products shall be stored in original containers with the original labels in legible condition. If surplus product must be disposed of, the General Contractor must follow the manufacturers or applicable jurisdictional requirements for proper disposal.		

F.1 – Daily Inspection Report by Trained Contractor

Material or Activity to be Mitigated: Fueling and Maintenance of Equipment Vehicles **Location:** During foundation, building, and sidewalk & roadway pavement works, C-102.00, C-103.00 and C-105.00		
Pollution Prevention Measures	**Compliant?** *(Yes, No, N/A[1])*	**Corrective Actions / Maintenance Needs**
All on-site vehicles and equipment shall be monitored for leaks and receive regular preventative maintenance to reduce the chance of leakage.		
Petroleum products shall be stored in tightly sealed containers and clearly labeled. Any petroleum storage tanks stored onsite shall be located within a containment area that is designed with an impervious surface between the tank and the ground.		
The secondary containment must be designed to provide a containment volume that is equal to 110% of the volume of the largest tank. Drip pans shall be provided for all dispensers.		
The location of any fuel tanks and/or equipment storage areas must be identified on Soil Erosion & Sediment Control Plan by the General Contractor once the locations have been determined. Fuel tanks and dispensers shall be locked at all times and located in a secured area.		
Material or Activity to be Mitigated: Washing of Equipment, Vehicles, and Buildings **Location:** During foundation, building, and sidewalk & roadway pavement works, C-102.00, C-103.00 and C-105.00		
Pollution Prevention Measures	**Compliant?** *(Yes, No, N/A[1])*	**Corrective Actions / Maintenance Needs**
Washing of Equipment, Vehicles and Buildings shall be conducted in an area where the likelihood of the area contributing to stormwater		

F.1 – Daily Inspection Report by Trained Contractor

discharges is negligible. If required, additional Best Management Practices must be implemented to prevent concrete wastes from contributing to stormwater discharges.		
Material or Activity to be Mitigated: Storage, Handling, and Disposal of Chemicals **Location:** During foundation, building, and final stabilization, C-102.00, C-103.00, and C-106.00		
Pollution Prevention Measures	**Compliant?** *(Yes, No, N/A[1])*	**Corrective Actions / Maintenance Needs**
All on-site vehicles and equipment shall be monitored for leaks and receive regular preventative maintenance to reduce the chance of leakage. Petroleum products shall be stored in tightly sealed containers and clearly labeled.		
Any petroleum storage tanks stored onsite shall be located within a containment area that is designed with an impervious surface between the tank and the ground. The secondary containment must be designed to provide a containment volume that is equal to 110% of the volume of the largest tank.		
Drip pans shall be provided for all dispensers. Any asphalt substances used onsite shall be applied according to the manufacturer's recommendations.		

F.1 – Daily Inspection Report by Trained Contractor

Material or Activity to be Mitigated: Construction and Domestic Wastes **Location:** During foundation, building, sidewalk & roadway pavement works, utility connections and final stabilization, C-102.00 through C-106.00		
Pollution Prevention Measures	**Compliant?** *(Yes, No, N/A[1])*	**Corrective Actions / Maintenance Needs**
All waste materials shall be collected and stored in a covered container leased from a local waste management company licensed to do business in New York State and the local jurisdiction.		
All trash and construction debris from the site shall be deposited in the container. The container shall be emptied a minimum of once per week or more often if necessary, and the trash shall be hauled to a landfill approved by the local jurisdiction.		
No construction waste materials shall be buried on site. All personnel shall be instructed regarding the correct procedures for waste disposal. All waste containers shall be located in an area where the likelihood of the containers contributing to stormwater discharges is negligible		
Material or Activity to be Mitigated: Detergents **Location:** During foundation and building works, C-102.00 through C-103.00		
Pollution Prevention Measures	**Compliant?** *(Yes, No, N/A[1])*	**Corrective Actions / Maintenance Needs**
Products shall be stored in original containers with the original labels in legible condition. Original labels and material safety data sheets (MSDS's) shall be compiled for each detergent used. If surplus product must be disposed of, the General Contractor		

F.1 – Daily Inspection Report by Trained Contractor

must follow the manufacturers or applicable jurisdictional requirements for proper disposal.		
Detergents shall be used in an area where the likelihood of the product contributing to stormwater discharges is negligible. Site personnel shall be instructed in these practices by the General Contractor's superintendent, who shall also be responsible for seeing that these practices are followed.		
Material or Activity to be Mitigated: Sanitary Waste **Location:** During site removals, foundation, building, and utility connection works, C-101.00 through C-104.00		
Pollution Prevention Measures	**Compliant?** *(Yes, No, N/A[1])*	**Corrective Actions / Maintenance Needs**
All sanitary waste shall be collected from the portable units a minimum of once per week by a licensed portable facility provider in compliance with local and state regulations. Sanitary waste units shall be located in an area where the likelihood of the unit contributing to stormwater discharges is negligible. If required, additional BMP's must be implemented to prevent wastes from contributing to stormwater discharges.		

F.1 – Daily Inspection Report by Trained Contractor

Material or Activity to be Mitigated: Hazardous and Toxic Materials and Wastes **Location:** During foundation, building, and sidewalk and roadway paving works, and final stabilization, C-102.00, C-103.00, C-105.00, and C-106.00		
Pollution Prevention Measures	**Compliant?** *(Yes, No, N/A[1])*	**Corrective Actions / Maintenance Needs**
An MSDS shall be posted in the immediate area where such product is stored and/or used and another copy of each MSDS must be maintained in an MSDS file at the job site construction office. Each employee who handles substances with hazardous properties shall be instructed on the use of MSDS sheets and the specific information in the applicable MSDS for the product being used, particularly information regarding spill control techniques.		
Products shall be stored in original containers with the original labels in legible condition. Original labels and material safety data sheets (MSDS's) shall be compiled for each material used. If surplus product must be disposed of, the General Contractor must follow the manufacturers or applicable jurisdictional requirements for proper disposal.		

[Add rows as needed to list all Pollution Prevention Measures and their associated Installation/Maintenance checklists]

[1]*For any items marked "N/A", include a note describing why the checklist item could not be inspected.*

F.2 – Qualified Inspector (QI) Report

PROJECT NAME
35-10 Steinway Street

SITE ADDRESS
35-10 Steinway Street, Astoria, Queens, NY

REQUIRED INSPECTION FREQUENCY
Insert inspection frequency for site

SWPTS APPLICATION ID
Insert SWPTS Application ID

SPDES CGP ID
Insert SPDES CGP ID

OTHER SPDES PERMIT IDS
Insert other permit IDs (if applicable)

STORMWATER CONSTRUCTION PERMIT ID
Insert Stormwater Construction Permit ID

DEVELOPER
Insert Name of Developer Entity

CONTRACTOR
Insert Name of Contractor Entity (when known)

QUALIFIED INSPECTOR
(Name and company)

SUPERVISED QUALIFIED INSPECTOR
(Name and company, if applicable)

CONTRACTOR SITE CONTACT
(Name, title, phone number, email)

DATE AND TIME OF INSPECTION
(Date, day of week, and time of day)

WEATHER AT TIME OF INSPECTION
(Temperature and weather conditions)

SOILS AT TIME OF INSPECTION
(Area disturbed [in acres] and condition [i.e. wet, dry, saturated, or frozen])

General Inspection Notes:

F.2 – Qualified Inspector (QI) Report

Table I: Points of Discharge		
Point of Discharge *Include all points of discharge from the site, including conveyance systems (i.e. pipes, culverts, ditches, etc.) and overland flow.*	**Inspected?** *(Yes, No)*	**Condition Observed** *Include description and photo ID, if applicable*
ID Number: Click or tap here to enter text. Type: 8" Combined Connection Location: Above cellar floor along 35th Avenue		

[Add or delete rows as needed to list all points of discharge for the project]

F.2 – Qualified Inspector (QI) Report

Table III: Erosion and Sediment Control Practices[1]			
Practice: Dust Control **Location:** Entire Site, Construction Phases I through IV, C-101.00 through C-104.00 **Type:** Sediment Control			
Inspection Checklist	**Compliant?** *(Yes, No, N/A[1])*	**Previously Identified Corrective Action and Status** *Include description, date identified, status, and photo ID.*	**New Corrective Action Identified** *Include description and photo ID.*
Is dust adequately controlled?			
Practice: Stabilized Construction Entrance **Location:** Along 38th Street, Construction Phases I through II, C-101.00 through C-102.00 **Type:** Soil Stabilization			
Inspection Checklist	**Compliant?** *(Yes, No, N/A[1])*	**Previously Identified Corrective Action and Status** *Include description, date identified, status, and photo ID.*	**New Corrective Action Identified** *Include description and photo ID.*
Stone is clean enough to effectively remove mud from vehicles.			
Installed per standards and specifications?			
Does all traffic use the stabilized entrance to enter and leave site?			
Is adequate drainage provided to prevent ponding at entrance?			
Practice: Storm Drain Inlet Protection **Location:** On catch basins on 38th Street and 35th Avenue Intersection, Construction Phases IV and V, C-104.00 through C-105.00 **Type:** Runoff Control			
Inspection Checklist	**Compliant?** *(Yes, No, N/A[1])*	**Previously Identified Corrective Action and Status** *Include description, date identified, status, and photo ID.*	**New Corrective Action Identified** *Include description and photo ID.*
Storm drain inlet protection installed on downstream inlet			

F.2 – Qualified Inspector (QI) Report

while work is being performed in the street.			
Practice: Silt Fence **Location:** Around the site area, Construction Phases I and II, C-101.00 and C-102.00 **Type:** Sediment Control			
Inspection Checklist	**Compliant?** *(Yes, No, N/A[1])*	**Previously Identified Corrective Action and Status** *Include description, date identified, status, and photo ID.*	**New Corrective Action Identified** *Include description and photo ID.*
Installed around soil disturbance area.			
Joints are constructed by wrapping the two ends together for continuous support.			
Fabric buried 6 inches minimum.			
Post is stable, fabric is tight and without rips or frayed areas.			
Practice: Protecting Vegetation **Location:** On existing sidewalk trees to remain within 50 feet of property boundary, Construction Phases I through V, C-101.00 through C-105.00 **Type:** Soil Stabilization			
Inspection Checklist	**Compliant?** *(Yes, No, N/A[1])*	**Previously Identified Corrective Action and Status** *Include description, date identified, status, and photo ID.*	**New Corrective Action Identified** *Include description and photo ID.*
Tree protecting fences installed around all existing trees fronting the subject property and within 50 ft from construction area.			
Tree protecting fence installed per NYC Parks & Recreation standard detail			

F.2 – Qualified Inspector (QI) Report

Practice: Concrete Washout **Location:** Along 38th Street, Construction Phases II through V, C-102.00 through C-105.00 **Type:** Sediment Control			
Inspection Checklist	**Compliant?** *(Yes, No, N/A[1])*	**Previously Identified Corrective Action and Status** *Include description, date identified, status, and photo ID.*	**New Corrective Action Identified** *Include description and photo ID.*
The concrete washout facility is NOT damaged or leaking			
The concrete washout facility is less than 75% full			
Hardened concrete is disposed off-site in construction/demolition landfill			
No concrete discharges are taking place in non-designated areas			
Practice: Material Stockpile **Location:** Inside the site area, Construction Phases I and II, C-101.00 and C-102.00 **Type:** Soil Stabilization			
Inspection Checklist	**Compliant?** *(Yes, No, N/A[1])*	**Previously Identified Corrective Action and Status** *Include description, date identified, status, and photo ID.*	**New Corrective Action Identified** *Include description and photo ID.*
Stockpiles are stabilized with plastic/geotextile cover.			
Sediment control is installed at the toe of the slope.			

[Add rows as needed to list all Pollution Prevention Measures and their associated Installation/Maintenance checklists]

[1]*For any items marked "N/A", include a note describing why the checklist item could not be inspected.*

F.2 – Qualified Inspector (QI) Report

Table IV: Pollution Prevention Measures[1]			
Material or Activity to be Mitigated: Paving Operations **Location:** During utility connections and sidewalk & roadway pavement works, C-104.00 and C-105.00			
Pollution Prevention Measures	**Compliant?** *(Yes, No, N/A[1])*	**Previously Identified Corrective Action and Status** *Include description, date identified, status, and Photo ID.*	**New Corrective Action Identified** *Include description and photo ID.*
Products shall be stored in original containers with the original labels in legible condition. If surplus product must be disposed of, the General Contractor must follow the manufacturers or applicable jurisdictional requirements for proper disposal.			
Material or Activity to be Mitigated: Concrete, Paint and Stucco Washout **Location:** During foundation, building, and sidewalk & roadway pavement works, C-102.00, C-103.00 and C-105.00			
Pollution Prevention Measures	**Compliant?** *(Yes, No, N/A[1])*	**Previously Identified Corrective Action and Status** *Include description, date identified, status, and photo ID.*	**New Corrective Action Identified** *Include description and photo ID.*
Concrete, paint, and stucco washout shall be conducted in an area where the likelihood of the area contributing to stormwater discharges is negligible. If required, additional Best Management Practices must be implemented to prevent concrete, paint and stucco wastes from contributing to stormwater discharges.			
Products shall be stored in original containers with the original labels in legible condition. If surplus product must be disposed of, the General Contractor must follow the			

manufacturers or applicable jurisdictional requirements for proper disposal.			
Material or Activity to be Mitigated: Fueling and Maintenance of Equipment Vehicles **Location:** During foundation, building, and sidewalk & roadway pavement works, C-102.00, C-103.00 and C-105.00			
Pollution Prevention Measures	**Compliant?** *(Yes, No, N/A[1])*	**Previously Identified Corrective Action and Status** *Include description, date identified, status, and photo ID.*	**New Corrective Action Identified** *Include description and photo ID.*
All on-site vehicles and equipment shall be monitored for leaks and receive regular preventative maintenance to reduce the chance of leakage			
Petroleum products shall be stored in tightly sealed containers and clearly labeled. Any petroleum storage tanks stored onsite shall be located within a containment area that is designed with an impervious surface between the tank and the ground.			
The secondary containment must be designed to provide a containment volume that is equal to 110% of the volume of the largest tank. Drip pans shall be provided for all dispensers.			
The location of any fuel tanks and/or equipment storage areas must be identified on Soil Erosion & Sediment Control Plan by the General Contractor once the locations have been determined. Fuel tanks and dispensers shall be locked at all times and located in a secured area.			

F.2 – Qualified Inspector (QI) Report

Material or Activity to be Mitigated: Washing of Equipment, Vehicles, and Buildings **Location:** During foundation, building, and sidewalk & roadway pavement works, C-102.00, C-103.00 and C-105.00			
Pollution Prevention Measures	**Compliant?** *(Yes, No, N/A[1])*	**Previously Identified Corrective Action and Status** *Include description, date identified, status, and photo ID.*	**New Corrective Action Identified** *Include description and photo ID.*
Washing of Equipment, Vehicles and Buildings shall be conducted in an area where the likelihood of the area contributing to stormwater discharges is negligible. If required, additional Best Management Practices must be implemented to prevent concrete wastes from contributing to stormwater discharges.			
Material or Activity to be Mitigated: Storage, Handling, and Disposal of Chemicals **Location:** During foundation, building, and final stabilization, C-102.00, C-103.00, and C-106.00			
Pollution Prevention Measures	**Compliant?** *(Yes, No, N/A[1])*	**Previously Identified Corrective Action and Status** *Include description, date identified, status, and photo ID.*	**New Corrective Action Identified** *Include description and photo ID.*
All on-site vehicles and equipment shall be monitored for leaks and receive regular preventative maintenance to reduce the chance of leakage. Petroleum products shall be stored in tightly sealed containers and clearly labeled.			
Any petroleum storage tanks stored onsite shall be located within a containment area that is designed with an impervious surface between the tank and the ground. The secondary containment must be designed to provide a containment			

volume that is equal to 110% of the volume of the largest tank.			
Drip pans shall be provided for all dispensers. Any asphalt substances used onsite shall be applied according to the manufacturer's recommendations.			
Material or Activity to be Mitigated: Construction and Domestic Wastes **Location:** During foundation, building, sidewalk & roadway pavement works, utility connections and final stabilization, C-102.00 through C-106.00			
Pollution Prevention Measures	**Compliant?** *(Yes, No, N/A[1])*	**Previously Identified Corrective Action and Status** *Include description, date identified, status, and photo ID.*	**New Corrective Action Identified** *Include description and photo ID.*
All waste materials shall be collected and stored in a covered container leased from a local waste management company licensed to do business in New York State and the local jurisdiction.			
All trash and construction debris from the site shall be deposited in the container. The container shall be emptied a minimum of once per week or more often if necessary, and the trash shall be hauled to a landfill approved by the local jurisdiction.			
No construction waste materials shall be buried on site. All personnel shall be instructed regarding the correct procedures for waste disposal. All waste containers shall be located in an area where the likelihood of the containers contributing to stormwater discharges is negligible			

F.2 – Qualified Inspector (QI) Report

Material or Activity to be Mitigated: Detergents **Location:** During foundation, building, sidewalk & roadway pavement works, utility connections and final stabilization, C-102.00 through C-106.00			
Pollution Prevention Measures	**Compliant?** *(Yes, No, N/A[1])*	**Previously Identified Corrective Action and Status** *Include description, date identified, status, and photo ID.*	**New Corrective Action Identified** *Include description and photo ID.*
Products shall be stored in original containers with the original labels in legible condition. Original labels and material safety data sheets (MSDS's) shall be compiled for each detergent used. If surplus product must be disposed of, the General Contractor must follow the manufacturers or applicable jurisdictional requirements for proper disposal.			
Detergents shall be used in an area where the likelihood of the product contributing to stormwater discharges is negligible. Site personnel shall be instructed in these practices by the General Contractor's superintendent, who shall also be responsible for seeing that these practices are followed.			
Material or Activity to be Mitigated: Sanitary Waste **Location:** During site removals, foundation, building, and utility connection works, C-101.00 through C-104.00			
Pollution Prevention Measures	**Compliant?** *(Yes, No, N/A[1])*	**Previously Identified Corrective Action and Status** *Include description, date identified, status, and photo ID.*	**New Corrective Action Identified** *Include description and photo ID.*
All sanitary waste shall be collected from the portable units a minimum of once per week by a licensed portable facility provider in compliance with local and state			

F.2 – Qualified Inspector (QI) Report

regulations. Sanitary waste units shall be located in an area where the likelihood of the unit contributing to stormwater discharges is negligible. If required, additional BMP's must be implemented to prevent wastes from contributing to stormwater discharges.			
Material or Activity to be Mitigated: Hazardous and Toxic Materials and Wastes **Location:** During foundation, building, and sidewalk and roadway paving works, and final stabilization, C-102.00, C-103.00, C-105.00, and C-106.00			
Pollution Prevention Measures	**Compliant?** *(Yes, No, N/A[1])*	**Previously Identified Corrective Action and Status** *Include description, date identified, status, and photo ID.*	**New Corrective Action Identified** *Include description and photo ID.*
An MSDS shall be posted in the immediate area where such product is stored and/or used and another copy of each MSDS must be maintained in an MSDS file at the job site construction office. Each employee who handles substances with hazardous properties shall be instructed on the use of MSDS sheets and the specific information in the applicable MSDS for the product being used, particularly information regarding spill control techniques.			
Products shall be stored in original containers with the original labels in legible condition. Original labels and material safety data sheets (MSDS's) shall be compiled for each material used. If surplus product must be disposed of, the General Contractor must follow the jurisdictional requirements for proper disposal.			

F.2 – Qualified Inspector (QI) Report

Table V: Stormwater Management Practices[1]				
Practice ID and Name	**Practice Location**	**Construction Status & SWPPP Compliance[1]**	**Previously Identified Corrective Action and Status** *Include description, date identified, status, and Photo ID.*	**New Corrective Action Identified** *Include description and photo ID.*
1 Green Roof	2nd Floor Terrace 10th Floor Terrace Roof over 27th Floor			
2 Detention Tank	Below 1st Floor Slab			

[Add rows as needed to list all Post-Construction Stormwater Management Practices and their associated Installation/Maintenance items]

[1]During each inspection, indicate whether the practice construction is (0) Not Started, (1) In Progress, Compliant, (2) In Progress, Non-Compliant, (3) Completed, Compliant, (4) Completed, Non-Compliant.

F.2 – Qualified Inspector (QI) Report

Table VI: Site Plan(s) *Show areas with active soil disturbance activity, areas that have been disturbed but are inactive at time of inspection, and areas that have been stabilized since the last inspection (CGP Part IV.C.4.h). Provide a legend and additional inspection information as needed.*
Drawing ID: **Other notes and references:**

[Duplicate table as needed]

F.2 – Qualified Inspector (QI) Report

Table VII: Photos *Include colored digital photographs, with date stamp, that clearly show the condition of all practices that have been identified as needing corrective actions (CGP Part IV.C.4.I).*	
Photo ID: **Other Notes and References:**	**Photo ID:** **Other Notes and References:**

[Duplicate table as needed]

F.2 – Qualified Inspector (QI) Report

Certification and acknowledgement of Qualified Inspector who conducted the inspection and completed the report.
Note: This may be a Supervised QI, or a certified/licensed QI, as required by project type.

By signing below, I certify that all information provided in this report is accurate and complete. The report, along with all attachments, is in compliance with the NYS DEC Construction General Permit and the applicable sections of the Rules of the City of New York (RCNY) Title 15, Chapter 19.1. I acknowledge that I must notify the Owner and appropriate Contractors or Subcontractors of any corrective actions that need to be taken, within one business day of the date of the inspection.

X	**X**
Qualified Inspector *Name and Title*	*Qualified Inspector* *Signature and Date*

Certification and acknowledgement of Qualified Inspector who oversaw the inspection and report development.
Note: This must be a certified/licensed QI, as required by project type. If this is the same person as the signatory above, they must provide a second certification below. If the QI who signed above was a Supervised QI, the QI signing this certification must be the person who oversaw the inspection and report development.

By signing below, I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I understand that certifying false, incorrect or inaccurate information is a violation of the laws of the City of New York and could subject me to criminal or civil penalties and/or administrative proceedings.

X	**X**
Qualified Inspector *Name, Title, Qualifying License/Certification*	*Qualified Inspector* *Signature and Date*

F.3 – Monthly Summary of QI Inspections

PROJECT NAME
35-10 Steinway Street

SITE ADDRESS
35-10 Steinway Street, Astoria, New York

REQUIRED INSPECTION FREQUENCY
Insert inspection frequency for site

SWPTS APPLICATION ID
Insert SWPTD Application ID

SPDES CGP ID
Insert SPDES CGP ID

OTHER SPDES PERMIT IDS
Insert other permit IDs (if applicable)

STORMWATER CONSTRUCTION PERMIT ID
Insert Stormwater Construction Permit ID

DEVELOPER
Insert Name of Developer Entity

CONTRACTOR
Insert Name of Contractor Entity (when known)

QUALIFIED INSPECTOR
(Name and company)

REPORTING MONTH
(Month during which inspections took place)

SUBMISSION DATE
(Date summary is emailed to DEP)

QUALIFIED INSPECTOR'S CERTIFICATION:
"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I understand that certifying false, incorrect or inaccurate information is a violation of the laws of the City of New York and could subject me to criminal or civil penalties and/or administrative proceedings."

X _____

Qualified Inspector
Name and Title

X _____

Qualified Inspector
Signature and Date

F.3 – Monthly Summary of QI Inspections

Summary of QI Inspections				
Date of Inspection	**Name of Inspector**	**Area of Disturbance on Site (acres)**	**Construction Completion (%)**	**Corrective Items Identified or Resolved**

Section A. SMP Installation Table

PROJECT NAME
35-10 Steinway Street

SITE ADDRESS
35-10 Steinway Street, Astoria, Queens, NY

SWPTS APPLICATION ID
Insert SWPTS Application ID

STORMWATER CONSTRUCTION PERMIT ID
Insert Stormwater Construction Permit ID

SPDES CGP ID
Insert SPDES CGP ID

OTHER SPDES PERMIT IDS
Insert other permit IDs (if applicable)

OWNER
Steinway 1 Owner LLC

DEVELOPER
Insert Name of Developer Entity

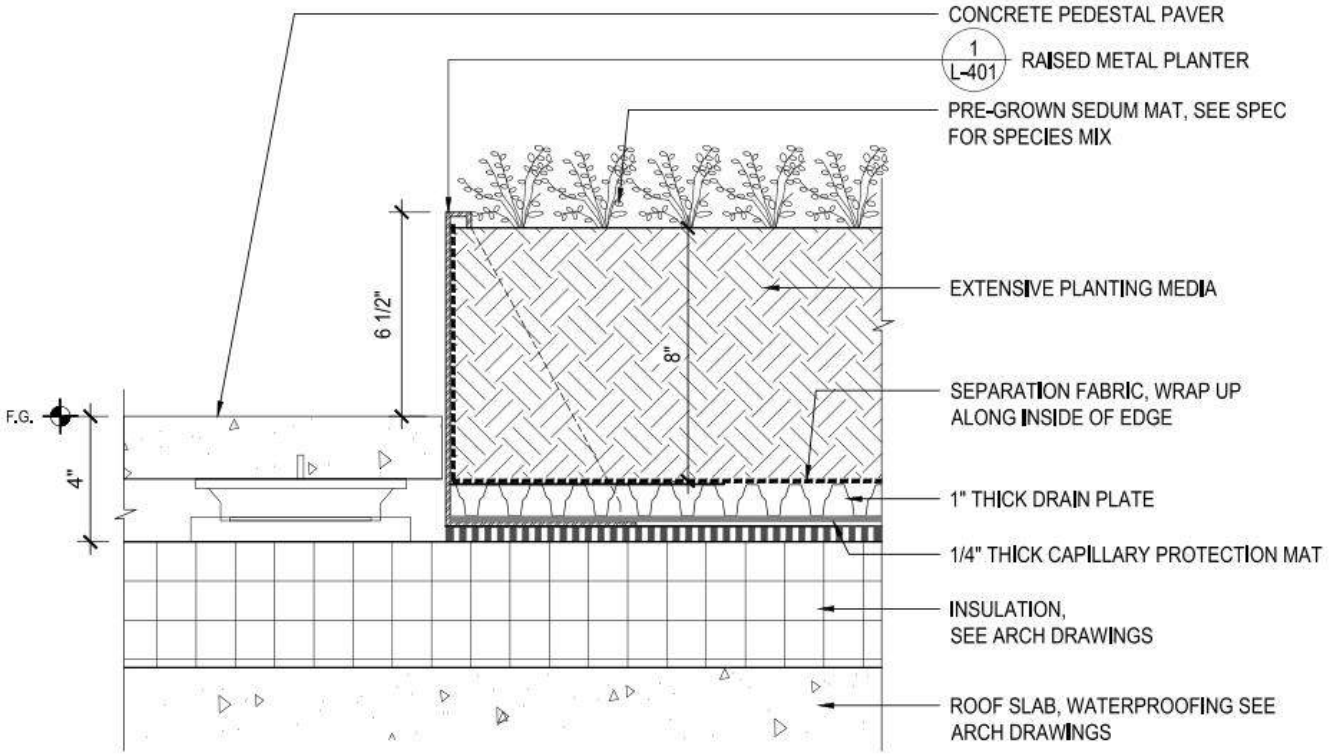
CONTRACTOR
Insert Name of Contractor Entity

Inspected SMP Component	Date & Time of Inspection	Name of Qualified Inspector	Certifies Conformance with Approved SWPPP [✓]	General Notes
Vegetation				
Plant species				
Plant density/spacing				
Growing Media				
Media Type & Composition				
Media Compaction				
Separation Layer / Root Barrier				
Integrity and Continuity				
Irrigation System				
Water Distribution				
Roof Drains				
Roof Drain Count & Layout				
Invert Elevation				

Pipe Diameter (For inlet piping to Detention Tank)				
Drainage Layer				
Dimensions (LxWxD)				
Waterproofing / Protection				
Integration				

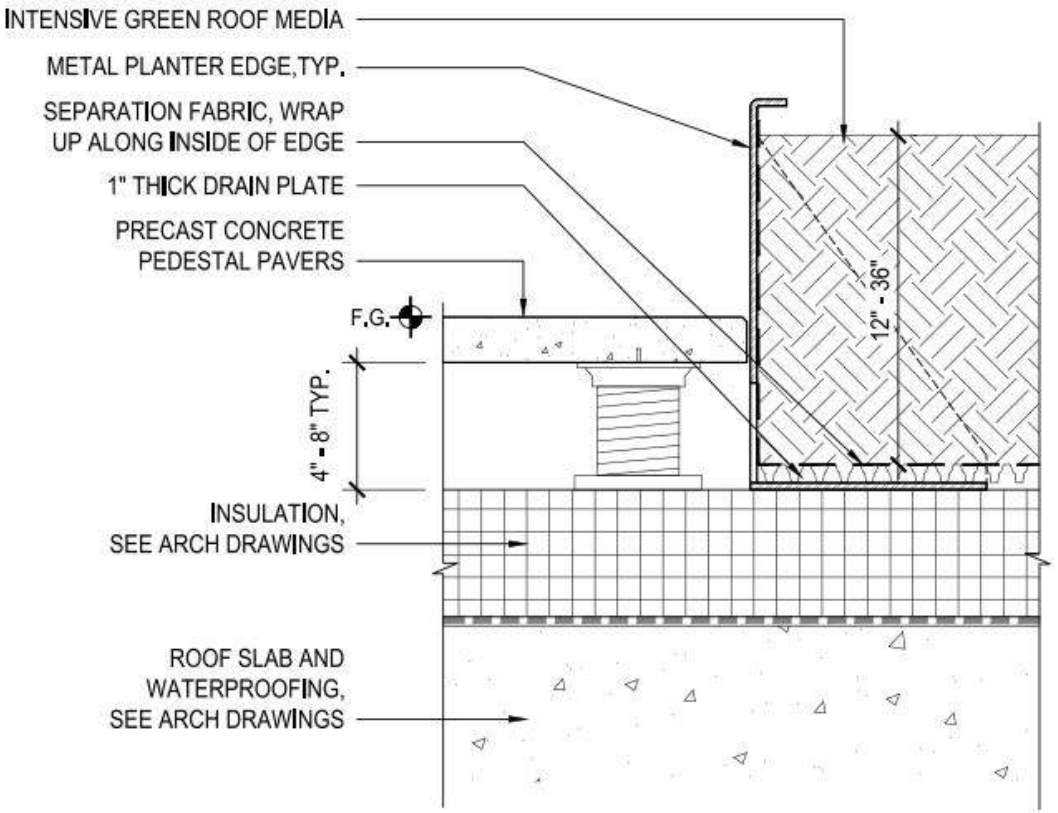
Section B. SMP Cross-Sections and/or Profiles

NOTES:
1. SHIM ALUMINUM EDGE AS REQUIRED TO MAINTAIN 3/4" REVEAL
2. EXTENSIVE GREEN ROOF SHALL BE IRRIGATED WITH DRIP IRRIGATION 12" O.C. LINE SPACING WITH 14" O.C. EMITTER SPACING
3. FOR WATERPROOFING AND ROOT BARRIER, SEE ARCHITECTURE DRAWINGS AND DIVISION 7 SPECIFICATIONS
4. ENSURE THAT 40 MILS ROOT BARRIER IS INSTALLED BETWEEN WATERPROOFING MEMBRANE AND INSULATION LAYER PRIOR TO THE INSULATION OF ANY VEGETATED ROOF ASSEMBLIES.



2 EXTENSIVE GREEN ROOF

3" = 1'-0"



3 INTENSIVE GREEN ROOF

1 1/2" = 1'-0"

Section C. SMP Photograph Log

SMP Installation Photographs *Include digital photographs, with date stamp, that clearly show the condition of all SMP components that have been constructed in accordance with the most recent approved SWPPP.*	
SMP Component: **Date of Inspection:**	**SMP Component:** **Date of Inspection:**

[Duplicate table rows as needed]

Section A. SMP Installation Table

PROJECT NAME
35-10 Steinway Street

SITE ADDRESS
35-10 Steinway Street, Astoria, Queens, NY

SWPTS APPLICATION ID
Insert SWPTS Application ID

STORMWATER CONSTRUCTION PERMIT ID
Insert Stormwater Construction Permit ID

SPDES CGP ID
Insert SPDES CGP ID

OTHER SPDES PERMIT IDS
Insert other permit IDs (if applicable)

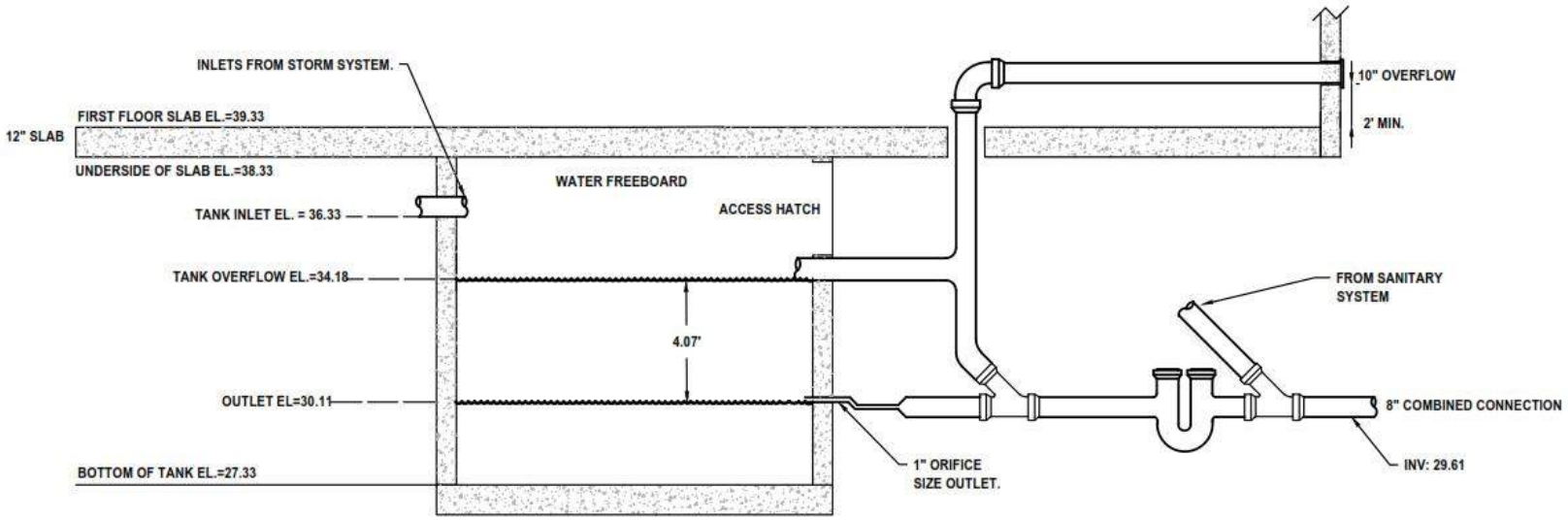
OWNER
Steinway 1 Owner LLC

DEVELOPER
Insert Name of Developer Entity

CONTRACTOR
Insert Name of Contractor Entity

Inspected SMP Component	Date & Time of Inspection	Name of Qualified Inspector	Certifies Conformance with Approved SWPPP [✓]	General Notes
Inlet Pipe				
Invert Elevations				
Pipe Diameter				
Internal Structural				
Re-Entrant Orifice Invert Elevation				
Orifice Pipe Diameter				
Vertical Distance between Overflow and Orifice Pipe (Effective Depth)				
Surface Grading				
Level 1 Elevation				
Inspection Port				
Dimension and Location				

Section B. SMP Cross-Sections and/or Profiles



DETENTION FACILITY-CONCRETE TANK
1128 SQ. FT. TANK AREA FOOTPRINT
DETENTION VOLUME REQUIRED = 4,573 CU.FT.
USABLE VOLUME: 1128 SF X 4.07 FT = 4,590.96 CU.FT.

DETENTION TANK SECTION

SCALE 1/4" = 1'-0"

Section C. SMP Photograph Log

SMP Installation Photographs *Include digital photographs, with date stamp, that clearly show the condition of all SMP components that have been constructed in accordance with the most recent approved SWPPP.*	
SMP Component: **Date of Inspection:**	**SMP Component:** **Date of Inspection:**

[Duplicate table rows as needed]

Appendix H: Draft Stormwater Maintenance Easement

Documents included:

☒ Draft Construction Maintenance Easement, including

- Cover Letter
- Easement Document (Exhibit A)
- Metes & Bounds Description
    - Note: A Survey Map of Project Lot may be used as an acceptable substitute to Metes & Bounds Description only if it is signed and sealed by a licensed surveyor.
- City/State Transfer Tax Forms

If any of the above documents are not included, explain why below:

Click or tap here to enter text.

Draft Stormwater Maintenance Easement

Application ID.: S415225

35-10 Steinway Street

35-10 Steinway Street, Astoria, New York 11101

Queens/Block: 668/ Lot: 6

Prepared For:

35-18 Steinway Street LLC

102 Motor Parkway, Suite 410, Hauppauge, New York 11788

Bernard Kennedy

(212) 233-0495

steinway1owner@lmxd.com

THIS STORMWATER MAINTENANCE EASEMENT (the "Easement"), made this _____ day of _____, 2025, (the "Effective Date") is by and between 35-18 Steinway Street LLC, Address: 102 Motor Parkway, Suite 410, Hauppauge, New York 11788, its successors and assigns (the "Grantor"), and THE CITY OF NEW YORK c/o Dept. of Environmental Protection, Address: 59-17 Junction Blvd., 9th Floor, Flushing NY 11373, its authorized representatives, successors, and assigns (the "Grantee"). The Grantor and the Grantee are hereinafter referred to collectively as the Parties.

WHEREAS, the Grantor is the owner of certain real property located at Borough Queens, Block _668 , Lot _6 , as shown on the City of New York Tax Map, situated in the City and State of New York, described in Exhibit A (the "Property"), attached hereto and incorporated as if fully set forth herein; and

WHEREAS, Title 24, Chapter 5-A of the New York City Administrative Code, in part, regulates the post-construction stormwater management facilities at the Property; and

WHEREAS, Grantor desires to develop the Property in a manner that requires a stormwater construction permit that includes post-construction stormwater management facilities and therefore must grant this easement and, when construction is complete, apply for and comply with a stormwater maintenance permit; and

WHEREAS, it is the intention of the Parties to enter into an easement related to the post-construction stormwater management facilities at the Property in accordance with Title 24, Chapter 5-A of the New York City Administrative Code;

NOW, THEREFORE, in consideration of the foregoing and the covenants hereinafter set forth, the Parties agree as follows:

1. The Grantor is required to maintain the post-construction stormwater management facilities at the Property pursuant to Title 24, Chapter 5-A of the New York City Administrative Code and Grantor's stormwater maintenance permit, which will be on file with the New York City Department of Environmental Protection (the "Department") upon recording of the Easement. Grantor shall operate and maintain the facilities in good working condition throughout their useful life and shall replace them as necessary in accordance with the Grantor's stormwater maintenance permit and applicable laws.

2. The Grantor grants to the Grantee and to persons authorized by the Grantee a perpetual easement (the "Easement") in, through, under, over, and across the Property for periodic inspection of the post-construction stormwater management facilities at reasonable times in accordance with law in order to ensure that such facilities are maintained in good working order and condition and in accordance with applicable design standards and applicable law. The Easement is granted only for the purpose of this inspection of the stormwater management facilities.

3. All of the covenants, agreements, and conditions contained in this Easement run with the land and shall inure to the benefit of and be binding upon the Parties and their respective successors and assigns, and shall remain in full force and effect for as long as the Grantee requires stormwater management facilities at the Property.

4. The Grantor agrees to execute, acknowledge, and deliver to or for the Grantee such further instruments and take such further actions as may be reasonably required to carry out and effectuate the intent and purpose of this Easement, or to confirm or perfect any right created hereunder.

5. Grantor hereby covenants and agrees that any deed for the conveyance of the Property or any portion thereof shall contain a provision establishing the Easement described herein for the benefit of the Grantee.

6. In the event of any breach, or threatened breach, of this Easement by either party hereto, the non-defaulting party shall have the right to any remedy available at law or in equity, including but not limited to, injunctive relief and specific performance.

7. This Easement constitutes the entire agreement between the Parties and may not be modified, amended, or terminated except by an instrument in writing signed by both of the Parties.

8. This Easement shall be recorded by the Grantor in the Office of the City Register within thirty (30) days of the Effective Date.

9. This Easement shall be governed and construed in accordance with the laws of the State of New York and the laws of the City of New York.

10. Any forbearance by either the Grantee or the Grantor in exercising any right or remedy afforded under this Easement or by law shall not be a waiver or preclude the exercising of any such right or remedy.

11. Invalidation of any one of these terms or provisions by any Court shall in no way affect any other provisions, which shall remain in full force and effect.

12. The Grantor, his/her heirs, successors and assigns do hereby covenant that the Grantee shall be held harmless from any and all claims of any person or persons arising from the use of the Property and the granting of this Easement.

WHEREFORE, the Parties have executed this Easement as of this _____day of _____, 20__.

For 35-18 Steinway Street LLC

_____

BY: _____
Name:
Title:

_____

BY: _____
Name:
Title:

For the Grantee, THE CITY OF NEW YORK

BY: _____
Nerissa Moray, Chief Financial Officer
New York City Department of Environmental Protection

Approved as to Form and Certified as to Legal Authority
by Standard Type of Class:
s/ Corporation Counsel

Dated: _____, 2025

ACKNOWLEDGMENTS

Acknowledgment taken in New York State

STATE OF NEW YORK
COUNTY OF , ss:

On the day of , in the year , before me the undersigned, personally appeared personally known to me or proved to me on the basis of satisfactory evidence, to be the individual(s) whose name(s) is (are) subscribed to the within instrument and acknowledged to me that (he) (she) (they) executed the same in (his) (her) (their) capacity(y)(ies), and that by (his) (her) (their) signature(s) on the instrument, the individual(s) or the person upon behalf of which the individual(s) acted, executed the instrument.

_____
Notary Public

Acknowledgment taken in New York State

STATE OF NEW YORK
COUNTY OF , ss:

On the day of , in the year , before me the undersigned, personally appeared personally known to me or proved to me on the basis of satisfactory evidence, to be the individual(s) whose name(s) is (are) subscribed to the within instrument and acknowledged to me that (he) (she) (they) executed the same in (his) (her) (their) capacity(y)(ies), and that by (his) (her) (their) signature(s) on the instrument, the individual(s) or the person upon behalf of which the individual(s) acted, executed the instrument.

_____
Notary Public

Acknowledgment taken in New York State

STATE OF NEW YORK
COUNTY OF , ss:

On the day of , in the year , before me the undersigned, personally appeared personally known to me or proved to me on the basis of satisfactory evidence, to be the individual(s) whose name(s) is (are) subscribed to the within instrument and acknowledged to me that (he) (she) (they) executed the same in (his) (her) (their) capacity(y)(ies), and that by (his) (her) (their) signature(s) on the instrument, the individual(s) or the person upon behalf of which the individual(s) acted, executed the instrument.

_____
Notary Public

MONTROSE SURVEYING CO., LLP.

CITY & LAND SURVEYORS

116-20 METROPOLITAN AVE • RICHMOND HILL, NY 11418-1090
PHONE (718) 849-0600 • FAX (718) 849-0401 • EMAIL INFO @MONTROSESURVEYING.COM

67961

Legal Description

Block 668

Tentative Tax Lot 6

All that certain plot piece or parcel of land, situate lying and being in the Borough and County of Queens, City and State of New York bounded and described as follows:

BEGINNING at the corner formed by the intersection of the easterly side of 38th Street (60 feet wide) with the southerly side of 35th Avenue (80 feet wide);

RUNNING THENCE southerly along the easterly side of 38th Street, 164.50 feet to a point;

RUNNING THENCE easterly at right angles to the last mentioned course, 97.46 feet to a point;

RUNNING THENCE southerly at right angles to the last mentioned course, 18.00 feet to a point;

RUNNING THENCE easterly at right angles to the last mentioned course, 88.27 feet the westerly side of Steinway Street (irregular width);

RUNNING THENCE northerly along the easterly side of Steinway Street, 182.50 feet to the southerly side of 35th Avenue;

RUNNING THENCE westerly along the southerly side of 35th Avenue, 185.96 feet to the point or place of BEGINNING;

The above-described parcel having an area of 32,172 square feet or 0.73857 acres.

X

Saeid Jalilvand, L.S., C.S.
Partner

Appendix I: Draft Post-Construction Operation and Maintenance Manual

Documents included:

☒ Draft Post-Construction Operation and Maintenance Manual **(Include when project installed post-construction stormwater management practices),** including:

- List of all SMPs installed on the project, including SMP IDs and plan references as listed in the SWPPP
- If applicable, a list of all BMPs that will be followed to address pollutant of concern sources
- Location map depicting SMPs to be maintained
- Contact information for Owner
- Contact information for responsible maintenance party, including information regarding whether the responsible maintenance party is employed by the Owner or by an outside contractor
- Table of maintenance tasks and frequencies for each SMP type
- Inspection form with list of maintenance checks and fields for recording observations
- Schedule of proposed self-inspections

Note: The final version of the Post-Construction Operation and Maintenance Manual shall be included in the NOT/Stormwater Maintenance Permit request, along with the following as-built plans:

- As-Built Drainage Utility Plan, showing:
    - Site surface features, including buildings, structures, and site furnishings, as well as surface footprints of any installed SMPs
    - Drainage structures, including manholes, inlets, rooftop drains, outfalls, and catch basins
    - Drainage pipes
    - Subsurface drainage features of installed SMPs, including the subsurface footprint (when different from the surface footprint) and any internal pipes or structures
    - Topographic contours, or spot elevations if the site is relatively flat
    - Callouts for all points of discharge from the site, including sewer connections, outfalls, on-site disposal systems, direct discharges, or any others related to other SPDES permits
    - Callouts for each installed SMP, including the SMP ID, type (manufacturer and model name), function, size, and storage volume
    - Callouts for drainage structures and pipes, including sizes, materials, and inverts, as known
- As-Built Cover and Contributing Drainage Area Plan, including:
    - Site surface features, including buildings, structures, and site furnishings, as well as surface footprints of any installed SMPs
    - Drainage structures, including manholes, inlets, rooftop drains, and catch basins
    - Drainage pipes
    - Delineation of all individual drainage areas across the entire site (i.e. no overlapping drainage areas). Indicate the "drainage point" (or points) associated with each individual drainage area
    - Within the boundary of each drainage area, also delineate each cover type shown in Table 2.8 of the NYC SWM, using a different hatch for each type
    - Add "design points" of interest, where the total contributing drainage area to that point is required for design or reporting purposes. At a minimum, include design points for each proposed SMP and any points of discharge, including sewer

connections, outfalls, on-site disposal systems, direct discharges, or any others related to other SPDES permits
    - Callouts for each design point, including the IDs of all individual drainage areas that contribute to the design point, the total contributing area to the design point, and the total area of each surface type within the total contributing area
- As-Built SMP Section/Detail Plans, showing:
    - Elevations for bottom of practice, interface of each media layer, top of ponding, and top of practice
    - Elevations for inverts in, inverts out, and/or overflows
    - Elevations of any groundwater table or bedrock
    - Elevations for the top and bottom of active storage zones
    - Ponding depths
    - Media slope, depths, and specifications
    - Any observation wells and their materials specifications
    - Any pretreatment devices and proprietary SMPs.

If any of the above documents are not included, explain why below:

As-Built Drainage Utility Plan: Plan to provided upon completion of construction.

As-Built Cover and Contributing Drainage Area Plan: Plan to provided upon completion

of construction.

As-Built SMP Section/Detail Plan: Plan to provided upon completion of construction.

Post Construction Operation and Maintenance (O&M) Manual

35-10 Steinway Street

35-10 Steinway Street, Astoria, Queens, New York 11101

(978) 835-6639

Prepared for:

35-18 Steinway Street LLC

102 Motor Parkway, Suite 410, Hauppauge,

New York 11788

(212) 233-0495

steinway1owner@lmxd.com

Prepared By:

Key Civil Engineering, P.C.

Yuriy Tupychak, P.E.

664 Blue Point Road, Unit B, Holtsville, NY 11742

(631) 961-0506

yt@keycivilengineering.com

Maintenance Entity:

Insert Company or Organization Name

Insert Contact Name

Insert Address, City, State, Zip Code

Insert Phone Number

Insert Fax/Email

On-site Manual Location

(Right-of-Way and Parks SMPs Only)

Insert Company or Organization Name

Insert Contact Name

Insert Address, City, State, Zip Code

Insert Phone Number

Insert Fax/Email

Inspector:

Key Civil Engineering, P.C.

Yuriy Tupychak, P.E.

664 Blue Point Road, Unit B, Holtsville, NY 11742

(631) 961-0506

yt@keycivilengineering.com

O&M Preparation Date:

November 2025

BBL:

4006680005

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SECTION 1: INTRODUCTION

1.1 Overview

The purpose of this manual is to provide instructions, checklists, as-built drawings, and reference documents for the inspection and maintenance of stormwater management practices (SMPs), connected drainage structures (inlets) and best management practices (BMPs) at 35-10 Steinway Street at 35-10 Steinway Street, Astoria, NY. Regular inspections and maintenance shall be performed to maintain the function of the SMPs and BMPs in accordance with this document.

Inspections shall be completed per this manual or the attached manufacturer manuals and shall be completed by designated individuals at the required intervals for each SMP, connected drainage structure and BMP. Maintenance shall also be performed at the required intervals, or as needed based on inspection data.

The inspection and maintenance records shall also detail follow up action items should any underlying issues be discovered. These inspection checklists are more detailed and specific to different SMPs. Frequent observations of the items below may indicate an underlying issue that may require additional investigation and analysis by a qualified professional. As detailed in Chapter 5 of the NYC Stormwater Manual, examples of some common problems that may need to be addressed via remediation or repair include:

- Erosion Problems
- Poorly Performing Plantings
- Differential Settlement
- Sedimentation and Clogging
- Structural Defects

Inspection and maintenance checklists, or related records, shall be kept on file within the building's maintenance office, or within the designated location indicated on the O&M Manual's cover sheet, for review upon request. Such documentation is required for Stormwater Maintenance Permit Annual Certification and Permit Renewal. The table below outlines important details regarding these two submissions.

	Annual Certification	**Permit Renewal**
Documentation	Certification signed by the owner that the SMPs & BMP are operating as designed and have been properly inspected and maintained.	Report certified by a qualified professional that all SMPs are operating as designed
Frequency of Submissions	Yearly	Every 5 years from the date of initial issuance
Timeframe	Submission to DEP within 30 days prior to permit anniversary date	Submission to DEP no later than 30 days prior to permit expiration
Submission Via	SWPTS Portal	SWPTS Portal

SECTION 2: SMP INFORMATION

2.1 List of SMPs

SMP Table:

SMP Type	DEP SMP ID.	SMP Structure ID No.	Function Type	No Net Increase (NNI) Requirement
Green Roof	####	1	Evapotranspiration	N/A
Detention Tank	####	2	Detention	N/A

2.2 List of Connected Drainage Structures

Connected Drainage Structures Table:

Connected Drainage Structure Type	Drainage Structure ID No.
To be completed once information is received	

2.3 SMP Descriptions & Maintenance Recommendations

- Color to be used in Sections 3 and 6

Green Roof

A green roof is a roof that is completely or partially covered with plant material. This material is planted in soil, which rests above a filter, an aeration system, water retention and drainage systems, and a waterproofing membrane.

Green roof systems manage stormwater by allowing water to be absorbed and retained within their vegetative and soil layers. Common components of green roofs include a waterproof membrane, drainage layers, growing medium, and vegetation. Due to their design, many green roofs incorporate drainage outlets to manage excess water and prevent pooling.

Maintaining the green roof's performance and preventing clogging is essential for long-term function and success. Green roofs should be inspected for plant health, structural damage, or debris buildup that might hinder water absorption. They should also be regularly cleaned of accumulated organic material to ensure proper drainage and functionality.

Note that green roofs cannot support heavy foot traffic during extreme weather conditions, such as snow accumulation, which should be allowed to melt naturally. If the waterproofing layer shows signs of wear or damage after installation, IMMEDIATELY contact the manufacturer or installer to address the issue. Avoid using harsh chemicals or tools that could harm the vegetation or damage the underlying layers.

Green Roof:

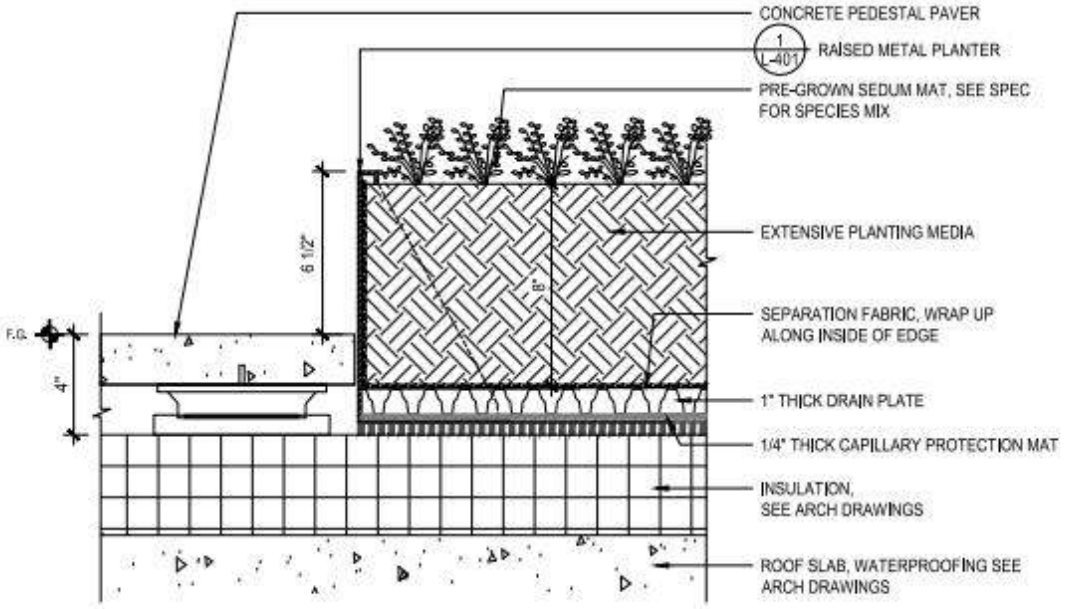
Figure 1: Green Roof

Table 2.1: [SMP] Inspection & Maintenance

ACTIVITY	**FREQUENCY**
Specify period when maintenance is required (e.g. Warranty Period, Ongoing, etc.)	
Watering	*During extended dry periods of no significant precipitation within 7 days, or as needed based on plant condition. Up until the first two years of establishment*
Weeding	*Quarterly at minimum during the growing season or more frequently based on ongoing inspections*
Vegetation Management	*Annually or as needed depending on the type of green roof vegetation*
Fertilization	*As necessary based on visual observation of plant health or soil fertility testing*
Outlet Cleaning	*Twice a year or as needed based on ongoing inspections*
Erosion Control	*During the growing season for plant materials and as warranted for mechanical methods based on annual and ongoing inspections*

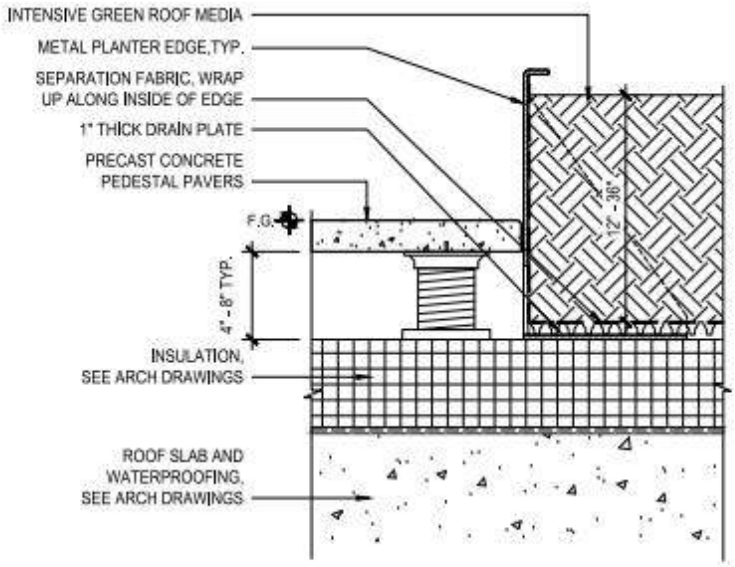
NOTES:

1. SHIM ALUMINUM EDGE AS REQUIRED TO MAINTAIN 3/4" REVEAL
2. EXTENSIVE GREEN ROOF SHALL BE IRRIGATED WITH DRIP IRRIGATION 12" O.C. LINE SPACING WITH 14" O.C. EMITTER SPACING
3. FOR WATERPROOFING AND ROOT BARRIER, SEE ARCHITECTURE DRAWINGS AND DIVISION 7 SPECIFICATIONS
4. ENSURE THAT 40 MILS ROOT BARRIER IS INSTALLED BETWEEN WATERPROOFING MEMBRANE AND INSULATION LAYER PRIOR TO THE INSULATION OF ANY VEGETATED ROOF ASSEMBLIES.



2 EXTENSIVE GREEN ROOF

3" = 1'-0"



3 INTENSIVE GREEN ROOF

1 1/2" = 1'-0"

- Color to be used in Sections 3 and 6

Detention Tank

A detention tank is a stormwater management system designed to temporarily store runoff and release it at a controlled rate to prevent overwhelming municipal drainage infrastructure. Detention systems are used to meet stormwater management requirements by regulating peak flow rates and ensuring compliance with site drainage regulations. The detention tank collects stormwater from sources such as roof drains and green roofs, directing it into the city's combined sewer system through an orifice pipe. This controlled release mechanism helps mitigate flooding risks and supports urban drainage efficiency.

Proper maintenance of a detention tank is essential for long-term functionality. It is important to inspect stormwater management systems for sediment buildup, structural integrity, and blockages. The orifice pipe, which regulates discharge, must remain unobstructed to ensure consistent flow. Inlet and overflow pipes should also be checked regularly to confirm proper water movement. Any accumulation of debris or sediment within the chamber should be removed to maintain storage capacity and prevent operational failures.

Structural integrity plays a critical role in detention tank performance. Since the tank is placed on a cellar floor, it must be designed to withstand surrounding loads while remaining watertight to prevent leaks. If any signs of wear, cracking, or leaks appear, immediate corrective action should be taken to prevent system failure. Unauthorized modifications or chemical treatments should be avoided to maintain the integrity of the concrete structure and its drainage components.

Detention Tank:

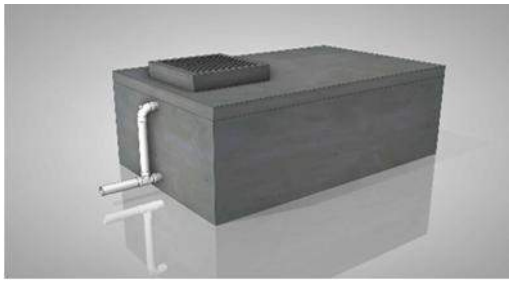


Figure 2: Detention Tank

Table 2.2: [SMP] Inspection & Maintenance

ACTIVITY	**FREQUENCY**
Specify period when maintenance is required (e.g. Warranty Period, Ongoing, etc.)	
Sediment Removal	*As warranted based on annual inspections*
Intake Cleaning	*Quarterly at a minimum or as warranted based on ongoing inspections*
Pipe Cleaning	*As warranted based on video pipe inspections conducted every 3 years*
Outlet Cleaning	*Twice a year or more frequently based in ongoing and annual inspections*
Inlet Cleaning	*Minimum annually or more frequently if debris accumulation is rapid based on ongoing and annual inspections*

SECTION 3 – SMP INSPECTION AND MAINTENANCE FORMS

3.1 SMP Inspection Checklists

Green Roof Inspection Checklist

Inspected by: Name X_____ Phone Number Email	**Site Address:** 35-10 Steinway Street, Astoria, Queens, NY
Date of Inspection: Click or tap here to enter text.	**Weather:** Click or tap here to enter text.
Location Description: Click or tap here to enter text.	

Frequency	Activity Item #	Inspection Items	Inspected? (Y/N)	Follow Up Action Needed
Monthly	**1.**	**Vegetation Health**		
	1a.	Are plants thriving and showing no signs of drying/wilting?	**1a.**	
	1b.	Is there any weed growth?	**1b.**	
Monthly	**2.**	**Drainage System**		
	2a.	Any drains free of debris or accumulated sediment?	**2a.**	
	2b.	Damage on the drains?	**2b.**	
Monthly	3.	**Roof Integrity**		
	3a.	Is the roof membrane intact?	**3a.**	
	3b.	Is the structure, including edge protection, in good condition?	**3b.**	
Annually	4.	**Soil/Substrate Condition**		
	4a.	Is there erosion or compaction in the substrate depth?	**4a.**	
Annually	5.	**Irrigation System (If applicable)**		
	5a.	Is water distributed evenly?	**5a.**	
	5b.	Are all the components functioning properly?	**5b.**	

Detention Tank Inspection Checklist

Inspected by: Name X_____ Phone Number Email	**Site Address:** 35-10 Steinway Street, Astoria, Queens, NY
Date of Inspection: Click or tap here to enter text.	**Weather:** Click or tap here to enter text.
Location Description: Click or tap here to enter text.	

Frequency	Activity Item #	Inspection Items	Inspected? (Y/N)	Follow Up Action Needed
Monthly	**6.**	**Orifice & Drainage System**		
	1a.	Is the re-entrant orifice clean and free of debris?		
	1b.	Are the inlet pips from the storm system unobstructed and is securely connected?		
Monthly	**7.**	**Tank Structural Integrity**		
	2a.	Is the concrete tank free of cracks, spalling, or other deterioration?		
	2b.	Is there minimal sediment buildup or biological growth inside the tank?		
Monthly	8.	**Overflow System**		
	3a.	Is the overflow's height difference from the first-floor slab at a minimum of 2 feet?		
	3b.	Is the overflow functioning correctly to divert excess water?		
Annually	9.	**Access & Service Hatch**		
	4a.	Is the access hatch secure and in good condition?		
Annually	10.	**Sanitary Connections**		
	5a.	Are the sanitary connections watertight and free from leaks?		

ONCE INSPECTION IS COMPLETED:

1) **KEEP COMPLETED INSPECTION CHECKLIST IN O&M MANUAL**

3.2 SMP Maintenance Checklist

Green Roof Maintenance Checklist		
Maintained by: John Doe X_____ Insert Phone Number Insert Email		**Site Address:** 35-18 Steinway Street, Astoria, Queens, NY
Date of Maintenance:		**Weather:**
FREQUENCY	**MAINTENANCE ACTIVITY DESCRIPTION & NOTES**	**ACTIVITY PHOTO**
[Maintenance Frequency]	*[Maintenance Activity Description]*	

Detention Tank Maintenance Checklist

Maintained by: John Doe X_____ Insert Phone Number Insert Email		**Site Address:** 35-10 Steinway Street, Astoria, Queens, NY
Date of Maintenance: Click or tap here to enter text.		**Weather:** Click or tap here to enter text.
FREQUENCY	**MAINTENANCE ACTIVITY DESCRIPTION & NOTES**	**ACTIVITY PHOTO**
[Maintenance Frequency]	*[Maintenance Activity Description]*	

3.3 SMP INSPECTION AND MAINTENANCE TRACKER FORM

Year: 2025

Project Name: 35-10 Steinway Street

Performed by: Contracted Company or Responsible Party

Location: 35-10 Steinway Street, Astoria, Queens, NY

INSPECTION AND MAINTENANCE TRACKER: Fill out the table when Inspection or Maintenance is completed.

REQUIRED FREQUENCY			
Activity Type	Detention Tank	Green Roof	Connected Drainage Structure
Inspection	MONTHLY	MONTHLY	BI-MONTHLY
Maintenance	QUARTERLY	QUARTERLY	QUARTERLY
Follow Up	AS INDICATED IN SECTION 3.1		

Detention Tank			Green Roof			Connected Drainage Structure		
Action	Date	Notes	Action	Date	Notes	Action	Date	Notes

3.4 Maintenance Permit

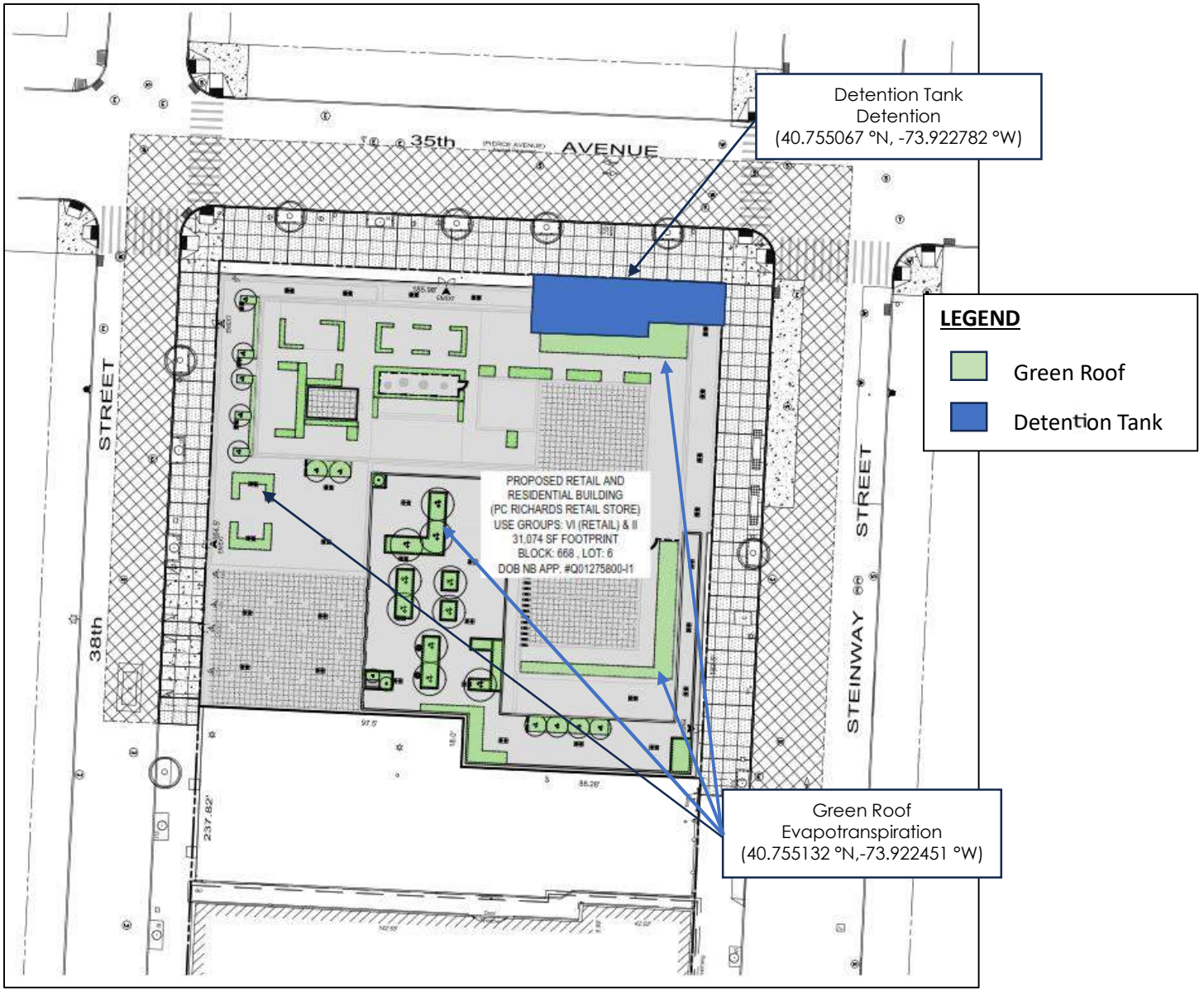
PLACEHOLDER FOR STORMWATER MAINTENANCE PERMIT.

INSERT WHEN RECEIVED.

SECTION 6 – MARKED UP AS-BUILTS

6.1 SMP Location Map

Note: Callouts correlate with the required list in the instructions.



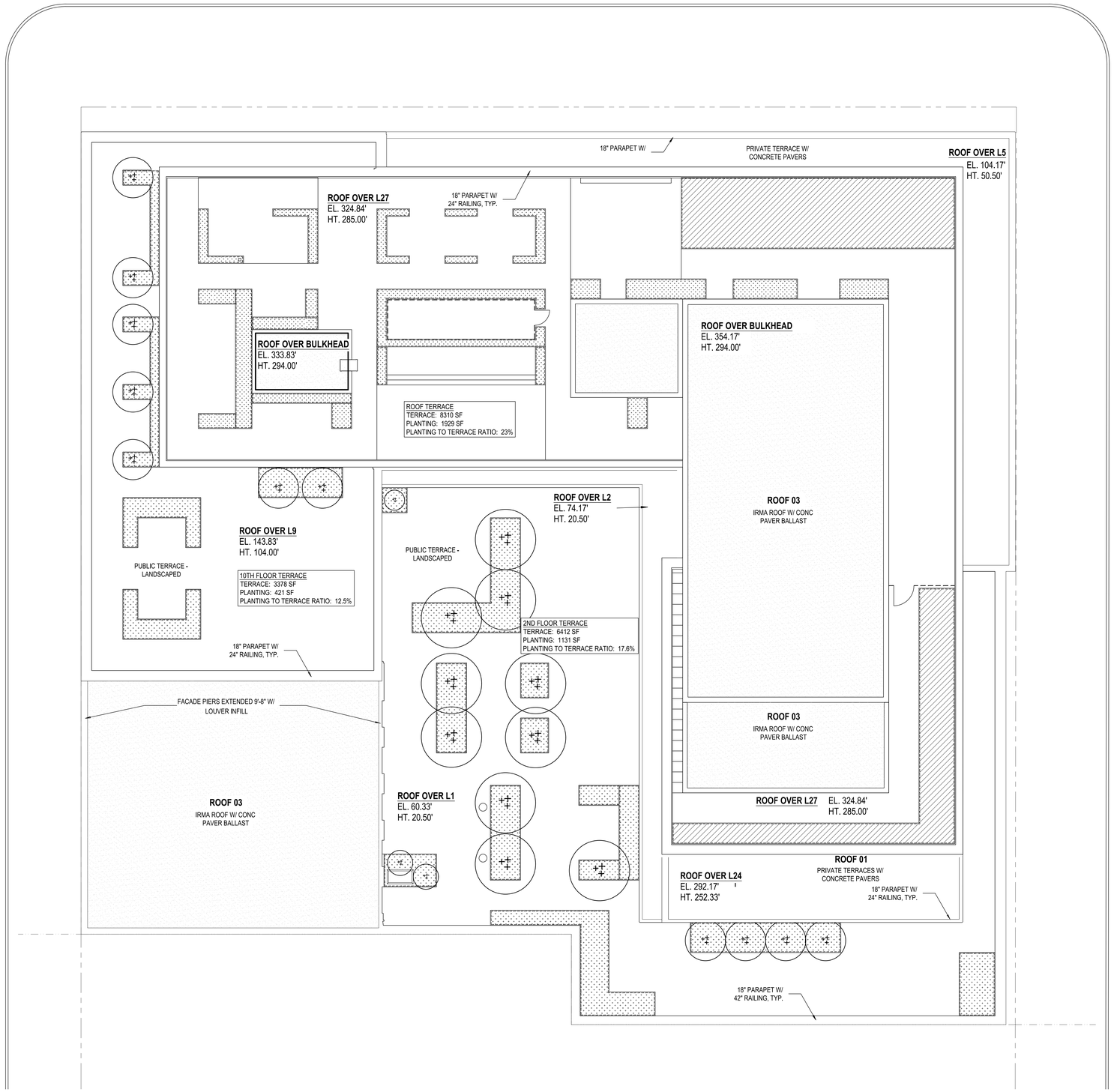
6.2 As-Built Plans

INSERT AS-BUILT PLANS

(Refer to Project Close-Out Materials Checklist)

- As-Built Cover & Contributing Drainage Area
- As-Built Drainage Utility & SMP Plan

6.3 Planting/Landscaping Plans



1 ROOF PLAN

1/8" = 1'-0"

0 4' 8' 16'

Scale: 1/8" = 1'-0"

N

PLANTING LEGEND

EXTENSIVE GREEN ROOF

SEDUM MIX
SEDUM ALBUM 'CORAL CARPET'
SEDUM KAMTSCHATICUM 'VARIEGATUM'
SEDUM KAMTSCHATICUM 'WEIHENSTEPH GOLD'
SEDUM SEXANGULARE
SEDUM SPURIUM 'ALBUM SUPERBUM'
SEDUM SPURIUM 'FULDAGLUT'
SEDUM SPURIUM 'SUMMER GLORY'
SEDUM TAKESIMENSIS 'GOLDEN CARPET'

INTENSIVE GREEN ROOF

SHRUBS
COTINUS COGGYGRIA 'ROYAL PURPLE'
ILEX GLABRA 'SHAMROCK'
LEUCOTHOE FONTANESIANA
RHUS AROMATICA 'GRO-LOW'

GRASSES & PERENNIALS
AMSONIA HUBRICHTII
CALAMAGROSTIS X ACUTIFLORA 'KARL FOERSTER'
CAREX FLACCA 'BLUE ZINGER'
DESCHAMPSIA CESPITOSA 'GOLDTAU'
SALVIA NEMOROSA 'MAINACHT'
SCHIZACHYRIUM SCOPARIUM 'STANDING OVATION'
SESLERIA AUTUMNALIS

TREES
BETULA NIGRA 'CULLY'
CORNUS FLORIDA VAR. RUBRA
JUNIPERUS CHINENSIS 'HETZII COLUMNARIS'

Soil Specification for Planters

Soil specification to meet the requirements of NYC Stormwater Manual Table 4.6 for Engineered Soil (CSS Area).

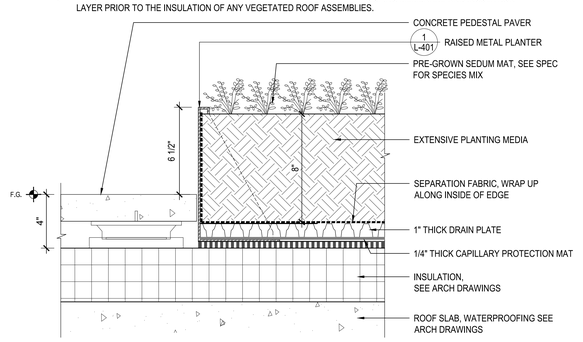
Sand (0.05-2mm) 80-8%, of which: Course Sand (0.5-1mm) 0-5% Medium Sand (0.25-0.5mm) 55-75% Fine Sand (0.1-0.25mm) 20-40%	Phosphorous - 80 - 100 lbs/acre Potasium - 100 - 300 lbs/acre Acid-producing Soil Test pH > 4.5 Free of refuse, hard clods, woody vegetation, stiff clay, construction debris (of any kind), boulders, stones greater than 1-1/2 inch, chemicals, or other deleterious material toxic to any vegetation used on this project.
Silt (0.002-0.05mm) 5-10%	
Clay (<0.002mm) 3-8%	
Organic Matter 3-6%	

Soil Specification for Green Roof

Soil specification to meet the requirements of NYC Stormwater Manual Table 4.6 for Green Roof Media.

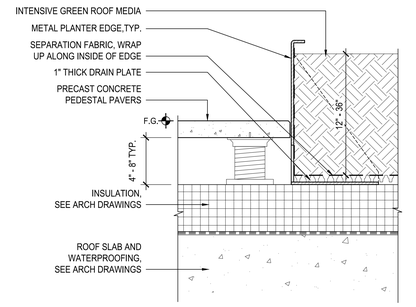
Green roof media	By weight: Silt (0.002-0.05mm) ≤ 10% Clay (<0.002mm) ≤ 2% Organic Matter ≤ 8%	pH 6.0-8.5 Maximum water holding capacity 35-65%

NOTES:
1. SHIM ALUMINUM EDGE AS REQUIRED TO MAINTAIN 3/4" REVEAL
2. EXTENSIVE GREEN ROOF SHALL BE IRRIGATED WITH DRIP IRRIGATION 12" O.C. LINE SPACING WITH 14" O.C. EMITTER SPACING
3. FOR WATERPROOFING AND ROOT BARRIER, SEE ARCHITECTURE DRAWINGS AND DIVISION 7 SPECIFICATIONS
4. ENSURE THAT 40 MILS ROOT BARRIER IS INSTALLED BETWEEN WATERPROOFING MEMBRANE AND INSULATION LAYER PRIOR TO THE INSULATION OF ANY VEGETATED ROOF ASSEMBLIES.



2 EXTENSIVE GREEN ROOF

3" = 1'-0"



3 INTENSIVE GREEN ROOF

1 1/2" = 1'-0"

35-10 STEINWAY STREET, ASTORIA, NY 11101

BEYER BLINDER BELLE

120 Broadway, 20th Fl, New York, NY 10271

CLIENT
STEINWAY 1 OWNER LLC
2 Park Avenue, 23rd Floor
New York, NY 10016

STRUCTURAL ENGINEER
DeSimone Consulting Engineers
140 Broadway, 25th Floor
New York NY 10005

MEPFP ENGINEER
EP Engineering
100 William Street, Suite 1205
New York, NY 10038

CIVIL ENGINEER
Key Civil Engineering
(631) 961-0506

VERTICAL CIRCULATION
Fortune Shepler Sailing, Inc.
(862) 400-6382

GEOTECH ENGINEER
JNZ Engineering
959 S. Springfield Avenue
Springfield, NJ 07081

ACOUSTIC CONSULTANT
WSP
One Penn Plaza
New York, New York, 10119

ENVELOPE CONSULTANT
RIMKUS Consulting Group, Inc
229 West 28th Street
New York, New York 10001

SUSTAINABILITY CONSULTANT
Bright Power
80 Broad Street
New York, NY 10004

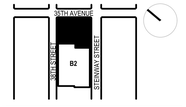
ACCESSIBILITY CONSULTANT
Accessibility Services
(718) 803-3782

LOW VOLTAGE CONSULTANT
Younity Inc.
18 West 18th Street, 2nd Floor
New York, NY, 10018

LANDSCAPE CONSULTANT
Starr Whitehouse Landscape Architects
80 Broad Street, Suite 1700
New York, NY 10004

LIGHTING CONSULTANT
Light Vs. Light
12 East 49th Street - Suite 1623
New York, NY 10017

KEY PLAN



STAMP

NO	DATE	DESCRIPTION
4	10/14/25	50% CD
3	08/22/25	DOB / HPD SUBMISSION
2	08/01/25	100% DD
1	04/18/25	100% SD

REVISIONS

SUBMITTAL

50% CONSTRUCTION DOCUMENTATION

INTERIM REVIEW ONLY NOT FOR CONSTRUCTION, APPROVAL OR PERMITTING

DRAWING TITLE

SWPPP PLAN & DETAILS

SCALE
DATE 10/06/25
PROJECT NUMBER 3053.00
DRAWING NUMBER

G-001.00

OF

DOB NOW JOB #

Appendix J: NYSDEC General Permit for Stormwater Discharges from Construction Sites

Documents included:

☒ New York State Department of Environmental Conservation SPDES General Permit for Stormwater Discharges for Construction Activity

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL
CONSERVATION (NYSDEC)

SPDES GENERAL PERMIT
FOR STORMWATER DISCHARGES

From

CONSTRUCTION ACTIVITY

Permit No. GP-0-25-001

Construction General Permit (CGP)

Issued Pursuant to Article 17, Titles 7, 8 and Article 70

of the Environmental Conservation Law

Effective Date: January 29, 2025 Expiration Date: January 28, 2030

Scott E. Sheeley

Chief Permit Administrator

Scott E. Sheeley JAN. 29, 2025

Authorized Signature Date

Address: NYSDEC
Division of Environmental Permits
625 Broadway, 4th Floor
Albany, N.Y. 12233-1750

PREFACE

Pursuant to Section 402 of the Clean Water Act (CWA), and 40 CFR 122.26(b)(14)(x), (15)(i), and (15)(ii), *stormwater discharges* from certain *construction activities* are unlawful unless they are authorized by a National Pollutant Discharge Elimination System (NPDES) permit or by a state permit program. New York State administers the approved State Pollutant Discharge Elimination System (SPDES) program with permits issued in accordance with the New York State Environmental Conservation Law (ECL) Article 17, Titles 7 and 8, and Article 70, as well as 6 NYCRR Parts 621 and 750.

C*onstruction activities* constitute construction of a *point source* and, therefore, pursuant to ECL sections 17-0505, 17-0701, and 17-0803, the *owner or operator* must have coverage under a SPDES permit prior to *commencement of construction activities*. The *owner or operator* cannot wait until there is an actual *discharge* from the *construction site* to obtain permit coverage.

***Note: The italicized words/phrases within this permit are defined in Appendix A.**

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
SPDES CONSTRUCTION GENERAL PERMIT (CGP) GP-0-25-001
FOR STORMWATER DISCHARGES FROM CONSTRUCTION ACTIVITIES

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Part I. How to Obtain Coverage and General Requirements

To be covered under this permit, the *owner or operator* must meet all eligibility requirements in Part I.A. and follow the requirements for obtaining permit coverage in Part I.D., F., or G.

A. Eligibility Requirements

For a *common plan of development or sale*, the *phase(s)* that meet the eligibility requirements in Part I.A. may obtain coverage under this permit even if other *phase(s)* of the same *common plan of development or sale* do not meet the eligibility requirements and require an individual SPDES permit.

1. The *owner's or operator's construction activities* involve soil disturbances of:

    a. one or more acres; or

    b. less than one acre which are part of a *common plan of development or sale* that will ultimately disturb one or more acres; or

    c. less than one acre where NYSDEC has determined that a SPDES permit is required for *stormwater discharges* based on the potential for contribution to a violation of a *water quality standard* or for significant contribution of pollutants to *surface waters of the State*.

        i. 5,000 square feet or more, but less than one acre, and are in the New York City Watershed located east of the Hudson River, Appendix C Figure 1; or

        ii. 20,000 square feet or more, but less than one acre, within the municipal boundaries of the City of New York (NYC); or

        iii. less than 20,000 square feet which are part of a *common plan of development or sale* that will ultimately disturb 20,000 square feet or more, but less than one acre, within the municipal boundaries of NYC; or

        iv. that creates 5,000 square feet or more of *impervious area* within the municipal boundaries of NYC.

2. *Discharges* from the *owner's or operator's construction activities* are/were not:

    a. already covered by a different SPDES permit; or

    b. covered under a different SPDES permit that was denied, terminated, or revoked; or

    c. identified in an expired individual SPDES permit that was not renewed; or

    d. required to obtain an individual SPDES permit or another general SPDES permit in accordance with Part VII.K.

3. If *construction activities* may adversely affect a species that is endangered or threatened, the *owner or operator* must obtain a:

    a. permit issued pursuant to 6 NYCRR Part 182 for the project; or

    b. letter issued by NYSDEC of non-jurisdiction pursuant to 6 NYCRR Part 182 for the project.

4. If *construction activities* have the potential to affect an *historic property*, the *owner or operator* must obtain one of the following:

    a. documentation that the *construction activity* is not within an archeological buffer area indicated on the sensitivity map, and that the *construction activity* is not located on or immediately adjacent to a property listed or determined to be eligible for listing on the National or State Registers of Historic Places, and that there is no new permanent building on the *construction site* within the following distances from a building, structure, or object that is more than 50 years old, or if there is such a new permanent building on the *construction site* within those parameters that NYS Office of Parks, Recreation and Historic Preservation (OPRHP), a Historic Preservation Commission of a Certified Local Government, or a qualified preservation professional has determined that the building, structure, or object more than 50 years old is not historically/archeologically significant:

        i. 1-5 acres of disturbance - 20 feet; or

        ii. 5-20 acres of disturbance - 50 feet; or

iii. 20+ acres of disturbance - 100 feet.

b. NYSDEC consultation form sent to OPRHP,[1] and copied to NYSDEC's Agency Historic Preservation Officer (APO), and

i. the State Environmental Quality Review Act (SEQR) Environmental Assessment Form (EAF) with a negative declaration or the Findings Statement, with documentation of OPRHP's agreement with the resolution; or

ii. documentation from OPRHP that the *construction activity* will result in No Impact; or

iii. documentation from OPRHP providing a determination of No Adverse Impact; or

iv. a Letter of Resolution signed by the *owner or operator*, OPRHP and the DEC APO which allows for this *construction activity* to be eligible for coverage under the general permit in terms of the State Historic Preservation Act (SHPA).

c. documentation of satisfactory compliance with Section 106 of the National Historic Preservation Act for a coterminous project area:

i. No Affect; or

ii. No Adverse Affect; or

iii. Executed Memorandum of Agreement.

d. documentation that SHPA Section 14.09 has been completed by NYSDEC or another state agency.

5. If *construction activities* are subject to SEQR, the *owner or operator* must obtain documentation that SEQR has been satisfied.

6. If *construction activities* are not subject to SEQR, but subject to the equivalent environmental review from another New York State or federal agency, the

[1] The consultation form can be submitted, along with other project information, through OPRHP's Cultural Resource Information System (CRIS) portal. If submitted through CRIS, paper copies of the consultation form need not be mailed.

owner or operator must obtain documentation that project review, pursuant to a process equivalent to SEQR from another New York State or federal agency, has been satisfied.

7. If *construction activities* require Uniform Procedures Act (UPA) Permits (see 6 NYCRR Part 621) from NYSDEC, or the equivalent from another New York State or federal agency, the *owner or operator* must:

    a. obtain all such necessary permits; or

    b. receive notification from NYSDEC pursuant to 6 NYCRR 621.3(a)(4) excepting Part I.A.7.a.

8. *Construction activities* are not eligible if they meet the following criteria in Part I.A.8.a. or b.:

    a. For linear transportation and linear utility project types, the *construction activities*:

        i. are within the watershed of *surface waters of the State* classified as AA or AA-S identified utilizing the Stormwater Interactive Map on NYSDEC's website; and

        ii. are undertaken on land with no existing *impervious cover*; and

        iii. disturb two or more acres of *steep slope*.

    b. For all other project types, the *construction activities*:

        i. are within the watershed of *surface waters of the State* classified as AA or AA-S identified utilizing the Stormwater Interactive Map on NYSDEC's website; and

        ii. are undertaken on land with no existing *impervious cover*; and

        iii. disturb one or more acres of *steep slope*.

B. Types of *Discharges* Authorized

1. The following *stormwater discharges* are authorized under this permit:

   a. *Stormwater discharges*, including *stormwater* runoff, snowmelt runoff, and surface runoff and drainage, associated with *construction activity*, are authorized under this permit provided that appropriate *stormwater* controls are designed, installed, and maintained in accordance with Part II. and Part III.

   b. *Stormwater discharges* from construction support activities at the *construction site* (including concrete or asphalt batch plants, equipment staging yards, material storage areas, excavated material disposal areas, and borrow areas) if the following requirements are met:

      i. The support activity is directly related to the *construction site* required to have permit coverage for *stormwater discharges*; and

      ii. The support activity is not a commercial operation, nor does it serve multiple unrelated *construction sites*; and

      iii. The support activity does not continue to operate beyond the completion of the *construction activity* at the site it supports; and

      iv. *Stormwater* controls are implemented in accordance with Part II. and Part III. for *discharges* from the support activity areas.

2. The following non-*stormwater discharges* associated with *construction activity* are authorized under this permit:

   a. Non-*stormwater discharges* listed in 6 NYCRR 750-1.2(a)(29)(vi), with the following exception: "*Discharges* from firefighting activities are authorized only when the firefighting activities are emergencies/unplanned"; and

   b. Non-*stormwater discharges* of waters to which other components have not been added that are used in accordance with the *SWPPP* to control dust or irrigate vegetation in stabilized areas; and

   c. Uncontaminated *discharges* from *dewatering* operations

3. Authorized *discharges* of *stormwater* or authorized *discharges* of non-*stormwater*, commingled with a *discharge* authorized by a different SPDES permit and/or a *discharge* that does not require SPDES permit authorization, are also authorized under this permit.

C. Prohibited *Discharges*

1. Non-*stormwater discharges* prohibited under this permit include but are not limited to:

    a. Wastewater from washout of concrete; and

    b. Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds, and other construction materials; and

    c. Fuels, oils, or other *pollutants* used in vehicle and equipment operation and maintenance; and

    d. Soaps, solvents, or detergents used in vehicle and equipment washing or external building washdown; and

    e. Toxic or hazardous substances from a spill or other release.

D. Electronic Notice of Intent (eNOI) Submittal

To receive authorization in accordance with Part I.D.3.b., the *owner or operator* must submit a complete eNOI in accordance with the requirements in Part I.D. The eNOI contains questions to: ensure eligibility requirements in Part I.A. have been met; obtain *owner or operator* contact information; obtain the total area to be disturbed and the existing/future *impervious areas* (rounded to the nearest tenth of an acre); confirm *Traditional Land Use Control MS4 Operator* jurisdiction over construction projects; satisfy the EPA eRule requirements; confirm that the Water Quality-Based Effluent Limitations in Part II. have been met; demonstrate consideration of the future risks due to climate change in accordance with Part III.A.2.; and confirm that the other *Stormwater Pollution Prevention Plan (SWPPP)* requirements in Part III. have been met.

1. An eNOI may be submitted for:

    a. *construction activities* that are not part of a *common plan of development or sale*; or

b. an entire *common plan of development or sale*; or

c. separate *phase(s)* of a *common plan of development or sale* if the following requirements are met:

    i. the *common plan of development or sale* meets the eligibility requirements of Part I.A.5. or 6.; and

    ii. the *phase(s)* meet(s) all other eligibility requirements of Part I.A.; and

    iii. Part III.C. Required *SWPPP* Components by Project Type is based on the *common plan of development or sale*, not the *phase(s)*; or

d. *tree clearing* that is associated with, or will support, a *renewable energy* generation, transmission, or storage project that meets Part I.A.5. and 6., if the *tree clearing*:

    i. meets all other eligibility requirements of Part I.A.; and

    ii. will occur in NYSDEC's Regions 3-9; and

    iii. is not within ¼ mile of a bat hibernaculum protected pursuant to 6 NYCRR Part 182; and

    iv. will occur between November 1st and March 31st.

2. As prerequisites for submitting an eNOI, the *owner or operator* must:

    a. prepare a *SWPPP* for Part I.D.1.a., b., c., or d. in accordance with Part III.; and

    b. based on the following criteria, upload the following signature forms signed in accordance with Part VII.J. to the eNOI prior to submission:

        i. for all eNOIs:

            1. the SWPPP Preparer Certification Form, Appendix F, signed by the *SWPPP* preparer; and

2. the Owner/Operator Certification Form, Appendix J, signed by the *owner or operator*; and

ii. if an eNOI includes *construction activities* within the municipal boundary(ies) of *Traditional Land Use Control MS4 Operator(s)* that will *discharge* to the *MS4(s)*:

1. determine if the *Traditional Land Use Control MS4 Operator(s)* have review authority. A *Traditional Land Use Control MS4 Operator* does not have review authority where:

a. the *owner or operator* of the *construction activities* in Part I.D.2.b.ii. is the same entity as the *Traditional Land Use Control MS4 Operator* identified in Part I.D.2.b.ii.; or

b. there is a statute exempting the *owner or operator* from zoning review by the *Traditional Land Use Control MS4 Operator*; or

c. there is no such statute per Part I.D.2.b.ii.1.b., the *Traditional Land Use Control MS4 Operator* concludes, after public hearing, that it does not have zoning review authority in accordance with Legal Memorandum LU14 Updated January 2020 “Governmental Immunity from Zoning and Other Legislation”; and

2. if the *Traditional Land Use Control MS4 Operator(s)* have review authority, submit the *SWPPP* to the *Traditional Land Use Control MS4 Operator(s)* for review and have:

a. if outside the municipal boundaries of NYC: the MS4 SWPPP Acceptance Form, Appendix G, signed by the principal executive officer or ranking elected official from the *Traditional Land Use Control MS4 Operator,* or by a duly authorized representative of that person in accordance with Part VII.J.2.; or

b. if within the municipal boundaries of NYC: The City of New York Department of Environmental Protection (NYCDEP) SWPPP Acceptance/Approval Form, Appendix H, signed by the principal executive officer or ranking elected official from the Traditional Land Use Control MS4 Operator, or by a duly authorized representative of that person in accordance with Part VII.J.2.; and

3. if the *Traditional Land Use Control MS4 Operator* does not have review authority, have the MS4 No Jurisdiction Form, Appendix I, signed by the principal executive officer or ranking elected official from the *Traditional Land Use Control MS4 Operator,* or by a duly authorized representative of that person in accordance with Part VII.J.2.

3. Submitting an eNOI:

a. The *owner or operator* must submit a complete Notice of Intent electronically using a NYSDEC approved form.[2]

b. The *owner or operator* is authorized to *commence construction activity* as of the authorization date indicated in the Letter of Authorization (LOA), which is sent by NYSDEC after a complete eNOI is submitted.

i. If an eNOI is received for a *SWPPP* that deviates from one of the technical standards but demonstrates *equivalence* in accordance with Part III.B.1.a.ii. or Part III.B.2.b.ii., if the *SWPPP* includes *construction activities* that are not within the municipal boundary(ies) of *Traditional Land Use Control MS4 Operator(s)*, and/or if the *SWPPP* includes *construction activities* within the municipal boundary(ies) of *Traditional Land Use Control MS4 Operator(s)* that do not have review authority in accordance with Part I.D.2.b.ii.1., the authorization date indicated in the LOA will be 60 business days after the eNOI submission date.

[2] Unless NYSDEC grants a waiver in accordance with 40 CFR 127.15(c) or (d). All waiver requests must be submitted to Stormwater_info@dec.ny.gov or NYSDEC, Bureau of Water Permits, 625 Broadway, 4th Floor, Albany, New York 12233-3505.

c. If *Traditional Land Use Control MS4 Operator(s)* have review authority in accordance with Part I.D.2.b.ii.2., the *owner or operator* must, within five business days of receipt of the LOA, send an electronic copy of the LOA to the *Traditional Land Use Control MS4 Operator(s)* with review authority.

E. General Requirements for *Owners or Operators* with Permit Coverage

1. As of the date the LOA is received, the *owner or operator* must make the eNOI, *SWPPP*, and LOA available for review and copying in accordance with the requirements in Part VII.H. When applicable, as of the date an updated LOA is received, the *owner or operator* must make the updated LOA available for review and copying in accordance with the requirements in Part VII.H.

2. The *owner or operator* must ensure compliance with all requirements of this permit and that the provisions of the *SWPPP*, including any changes made to the *SWPPP* in accordance with Part III.A.5., are properly implemented and maintained from the *commencement of construction activity* until:

   a. all areas of disturbance have achieved *final stabilization;* and

   b. the owner's or operator's coverage under this permit is terminated in accordance with Part V.A.5.a.

3. As of the date of the *commencement of construction activities* until Part I.E.2.a. and b. have been met, the *owner or operator* must maintain at the *construction site*, a copy of:

   a. all documentation necessary to demonstrate eligibility with this permit; and

   b. this permit; and

   c. the *SWPPP*; and

   d. the signed SWPPP Preparer Certification Form; and

   e. the signed MS4 SWPPP Acceptance Form or signed NYCDEP SWPPP Acceptance/Approval Form or signed MS4 No Jurisdiction Form (when applicable); and

   f. the signed Owner/Operator Certification Form; and

g. the eNOI; and

h. the LOA; and

i. the LOA transmittal to the Traditional Land Use Control MS4 Operator in accordance with Part I.D.3.c. (when applicable).

4. The *owner or operator* must maintain at the *construction site*, until Part I.E.2.a. and b. have been met, as of the date the documents become final or are received, a copy of the:

   a. responsible contractor's or subcontractor's certification statement(s) in accordance with Part III.A.7.; and

   b. inspection reports in accordance with Part IV.C.4. and 6.; and

   c. Request to Disturb Greater Than Five Acres and the Authorization Letter to Disturb Greater Than Five Acres in accordance with Part I.E.6. (when applicable); and

   d. Request to Continue Coverage and the Letter of Continued Coverage (LOCC) in accordance with Part I.F.2. and 4. (when applicable); and

   e. The updated LOA(s) in accordance with Part I.E.9. (when applicable).

5. The *owner or operator* must maintain the documents in Part I.E.3. and 4. in a secure location, such as a job trailer, on-site construction office, or mailbox with lock. The secure location must be accessible during normal business hours to an individual performing a compliance inspection. The documents must be paper documents unless electronic documents are accessible to the inspector during an inspection to the same extent as a paper copy stored at the site would be. If electronic documents are kept on site, the *owner or operator* must maintain functional equipment on site available to an inspector during normal hours of operation such that an inspector may view the electronic documents in a format that can be read in a similar manner as a paper record and in a legally dependable format with no less evidentiary value than their paper equivalent.

6. The *owner or operator* must meet the following requirements prior to disturbing greater than five acres of soil at any one time:

   a. The *owner or operator* must submit a written Request to Disturb Greater Than Five Acres to:

i. NYSDEC's Regional Office Division of Water staff based on the project location, Appendix E, if a *Traditional Land Use Control MS4 Operator* does not have review authority in accordance with Part I.D.2.b.ii.1.; or

ii. the *Traditional Land Use Control MS4 Operator*, if a *Traditional Land Use Control MS4 Operator* has review authority in accordance with Part I.D.2.b.ii.1.; or

iii. NYSDEC's Regional Office Division of Water staff based on the project location, Appendix E, and each involved *Traditional Land Use Control MS4 Operator*, if the project spans multiple municipalities with more than one *Traditional Land Use Control MS4 Operator* involved with review authority in accordance with Part I.D.2.b.ii.1.

b. The written Request to Disturb Greater Than Five Acres must include:

i. The SPDES permit identification number (Permit ID); and

ii. Full technical justification demonstrating why alternative methods of construction that would result in five acres of soil disturbance or less at any one time are not feasible; and

iii. The phasing plan for the project and sequencing plans for all *phases* from the *SWPPP* in accordance with Part III.B.1.d.; and

iv. Plans with locations and details of erosion and sediment control practices such that the heightened concern for erosion when disturbing greater than five acres at one time has been addressed; and

v. Acknowledgment that "the *owner or operator* will comply with the requirements in Part IV.C.2.b."; and

vi. Acknowledgment that "the *owner or operator* will comply with the requirements in Part II.B.1.b."

c. The *owner or operator* must be in receipt of an Authorization Letter to Disturb Greater Than Five Acres, which will include when the

authorization begins and ends and indicate a maximum area (acres) of soil disturbance allowed at any one time, from:

i. NYSDEC, if Part I.E.6.a.i. or iii. apply; or

ii. the *Traditional Land Use Control MS4 Operator*, if Part I.E.6.a.ii. applies.

7. Upon a finding of significant non-compliance with the practices described in the *SWPPP* or violation of this permit, NYSDEC may order an immediate stop to all *construction activity* at the site until the non-compliance is remedied. The stop work order must be in writing, describe the non-compliance in detail, and be sent to the *owner or operator*.

8. If any human remains or archaeological remains are encountered during excavation, the *owner or operator* must immediately cease, or cause to cease, all *construction activity* in the area of the remains and notify the appropriate Regional Water Engineer (RWE).[3] *Construction activity* shall not resume until written permission to do so has been received from the RWE.

9. To be authorized to implement modifications to the information previously submitted in the eNOI, the *owner or operator* must:

   a. notify NYSDEC via email at Stormwater_info@dec.ny.gov requesting access to update the eNOI; and

   b. update the eNOI to reflect the modifications and resubmit the eNOI in accordance with Part I.D.; and

   c. receive an updated LOA.

10. The eNOI, *SWPPP*, LOA, updated LOAs (when applicable), and inspection reports required by this permit are public documents that the *owner or operator* must make available for review and copying by any person within five business days of the *owner or operator* receiving a written request by any such person to review these documents. Copying of documents will be done at the requester's expense.

[3] The Regional Water Manager where a DEC Region does not have a RWE.

F. Permit Coverage for *Discharges* Authorized Under GP-0-20-001

When applicable:

1. Upon the effective date of this permit, an *owner or operator* of *a construction activity*, with coverage under GP-0-20-001, will have interim coverage under GP-0-25-001 for 45 calendar days starting on the effective date of GP-0-25-001 so long as the *owner or operator* maintains compliance with all applicable requirements of this permit.

2. Within 30 calendar days of the effective date of this permit, the *owner or operator*, with coverage under GP-0-20-001, must submit a complete Request to Continue Coverage electronically using a NYSDEC approved form,[4] which contains the information identified in Part I.F.3. below, if:

   a. the *owner or operator* continues to implement the SMP component in conformance with the technical standards in place at the time of initial project authorization; and

   b. the *owner or operator* will comply with all non-design requirements of GP-0-25-001.

3. The Request to Continue Coverage form contains questions to: ensure eligibility requirements in Part I.A. have been met; verify *owner or operator* contact information; verify the permit identification number; verify the original eNOI submission ID, if applicable; verify Part I.F.2.a. and b.; verify the version of the Design Manual that the technical/design components conform to; and receive an updated Owner/Operator Certification Form, Appendix I.

4. The *owner or operator* has obtained continued coverage under GP-0-25-001 as of the date indicated in the LOCC, which is sent by NYSDEC after a complete Request to Continue Coverage form is submitted.

5. If the owner or operator does not submit the Request to Continue Coverage form in accordance with Part I.F.2. and 3., coverage under this permit is automatically terminated after interim coverage expires.

[4] Unless NYSDEC grants a waiver in accordance with 40 CFR 127.15(c) or (d). All waiver requests must be submitted to Stormwater_info@dec.ny.gov or NYSDEC, Bureau of Water Permits, 625 Broadway, 4th Floor, Albany, New York 12233-3505.

G. Change of *Owner or Operator*

When applicable:

1. When property ownership changes, or when there is a change in operational control over the construction plans and specifications, the following process applies:

    a. The new *owner or operator* must meet the applicable prerequisites for submitting an eNOI in accordance with Part I.D.2.; and

    b. The new *owner or operator* must submit an eNOI in accordance with Part I.D.3.; and

    c. Permit coverage for the new *owner or operator* will be effective upon receipt of the LOA in accordance with Part I.D.3.b.; and

    d. The new *owner or operator*, upon receipt of their LOA, must provide their Permit ID to the original *owner or operator*; and

    e. If the original *owner or operator* will no longer be the *owner or operator* of the *construction activity* identified in the original *owner's or operator's* eNOI, the original *owner or operator*, upon receipt of the new *owner's or operator's* Permit ID in accordance with Part I.G.1.d., must submit to NYSDEC a completed eNOT in accordance with Part V. that includes the name and Permit ID of the new *owner or operator*; or

    f. If the original *owner or operator* maintains ownership of a portion of the *construction activity*, the original *owner or operator* must maintain their coverage under the permit by modifying their eNOI; modifications to the eNOI must include:

        i. the revised area of disturbance and/or *impervious area(s)*; and

        ii. the revised SMP information, if applicable; and

        iii. a narrative description of what has changed; and

        iv. the new *owner's or operator's* Permit ID for the portion of the project removed from the eNOI.

    Owners or operators must follow Part I.E.9. to modify the eNOI.

Part II. Water Quality-Based Effluent Limitations

A. Maintaining Water Quality

NYSDEC expects that compliance with the requirements of this permit will control *discharge*s necessary to meet applicable *water quality standards*. It shall be a violation of the *ECL* for any *discharge* to either cause or contribute to a violation of the following *water quality standards* as contained in Parts 700 through 705 of Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York:

1. There must be no increase in turbidity that will cause a substantial visible contrast to natural conditions; and

2. There must be no increase in suspended, colloidal or settleable solids that will cause deposition or impair the waters for their best usages; and

3. There must be no residue from oil and floating substances, nor visible oil film, nor globules of grease.

If there is evidence indicating that the *stormwater discharge*s authorized by this permit are causing, have the reasonable potential to cause, or are contributing to a violation of the *water quality standard,* the *owner or operator* must take appropriate corrective action in accordance with Part IV.C.5. of this permit and document in accordance with Part IV.C.4. of this permit. To address the *water quality standard* violation the *owner or operator* must include and implement appropriate controls in the *SWPPP* to correct the problem or obtain an individual SPDES permit.

If, despite compliance with the requirements of this permit, it is demonstrated that the *stormwater discharge*s authorized by this permit are causing or contributing to a violation of *water quality standards*, or if NYSDEC determines that a modification of this permit is necessary to prevent a violation of *water quality standards*, the authorized *discharge*s will no longer be eligible for coverage under this permit, and the *owner or operator* must obtain an individual SPDES permit prior to further *discharges* from the *construction site*.

B. Effluent Limitations Applicable to *Discharges* from *Construction Activities*

*Discharge*s authorized by this permit must achieve, at a minimum, the effluent limitations in Part II.B.1.a., b., c., d., and e. These limitations represent the

degree of effluent reduction attainable by the application of best practicable technology currently available.

1. Erosion and Sediment Control Requirements - The *owner or operator* must select, design, install, implement, and maintain control measures to *minimize* the *discharge* of *pollutants* and prevent a violation of the *water quality standards*. The selection, design, installation, implementation, and maintenance of these control measures must meet the non-numeric effluent limitations in Part II.B.1.a., b., c., d., and e. and be in accordance with the New York State Standards and Specifications for Erosion and Sediment Control (BB), dated November 2016, using sound engineering judgment. Where control measures are not designed in conformance with the design criteria included in the technical standard, the *owner or operator* must include in *SWPPP* the reason(s) for the deviation, or alternative design, and provide information in the *SWPPP* demonstrating that the deviation or alternative design is *equivalent* to the technical standard.

    a. **Erosion and Sediment Controls.** At a minimum, erosion and sediment controls must be selected, designed, installed, implemented, and maintained to:

        i. *Minimize* soil erosion through application of runoff control and soil stabilization control measure to *minimize pollutant discharge*s; and

        ii. Control *stormwater discharge*s, including both peak flow rates and total *stormwater* volume, to *minimize* channel and *streambank* erosion and scour in the immediate vicinity of the *discharge* points; and

        iii. *Minimize* the amount of soil exposed during *construction activity*; and

        iv. *Minimize* the disturbance of *steep slope*; and

        v. *Minimize* sediment *discharge*s from the site; and

        vi. Provide and maintain *natural buffers* around surface waters, direct *stormwater* to vegetated areas and maximize *stormwater* infiltration to reduce *pollutant discharge*s, unless *infeasible*; and

        vii. *Minimize* soil compaction. *Minimizing* soil compaction is not required

where the intended function of a specific area of the site dictates that it be compacted; and

viii. Unless *infeasible*, preserve a sufficient amount of topsoil to complete soil restoration and establish a uniform, dense vegetative cover; and

ix. *Minimize* dust. On areas of exposed soil, *minimize* dust through the appropriate application of water or other dust suppression techniques to control the generation of *pollutants* that could be discharged from the site.

b. **Soil Stabilization**. In areas where soil disturbance activity has ceased, whether permanently or *temporarily ceased*, the application of soil stabilization measures must be initiated by the end of the next business day and completed within 14 calendar days from the date the current soil disturbance activity ceased. For *construction sites* that *directly discharge* to one of the 303(d) segments listed in Appendix D, or are located in one of the watersheds listed in Appendix C, or are authorized to disturb greater than five acres in accordance with Part I.E.5.a.viii., the application of soil stabilization measures must be initiated by the end of the next business day and completed within seven calendar days from the date the soil disturbance activity ceased.

c. **Dewatering**. *Discharge*s from *dewatering* activities, including *discharge*s from *dewatering* of trenches and excavations, must be managed by appropriate control measures.

d. **Pollution Prevention Measures**. Select, design, install, implement, and maintain effective pollution prevention measures to *minimize* the *discharge* of *pollutants* and prevent a violation of the *water quality standards*. At a minimum, such measures must be selected, designed, installed, implemented, and maintained to:

i. *Minimize* the *discharge* of *pollutants* from equipment and vehicle washing, wheel wash water, and other wash waters. Soaps, detergents and solvents cannot be used; and

ii. *Minimize* the exposure of building materials, building products, construction wastes, trash, landscape materials, fertilizers, pesticides, herbicides, detergents, sanitary waste, hazardous and toxic waste, and other materials present on the site to precipitation

and to *stormwater*. *Minimization* of exposure is not required in cases where the exposure to precipitation and to *stormwater* will not result in a *discharge* of *pollutants*, or where exposure of a specific material or product poses little risk of *stormwater* contamination (such as final products and materials intended for outdoor use); and

iii. Prevent the *discharge* of *pollutants* from spills and leaks and implement chemical spill and leak prevention and response procedures.

e. **Surface Outlets.** When discharging from basins and impoundments, the surface outlets must be designed, constructed, and maintained in such a manner that sediment does not leave the basin or impoundment and that erosion at or below the outlet does not occur.

C. Post-Construction Stormwater Management Practice (SMP) Requirements

1. The *owner or operator* of a *construction activity* that requires post-construction SMPs, in accordance with Part III.C., must select, design, install, implement, and maintain the SMPs to meet the *performance criteria* in the New York State Stormwater Management Design Manual, dated July 31, 2024 (DM), using sound engineering judgment. Where SMPs are not designed in conformance with the *performance criteria* in the DM, the *owner or operator* must include in the *SWPPP* the reason(s) for the deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the technical standard.

2. The *owner or operator* of a *construction activity*, that requires SMPs in accordance with Part III.C., must design the practices to meet the applicable *sizing criteria* in Part II.C.2.a., b., c., or d.

a. Sizing Criteria for *New Development*

i. Runoff Reduction Volume (RRv) and Water Quality Volume (WQv):

1. Reduce the total WQv by application of RR techniques and standard SMPs with RRv capacity. The total WQv must be calculated in accordance with the criteria in Section 4.2 of the DM; or

2. Minimum RRv and Treatment of Remaining Total WQv: *Construction activities* that cannot meet the requirements in Part II.C.2.a.i.1. due to *site limitations* must direct runoff from all newly constructed *impervious areas* to a RR technique or standard SMP with RRv capacity unless *infeasible*. The specific *site limitations* that prevent the reduction of 100% of the WQv must be documented in the *SWPPP*. For each *impervious area* that is not directed to a RR technique or standard SMP with RRv capacity, the *SWPPP* must include documentation which demonstrates that all options were considered and for each option explains why it is considered *infeasible*.

   In no case shall the runoff reduction achieved from the newly constructed *impervious areas* be less than the Minimum RRv as calculated using the criteria in Section 4.4 of the DM. The remaining portion of the total WQv that cannot be reduced must be treated by application of standard SMPs.

ii. Channel Protection Volume (CPv): Provide 24 hour extended detention of the post-developed 1-year, 24-hour storm event, remaining after runoff reduction. Where a CPv control orifice is provided, the minimum orifice size must be 3 inches, with acceptable external trash rack or orifice protection. The CPv requirement does not apply when:

   1. Reduction of the entire CPv is achieved by application of runoff reduction techniques or infiltration systems; or

   2. The 1-year post-development peak *discharge* is less than or equal to 2.0 cfs without detention or velocity controls; or

   3. The site *directly discharges* into a fifth order or larger water body (stream, river, or lake), or tidal waters, where the increase in smaller flows will not impact the stream bank or channel integrity. However, the point of *discharge* must be adequately protected against scour and erosion by the increased peak *discharge*.

iii. *Overbank* Flood Control Criteria (Qp): Requires storage to attenuate the post-development 10-year, 24-hour peak *discharge* rate (Qp) to predevelopment rates. The Qp requirement does not apply when:

1. the site *directly discharges* to tidal waters or fifth order or larger streams, or

2. A downstream analysis reveals that *overbank* control is not required.

iv. Extreme Flood Control Criteria (Qf): Requires storage to attenuate the post-development 100-year, 24-hour peak *discharge* rate (Qf) to predevelopment rates. The Qf requirement does not apply when:

1. the site *directly discharges* to tidal waters or fifth order or larger streams, or

2. A downstream analysis reveals that *overbank* control is not required.

b. *Sizing Criteria* for *New Development* in Enhanced Phosphorus Removal Watersheds

i. Runoff Reduction Volume (RRv) and Water Quality Volume (WQv):

1. Reduce the WQv by application of RR techniques and standard SMPs with RRv capacity. The total WQv is the runoff volume from the 1-year, 24-hour design storm over the post-developed watershed and must be calculated in accordance with the criteria in Section 4.3 of the DM; or

2. Minimum RRv and Treatment of Remaining Total WQv: *Construction activities* that cannot meet the criteria in Part II.C.2.b.i.1. due to *site limitations* must direct runoff from all newly constructed *impervious areas* to a RR technique or standard SMP with RRv capacity unless *infeasible*. The specific *site limitations* that prevent the reduction of 100% of the WQv must be documented in the *SWPPP*. For each *impervious area* that is not directed to a RR technique or standard SMP with RRv capacity, the *SWPPP* must include

documentation which demonstrates that all options were considered and for each option explains why it is considered *infeasible.*

In no case shall the runoff reduction achieved from the newly constructed *impervious areas* be less than the Minimum RRv as calculated using the criteria in Section 4.5 of the DM. The remaining portion of the total WQv that cannot be reduced must be treated by application of standard SMPs.

ii. Channel Protection Volume (CPv): Provide 24 hour extended detention of the post-developed 1-year, 24-hour storm event, remaining after runoff reduction. Where a CPv control orifice is provided, the minimum orifice size must be 3 inches, with acceptable external trash rack or orifice protection. The CPv requirement does not apply when:

1. Reduction of the entire CPv is achieved by application of runoff reduction techniques or infiltration systems; or

2. The 1-year post-development peak *discharge* is less than or equal to 2.0 cfs; or

3. The site *directly discharges* to tidal waters, or a fifth order or larger water body (stream, river, or lake) where the increase in smaller flows will not impact the stream bank or channel integrity. However, the point of *discharge* must be adequately protected against scour and erosion by the increased peak *discharge*.

iii. *Overbank* Flood Control Criteria (Qp): Requires storage to attenuate the post-development 10-year, 24-hour peak *discharge* rate (Qp) to predevelopment rates. The Qp requirement does not apply when:

1. the site *directly discharges* to tidal waters or fifth order or larger streams; or

2. A downstream analysis reveals that *overbank* control is not required.

iv. Extreme Flood Control Criteria (Qf): Requires storage to attenuate the post-development 100-year, 24-hour peak *discharge* rate (Qf) to predevelopment rates. The Qf requirement does not apply when:

1. the site *directly discharges* to tidal waters or fifth order or larger streams; or

2. A downstream analysis reveals that *overbank* control is not required.

c. *Sizing Criteria* for *Redevelopment Activity*

i. Water Quality Volume (WQv): The WQv treatment objective for *redevelopment activity* must be addressed by one of the following options, as outlined in Section 9.2.1. *Redevelopment activities* located in an Enhanced Phosphorus Removal Watershed (see Part III.B.3. and Appendix C) must calculate the WQv in accordance with Section 4.3 of the DM. All other *redevelopment activities* must calculate the WQv in accordance with Section 4.2 of the DM.

1. Reduce the existing *impervious cover* by a minimum of 25% of the total disturbed, *impervious area*. The Soil Restoration criteria in Section 5.1.6 of the DM must be applied to all newly created pervious areas; or

2. Capture and treat 100% of the required WQv, for a minimum of 25% of the disturbed redevelopment *impervious area*, by implementation of standard SMPs or reduced by application of runoff reduction techniques; or

3. Capture and treat 100% of the required WQv, for a minimum of 75% of the disturbed redevelopment *impervious area*, by implementation of a volume-based alternative SMP, as defined in Section 9.4 of the DM; or

4. Capture and treat 100% of the required WQv, for a minimum of 75% of the disturbed redevelopment *impervious area*, by implementation of a flow-through alternative SMP sized to treat the peak rate of runoff from the WQv design storm; or

5. Application of a combination of 1 through 4 above that provide a weighted average of at least two of the above methods. Application of this method must be in accordance with the criteria in Section 9.2.1(A)(V) of the DM; or

6. If there is an existing SMP located on the site that captures and treats runoff from the *impervious area* that is being disturbed, the WQv treatment option selected must, at a minimum, provide treatment equal to the treatment that was being provided by the existing practice(s) if that treatment is greater than the treatment required by options 1 through 5 above.

ii. Channel Protection Volume (CPv) is not required if there is 0% change to hydrology that increases the *discharge* rate and volume from the project site.

iii. *Overbank* Flood Control (Qp) is not required if there is 0% change to hydrology that increases the *discharge* rate from the project site.

iv. Extreme Flood Control (Qf) is not required if there is 0% change to hydrology that increases the *discharge* rate from the project site.

d. *Sizing Criteria* for Combination of *Redevelopment Activity* and *New Development*

Construction projects, that include both *new development* and *redevelopment activity*, must use SMPs that meet the *sizing criteria* calculated as an aggregate of the *sizing criteria* in Part II.C.2.a. or b. for the *new development* portion of the project and Part II.C.2.c. for the *redevelopment activity* portion of the project.

Part III. Stormwater Pollution Prevention Plan (SWPPP)

A. General *SWPPP* Requirements

1. A *SWPPP* must be prepared and implemented by the *owner or operator* of all *construction activity* covered by this permit. All authorized *discharges* must be identified in the *SWPPP*. The *SWPPP* must document the selection, design, installation, implementation and maintenance of the control measures and

practices that will be used to meet the effluent limitations in Part II.B. and, where applicable, the SMP requirements in Part II.C.

2. The *SWPPP* must demonstrate consideration in narrative format of the future physical risks due to climate change pursuant to the Community Risk and Resiliency Act (CRRA), 6 NYCRR Part 490, and associated guidance.

    a. The owner or operator must consider:

        i. the following physical risks due to climate change:

            (i) increasing temperature; and

            (ii) increasing precipitation; and

            (iii) increasing variability in precipitation, including chance of drought; and

            (iv) increasing frequency and severity of flooding; and

            (v) rising sea level; and

            (vi) increasing storm surge; and

            (vii) shifting ecology.

        ii. for each of the following:

            (i) overall site planning; and

            (ii) location, elevation, and sizing of:

                a. control measures and practices; and

                b. conveyance system(s); and

                c. detention system(s).

3. The *SWPPP* must describe the erosion and sediment control practices and where required, SMPs that will be used and/or constructed to reduce the *pollutants* in *stormwater discharges* and to assure compliance with the

requirements of this permit. In addition, the *SWPPP* must identify potential sources of pollution which may reasonably be expected to affect the quality of *stormwater discharges*.

4. All *SWPPPs*, that require the SMP component in accordance with Part III.B.2., must be prepared by a *qualified professional*.

5. The *owner or operator* must keep the *SWPPP* current so that, at all times, it accurately documents the erosion and sediment control practices that are being used or will be used during construction, and all SMPs that will be constructed on the site. At a minimum, the *owner or operator* must modify the *SWPPP*, including construction drawings:

   a. whenever the current provisions prove to be ineffective in *minimizing pollutants* in *stormwater discharges* from the site; and

   b. whenever there is a change in design, construction, or operation at the *construction site* that has or could have an effect on the *discharge* of *pollutants*; and

   c. to address issues or deficiencies identified during an inspection by the *qualified inspector,* NYSDEC, or other regulatory authority; and

   d. to document the final construction conditions in an as-built drawing.

6. NYSDEC may notify the *owner or operator* at any time that the *SWPPP* does not meet one or more of the minimum requirements of this permit. The notification must be in writing and identify the provisions of the *SWPPP* that require modification. Within fourteen (14) calendar days of such notification, or as otherwise indicated by NYSDEC, the *owner or operator* must make the required changes to the *SWPPP* and submit written notification to NYSDEC that the changes have been made. If the *owner or operator* does not respond to NYSDEC's comments in the specified time frame, NYSDEC may suspend the *owner's or operator's* coverage under this permit or require the *owner or operator* to obtain coverage under an individual SPDES permit in accordance with Part II.D.4.

7. Prior to the *commencement of construction activity*, the *owner or operator* must identify the contractor(s) and subcontractor(s) that will be responsible for installing, constructing, repairing, replacing, inspecting, and maintaining the erosion and sediment control practices included in the *SWPPP* and the

contractor(s) and subcontractor(s) that will be responsible for constructing the SMPs included in the *SWPPP*. The *owner or operator* must have each of the contractors and subcontractors identify at least one person from their company to be *trained contractor* that will be responsible for implementation of the *SWPPP*. The *owner or operator* must ensure that at least one *trained contractor* is on site daily when soil disturbance activities are being performed.

The *owner or operator* must have each of the contractors and subcontractors identified above sign a copy of the following certification statement below before the *commencement of construction activities*:

> "I hereby certify under penalty of law that I understand and agree to comply with the requirements of the *SWPPP* and agree to implement any corrective actions identified by the *qualified inspector* during a site inspection. I also understand that the *owner or operator* must comply with the requirements of the most current version of the New York State Pollutant Discharge Elimination System (SPDES) Construction General Permit (CGP) for Stormwater Discharges from Construction Activities and that it is unlawful for any person to cause or contribute to a violation of *water quality standards*. Furthermore, I am aware that there are significant penalties for submitting false information, that I do not believe to be true, including the possibility of fine and imprisonment for knowing violations"

In addition to providing the certification statement above, the certification page must also identify the specific elements of the *SWPPP* that each contractor and subcontractor will be responsible for and include the name and title of the person providing the signature; the name and title of the *trained contractor* responsible for *SWPPP* implementation; the name, address and telephone number of the contracting firm; the address (or other identifying description) of the site; and the date the certification statement is signed. The *owner or operator* must attach the certification statement(s) to the copy of the *SWPPP* that is maintained at the *construction site*. If new or additional contractors are hired to implement measures identified in the *SWPPP* after the *commencement of construction activities*, they must also sign the certification statement and provide the information listed above prior to performing *construction activities*.

B. Required *SWPPP* Contents

1. Erosion and sediment control component - The *owner or operator* must prepare a *SWPPP* that includes erosion and sediment control practices.

    a. Erosion and sediment control practices must be designed:

        i. in conformance with the BB; or

        ii. *equivalent* to the BB if deviating from Part III.B.1.a.i.

    b. If the erosion and sediment control practices are designed in conformance with Part III.B.1.a.ii., the *SWPPP* must include a demonstration of *equivalence* to the BB.

    c. At a minimum, the erosion and sediment control component of the *SWPPP* must include the following:

        i. Background information about the scope of the project, including the location, type and size of project; and

        ii. A site map/construction drawing(s) with north arrows for the project, including a general location map. At a minimum, the site map must show the total site area; all improvements; areas of disturbance; areas that will not be disturbed; existing vegetation; on-site and adjacent off-site surface water(s); floodplain/floodway boundaries; wetlands and drainage patterns that could be affected by the *construction activity*; existing and final contours; locations of different soil types with boundaries; material, waste, borrow or equipment storage areas located on adjacent properties; and location(s) of the *stormwater discharge*(s) and receiving surface water(s); and

        iii. A description of the soil(s) present at the site, including an identification of the Hydrologic Soil Group (HSG); and

        iv. A phasing plan for the project and sequencing plans for all *phases*, both of which must address clearing and grubbing, excavation and grading, utility and infrastructure installation, *final stabilization*,

and any other *construction activity* at the site that will result in soil disturbance.

1. The phasing plan must include:

    a. a map delineating and labeling the limits of soil disturbance for all *phases* of a project; and

    b. a table identifying the order and intended schedule of when each *phase* will begin and end its sequencing plan. The table must identify the total disturbed area for each *phase* at any one time and the total disturbed area for the overall project at any one time all on one timeline showing all overlapping quantities of disturbed area at any one time; and

2. A sequencing plan for a specific *phase* must include:

    a. a table indicating the order and intended schedule of *construction activities* within a *phase*, and corresponding construction drawings with a description of the work to be performed; and

    b. all permanent and *temporary stabilization* measures; and

v. A description of the minimum erosion and sediment control practices to be installed or implemented for each *construction activity* that will result in soil disturbance. Include a schedule that identifies the timing of initial placement or implementation of each erosion and sediment control practice and the minimum time frames that each practice should remain in place or be implemented; and

vi. A site map/construction drawing(s) showing the specific location(s), size(s), and length(s) of each erosion and sediment control practice; and

vii. The dimensions, material specifications, installation details, and operation and maintenance requirements for all erosion and sediment control practices. Include the location and sizing of any

temporary sediment basins and structural practices that will be used to divert flows from exposed soils; and

viii. A maintenance inspection schedule for the contractor(s) and subcontractor(s) identified in Part III.A.7. to ensure continuous and effective operation of the erosion and sediment control practices. The maintenance inspection schedule must be in accordance with the requirements in the BB technical standard; and

ix. A description of the pollution prevention measures that will be used to control litter, construction chemicals and construction debris from becoming a *pollutant* source in the *stormwater discharges*; and

x. A description and location of any *stormwater discharges* associated with industrial activity other than construction at the site, including, but not limited to, *stormwater discharges* from asphalt plants and concrete plants located on the *construction site*; and

xi. Identification of any elements of the design that are not in conformance with the design criteria in the BB technical standard. Include the reason for the deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the technical standard.

2. SMP component – The *owner or operator* of *construction activity* identified in Table 2 of Appendix B must prepare a *SWPPP* that includes SMPs.

   a. SMPs must be designed in conformance with the applicable *sizing criteria* in Part II.C.2.a., c., or d.; and

   b. SMPs must be designed in conformance with the *performance criteria*:

      i. in the DM; or

      ii. *equivalent* to the DM if deviating from Part III.B.2.b.i.; or

      iii. in the New York State Stormwater Management Design Manual, dated January 2015 (2015 Design Manual), or *equivalent* to it, if the following criteria are met:

1. The eNOI is submitted in accordance with Part I.D. before January 29, 2027 for *construction activities* that are either:

    a. subject to governmental review and approval:

        i. where the *owner or operator* made any application to that governmental entity prior to the effective date of this permit; and

        ii. such application included a *SWPPP* developed using the 2015 Design Manual or *equivalent* to it; or

    b. not subject to governmental review and approval:

        i. where a fiscal allocation for the *construction activities* has been developed and approved by a governmental entity; and

        ii. the *SWPPP* was developed using the 2015 Design Manual or *equivalent* to it; and

c. If SMPs are designed in conformance with Part III.B.2.b.ii., the *SWPPP* must include the reason(s) for the deviation or alternative design and a demonstration of *equivalence* to the DM; and

d. If SMPs are designed in conformance with Part III.B.2.b.iii., the *SWPPP* must include supporting information or documentation demonstrating that Part III.B.2.b.iii.1.a. or b. apply; and

e. The SMP component of the *SWPPP* must include the following:

    i. Identification of all SMPs to be constructed as part of the project, including which option the SMP designs conform to, either Part III.B.2.b.i., ii., or iii. Include the dimensions, material specifications and installation details for each SMP; and

    ii. A site map/construction drawing(s) showing the specific location and size of each SMP; and

iii. A Stormwater Modeling and Analysis Report that includes:

(i) Map(s) showing pre-development conditions, including watershed/subcatchments boundaries, flow paths/routing, and design points; and

(ii) Map(s) showing post-development conditions, including watershed/subcatchments boundaries, flow paths/routing, design points and SMPs; and

(iii) Results of *stormwater* modeling (i.e. hydrology and hydraulic analysis) for the required storm events. Include supporting calculations (model runs), methodology, and a summary table that compares pre- and post-development runoff rates and volumes for the different storm events; and

(iv) Summary table, with supporting calculations, which demonstrates that each SMP has been designed in conformance with the *sizing criteria* included in the DM; and

(v) Identification of any *sizing criteria* that is not required based on the requirements included in Part II.C.; and

(vi) Identification of any elements of the design that are not in conformance with the *performance criteria* in the DM. Include the reason(s) for the deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the DM.

iv. Soil testing results and locations (test pits, borings); and

v. Infiltration test results, when required in accordance with Part III.B.2.a.; and

vi. An operations and maintenance plan that includes inspection and maintenance schedules and actions to ensure continuous and effective operation of each SMP. The plan must identify the entity

that will be responsible for the long-term operation and maintenance of each practice; and

3. Enhanced Phosphorus Removal Standards - The *owner or operator* of *construction activity* identified in Table 2 of Appendix B that is located in a watershed identified in Appendix C must prepare a *SWPPP* that includes SMPs designed in conformance with the applicable *sizing criteria* in Part II.C.2.b., c., or d. and the *performance criteria* Enhanced Phosphorus Removal Standards included in the DM. At a minimum, the SMP component of the *SWPPP* must meet the requirements of Part III.B.2.

C. Required *SWPPP* Components by Project Type

Owners or operators of *construction activities*, identified in Table 1 of Appendix B, are required to prepare a *SWPPP* that only includes erosion and sediment control practices designed in accordance with Part III.B.1. *Owners or operators* of the *construction activities*, identified in Table 2 of Appendix B, must prepare a *SWPPP* that also includes SMPs designed in accordance with Part III.B.2 or 3.

For the entire area of disturbance, including the entire *common plan of development or sale* if applicable, the owner or operator must evaluate every bullet from Appendix B Table 1 and Table 2 separately. If bullets from both Table 1 and Table 2 apply, the *SWPPP* must include erosion and sediment control practices for all *construction activities* but SMPs for only those portions of the *construction activities* that fall under Table 2 bullet(s).

Part IV. Inspection and Maintenance Requirements

A. General Construction Site Inspection and Maintenance Requirements

1. The *owner or operator* must ensure that all erosion and sediment control practices (including pollution prevention measures), and all SMPs identified in the *SWPPP*, are inspected and maintained in accordance with Part IV.B. and C.

B. Contractor Maintenance Inspection Requirements

1. The *owner or operator* of each *construction activity*, identified in Tables 1 and 2 of Appendix B, must have a *trained contractor* inspect the erosion and sediment control practices and pollution prevention measures being

implemented within the active work area daily to ensure that they are being maintained in effective operating condition at all times. If deficiencies are identified, the contractor must:

a. if the corrective action does not require engineering design:

    i. begin implementing corrective actions within one business day; and

    ii. complete the corrective actions within five business days; or

b. if the corrective action requires engineering design:

    i. begin the engineering design process within five business days; and

    ii. complete the corrective action in a reasonable time frame but no later than within 60 calendar days.

2. For *construction sites* where soil disturbance activities have been temporarily suspended (e.g. winter shutdown) and *temporary stabilization* measures have been applied to all disturbed areas, the *trained contractor* can stop conducting the maintenance inspections in accordance with Part IV.B.1. The *trained contractor* must begin conducting the maintenance inspections in accordance with Part IV.B.1. as soon as soil disturbance activities resume.

3. For *construction sites* where soil disturbance activities have been shut down with partial project completion, the *trained contractor* can stop conducting the maintenance inspections in accordance with Part IV.B.1. if all areas disturbed as of the project shutdown date have achieved *final stabilization* and all SMPs required for the completed portion of the project have been constructed in conformance with the *SWPPP* and are operational.

C. *Qualified Inspector* Inspection Requirements

1. With the exception of the following *construction activities* identified in Tables 1 and 2 of Appendix B, a *qualified inspector* must conduct site inspections for all other *construction activities* identified in Tables 1 and 2 of Appendix B:

    a. the construction of a single-family residential subdivision with 25% or less *impervious cover* at total site build-out that involves a soil disturbance of one (1) or more acres of land but less than or equal to five (5) acres and is

not located in one of the watersheds listed in Appendix C and not *directly discharging* to one of the 303(d) segments listed in Appendix D; and

b. the construction of a single-family home that involves soil disturbances of one (1) or more acres but less than or equal to five (5) acres and is not located in one of the watersheds listed in Appendix C and not *directly discharging* to one of the 303(d) segments listed in Appendix D; and

c. construction on *agricultural property* that involves soil disturbances of one (1) or more acres but less than five (5) acres; and

d. *construction activities* located in the New York City Watershed located east of the Hudson River, see Appendix C Figure 1, that involve soil disturbances of 5,000 square feet or more, but less than one acre.

2. The *qualified inspector* must conduct site inspections in accordance with the following timetable:

   a. For *construction sites* where soil disturbance activities are on-going, the *qualified inspector* must conduct a site inspection at least once every seven (7) calendar days; or

   b. For *construction sites* where soil disturbance activities are on-going and the *owner or operator* has received authorization in accordance with Part I.E.6. to disturb greater than five (5) acres of soil at any one time, the *qualified inspector* must conduct at least two (2) site inspections every seven (7) calendar days. The two (2) inspections must be separated by a minimum of two (2) full calendar days; or

   c. For *construction sites* where soil disturbance activities have been temporarily suspended (e.g. winter shutdown) and *temporary stabilization* measures have been applied to all disturbed areas, the *qualified inspector* must conduct a site inspection at least once every thirty (30) calendar days. The *owner or operator* must notify the DOW Water (SPDES) Program contact at the Regional Office (see contact information in Appendix E) or, in areas under the jurisdiction of a *Traditional Land Use Control MS4 Operator,* the *Traditional Land Use Control MS4 Operator* (provided the *Traditional Land Use Control MS4 Operator* is not the *owner or operator* of the *construction activity*) by hard copy or email prior to reducing the inspections to this frequency and again by hard copy or email prior to re-commencing construction; or

d. For *construction sites* where soil disturbance activities have been shut down with partial project completion, the requirement to have the *qualified inspector* conduct inspections ceases if all areas disturbed as of the project shutdown date have achieved *final stabilization* and all SMPs required for the completed portion of the project have been constructed in conformance with the *SWPPP* and are operational. The *owner or operator* must notify the DOW Water (SPDES) Program contact at the Regional Office (see contact information in Appendix E) or, in areas subject to the review authority of *Traditional Land Use Control MS4 Operator(s)* in accordance with Part I.D.2.b.ii.1., the *Traditional Land Use Control MS4 Operator(s)* (provided the *Traditional Land Use Control MS4 Operator(s)* are not the *owners or operators* of the *construction activity*) in writing prior to the shutdown and again in writing prior to resuming *construction activity*. If soil disturbance activities are not resumed within 2 years from the date of shutdown, the *owner or operator* must terminate coverage by meeting the requirements of Part V; or

e. For *construction sites* involving soil disturbance of one (1) or more acres that *directly discharge* to one of the 303(d) segments listed in Appendix D or is located in one of the watersheds listed in Appendix C, the *qualified inspector* must conduct at least two (2) site inspections every seven (7) calendar days. The two (2) inspections must be separated by a minimum of two (2) full calendar days.

3. At a minimum, the *qualified inspector* must inspect:

   a. all erosion and sediment control practices and pollution prevention measures to ensure integrity and effectiveness; and

   b. all SMPs under construction to ensure that they are constructed in conformance with the *SWPPP*; and

   c. all areas of disturbance that have not achieved *final stabilization*; and

   d. all points of *discharge* to *surface waters of the State* located within, or immediately adjacent to, the property boundaries of the *construction site*; and

   e. all points of *discharge* from the *construction site*.

4. The *qualified inspector* must prepare an inspection report subsequent to each and every inspection. At a minimum, the inspection report must include and/or address all of the following, for all *construction activities* except those listed in Part IV.C.1.:

   a. Permit identification number; and

   b. Date and time of inspection; and

   c. Name and title of person(s) performing inspection; and

   d. A description of the weather and soil conditions (e.g. dry, wet, saturated) at the time of the inspection, including the temperature at the time of the inspection; and

   e. A description of the condition of the runoff at all points of *discharge* from the *construction site*. This must include identification of any *discharges* of sediment from the *construction site*. Include *discharges* from conveyance systems (i.e. pipes, culverts, ditches, etc.) and overland flow; and

   f. A description of the condition of all *surface waters of the State* located within, or immediately adjacent to, the property boundaries of the *construction site* which receive runoff from disturbed areas. This must include identification of any *discharges* of sediment to the *surface waters of the State*; and

   g. Identification of all erosion and sediment control practices and pollution prevention measures that need repair or maintenance; and

   h. Identification of all erosion and sediment control practices and pollution prevention measures that were not installed properly or are not functioning as designed and need to be reinstalled or replaced; and

   i. Description and sketch (map) of areas with active soil disturbance activity, areas that have been disturbed but are inactive at the time of the inspection, and areas that have been stabilized (temporary and/or final) since the last inspection; and

   j. Estimates, in square feet or acres, of the following areas:

i. Total area with active soil disturbance (not requiring either *temporary stabilization* or *final stabilization*); and

ii. Total area with inactive soil disturbance (requiring either *temporary stabilization* or *final stabilization*); and

iii. Total area that has achieved *temporary stabilization*; and

iv. Total area that has achieved *final stabilization*; and

k. Current stage of construction of all SMPs and identification of all *construction activity* on site that is not in conformance with the *SWPPP* and technical standards; and

l. Corrective action(s) that must be taken to install, repair, replace or maintain erosion and sediment control practices and pollution prevention measures; and to correct deficiencies identified with the construction of the SMP(s); and

m. Identification and status of all corrective actions that were required by previous inspection; and

n. Digital photographs, with date stamp, that clearly show the condition of all practices that have been identified as needing corrective actions. The *qualified inspector* must attach color copies of the digital photographs to the inspection report being maintained onsite within seven (7) calendar days of the date of the inspection. The *qualified inspector* must also take digital photographs, with date stamp, that clearly show the condition of the practice(s) after the corrective action has been completed. The *qualified inspector* must attach paper color copies of the digital photographs to the inspection report that documents the completion of the corrective action work within seven (7) calendar days of that inspection.

5. Within one business day of the completion of an inspection, the *qualified inspector* must notify the *owner or operator*, and appropriate contractor or subcontractor identified in Part III.A.7., of any corrective actions that need to be taken. The contractor or subcontractor must:

a. if the corrective action does not require engineering design:

i. begin implementing corrective actions within one business day; and

ii. complete the corrective actions within five business days; or

b. if the corrective action requires engineering design:

i. begin the engineering design process within five business days; and

ii. complete the corrective action in a reasonable time frame but no later than within 60 calendar days.

6. All inspection reports must be signed by the *qualified inspector.* In accordance with Part I.E.3., the inspection reports must be maintained on site with the *SWPPP*.

Part V. How to Terminate CGP Coverage

A. Electronic Notice of Termination (eNOT) Submittal

The eNOT contains questions to ensure requirements in Part V.A. have been met.

1. An *owner or operator* must terminate coverage when one or more of the following requirements have been met:

a. Total project completion:

i. all *construction activity* identified in the *SWPPP* has been completed; and

ii. all areas of disturbance have achieved *final stabilization*; and

iii. all temporary, structural erosion and sediment control measures have been removed; and

iv. all SMPs have been constructed in conformance with the *SWPPP* and are operational; and

v. an as-built drawing has been prepared; or

b. Planned shutdown with partial project completion:

   i. all soil disturbance activities have ceased; and

   ii. all areas disturbed as of the project shutdown date have achieved *final stabilization*; and

   iii. all temporary, structural erosion and sediment control measures have been removed; and

   iv. all SMPs required for the completed portion of the project have been constructed in conformance with the *SWPPP* and are operational; and

   v. an as-built drawing has been prepared; or

c. In accordance with Part I.G. Change of Owner or Operator; or

d. The *owner or operator* has obtained coverage under an alternative general SPDES permit or an individual SPDES permit.

2. For *construction activities* that require *qualified inspector* inspections in accordance with Part IV.C.1. and have met Part V.A.1.a. or b., the *owner or operator* must have the *qualified inspector* perform a final site inspection prior to submitting the eNOT. The *qualified inspector* must, by signing the "Final Stabilization" and "Post-Construction Stormwater Management Practice(s)" certification statements on the eNOT, certify that all the requirements in Part V.A.1.a. or b. have been achieved.

3. For *construction activities* that are subject to the review authority of *Traditional Land Use Control MS4 Operator(s)* in accordance with Part I.D.2.b.ii.1. and meet Part V.A.1.a. or b., the *owner or operator* must have the *Traditional Land Use Control MS4 Operator(s)* sign the "MS4 Acceptance" statement on the eNOT in accordance with the requirements in Part VII.J. A *Traditional Land Use Control MS4 Operator* official, by signing this statement, determined that it is acceptable for the *owner or operator* to submit the eNOT in accordance with the requirements of this Part. A *Traditional Land Use Control MS4 Operator* can make this determination by performing a final site inspection themselves or by accepting the *qualified inspector*'s final site inspection certification(s) when required in Part V.A.2.

4. For *construction activities* that require SMPs and meet Part V.A.1.a. or b., the *owner or operator* must, prior to submitting the eNOT, ensure one of the following:

    a. for SMP(s) that were constructed by a private entity, but will be owned, operated, and maintained by a public entity, the SMP(s) and any right-of-way(s) needed to operate and maintain such practice(s) have been deeded to the municipality in which the practice(s) is located; or

    b. for SMP(s) that are privately owned, but will be operated and maintained by a public entity, an executed operation and maintenance agreement is in place with the municipality that will operate and maintain the SMP(s); or

    c. for SMP(s) that are privately owned, the *owner or operator* has a mechanism in place that requires operation and maintenance of the practice(s) in accordance with the operation and maintenance plan, such as a deed covenant in the *owner or operator's* deed of record; or

    d. for SMP(s) that are owned by a public or private institution (e.g. school, university, hospital), government agency or authority, or public utility, the *owner or operator* has policies and procedures in place that ensure operation and maintenance of the practices in accordance with the operation and maintenance plan.

5. An *owner or operator* that has met the requirements of Part V.A.1., 2., 3., and 4. must request termination of coverage under this permit by submitting a complete Notice of Termination form electronically using a NYSDEC approved form.[5]

    a. The owner's or operator's coverage is terminated as of the termination date indicated in the Letter of Termination (LOT), which is sent by NYSDEC after a complete eNOT is submitted.

[5] Unless NYSDEC grants a waiver in accordance with 40 CFR 127.15(c) or (d). All waiver requests must be submitted to Stormwater_info@dec.ny.gov or NYSDEC, Bureau of Water Permits, 625 Broadway, 4th Floor, Albany, New York 12233-3505.

Part VI. Record Retention and Reporting

A. Record Retention

The *owner or operator* must retain a copy of the documents listed in Part I.E.3. and a copy of the LOT for a period of at least five years from the date that NYSDEC accepts a complete NOT submitted in accordance with Part V.

B. Reporting

Except for the eNOI, the signature forms associated with the eNOI, and the eNOT, all other written correspondence requested by NYSDEC, including individual permit applications, must be sent to the address of the appropriate DOW (SPDES) Program contact at the Regional Office listed in Appendix E.

Part VII. Standard Permit Requirements

For the purposes of this permit, examples of contractors and subcontractors include: third-party maintenance and construction contractors.

A. Duty to Comply

The *owner or operator*, and all contractors or subcontractors, must comply with all requirements of this permit. Any non-compliance with the requirements of this permit constitutes a violation of the New York State Environmental Conservation Law (ECL), and its implementing regulations, and is grounds for enforcement action. Filing of a request for termination of coverage under this permit, or a notification of planned changes or anticipated non-compliance, does not limit, diminish or stay compliance with any requirements of this permit.

B. Need to Halt or Reduce Activity Not a Defense

The necessity to halt or reduce the *construction activity* regulated by this permit, in order to maintain compliance with the requirements of this permit, must not be a defense in an enforcement action.

C. Penalties

There are substantial criminal, civil, and administrative penalties associated with violating the requirements of this permit. Fines of up to $37,500 per day for each

violation and imprisonment for up to 15 years may be assessed depending upon the nature and degree of the offense.

D. False Statements

Any person who knowingly makes any false material statement, representation, or certification in any application, record, report, or other document filed or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance must, upon conviction, be punished in accordance with ECL §71-1933 and or New York State Penal Law Articles 175 and 210.

E. Re-Opener Clause

Upon issuance of this permit, a determination has been made on the basis of a submitted Notice of Intent, plans, or other available information, that compliance with the specified permit requirements will reasonably protect classified water use and assure compliance with applicable *water quality standards*. Satisfaction of the requirements of this permit notwithstanding, if operation pursuant to this permit causes or contributes to a condition in contravention of State *water quality standards* or guidance values, or if NYSDEC determines that a modification is necessary to prevent impairment of the best use of the waters or to assure maintenance of *water quality standards* or compliance with other provisions of ECL Article 17 or the Clean Water Act (CWA), or any regulations adopted pursuant thereto, NYSDEC may require such modification and the Commissioner may require abatement action to be taken by the *owner or operator* and may also prohibit such operation until the modification has been implemented.

F. Duty to Mitigate

The *owner or operator*, and its contractors and subcontractors, must take all reasonable steps to *minimize* or prevent any *discharge* in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

G. Requiring Another General Permit or Individual SPDES Permit

NYSDEC may require any *owner or operator* authorized to *discharge* in accordance with this permit to apply for and obtain an individual SPDES permit or apply for authorization to *discharge* in accordance with another general SPDES permit.

1. Cases where an individual SPDES permit or authorization to discharge in accordance with another general SPDES permit may be required include, but is not limited to the following:

a. the *owner or operator* is not in compliance with the conditions of this permit or does not meet the requirements for coverage under this permit; and

b. a change has occurred in the availability of demonstrated technology or practices for the control or abatement of *pollutants* applicable to the *point source*; and

c. new effluent limitation guidelines or new source performance standards are promulgated that are applicable to *point sources* authorized to *discharge* in accordance with this permit; and

d. existing effluent limitation guidelines or new source performance standards that are applicable to *point sources* authorized to *discharge* in accordance with this permit are modified; and

e. a water quality management plan containing requirements applicable to such *point sources* is approved by NYSDEC; and

f. circumstances have changed since the time of the request to be covered so that the *owner or operator* is no longer appropriately controlled under this permit, or either a temporary or permanent reduction or elimination of the authorized *discharge* is necessary; and

g. the *discharge* is in violation of section 17-0501 of the ECL; and

h. the *discharge(s)* is a significant contributor of *pollutants*. In making this determination, NYSDEC may consider the following factors:

   i. the location of the *discharge(s)* with respect to *surface waters of the State*; and

   ii. the size of the *discharge(s)*; and

   iii. the quantity and nature of the *pollutants discharged* to *surface waters of the State*; and

   iv. other relevant factors including compliance with other provisions of ECL Article 17, or the CWA.

2. When NYSDEC requires any *owner or operator* authorized by this permit to apply for an individual SPDES permit as provided for in this subdivision, it must notify the *owner or operator* in writing that a permit application is required. This notice must include a brief statement of the reasons for this decision, an application

form, a statement setting a time for the *owner or operator* to file the application for an individual SPDES permit, and a deadline, not sooner than 180 days from the *owner's or operator's* receipt of the notification letter, whereby the authorization to *discharge* under this permit must be terminated. NYSDEC may grant additional time upon demonstration, to the satisfaction of the RWE,[6] that additional time to apply for an alternative authorization is necessary or where NYSDEC has not provided a permit determination in accordance with 6 NYCRR Part 621.

3. When an individual SPDES permit is issued to an *owner or operator* authorized to *discharge* under this permit for the same *discharge(s)*, this permit authorization for *construction activities* authorized under the individual SPDES permit is automatically terminated on the effective date of the individual SPDES permit unless termination is earlier in accordance with 6 NYCRR Part 750.

H. Duty to Provide Information

The *owner or operator* must furnish to NYSDEC, within five business days, unless otherwise set forth by NYSDEC, any information that NYSDEC may request to determine whether cause exists to determine compliance with this permit or to determine whether cause exists for requiring an individual SPDES permit in accordance with 6 NYCRR 750-1.21(e) (see Part VII.G. Requiring Another General Permit or Individual Permit).

The *owner or operator* must make available to NYSDEC, for inspection and copying, or furnish to NYSDEC within 25 business days of receipt of a NYSDEC request for such information, any information retained in accordance with this permit.

Except for Part I.D.4. and 5. and Part I.G., the following applies: where the *owner or operator* becomes aware that it failed to submit any relevant facts on the Notice of Intent, or submitted incorrect information in a Notice of Intent or in any report to NYSDEC, the *owner or operator* must submit such facts or corrected information to NYSDEC within five business days.

I. Extension

In the event a new permit is not issued and effective prior to the expiration of this permit, and this permit is extended pursuant to the State Administrative Procedure Act and 6 NYCRR Part 621, then the *owner or operator* with coverage under this permit may continue to operate and *discharge* in accordance with the requirements of this permit until a new permit is issued and effective.

[6] The Regional Water Manager where a DEC Region does not have a RWE.

J. Signatories and Certification

The Notice of Intent, Notice of Termination, and reports required by this permit must be signed as provided in 40 CFR §122.22.

1. All Notices of Intent and Notices of Termination must be signed as follows:

    a. For a corporation. By a responsible corporate officer. For the purpose of this section, a responsible corporate officer means:

        (i) a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision-making functions for the corporation; or

        (ii) the manager of one or more manufacturing, production or operating facilities, provided, the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for Notice of Intent or Notice of Termination requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

        Note: NYSDEC does not require specific assignments or delegations of authority to responsible corporate officers identified in 40 CFR §122.22(a)(1)(i). NYSDEC will presume that these responsible corporate officers have the requisite authority to sign the Notice of Intent or Notice of Termination unless the corporation has notified NYSDEC to the contrary. Corporate procedures governing authority to sign a Notice of Intent or Notice of Termination may provide for assignment or delegation to applicable corporate positions under 40 CFR §122.22(a)(1)(ii) rather than to specific individuals.

    b. For a partnership or sole proprietorship. By a general partner or the proprietor, respectively.

c. For a municipality, State, Federal, or other public agency. By either a principal executive officer or ranking elected official. For purposes of this section, a principal executive officer of a Federal agency includes:

    1. the chief executive officer of the agency; or

    2. a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrators of EPA).

2. All reports required by this permit, and other information requested by NYSDEC, must be signed by a person described in Part VII.J.1., or by a duly authorized representative of that person. A person is a duly authorized representative only if:

    a. The authorization is made in writing by a person described in Part VII.J.1. or using the Duly Authorized Form, found on the DEC website; and

    b. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position); and

    c. The written authorization is submitted to NYSDEC.

3. Changes to authorization. If an authorization under Part VII.J.2. is no longer accurate because a different individual or position has responsibility for the overall operation of the *construction activity*, a new authorization satisfying the requirements of Part VII.J.2. must be submitted to NYSDEC prior to or together with any reports, information, or applications to be signed by an authorized representative.

4. Certification. Any person signing a document under Part VII.J.1. or 2. must make the following certification:

    I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who

manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

5. Electronic reporting. If documents described in Part VII.J.1. or 2. are submitted electronically by or on behalf of the *construction activity* with coverage under this permit, any person providing the electronic signature for such documents must meet all relevant requirements of this section, and must ensure that all of the relevant requirements of 40 CFR Part 3 (including, in all cases, subpart D to Part 3) (Cross-Media Electronic Reporting) and 40 CFR Part 127 (NPDES Electronic Reporting Requirements) are met for that submission.

K. Inspection and Entry

The *owner or operator* must allow NYSDEC, the USEPA Regional Administrator, the applicable county health department, or any authorized representatives of those entities, or, in the case of a *construction site* which *discharges* through an *MS4*, an authorized representative of the *MS4* receiving the *discharge*, upon the presentation of credentials and other documents as may be required by law, to:

1. enter upon the *owner's or operator's* premises where a regulated facility or activity is located or conducted or where records must be kept under the requirements of this permit; and

2. have access to and copy at reasonable times, any records that must be kept under the requirements of this permit, including records required to be maintained for purposes of operation and maintenance; and

3. inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices or operations regulated or required under this permit; and

4. sample or monitor at reasonable times, for the purposes of assuring general SPDES permit compliance or as otherwise authorized by the CWA or ECL, any substances or parameters at any location; and

5. enter upon the property of any contributor to the regulated facility or activity under authority of the *owner or operator*.

L. Confidentiality of Information

The following must not be held confidential: this permit, the fact sheet for this permit, the name and address of any *owner or operator*, effluent data, the Notice of Intent, and information regarding the need to obtain an individual permit or an alternative general SPDES permit. This includes information submitted on forms themselves and any attachments used to supply information required by the forms (except information submitted on usage of substances). Upon the request of the *owner or operator*, NYSDEC must make determinations of confidentiality in accordance with 6 NYCRR Part 616, except as set forth in the previous sentence. Any information accorded confidential status must be disclosed to the Regional Administrator upon his or her written request. Prior to disclosing such information to the Regional Administrator, NYSDEC will notify the Regional Administrator of the confidential status of such information.

M. Other Permits May Be Required

Nothing in this permit relieves the *owner or operator* from a requirement to obtain any other permits required by law.

N. NYSDEC Orders or Civil Decrees/Judgments

The issuance of this permit by the NYSDEC, and the coverage under this permit by the *owner or operator*, does not supersede, revoke, or rescind any existing order on consent or civil Decree/Judgment, or modification to any such documents or to any order issued by the Commissioner, or any of the terms, conditions, or requirements contained in such order or modification therefore, unless expressly noted.

O. Property Rights

Coverage under this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Federal, State, or local laws or regulations, nor does it obviate the necessity of obtaining the assent of any other jurisdiction as required by law for the *discharge* authorized.

P. Compliance with Interstate Standards

If the *construction activity* covered by this permit originates within the jurisdiction of an interstate water pollution control agency, then the *construction activity* must also comply with any applicable effluent standards or *water quality standards* promulgated by that interstate agency and as set forth in this permit for such *construction activities*.

Q. Oil and Hazardous Substance Liability

Coverage under this permit does not affect the imposition of responsibilities upon, or the institution of any legal action against, the *owner or operator* under section 311 of the CWA, which must be in conformance with regulations promulgated pursuant to section 311 governing the applicability of section 311 of the CWA to *discharges* from facilities with *NPDES* permits, nor must such issuance preclude the institution of any legal action or relieve the *owner or operator* from any responsibilities, liabilities, or penalties to which the *owner or operator* is or may be subject pursuant to the Comprehensive Environmental Response, Compensation and Liability Act of 1980, 42 U.S.C. section 9601 et seq. (CERCLA).

R. Severability

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, must not be affected thereby.

S. NYSDEC Approved Forms

The *owner or operator* must provide all relevant information that is requested by NYSDEC, and required by this permit, on all NYSDEC approved forms.

APPENDIX A – Abbreviations and Definitions

Abbreviations

APO – Agency Preservation Officer
BB – New York State Standards and Specifications for Erosion and Sediment Control (Blue Book), dated November 2016
BMP – Best Management Practice
CPESC – Certified Professional in Erosion and Sediment Control
CPv – Channel Protection Volume
CWA – Clean Water Act (or the Federal Water Pollution Control Act, 33 U.S.C. §1251 et seq)
DM – New York State Stormwater Management Design Manual (Design Manual), dated July 31, 2024
DOW – Division of Water
EAF – Environmental Assessment Form
ECL – chapter 43-B of the Consolidated Laws of the State of New York, entitled the Environmental Conservation Law
EPA – U.S. Environmental Protection Agency
HSG – Hydrologic Soil Group
MS4 – Municipal Separate Storm Sewer System
NOI – Notice of Intent
NOT – Notice of Termination
NPDES – National Pollutant Discharge Elimination System
NYC – The City of New York
NYCDEP – The City of New York Department of Environmental Protection
NYSDEC – The New York State Department of Environmental Conservation
OPRHP – Office of Parks, Recreation and Historic Places
Qf – Extreme Flood
Qp – Overbank Flood
RR – Runoff Reduction
RRv – Runoff Reduction Volume
RWE – Regional Water Engineer
SEQR – State Environmental Quality Review Act
SHPA – State Historic Preservation Act
SMP – Post-Construction Stormwater Management Practice
SPDES – State Pollutant Discharge Elimination System
SWPPP – Stormwater Pollution Prevention Plan
TMDL – Total Maximum Daily Load
UPA – Uniform Procedures Act
USDA – United States Department of Agriculture
WQv – Water Quality Volume

Definitions

All definitions in this section are solely for the purposes of this permit. If a word is not italicized in the permit, use its common definition.

Agricultural Building – a structure designed and constructed to house farm implements, hay, grain, poultry, livestock or other horticultural products; excluding any structure designed, constructed or used, in whole or in part, for human habitation, as a place of employment where agricultural products are processed, treated or packaged, or as a place used by the public.

Agricultural Property – the land for construction of a barn, *agricultural building*, silo, stockyard, pen or other structural practices identified in Table II in the "Agricultural Best Management Practice Systems Catalogue" (dated June 2023).

Alter Hydrology from Pre- to Post-Development Conditions – the post-development peak flow rate(s) has increased by more than 5% of the pre-developed condition for the design storm of interest (e.g. 10 yr and 100 yr).

Combined Sewer System – a sewer system which conveys sewage and *stormwater* through a single pipe system to a publicly owned treatment works.

Commence (Commencement of) Construction Activities – the initial disturbance of soils associated with clearing, grading or excavation activities; or other construction related activities that disturb or expose soils such as demolition, stockpiling of fill material, and the initial installation of erosion and sediment control practices required in the *SWPPP*. See definition for "*Construction Activity(ies)*" also.

Common Plan of Development or Sale – a contiguous area where multiple separate and distinct *construction activities* are occurring, or may occur, under one plan. The "common plan" of development or sale is broadly defined as any announcement or piece of documentation (including a sign, public notice or hearing, marketing plan, advertisement, drawing, permit application, State Environmental Quality Review Act (SEQR) environmental assessment form or other documents, zoning request, computer design, etc.) or physical demarcation (including boundary signs, lot stakes, surveyor markings, etc.) indicating *construction activities* may occur on a specific plot. A *common plan of development or sale* is comprised of two or more *phases*.

Common plan of development or sale does not include separate and distinct *construction activities* that are occurring, or may occur, under one plan that are at least 1/4 mile apart provided any interconnecting road, pipeline or utility project that is part of the same "common plan" is not concurrently being disturbed.

Construction Activity(ies) – identified within 40 CFR 122.26(b)(14)(x), 122.26(b)(15)(i), and 122.26(b)(15)(ii), any clearing, grading, excavation, filling, demolition or stockpiling activities that result in soil disturbance. Clearing activities can include, but are not limited to, mechanized logging equipment operation, the cutting and skidding of trees, stump removal and/or brush root removal.

Construction activity does not include routine maintenance that is performed to maintain the original line and grade, hydraulic capacity, or original purpose of a facility, which is excluded from the calculation of the soil disturbance for a project. Routine maintenance includes, but is not limited to:

- Re-grading of gravel roads or parking lots; and
- Cleaning and shaping of existing roadside ditches and culverts that maintains the approximate original line and grade, and maintains or improves the hydraulic capacity of the ditch; and
- Replacement of existing culverts that maintains the approximate original line and grade, and maintains or improves the hydraulic capacity of a ditch; and
- Replacement of existing bridges that maintains the approximate original line and grade, and maintains or improves the hydraulic capacity beneath the bridges; and
- Cleaning and shaping of existing roadside ditches that does not maintain the approximate original grade, hydraulic capacity and purpose of the ditch if the changes to the line and grade, hydraulic capacity or purpose of the ditch are installed to improve water quality and quantity controls (e.g. installing grass lined ditch); and
- Placement of aggregate shoulder backing that stabilizes the transition between the road shoulder and the ditch or *embankment*; and
- Full depth milling and filling of existing asphalt pavements, replacement of concrete pavement slabs, and similar work that does not expose soil or disturb the bottom six (6) inches of subbase material; and
- Long-term use of equipment storage areas at or near highway maintenance facilities; and
- Removal of sediment from the edge of the highway to restore a previously existing sheet-flow drainage connection from the highway surface to the highway ditch or *embankment*; and
- Existing use of Canal Corp owned upland disposal sites for the canal, and
- Replacement of curbs, gutters, sidewalks and guide rail posts; and
- Maintenance of ski trails including brush hog use and mowing; and
- Above ground snowmaking pipe replacement; and
- Replacement of existing utility poles; etc.

Construction Site – the land area where *construction activity(ies)* will occur. See also the definitions for "*Commence (Commencement of) Construction Activities"* and "*Common Plan of Development or Sale."*

Dewatering – the act of draining rainwater and/or groundwater from building foundations, vaults or excavations/trenches.

Directly Discharge(s)(ing) (to a specific surface waterbody) – runoff flows from a *construction site* by overland flow and the first point of *discharge* is the specific surface waterbody, or runoff flows from a *construction site* to a separate storm sewer system and the first point of *discharge* from the separate storm sewer system is the specific surface waterbody.

Discharge(s)(d) – any addition of any *pollutant* to waters of the State through an outlet or *point source*.

Embankment – an earthen or rock slope that supports a road/highway.

Equivalent (Equivalence) – the practice or measure meets all the performance, longevity, maintenance, and safety objectives of the technical standard and will provide an equal or greater degree of water quality protection.

Final Stabilization – all soil disturbance activities have ceased and a uniform, perennial vegetative cover with a density of eighty (80) percent over the entire pervious surface has been established; or other *equivalent* stabilization measures, such as permanent landscape mulches, rock rip-rap or washed/crushed stone have been applied on all disturbed areas that are not covered by permanent structures, concrete or pavement.

Historic Property – any building, structure, site, object or district that is listed on the State or National Registers of Historic Places or is determined to be eligible for listing on the State or National Registers of Historic Places.

Impervious Area (Cover) – all impermeable surfaces that cannot effectively infiltrate rainfall. This includes paved, concrete and compacted gravel surfaces (i.e. parking lots, driveways, roads, runways and sidewalks); building rooftops and miscellaneous impermeable structures such as patios, pools, and sheds.

Infeasible – not technologically possible, or not economically practicable and achievable considering best industry practices.

Minimize(ing)(ation) – reduce and/or eliminate to the extent achievable using control measures (including best management practices) that are technologically available and economically practicable and achievable in light of best industry practices.

Municipal Separate Storm Sewer System (MS4) - a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains):

1. owned or operated by a State, city, town, village, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, *stormwater*, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the CWA, that *discharges* to *surface waters of the State*; and

2. designed or used for collecting or conveying *stormwater*; and

3. which is not a *combined sewer system*; and

4. which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.2.

Natural Buffer(s) – an undisturbed area with natural cover running along a surface water (e.g. wetland, stream, river, lake, etc.).

New Development – any land disturbance that does not meet the definition of *Redevelopment Activity* included in this appendix.

New York State Erosion and Sediment Control Certificate Program – a certificate program that establishes and maintains a process to identify and recognize individuals who are capable of developing, designing, inspecting and maintaining erosion and sediment control plans on projects that disturb soils in New York State. The certificate program is administered by the New York State Conservation District Employees Association.

Nonpoint Source(s) – any source of water pollution or *pollutants* which is not a discrete conveyance or *point source* permitted pursuant to Title 7 or 8 of Article 17 of the Environmental Conservation Law (see ECL Section 17-1403).

Overbank – flow events that exceed the capacity of the stream channel and spill out into the adjacent floodplain.

Owner or Operator – the person, persons, or legal entity which owns or leases the property on which the *construction activity* is occurring; an entity that has operational control over the construction plans and specifications, including the ability to make modifications to the plans and specifications; and/or an entity that has day-to-day operational control of those activities at a project that are necessary to ensure compliance with the permit requirements.

Performance Criteria – the six performance criteria for each group of SMPs in Chapters 5 and 6 of the technical standard, New York State Stormwater Management Design Manual (DM), dated July 31, 2024. These include feasibility, conveyance, pretreatment, treatment, landscaping, and maintenance. It does not include the *Sizing Criteria* (i.e. WQv, RRv, CPv, Qp and Qf) in Part I.C.2. of the permit.

Phase – a defined area in which *construction activities* are occurring or will occur separate from other defined area(s).

Point Source – any discernible, confined, and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, vessel or other floating craft, or landfill leachate collection system from which *pollutants* are or may be *discharged*.

Pollutant(s) – dredged spoil, filter backwash, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand and industrial, municipal, agricultural waste and ballast *discharged* into water; which may cause or might reasonably be expected to cause pollution of the waters of the state in contravention of the standards or guidance values adopted as provided in 6 NYCRR Parts 700 et seq.

Qualified Inspector – a person that is knowledgeable in the principles and practices of erosion and sediment control, such as a licensed Professional Engineer, Certified Professional in Erosion and Sediment Control (CPESC), Registered Landscape Architect, *New York State Erosion and Sediment Control Certificate Program* holder or other NYSDEC endorsed individual(s).

It can also mean someone working under the direct supervision of, and at the same company as, the licensed Professional Engineer or Registered Landscape Architect, provided that person has training in the principles and practices of erosion and sediment control. Training in the principles and practices of erosion and sediment control means that the individual working under the direct supervision of the licensed Professional Engineer or Registered Landscape Architect has received four (4) hours of NYSDEC endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other NYSDEC endorsed entity. After receiving the initial training, the individual working under the direct supervision of the licensed Professional Engineer or Registered Landscape Architect shall receive four (4) hours of training every three (3) years.

It can also mean a person that meets the *Qualified Professional* qualifications in addition to the *Qualified Inspector* qualifications.

Note: Inspections of any SMPs that include structural components, such as a dam for an impoundment, shall be performed by a licensed Professional Engineer.

Qualified Professional – a person that is knowledgeable in the principles and practices of *stormwater* management and treatment, such as a licensed Professional Engineer, Registered Landscape Architect or other NYSDEC endorsed individual(s). Individuals preparing *SWPPPs* that require the SMP component must have an understanding of the principles of hydrology, water quality management practice design, water quantity control design, and, in many cases, the principles of hydraulics. All components of the *SWPPP* that involve the practice of engineering, as defined by the NYS Education Law (see Article 145), shall be prepared by, or under the direct supervision of, a professional engineer licensed to practice in the State of New York.

Redevelopment Activity(ies) – the disturbance and reconstruction of existing *impervious area*, including *impervious areas* that were removed from a project site within five (5) years of preliminary project plan submission to the local government (i.e. site plan, subdivision, etc.).

Renewable Energy – electricity or thermal energy generated by renewable energy systems through use of the following technologies: solar thermal, photovoltaics, on land and offshore wind, hydroelectric, geothermal electric, geothermal ground source heat, tidal energy, wave energy, ocean thermal, and fuel cells which do not utilize a fossil fuel resource in the process of generating electricity.

Site Limitations – site conditions that prevent the use of an infiltration technique and or infiltration of the total WQv. Typical *site limitations* include: seasonal high groundwater, shallow depth to bedrock, and soils with an infiltration rate less than 0.5 inches/hour. The existence of *site limitations* shall be confirmed and documented using actual field testing (i.e. test pits, soil borings, and infiltration test) or using information from the most current United States Department of Agriculture (USDA) Soil Survey for the County where the project is located.

Sizing Criteria – the criteria included in Part I.C.2 of the permit that are used to size SMPs. The criteria include; Water Quality Volume (WQv), Runoff Reduction Volume (RRv), Channel Protection Volume (Cpv), *Overbank* Flood (Qp), and Extreme Flood (Qf).

Steep Slope – land area designated on the current United States Department of Agriculture (USDA) Soil Survey as Soil Slope Phase D, (provided the map unit name or description is inclusive of slopes greater than 25%), or Soil Slope Phase E or F, (regardless of the map unit name), or a combination of the three designations.

Stormwater – that portion of precipitation that, once having fallen to the ground, is in excess of the evaporative or infiltrative capacity of soils, or the retentive capacity of surface features, which flows or will flow off the land by surface runoff to waters of the State.

Streambank – the terrain alongside the bed of a creek or stream. The bank consists of the sides of the channel, between which the flow is confined.

Stormwater Pollution Prevention Plan (SWPPP) – a project specific report, including construction drawings, that among other things: describes the *construction activity(ies)*, identifies the potential sources of pollution at the *construction site*; describes and shows the *stormwater* controls that will be used to control the *pollutants* (i.e. erosion and sediment controls; for many projects, includes SMPs); and identifies procedures the *owner or operator* will implement to comply with the requirements of the permit. See Part III of the permit for a complete description of the information that must be included in the *SWPPP*.

Surface Waters of the State – shall be construed to include lakes, bays, sounds, ponds, impounding reservoirs, springs, rivers, streams, creeks, estuaries, marshes, inlets, canals, the Atlantic ocean within the territorial seas of the state of New York and all other bodies of surface water, natural or artificial, inland or coastal, fresh or salt, public or private (except those private waters that do not combine or effect a junction with natural surface waters), which are wholly or partially within or bordering the state or within its jurisdiction. Waters of the state are further defined in 6 NYCRR Parts 800 to 941.

Temporarily Ceased – an existing disturbed area will not be disturbed again within 14 calendar days of the previous soil disturbance.

Temporary Stabilization – exposed soil has been covered with material(s) as set forth in the technical standard, New York Standards and Specifications for Erosion and Sediment Control, to prevent the exposed soil from eroding. The materials can include, but are not limited to, mulch, seed and mulch, and erosion control mats (e.g. jute twisted yarn, excelsior wood fiber mats).

Total Maximum Daily Load (TMDL) – the sum of the allowable loads of a single *pollutant* from all contributing point and *nonpoint source*s. It is a calculation of the maximum amount of a *pollutant* that a waterbody can receive and still meet *water quality standards*, and an allocation of that amount to the *pollutant's* sources. A TMDL stipulates Waste Load Allocations (WLA) for *point source discharges*, Load Allocations (LA) for *nonpoint source*s, and a margin of safety (MOS).

Traditional Land Use Control MS4 Operator – a city, town, or village with land use control authority that is authorized to *discharge* under New York State DEC's SPDES General Permit For Stormwater Discharges from Municipal Separate Stormwater Sewer Systems (MS4s) or the City of New York's Individual SPDES Permit for their Municipal Separate Storm Sewer Systems (NY-0287890).

Trained Contractor – an employee from the contracting (construction) company, identified in Part III.A.7., that has received four (4) hours of NYSDEC endorsed training

in proper erosion and sediment control principles from a Soil and Water Conservation District, or other NYSDEC endorsed entity. After receiving the initial training, the *trained contractor* shall receive four (4) hours of training every three (3) years.

It can also mean an employee from the contracting (construction) company, identified in Part III.A.7., that meets the *qualified inspector* qualifications (e.g. licensed Professional Engineer, Certified Professional in Erosion and Sediment Control (CPESC), Registered Landscape Architect, *New York State Erosion and Sediment Control Certificate Program* holder, or someone working under the direct supervision of, and at the same company as, the licensed Professional Engineer or Registered Landscape Architect, provided they have received four (4) hours of NYSDEC endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other NYSDEC endorsed entity).

The *trained contractor* is responsible for the day-to-day implementation of the *SWPPP*.

Tree Clearing – *construction activities* limited to felling and removal of trees.

Tree clearing does not include hand felling and leaving the trees in place with no support from mechanized equipment, which is not considered *construction activity* requiring coverage under this permit.

Water Quality Standard – such measures of purity or quality for any waters in relation to their reasonable and necessary use as promulgated in 6 NYCRR Part 700 et seq.

APPENDIX B – Required SWPPP Components by Project Type

Table 1
CONSTRUCTION ACTIVITIES THAT REQUIRE THE PREPARATION OF A *SWPPP* THAT ONLY INCLUDES EROSION AND SEDIMENT CONTROLS

The following *construction activities* that involve soil disturbances of one (1) or more acres of land, but less than five (5) acres:

- Single-family home not located in one of the watersheds listed in Appendix C and not *directly discharging* to one of the 303(d) segments listed in Appendix D
- Single-family residential subdivisions with 25% or less *impervious cover* at total site build-out and not located in one of the watersheds listed in Appendix C and not *directly discharging* to one of the 303(d) segments listed in Appendix D
- Construction of a barn or other *agricultural building*, silo, stock yard or pen.
- Structural agricultural conservation practices as identified in Table II in the "Agricultural Best Management Practice Systems Catalogue" (dated June 2023) that include construction or reconstruction of *impervious area* or *alter hydrology from pre- to post-development* conditions.

The following *construction activities* that involve soil disturbances between five thousand (5000) square feet and one (1) acre of land:

- All construction activities located in the New York City Watershed located east of the Hudson River, see Appendix C Figure 1, that involve soil disturbances between five thousand (5,000) square feet and one (1) acre of land.

Within the municipal boundaries of NYC:

- Stand-alone road reconstruction, where the total soil disturbance from only that road construction, is less than one (1) acre of land.

The following *construction activities*:

- Installation of underground linear utilities; such as gas lines, fiber-optic cable, cable TV, electric, telephone, sewer mains, and water mains
- Environmental enhancement projects, such as wetland mitigation, *stormwater* retrofits, stream restoration, and resiliency projects that reconstruct shoreline areas to address sea level rise
- Pond construction
- Linear bike paths running through areas with vegetative cover, including bike paths surfaced with an *impervious cover*
- Cross-country ski trails, walking/hiking trails, and mountain biking trails, including a de minimis parking lot (maximum 10 spaces total, sized for passenger cars) with 35 feet minimum preservation of undisturbed area downgradient from the parking lot
- Dam rehabilitation (the structure of the dam itself)
- Sidewalks, bike paths, or walking paths, surfaced with an *impervious cover*, that are not part of residential, commercial, or institutional development;
- Sidewalks, bike paths, or walking paths, surfaced with an *impervious cover*, that include incidental shoulder or curb work along an existing highway to support construction of the sidewalk, bike path, or walking path.

Table 1 (Continued)
CONSTRUCTION ACTIVITIES THAT REQUIRE THE PREPARATION OF A *SWPPP* THAT ONLY INCLUDES EROSION AND SEDIMENT CONTROLS

The following *construction activities*:

- Slope stabilization
- Slope flattening that changes the grade of the site, but does not significantly change the runoff characteristics
- Spoil areas that will be covered with vegetation
- Vegetated open space (i.e. recreational parks, lawns, meadows, fields, downhill ski trails) that do not *alter hydrology from pre- to post-development* conditions
- Athletic fields (natural grass) that do not include the construction or reconstruction of *impervious area* and do not *alter hydrology from pre- to post-development* conditions
- Demolition where vegetation will be established, and no *redevelopment activity* is planned[1]
- Installation or replacement of either an overhead electric transmission line or a ski lift tower that does not include the construction of permanent access roads or parking areas surfaced with *impervious cover*.
- Solar array field areas that have tables elevated off the ground, spaced one table width apart, do not *alter hydrology from pre- to post-development conditions*, and address water quality volume and runoff reduction volume by maintaining sheet flow on slopes less than 8%.
- Structural agricultural conservation practices as identified in Table II in the "Agricultural Best Management Practice Systems Catalogue" (dated June 2023) that do not include construction or reconstruction of *impervious area* and do not *alter hydrology from pre- to post-development* conditions.
- Temporary access roads, median crossovers, detour roads, lanes, or other temporary *impervious areas* that will be restored to pre-construction conditions once the *construction activity* is complete (in this context, "temporary" means the *impervious area* will be in place for two years or less)
- Other *construction activities* that do not include the construction or reconstruction of *impervious area*, and do not *alter hydrology from pre- to post-development* conditions, and are not listed in Table 2.

1. If the site is redeveloped in the future, a new eNOI must be submitted.

Table 2
CONSTRUCTION ACTIVITIES THAT REQUIRE THE PREPARATION OF A *SWPPP* THAT INCLUDES POST-CONSTRUCTION STORMWATER MANAGEMENT PRACTICES (SMPS)

The following *construction activities*:

- Single-family home located in one of the watersheds listed in Appendix C or *directly discharging* to one of the 303(d) segments listed in Appendix D
- Single-family home that disturbs five (5) or more acres of land
- Single-family residential subdivisions located in one of the watersheds listed in Appendix C or *directly discharging* to one of the 303(d) segments listed in Appendix D
- Single-family residential subdivisions that involve soil disturbances of between one (1) and five (5) acres of land with greater than 25% *impervious cover* at total site build-out
- Single-family residential subdivisions that involve soil disturbances of between 20,000 square feet and one (1) acre of land within the municipal boundaries of NYC with greater than 25% *impervious cover* at total site build-out
- Single-family residential subdivisions that involve soil disturbances of five (5) or more acres of land, and single-family residential subdivisions that involve soil disturbances of less than five (5) acres that are part of a *common plan of development or sale* that will ultimately disturb five (5) or more acres of land
- Multi-family residential developments; includes duplexes, townhomes, condominiums, senior housing complexes, apartment complexes, and mobile home parks
- Creation of 5,000 square feet or more of *impervious area* in the municipal boundaries of NYC
- Airports
- Amusement parks
- Breweries, cideries, and wineries, including establishments constructed on agricultural land
- Campgrounds
- Cemeteries that include the construction or reconstruction of *impervious area* (>5% of disturbed area) or *alter the hydrology from pre- to post-development* conditions
- Commercial developments
- Churches and other places of worship
- Construction of a barn or other *agricultural building* (e.g. silo) that involves soil disturbance greater than five acres.
- Structural agricultural conservation practices as identified in Table II in the “Agricultural Best Management Practice Systems Catalogue” (dated June 2023) that involves soil disturbance greater than five acres and include the construction or reconstruction of *impervious area* or *alter hydrology from pre- to post-development* conditions.
- Facility buildings, including ski lodges, restroom buildings, pumphouses, ski lift terminals, and maintenance and groomer garages
- Institutional development; includes hospitals, prisons, schools and colleges
- Industrial facilities; includes industrial parks
- Landfills; including creation of landfills or capping landfills.
- Municipal facilities; includes highway garages, transfer stations, office buildings, POTWs, water treatment plants, and water storage tanks
- Golf courses
- Office complexes

Table 2 (Continued)

CONSTRUCTION ACTIVITIES THAT REQUIRE THE PREPARATION OF A *SWPPP* THAT INCLUDES POST-CONSTRUCTION STORMWATER MANAGEMENT PRACTICES (SMPS)

The following *construction activities*:

- Permanent laydown yards and equipment storage lots
- Playgrounds that include the construction or reconstruction of *impervious area*
- Sports complexes
- Racetracks; includes racetracks with earthen (dirt) surfaces
- Road construction or reconstruction, outside the municipal boundaries of NYC
- Road construction within the municipal boundaries of NYC
- Stand-alone road reconstruction, within the municipal boundaries of NYC where the total soil disturbance from that road reconstruction involves soil disturbance of one (1) acre or more of land
- Parking lot construction or reconstruction (as with all Table 2 bullets, this includes parking lots constructed as part of the *construction activities* listed in Table 1, unless a Table 1 bullet specifies otherwise)
- Athletic fields (natural grass) that include the construction or reconstruction of *impervious area* (>5% of disturbed area) or *alter the hydrology from pre- to post-development* conditions
- Athletic fields with artificial turf
- Permanent access roads, parking areas, substations, compressor stations, and well drilling pads, surfaced with *impervious cover,* and constructed as part of an overhead electric transmission line, wind-power, cell tower, oil or gas well drilling, sewer or water main, ski lift, or other linear utility project
- Sidewalks, bike paths, or walking paths, surfaced with an *impervious cover*, that are part of a residential, commercial or institutional development
- Sidewalks, bike paths, or walking paths, surfaced with an *impervious cover*, that are part of highway construction or reconstruction
- Solar array field areas on slopes greater than 8% that cannot maintain sheet flow using management practices identified in the BB or the DM
- Solar array field areas on slopes less than 8% that will *alter the hydrology from pre- to post-development* conditions
- Solar array field areas with tables that are not elevated high enough to achieve *final stabilization* beneath the tables
- Traditional *impervious areas* associated with solar development (e.g. roads, buildings, transformers)
- Utility pads surfaced with *impervious cover*, including electric vehicle charging stations
- All other *construction activities* that include the construction or reconstruction of *impervious area* or *alter the hydrology from pre- to post-development* conditions, and are not listed in Table 1

APPENDIX C – Watersheds Requiring Enhanced Phosphorus Removal

Watersheds where *owners or operators* of *construction activities* identified in Table 2 of Appendix B must prepare a *SWPPP* that includes SMPs designed in conformance with the Enhanced Phosphorus Removal Standards included in the DM technical standard.

- Entire New York City Watershed located east of the Hudson River – Figure 1
- Onondaga Lake Watershed – Figure 2
- Greenwood Lake Watershed – Figure 3
- Oscawana Lake Watershed – Figure 4
- Kinderhook Lake Watershed – Figure 5

Figure 1 - New York City Watershed East of the Hudson

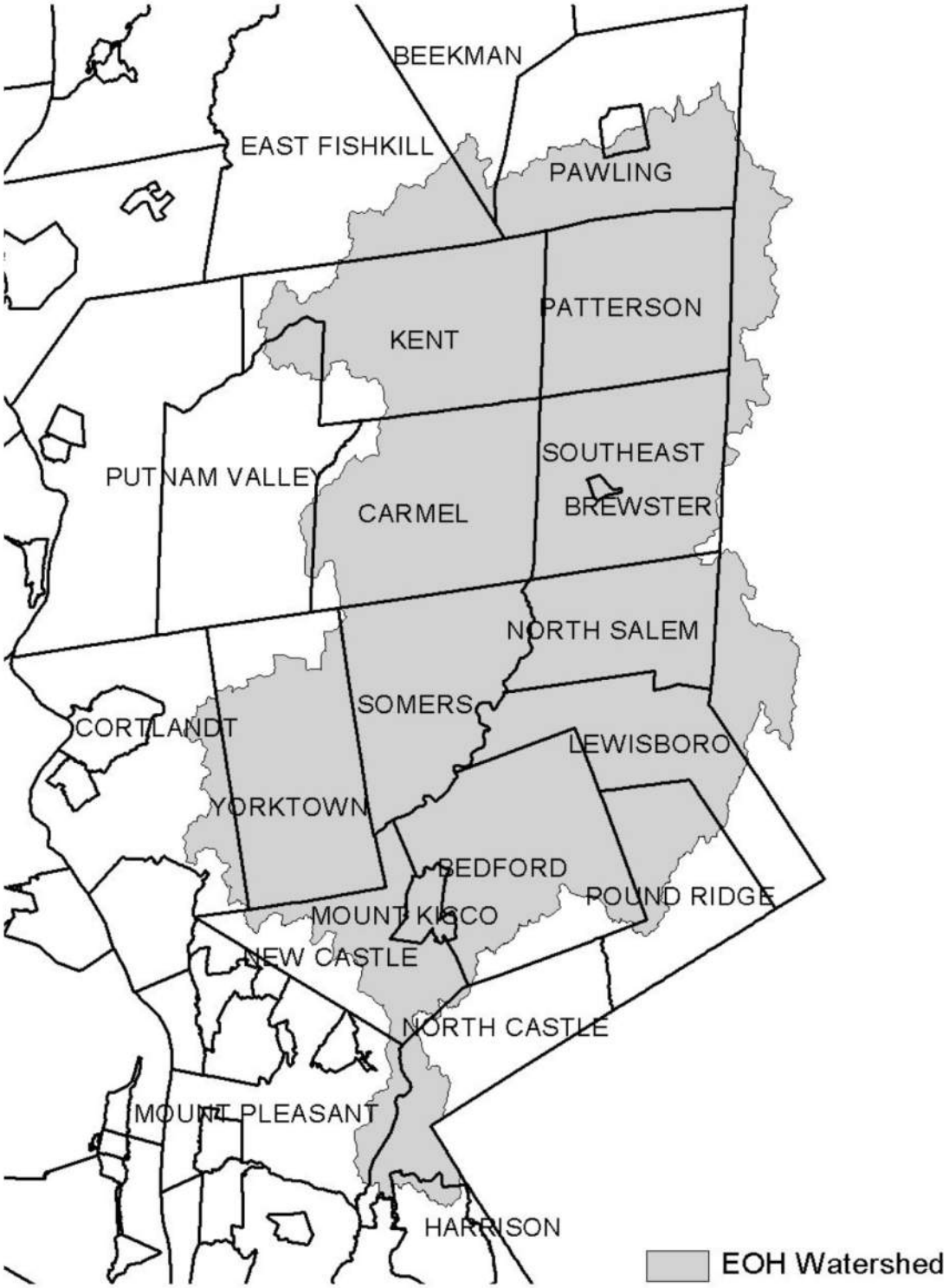


Figure 2 - Onondaga Lake Watershed

Figure 3 - Greenwood Lake Watershed

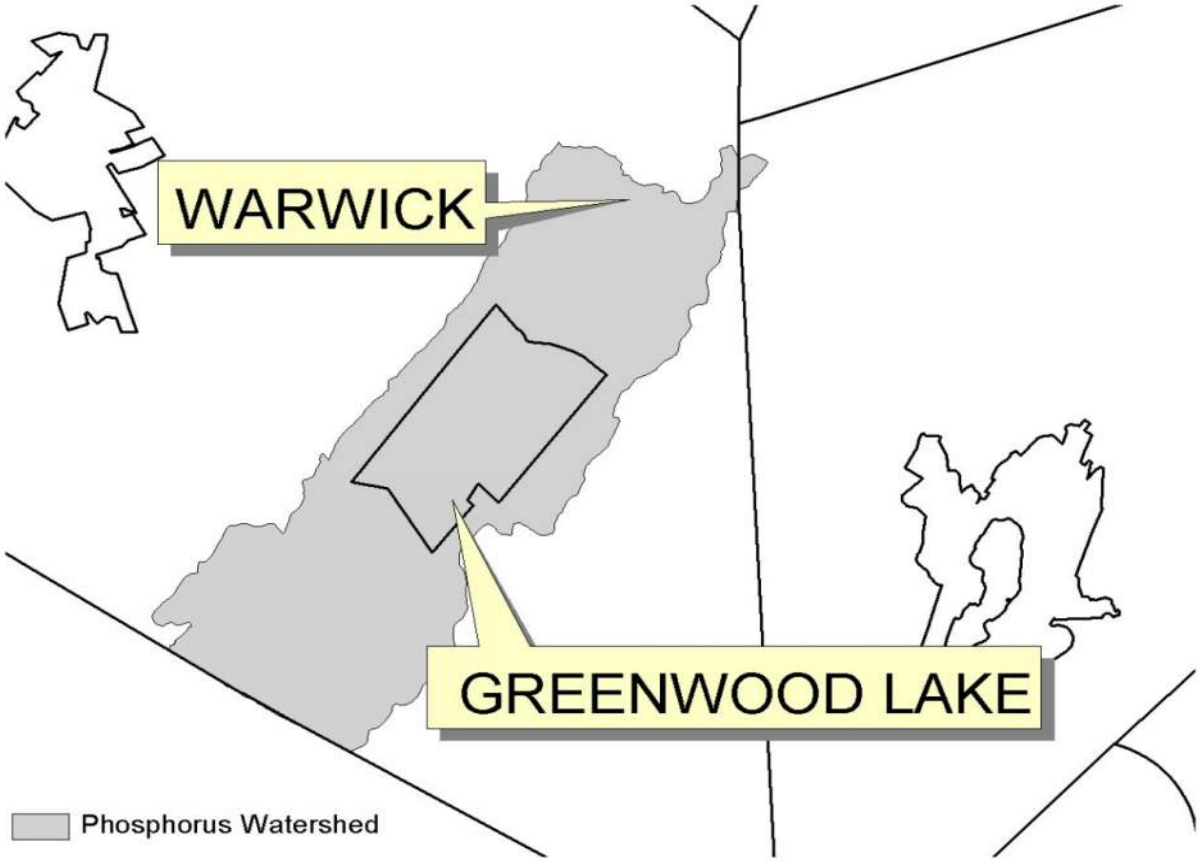


Figure 4 - Oscawana Lake Watershed

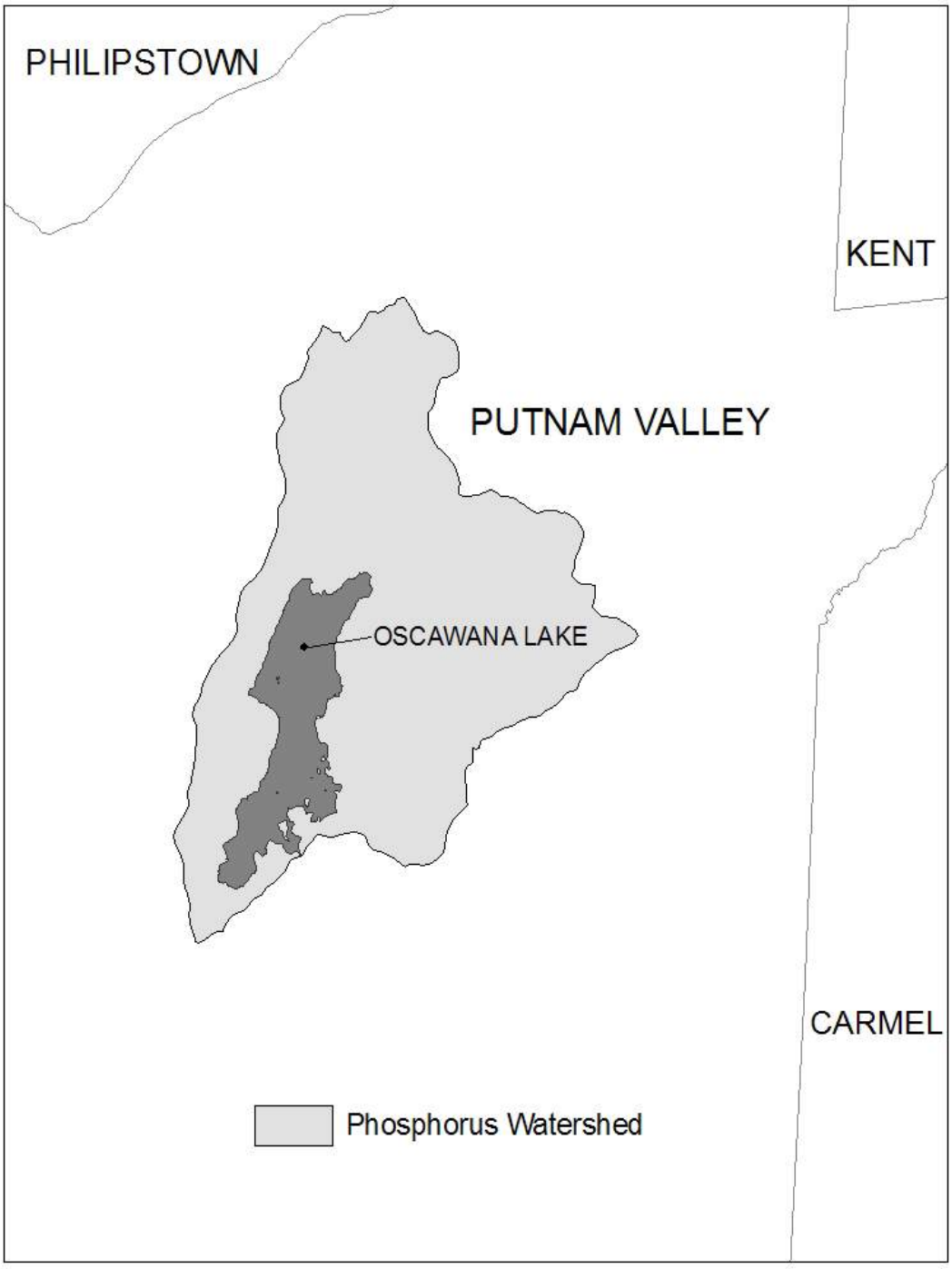
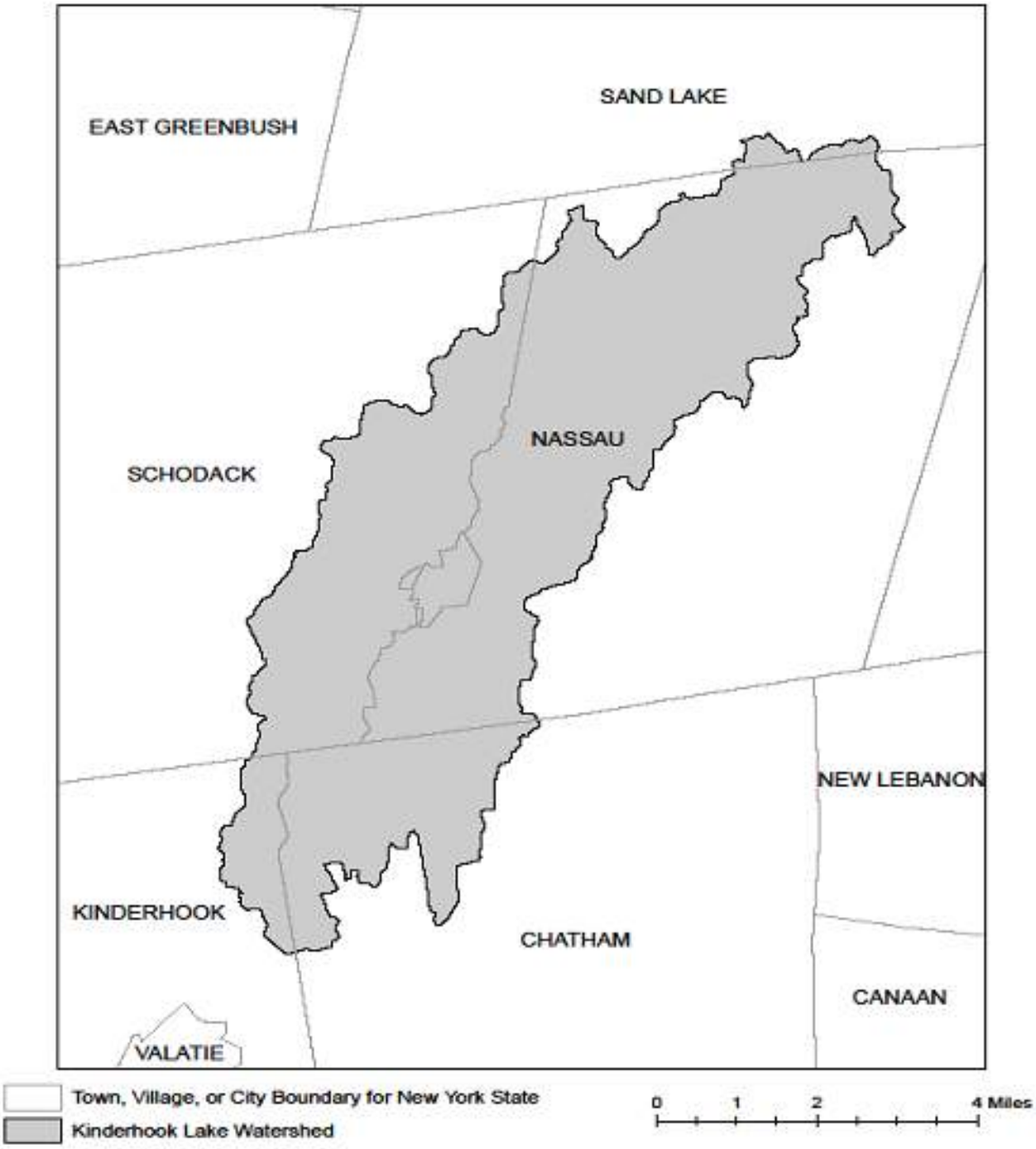


Figure 5 - Kinderhook Lake Watershed



APPENDIX D – Impaired Waterbodies (by Construction Related Pollutants)

List of waterbodies impaired by *pollutants* related to *construction activity*, including turbidity, silt/sediment, and nutrients (e.g. nitrogen, phosphorus). This list is a subset of "The Final New York State 2018 Section 303(d) List of Impaired Waters Requiring a TMDL" dated June 2020.

County	Waterbody	Pollutant
Albany	Ann Lee (Shakers) Pond, Stump Pond (1201-0096)	Phosphorus
Albany	Lawsons Lake (1301-0235)	Phosphorus
Allegany	Amity Lake, Saunders Pond (0403-0054)	Phosphorus
Allegany	Andover Pond (0403-0056)	Phosphorus
Bronx	Reservoir No.1/Lake Isle (1702-0075)	Phosphorus
Bronx	Van Cortlandt Lake (1702-0008)	Phosphorus
Broome	Blueberry, Laurel Lakes (1404-0033)	Phosphorus
Broome	Fly Pond, Deer Lake (1404-0038)	Phosphorus
Broome	Minor Tribs to Lower Susquehanna (0603-0044)	Phosphorus
Broome	Whitney Point Lake/Reservoir (0602-0004)	Phosphorus
Cattaraugus	Allegheny River/Reservoir (0201-0023)	Phosphorus
Cattaraugus	Beaver Lake/Alma Pond (0201-0073)	Phosphorus
Cattaraugus	Case Lake (0201-0020)	Phosphorus
Cattaraugus	Linlyco/Club Pond (0201-0035)	Phosphorus
Cayuga	Duck Lake (0704-0025)	Phosphorus
Cayuga	Owasco Inlet, Upper, and tribs (0706-0014)	Nutrients
Chautauqua	Chadakoin River and tribs (0202-0018)	Phosphorus
Chautauqua	Hulburt/Clymer Pond (0202-0079)	Phosphorus
Chautauqua	Middle Cassadaga Lake (0202-0002)	Phosphorus
Clinton	Great Chazy River, Lower, Main Stem (1002-0001)	Silt/Sediment
Columbia	Robinson Pond (1308-0003)	Phosphorus
Cortland	Dean Pond (0602-0077)	Phosphorus
Dutchess	Fallkill Creek (1301-0087)	Phosphorus
Dutchess	Hillside Lake (1304-0001)	Phosphorus
Dutchess	Wappingers Lake (1305-0001)	Phosphorus
Dutchess	Wappingers Lake (1305-0001)	Silt/Sediment
Erie	Beeman Creek and tribs (0102-0030)	Phosphorus
Erie	Delaware Park Pond (0101-0026)	Phosphorus
Erie	Ellicott Creek, Lower, and tribs (0102-0018)	Phosphorus
Erie	Ellicott Creek, Lower, and tribs (0102-0018)	Silt/Sediment
Erie	Green Lake (0101-0038)	Phosphorus
Erie	Little Sister Creek, Lower, and tribs (0104-0045)	Phosphorus
Erie	Murder Creek, Lower, and tribs (0102-0031)	Phosphorus

Erie	Rush Creek and tribs (0104-0018)	Phosphorus
Erie	Scajaquada Creek, Lower, and tribs (0101-0023)	Phosphorus
Erie	Scajaquada Creek, Middle, and tribs (0101-0033)	Phosphorus
Erie	Scajaquada Creek, Upper, and tribs (0101-0034)	Phosphorus
Erie	South Branch Smoke Cr, Lower, and tribs (0101-0036)	Phosphorus
Erie	South Branch Smoke Cr, Lower, and tribs (0101-0036)	Silt/Sediment
Genesee	Bigelow Creek and tribs (0402-0016)	Phosphorus
Genesee	Black Creek, Middle, and minor tribs (0402 0028)	Phosphorus
Genesee	Black Creek, Upper, and minor tribs (0402-0048)	Phosphorus
Genesee	Bowen Brook and tribs (0102-0036)	Phosphorus
Genesee	LeRoy Reservoir (0402-0003)	Phosphorus
Genesee	Mill Pond (0402-0050)	Phosphorus
Genesee	Oak Orchard Cr, Upper, and tribs (0301-0014)	Phosphorus
Genesee	Oatka Creek, Middle, and minor tribs (0402-0031)	Phosphorus
Genessee	Tonawanda Cr, Middle, Main Stem (0102-0002)	Phosphorus
Greene	Schoharie Reservoir (1202-0012)	Silt/Sediment
Greene	Sleepy Hollow Lake (1301-0059)	Silt/Sediment
Herkimer	Steele Creek tribs (1201-0197)	Phosphorus
Herkimer	Steele Creek tribs (1201-0197)	Silt/Sediment
Kings	Hendrix Creek (1701-0006) 18	Nitrogen
Kings	Prospect Park Lake (1701-0196)	Phosphorus
Lewis	Mill Creek/South Branch, and tribs (0801-0200)	Nutrients
Livingston	Christie Creek and tribs (0402-0060)	Phosphorus
Livingston	Conesus Lake (0402-0004)	Phosphorus
Livingston	Mill Creek and minor tribs (0404-0011)	Silt/Sediment
Monroe	Black Creek, Lower, and minor tribs (0402-0033)	Phosphorus
Monroe	Buck Pond (0301-0017)	Phosphorus
Monroe	Cranberry Pond (0301-0016)	Phosphorus
Monroe	Durand, Eastman Lakes (0302-0037)	Phosphorus
Monroe	Lake Ontario Shoreline, Western (0301-0069) 9	Phosphorus
Monroe	Long Pond (0301-0015)	Phosphorus
Monroe	Mill Creek and tribs (0302-0025)	Phosphorus 2
Monroe	Mill Creek/Blue Pond Outlet and tribs (0402-0049)	Phosphorus
Monroe	Minor Tribs to Irondequoit Bay (0302-0038)	Phosphorus
Monroe	Rochester Embayment - East (0302-0002) [9]	Phosphorus
Monroe	Rochester Embayment - West (0301-0068) 9	Phosphorus
Monroe	Shipbuilders Creek and tribs (0302-0026)	Phosphorus 2
Monroe	Thomas Creek/White Brook and tribs (0302-0023)	Phosphorus

Nassau	Bannister Creek/Bay (1701-0380)	Nitrogen
Nassau	Beaver Lake (1702-0152)	Phosphorus
Nassau	Browswere Bay (1701-0383)	Nitrogen
Nassau	Camaans Pond (1701-0052)	Phosphorus
Nassau	East Meadow Brook, Upper, and tribs (1701-0211)	Silt/Sediment
Nassau	East Rockaway Channel (1701-0381)	Nitrogen
Nassau	Glen Cove Creek, Lower, and tribs (1702-0146)	Silt/Sediment
Nassau	Grant Park Pond (1701-0054)	Phosphorus
Nassau	Hempstead Bay, Broad Channel (1701-0032)	Nitrogen
Nassau	Hempstead Lake (1701-0015)	Phosphorus
Nassau	Hewlett Bay (1701-0382)	Nitrogen
Nassau	Hog Island Channel (1701-0220)	Nitrogen
Nassau	Massapequa Creek, Upper, and tribs (1701-0174)	Phosphorus
Nassau	Milburn/Parsonage Creeks, Upp, and tribs (1701-0212)	Phosphorus
Nassau	Reynolds Channel, East (1701-0215) [12]	Nitrogen
Nassau	Reynolds Channel, West (1701-0216) 12	Nitrogen
Nassau	Tidal Tribs to Hempstead Bay (1701-0218)	Nitrogen
Nassau	Tribs (fresh) to East Bay (1701-0204)	Silt/Sediment
Nassau	Tribs (fresh) to East Bay (1701-0204)	Phosphorus
Nassau	Tribs to Smith Pond/Halls Pond (1701-0221)	Phosphorus
Nassau	Woodmere Channel (1701-0219)	Nitrogen
New York	Harlem Meer (1702-0103)	Phosphorus
New York	The Lake in Central Park (1702-0105)	Phosphorus
Niagara	Bergholtz Creek and tribs (0101-0004)	Phosphorus
Niagara	Hyde Park Lake (0101-0030)	Phosphorus
Niagara	Lake Ontario Shoreline, Western (0301-0053) 9	Phosphorus
Niagara	Lake Ontario Shoreline, Western (0301-0072) 9	Phosphorus
Oneida	Ballou, Nail Creeks (1201-0203)	Phosphorus
Onondaga	Ley Creek and tribs (0702-0001) 10	Nutrients (phosphorus)
Onondaga	Minor Tribs to Onondaga Lake (0702-0022) 10	Nutrients (phosphorus)
Onondaga	Minor Tribs to Onondaga Lake (0702-0022) 10	Nitrogen (NH3, NO2)
Onondaga	Onondaga Creek, Lower (0702-0023) 10	Nutrients (phosphorus)
Onondaga	Onondaga Creek, Lower, and tribs (0702-0023)	Turbidity
Onondaga	Onondaga Creek, Middle, and tribs (0702-0004)	Turbidity
Onondaga	Onondaga Creek, Upper, and tribs (0702-0024)	Turbidity
Ontario	Great Brook and minor tribs (0704-0034)	Phosphorus 2
Ontario	Great Brook and minor tribs (0704-0034)	Silt/Sediment

Ontario	Hemlock Lake Outlet and minor tribs (0402-0013)	Phosphorus
Ontario	Honeoye Lake (0402-0032)	Phosphorus
Orange	Brown Pond Reservoir (1303-0013)	Phosphorus
Orange	Lake Washington (1303-0012)	Phosphorus
Orange	Minor Tribs to Middle Wallkill (1306-0061)	Phosphorus
Orange	Monhagen Brook and tribs (1306-0074)	Phosphorus
Orange	Orange Lake (1301-0008) [16]	Phosphorus
Orange	Quaker Creek and tribs (1306-0025)	Phosphorus
Orange	Wallkill River, Middle, Main Stem (1306-0038)	Phosphorus
Orange	Wallkill River, Upper, and Minor tribs (1306-0017)	Phosphorus
Orleans	Glenvwood Lake (0301-0041)	Phosphorus
Orleans	Lake Ontario Shoreline, Western (0301-0070) 9	Phosphorus
Orleans	Lake Ontario Shoreline, Western (0301-0071) 9	Phosphorus
Oswego	Lake Neatahwanta (0701-0018)	Nutrients (phosphorus)
Oswego	Pleasant Lake (0703-0047)	Phosphorus
Putnam	Lost Lake, Putnam Lake (1302-0053)	Phosphorus
Putnam	Minor Tribs to Croton Falls Reservoir (1302-0001)	Phosphorus
Queens	Bergen Basin (1701-0009) 18	Nitrogen
Queens	Jamaica Bay, Eastern, and tribs, Queens (1701-0005) 18	Nitrogen
Queens	Kissena Lake (1702-0258)	Phosphorus
Queens	Meadow Lake (1702-0030)	Phosphorus
Queens	Shellbank Basin (1701-0001) 18	Nitrogen
Queens	Willow Lake (1702-0031)	Phosphorus
Rensselaer	Nassau Lake (1310-0001)	Phosphorus
Rensselaer	Snyders Lake (1301-0043)	Phosphorus
Richmond	Grassmere Lake/Bradys Pond (1701-0357)	Phosphorus
Rockland	Congers Lake, Swartout Lake (1501-0019)	Phosphorus
Rockland	Rockland Lake (1501-0021)	Phosphorus
Saratoga	Ballston Lake (1101-0036)	Phosphorus
Saratoga	Dwaas Kill and tribs (1101-0007)	Phosphorus
Saratoga	Dwaas Kill and tribs (1101-0007)	Silt/Sediment
Saratoga	Lake Lonely (1101-0034)	Phosphorus
Saratoga	Round Lake (1101-0060)	Phosphorus
Saratoga	Tribs to Lake Lonely (1101-0001)	Phosphorus
Schenectady	Collins Lake (1201-0077)	Phosphorus
Schenectady	Duane Lake (1311-0006)	Phosphorus
Schenectady Lake	Mariaville Lake (1201-0113)	Phosphorus
Schuyler	Cayuta Lake (0603-0005)	Phosphorus

Seneca	Reeder Creek and tribs (0705-0074)	Phosphorus
St.Lawrence	Black Lake Outlet, Black Lake (0906-0001)	Phosphorus
St.Lawrence	Fish Creek and minor tribs (0906-0026)	Phosphorus
Steuben	Smith Pond (0502-0012)	Phosphorus
Suffolk	Agawam Lake (1701-0117)	Phosphorus
Suffolk	Big/Little Fresh Ponds (1701-0125)	Phosphorus
Suffolk	Canaan Lake (1701-0018)	Phosphorus
Suffolk	Canaan Lake (1701-0018)	Silt/Sediment
Suffolk	Fresh Pond (1701-0241)	Phosphorus
Suffolk	Great South Bay, East (1701-0039)	Nitrogen
Suffolk	Great South Bay, Middle (1701-0040)	Nitrogen
Suffolk	Great South Bay, West (1701-0173)	Nitrogen
Suffolk	Lake Ronkonkoma (1701-0020)	Phosphorus
Suffolk	Mattituck/Marratooka Pond (1701-0129)	Phosphorus
Suffolk	Mill and Seven Ponds (1701-0113)	Phosphorus
Suffolk	Millers Pond (1702-0013)	Phosphorus
Suffolk	Moriches Bay, East (1701-0305)	Nitrogen
Suffolk	Moriches Bay, West (1701-0038)	Nitrogen
Suffolk	Quantuck Bay (1701-0042)	Nitrogen
Suffolk	Shinnecock Bay and Inlet (1701-0033)	Nitrogen
Suffolk	Tidal Tribs to West Moriches Bay (1701-0312)	Nitrogen
Sullivan	Bodine, Mongomery Lakes (1401-0091)	Phosphorus
Sullivan	Davies Lake (1402-0047)	Phosphorus
Sullivan	Evens Lake (1402-0004)	Phosphorus
Sullivan	Pleasure Lake (1402-0055)	Phosphorus
Sullivan	Swan Lake (1401-0063)	Phosphorus
Tompkins	Cayuga Lake, Southern End (0705-0040)	Phosphorus
Tompkins	Cayuga Lake, Southern End (0705-0040)	Silt/Sediment
Ulster	Ashokan Reservoir (1307-0004)	Silt/Sediment
Ulster	Esopus Creek, Lower, Main Stem (1307-0010) [17]	Turbidity
Ulster	Esopus Creek, Middle, Main Stem (1307-0003) 17	Turbidity
Ulster	Esopus Creek, Upper, and minor tribs (1307-0007)[3]	Silt/Sediment
Ulster	Wallkill River, Lower, Main Stem (1306-0027)	Phosphorus
Warren	Hague Brook and tribs (1006-0006)	Silt/Sediment
Warren	Huddle/Finkle Brooks and tribs (1006-0003)	Silt/Sediment
Warren	Indian Brook and tribs (1006-0002)	Silt/Sediment
Warren	Lake George (1006-0016) and tribs	Silt/Sediment
Warren	Tribs to Lake George, East Shore (1006-0020)	Silt/Sediment
Warren	Tribs to Lake George, Lk.George Village (1006-0008)	Silt/Sediment

Washington	Wood Cr/Champlain Canal and tribs (1005-0036)	Phosphorus
Westchester	Lake Katonah (1302-0136)	Phosphorus
Westchester	Lake Lincolndale (1302-0089)	Phosphorus
Westchester	Lake Meahagh (1301-0053)	Phosphorus
Westchester	Lake Mohegan (1301-0149)	Phosphorus
Westchester	Lake Shenorock (1302-0083)	Phosphorus
Westchester	Mamaroneck River, Lower (1702-0071)	Silt/Sediment
Westchester	Mamaroneck River, Upp, & minor tribs (1702-0123)	Silt/Sediment
Westchester	Saw Mill River (1301-0007)	Phosphorus
Westchester	Saw Mill River, Middle, and tribs (1301-0100)	Phosphorus
Westchester	Sheldrake River (1702-0069)	Phosphorus
Westchester	Sheldrake River (1702-0069)	Silt/Sedimnt
Westchester	Silver Lake (1702-0040)	Phosphorus
Westchester	Teatown Lake (1302-0150)	Phosphorus
Westchester	Truesdale Lake (1302-0054)	Phosphorus
Westchester	Wallace Pond (1301-0140)	Phosphorus

APPENDIX E – List of NYSDEC Regional Offices

Region	Covering the following counties:	DIVISION OF ENVIRONMENTAL PERMITS (DEP) Permit Administrators	DIVISION OF WATER (DOW) Water (SPDES) Program
1	Nassau and Suffolk	50 Circle Road Stony Brook, NY 11790 Tel. (631) 444-0365	50 Circle Road Stony Brook, NY 11790-3409 Tel. (631) 444-0405
2	Bronx, Kings, New York, Queens and Richmond	1 Hunters Point Plaza, 47-40 21st St. Long Island City, NY 11101-5407 Tel. (718) 482-4997	1 Hunters Point Plaza, 47-40 21st St. Long Island City, NY 11101-5407 Tel. (718) 482-4933
3	Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster and Westchester	21 South Putt Corners Road New Paltz, NY 12561-1696 Tel. (845) 256-3059	220 White Plains Road, Suite 110 Tel. (914) 428 - 2505
4	Albany, Columbia, Delaware, Greene, Montgomery, Otsego, Rensselaer, Schenectady and Schoharie	1130 North Westcott Road Schenectady, NY 12306-2014 Tel. (518) 357-2069	1130 North Westcott Road Schenectady, NY 12306-2014 Tel. (518) 357-2045
5	Clinton, Essex, Franklin, Fulton, Hamilton, Saratoga, Warren and Washington	1115 State Route 86, Po Box 296 Ray Brook, NY 12977-0296 Tel. (518) 897-1234	232 Golf Course Road Warrensburg, NY 12885-1172 Tel. (518) 623-1200
6	HERKIMER, JEFFERSON, LEWIS, ONEIDA AND ST. LAWRENCE	STATE OFFICE BUILDING 317 WASHINGTON STREET WATERTOWN, NY 13601-3787 TEL. (315) 785-2245	STATE OFFICE BUILDING 207 GENESEE STREET UTICA, NY 13501-2885 TEL. (315) 793-2554
7	BROOME, CAYUGA, CHENANGO, CORTLAND, MADISON, ONONDAGA, OSWEGO, TIOGA AND TOMPKINS	5786 WIDEWATERS PARKWAY SYRACUSE, NY 13214-1867 TEL. (315) 426-7438	5786 WIDEWATERS PARKWAY SYRACUSE, NY 13214-1867 TEL. (315) 426-7500
8	CHEMUNG, GENESEE, LIVINGSTON, MONROE, ONTARIO, ORLEANS, SCHUYLER, SENECA, STEUBEN, WAYNE AND YATES	6274 EAST AVON-LIMA ROADAVON, NY 14414-9519 TEL. (585) 226-2466	6274 EAST AVON-LIMA RD. AVON, NY 14414-9519 TEL. (585) 226-2466
9	ALLEGANY, CATTARAUGUS, CHAUTAUQUA, ERIE, NIAGARA AND WYOMING	700 DELAWARE AVENUE BUFFALO, NY 14209-2999 TEL. (716) 851-7165	700 DELAWARE AVENUE BUFFALO, NY 14209-2999 TEL. (716) 851-7070

APPENDIX F – SWPPP Preparer Certification Form

The SWPPP Preparer Certification Form required by this permit begins on the following page.

SWPPP Preparer Certification Form

SPDES General Permit for Stormwater Discharges from Construction Activity, GP-0-25-001 (CGP)

(In accordance with CGP Part I.D.2.b., the completed form must be attached to the eNOI and submitted to NYSDEC electronically.)

Project/Site Name:	35-10 Steinway Street
eNOI Submission ID:	
Owner/Operator Name:	

Certification Statement – SWPPP Preparer

I hereby certify that the Stormwater Pollution Prevention Plan (SWPPP) has been prepared in accordance with the requirements of GP-0-25-001. I certify under penalty of law that the SWPPP and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Yuriy		Tupychack
SWPPP Preparer First Name	MI	SWPPP Preparer Last Name

Signature Date

Revised: January 2025

APPENDIX G – MS4 SWPPP Acceptance Form

The MS4 SWPPP Acceptance Form required by this permit begins on the following page.

MS4 SWPPP Acceptance Form

for construction activities seeking authorization under the

SPDES General Permit for Stormwater Discharges from Construction Activity, GP-0-25-001 (CGP)

(In accordance with CGP Part I.D.2.b., the completed form must be attached to the eNOI and submitted to NYSDEC electronically.)

I. Project Owner/Operator Information
1. Owner/Operator Name:
2. Contact Person:
3. Street Address:
4. City/State/Zip:
II. Project Site Information
5. Project/Site Name:
6. Street Address:
7. City/State/Zip:
III. Stormwater Pollution Prevention Plan (SWPPP) Review and Acceptance Information
8. SWPPP Reviewed by:
9. Title/Position:
10. Date Final SWPPP Reviewed and Accepted:
IV. Regulated MS4 Information
11. Name of MS4 Operator:
12. MS4 SPDES Permit Identification Number: NYR20A
13. Street Address:
14. City/State/Zip:
15. Telephone Number:

MS4 SWPPP Acceptance Form - continued

V. Certification Statement - MS4 Official (principal executive officer or ranking elected official) or Duly Authorized Representative

I hereby certify that the final Stormwater Pollution Prevention Plan (SWPPP) for the construction project identified in section II. of this form has been reviewed and meets the substantive requirements in the SPDES General Permit for Stormwater Discharges from Construction Activity, GP-0-25-001 (CGP). Note: The MS4 Operator, through the acceptance of the SWPPP, assumes no responsibility for the accuracy and adequacy of the design included in the SWPPP. In addition, review and acceptance of the SWPPP by the MS4 Operator does not relieve the owner/operator or their SWPPP preparer of responsibility or liability for errors or omissions in the plan.

Printed Name[1]:

Title/Position:

Signature:

Date:

VI. Additional Information

[1] Printed name of the principal executive officer or ranking elected official for the MS4 Operator or their duly authorized representative in accordance with CGP Part VII.J.2.

APPENDIX H – NYCDEP SWPPP Acceptance/Approval Form

The City of New York Department of Environmental Protection (NYCDEP) SWPPP Acceptance/Approval form required by this permit begins on the following page.

THE CITY OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Bureau of Environmental Planning and Analysis
59-17 Junction Blvd., 9th Floor; Flushing, NY 11373

SWPPP Acceptance/Approval

Application Number:

I. Project Owner/Operator Information
1. Owner/Operator Name:
2. Contact Person:
3. Street Address:
4. City/State/Zip:
II. Project Site Information
5. Project/Site Name:
6. Street Address:
7. City/State/Zip:
III. Stormwater Pollution Prevention Plan (SWPPP) Review and Acceptance/Approval
8. SWPPP Reviewed by:
9. Title/Position: /
10. Date Final SWPPP Reviewed and Accepted:
11. Acceptance/Approval Expiration Date:
IV. Regulated MS4 Information for projects that require coverage under the NY State Pollution Discharge Elimination System General Permit for Stormwater Discharges from Construction Activity
12. Name of MS4: *CITY OF NEW YORK*
13. MS4 SPDES Permit Identification Number: *NY-0287890*
14. Contact Person:
15. Street Address: *59-17 Junction Blvd. 9th Floor*
16. City/State/Zip: *Flushing, NY 11373*
17. Telephone Number:

Projects in the MS4 area must submit a copy of this SWPPP Acceptance with a Notice of Intent for coverage under the NY SPDES General Permit for Stormwater Discharges from Construction Activity to: NYS Department of Environmental Conservation, Division of Water; 625 Broadway, 4th Floor; Albany, New York 12233-3505.

V. Certification Statement - MS4 Official (principal executive officer or ranking elected official) or Duly Authorized Representative

I hereby certify that the final Stormwater Pollution Prevention Plan (SWPPP) for the construction project identified in question 5 has been reviewed and meets the substantive requirements in the SPDES General Permit For Stormwater Discharges from Municipal Separate Storm Sewer Systems (MS4s).

Note: The MS4, through the acceptance of the SWPPP, assumes no responsibility for the accuracy and adequacy of the design included in the SWPPP. In addition, review and acceptance of the SWPPP by the MS4 does not relieve the owner/operator or their SWPPP preparer of responsibility or liability for errors or omissions in the plan.

Printed Name:

Title/Position:

Signature:

Date:

VI. Conditions of Acceptance/Approval and Additional Information

Projects in the MS4 area must submit a copy of this SWPPP Acceptance with a Notice of Intent for coverage under the NY SPDES General Permit for Stormwater Discharges from Construction Activity to: NYS Department of Environmental Conservation, Division of Water; 625 Broadway, 4th Floor; Albany, New York 12233-3505.

APPENDIX I – MS4 No Jurisdiction Form

The MS4 No Jurisdiction Form required by this permit begins on the following page.

MS4 No Jurisdiction Form

for construction activities seeking authorization under the

SPDES General Permit for Stormwater Discharges from Construction Activity, GP-0-25-001 (CGP)

(In accordance with CGP Part I.D.2.b., the completed form must be attached to the eNOI and submitted to NYSDEC electronically.)

I. Project Owner/Operator Information

a. Owner/Operator Name:

b. Contact Person:

c. Street Address:

d. City/State/Zip:

II. Project Site Information

a. Project/Site Name:

b. Street Address:

c. City/State/Zip:

d. eNOI Submission ID:

III. Traditional Land Use Control MS4 Operator Information

a. Name of MS4 Operator:

b. MS4 SPDES Permit ID Number: NYR20A

c. Street Address:

d. City/State/Zip:

e. Telephone Number:

IV. Certification Statement

In accordance with CGP Part I.D.2.b.ii.3., I hereby certify that the Traditional Land Use Control MS4 Operator identified in section III. of this form does not have review authority over the construction project identified in section II. of this form, which is owned/operated by the entity identified in section I. of this form. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

a. Printed name of the principal executive officer or ranking elected official for the MS4 Operator or their duly authorized representative in accordance with CGP Part VII.J.2.:

b. Title/Position:

c. Signature:

d. Date:

APPENDIX J – Owner/Operator Certification Form

The Owner/Operator Certification Form required by this permit begins on the following page.

Owner/Operator Certification Form

SPDES General Permit for Stormwater Discharges from Construction Activity, GP-0-25-001 (CGP)

(In accordance with CGP Part I.D.2.b. or Part I.F.2. and 3., the completed form must be attached to the eNOI or the Request to Continue Coverage, and submitted to NYSDEC electronically.

Project/Site Name: _____

eNOI Submission ID: _____

eNOI Submitted by: ☐ **Owner/Operator** ☐ **SWPPP Preparer** ☐ **Other**

Certification Statement - Owner/Operator

I hereby certify that I read, and will comply with, the GP-0-25-001 permit requirements. I understand that authorization to discharge under the permit for the project/site named above is dependent on receipt of a Letter of Authorization (LOA) or a Letter of Continued Coverage (LOCC) from the New York State Department of Environmental Conservation (NYSDEC) in accordance with CGP Part I.D.3.b. or Part I.F.4. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Owner/Operator First Name MI Owner/Operator Last Name

_____

Signature

_____

Date

Revised: January 2025

Appendix L: Underground Injection Well Documentation

Documents included:

☐ Copy of EPA 7520-16 Online Form
☐ Relevant communication with EPA Region 2 Office indicating compliance with UIC Rule:
- Insert list of correspondence included in this appendix
- Add rows as needed

☐ Relevant technical documentation demonstrating use of BMPs and compliance with UIC Rule
- Insert list of technical documents included in this appendix
- Add rows as needed

If any of the above documents are not included, explain why below:

There is no existing or proposed underground injection well within the site.

Appendix Z: Additional Documentation

Documents included:

- Document title: RP-602 form

New York City Department of Finance • Property Division • Tax Map Office

APPLICATION FOR APPORTIONMENTS OR MERGERS

Instructions: Please complete this application and *submit in person* to: ***Department of Finance, Property Division - Tax Map Office, 66 John Street, 2nd floor,*** *New York, NY 10038.* Please read the instructions for further details before completing this form. Print clearly.

SECTION A: PROPERTY INFORMATION

Borough: QUEENS Block: 668 Present Lot(s): 5

DO NOT WRITE IN THIS SPACE - FOR OFFICE USE ONLY
Lot Number: 5, 6

☐ Merger ☒ Apportionment Number of Lots Requested 2

☐ Air ☐ Subterranean

Lot(s)Usage: (check one)
☐ *Residential* Building Gross Sq/Ft:
☒ *Commercial* Building Gross Sq/Ft: 28,693
☐ *Mix* (Residential & Commercial) Building Gross Sq/Ft:

1. Property Owner's Name (as per Deed): LAST NAME FIRST NAME
   OR
   Company Name: 35-18 STEINWAY STREET LLC.
2. Property Address: 186 CENTRAL AVENUE. BETHPAGE, NY 11714
   NUMBER AND STREET CITY STATE ZIP CODE
3. Filing Representative (if applicable): JOSEPH TODISCO

SECTION B: CERTIFICATION

1. Architect/Engineer/Applicant's Name: Pau (LAST NAME) Maxwell (FIRST NAME)
2. Address: 120 Broadway, 20th Floor (NUMBER AND STREET) New York (CITY) NY (STATE) 10271 (ZIP CODE)
3. Telephone Number: 212 777 7800 4. Email Address: mpau@bbbarch.com

The applicant hereby certifies that, in making this application for merger/apportionment, s/he is the owner, or acting under the direction of the owner.

Signature of Architect/ Engineer/Applicant: Date: 4 / 10 / 2025

TAX MAP CHANGE WILL NOT BE MADE UNTIL PRESENTATION OF REQUIRED DOCUMENTS (see reverse for the required documents)

DRAW SKETCH TO SCALE 1" = 50', IF POSSIBLE INDICATE NORTH ARROW

SEE NEXT PAGE

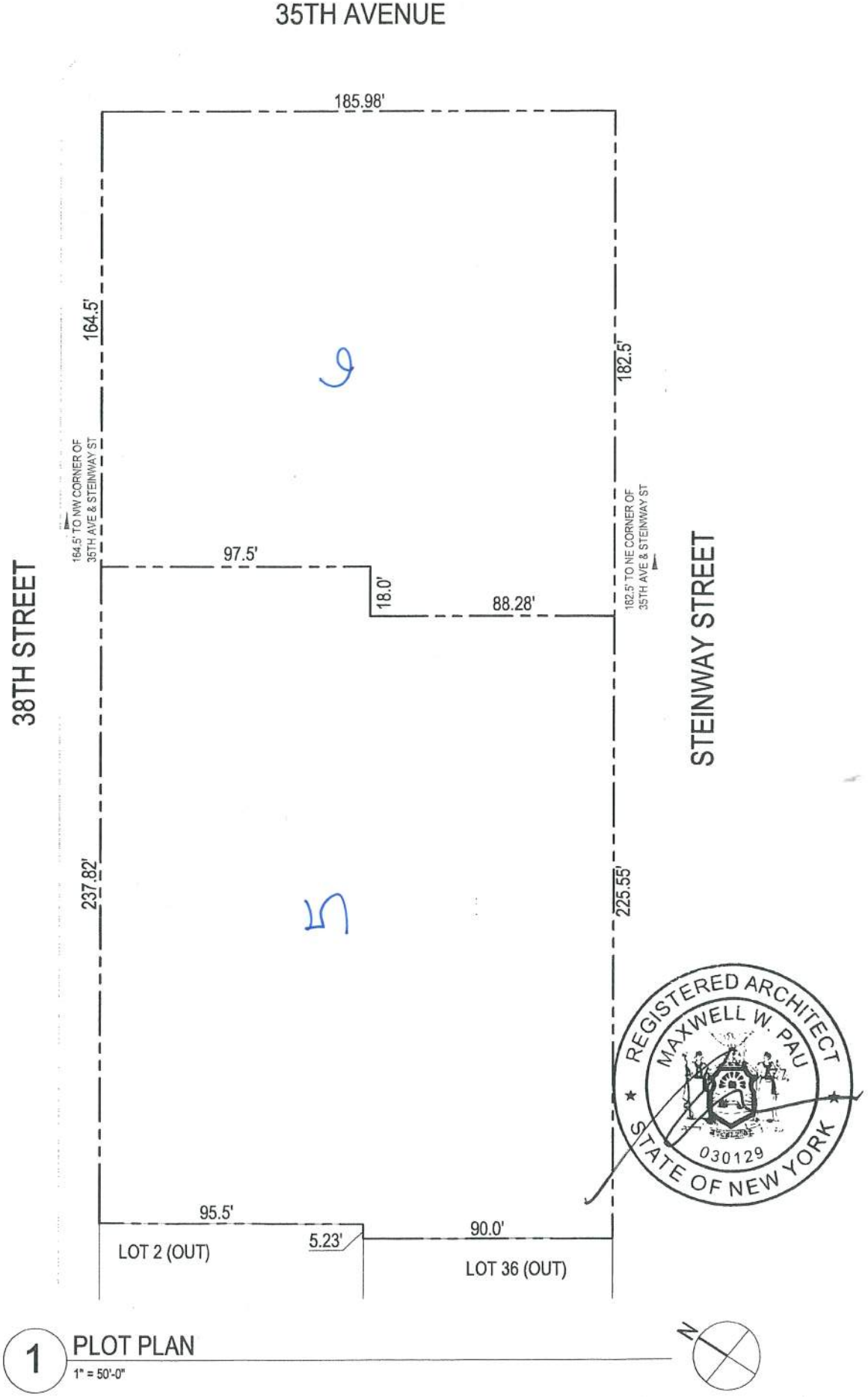
(Architect or Engineer's seal)

Tentative Lot(s) issued:
Customer Service Representative: _____ Date: 4/10/25 New Lot(s): 6 Lot(s) Affected: 5 Lot(s) Dropped: —

Please note: Map changes will not be made until presentation of all required documents is reviewed and approved by the Specialist. Lots are tentative until final approval is received from the Tax Map Office.

Map Updated:
Tax Map Specialist: _____ Date: ___/___/___

RP-602 Rev. 7.8.2019



1 PLOT PLAN

1" = 50'-0"

APPENDIX I

Resumes of Key Personnel

PROFESSIONAL PROFILE

CONTACT INFORMATION
Main: (631) 232-2600
Direct: (631) 630-2433
Email: jrusk@rouxinc.com
Website: www.rouxinc.com

209 Shafter Street
Islandia, NY 11749

EDUCATION
BS, Earth and Atmospheric Science, Cornell University, 2020

Jack Rusk

Project Geologist

EXPERIENCE SUMMARY
Over four years of experience: Project Geologist (2024-Present) and Staff Geologist II (2021-2024) at Roux, Islandia, New York; Geologist at Tectonic Engineering Consultants, Geologists & Land Surveyors, D.P.C., Newburgh, New York (2020-2021).

TECHNICAL SPECIALTIES
Drilling and soil boring oversight; assessments of lithology; soil characterization; multiple soil, soil vapor, and groundwater sampling techniques; management of soil trucking and manifestation processes; and management of Community Air Monitoring Projects (CAMP).

REPRESENTATIVE PROJECTS

- Project manager for projects to support remediation activities at the Amtrak Sunnyside Yard State Superfund Site in Long Island City, New York. Oversaw the implementation of remediation activities, including soil excavation, off-site disposal, and a Community Air Monitoring Plan (CAMP).
- Project manager for remediation activities for a redevelopment in Greenpoint, Brooklyn, New York enrolled in the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP). Oversaw the implementation of remediation activities, including soil excavation, offsite disposal, and endpoint confirmation sampling, and the construction of a geothermal heat exchange system.
- Project manager of multiple Phase II Environmental Site Assessments (ESAs) for a solar battery company throughout the NY metropolitan area. The Phase II ESAs included groundwater, soil, and soil vapor sampling to investigate the potential presence of contamination at the sites associated with historical operations.
- Project manager responsible for the implementation of a remedial investigation in Long Island City, New York for a site enrolled in the NYSDEC BCP with petroleum-related contamination in soils and groundwater. Technical responsibilities included management of the field operations, daily reporting to NYSDEC, and budget management.
- Field manager responsible for the field implementation of a remedial investigation in Long Island City, New York. Responsibilities included oversight of soil boring advancement using a Geoprobe direct push rig and sonic drill rig, subcontractor oversight, lithologic classification of 22 soil borings, collection and screening of soil samples, installation of six monitoring wells, installation of ten soil vapor points, soil vapor sampling, groundwater sampling, and laboratory coordination. Responsible for performance of CAMP and daily reporting to NYSDEC.
- Field manager responsible for the remediation of a BCP site in the Inwood neighborhood of Manhattan, New York. Responsibilities included oversight of excavation, import and export of material, performance of CAMP and daily reporting to NYSDEC, UST removal, and endpoint sampling. More than 2,100 truckloads of material were disposed at five different facilities, and 96 confirmation endpoint samples were taken. The Site reached its unrestricted use goals.
- Field manager responsible for the field implementation of a remedial investigation in Sunset Park, Brooklyn, New York. Responsibilities included oversight of soil boring advancement using a Geoprobe direct push rig, subcontractor oversight, lithologic classification of 16 soil borings, collection and screening of soil samples, installation of four monitoring wells,

installation of three soil vapor points, soil vapor sampling, groundwater sampling, and laboratory coordination. Responsible for performance of CAMP and daily reporting to the NYSDEC.

- Field manager responsible for waste characterization and soil trucking at a site in Williamsburg, Brooklyn, New York. Responsibilities included waste characterization sampling, oversight of excavation, organization and proper handling of waste manifests, and updating of daily truck logs. Responsible for performance of CAMP and daily reporting to OER.
- Field manager responsible for sediment sampling with a barge-mounted rig at a site in the Arthur Kill River off of Staten Island, New York. Responsibilities included classification of soil, lithology, collection and screening of soil samples, gINT logging, and tide coordination.
- Storm Water Pollution Protection Plan (SWPPP) inspector for two sites in South Bronx, New York. Weekly reports were completed detailing changes in stormwater management at the sites.
- Assisted in annual groundwater monitoring program at a former petroleum refinery and terminal in Brooklyn, New York. This work was done to monitor the largest subsurface free product plume in North America. Fieldwork responsibilities included the gauging of over 50 wells for petroleum-contaminated groundwater.
- Site Safety Officer for various remedial investigation sites. Responsibilities include preparation of health and safety plans (HASPs), job safety analysis (JSA) documents development and review, on-site safety meeting management, safety document preparation (Lessons Learned, Near Loss, Field Audits, etc.), and planning/execution of corrective actions.
- Assisted with groundwater sampling at a New York State Brownfields Cleanup Program site in Long Island City, New York. The three-acre Site was formally used for the manufacturing and storage of disinfectants, soaps, and pesticides, which created a large Creosote plume. Fieldwork included sampling 13 off-site wells.
- Field Manager at a one-acre former industrial paint manufacturing site enrolled in the NYSDEC BCP. Responsibilities included oversight of excavation, removal of USTs, performance of CAMP, and daily reporting.
- Field Manager responsible for oversight of soil boring advancement using hand tools and a Geoprobe for a pre-design investigation in Howard Beach, Queens, New York. Responsibilities included subcontractor oversight classification of soil, lithology, collection and screening of soil samples, installation of temporary monitoring wells, groundwater sampling, and laboratory coordination.
- Field Manager responsible for the implementation of a subsurface investigation in Astoria, Queens, New York. Responsibilities included oversight of soil boring advancement using a CME drill rig, lithologic classification of soil and rock cores, oversight of cone penetration testing, and oversight of geophysical seismic testing.

PROFESSIONAL TRAININGS

OSHA 40-Hour HAZWOPER Training, 2021

OSHA 30-hour Construction Safety Training, 2021

NYC Site Safety Training, 2021

Storm Water Pollution Prevention Plan Certified

JUDY V. HARRY
P. O. Box 208
120 Cobble Creek Rd.
North Creek, NY 12853

Occupation: Data Validator/Environmental Technical Consultant

Years Experience: 45

Education: B.S., Chemistry, Magna cum laude, 1976, Phi Beta Kappa

Certifications: New York State Woman-Owned Business Enterprise (WBE)

Relevant Work History:

Data Validation Services: September 1989 - present

Sole proprietor of Data Validation Services, a woman-owned small business registered with SAM, providing consultation/validation services to regulatory and commercial clients.

These services include the review of analytical laboratory data for compliance with respect to specific protocols, accuracy and defensibility of data, verification of reported values, and evaluation of quality parameters for analytical usability of results. Approved by USEPA, NYSDEC, NJDEP, NYSERDA, and NYCDEP as a data validator for projects, including USEPA Superfund, Brownfield, and lead sites, and those contracted through the NYSDEC Division of Hazardous Waste Remediation, Division of Solid Waste, and Division of Water Quality.

Performed validation for compliance with laboratory analytical protocols including USEPA OLM, USEPA OLC, USEPA ILM, USEPA DFLM, USEPA SOW3/90, USEPA SOW 7/87 CLP, USEPA SOW 2/88 CLP, USEPA SW846, RCRA, AFCEE, NYS 6 NYCRR Part 360, 40 CFR, Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, including TO-15, 1989/1991/1995/2000/2005 NYSDEC ASPs, and 1987 NYSDEC CLP.

Performed validation according to the USEPA National and Regional SOPs and Functional Guidelines, AFCEE requirements, NYSDEC Validation Scope of Work, NYS DUSR, and NJDEP Division of Hazardous Site Mitigation/Publicly Funded Site Remediation SOPs.

Performed validation for USEPA Superfund Sites including Salem Acres, York Oil, Port Washington L-4 Landfill, Bridgeport Rental and Oil Services, GE-MRFA, MMR/ OTIS AFB, LCP, and Peter Cooper site; and for USEPA lead sites including SJ&J Piconne, Maska, Bowe System, Jones Sanitation, and Syossett Landfill, involving CLP, RAS, and SAS protocols.

Contracted for NYSDEC Superfund Standby Contracts with LMS Engineers/HDR, CDM Smith, Malcolm-Pirnie/ARCADIS, Ecology & Environment, Shaw Environmental/APTIM, CG&I, O'Brien & Gere Engineers, and EC Jordan, involving samples collected at NYS Superfund Sites and analyzed under the NYSDEC ASP.

Performed validation services for NYSDEC Phase II remedial investigations, RI/FS projects, Brownfield sites, and PRP over-site projects for hazardous waste sites.

Performed validation services for clients conducting RI/FS activities involving samples of many matrices, including waste, air, sludges, leachates, solids/sediments, aqueous, and biota.

Clients have included AECOM, ARCADIS, Barton & Loguidice, Benchmark Engineering, Bergmann Associates, Blasland, Bouck & Lee, Brown and Caldwell, CDM Smith, CB&I Shaw Environmental, C&S Consulting Engineers, Chazen Companies, Clough Harbour & Associates, Columbia Analytical Services, C.T. Male, Dames & Moore, Day Engineering, EA Engineering, EcolSciences, Ecology & Environment, Ecosystems, EC Jordan, Environmental Chemical Corporation, EHRT, ENSR Consulting, ELM, ERM-Northeast, Fagan Engineers, Fanning Phillips & Molnar, FluorDaniel GTI, Frontier, Foster Wheeler Environmental Corp, Frontier Technical, Galson Consultants, GEI, GE&R, Geomatrix Consultants, GZA Environmental, Handex of N, Hazard Evaluations, H2M Group, HDR, HRP, IT Corp, Jacques Whitford, JTM Associates, JMT, Labella Associates, Langan Engineers, Leader Environmental, Lockwood, Kessler & Bartlett, LMS Engineers, Malcolm-Pirnie, Metcalf & Eddy, NWEC&C, O'Brien & Gere Engineers, Pace, Parsons Engineering-Science, Plumley Engineering, Prescott Environmental, P. W. Grosser, Rizzo Associates, Roux Associates, Sear Brown Group, SECOR, Shaw Environmental, Stantec, ThermoRemediation Inc., TRC Environmental, Turnkey Environmental Restoration, TVGA Engineering, URS Consultants, Wehran Emcon, Weston, Wittman Geosciences, YEC, and private firms.

Provided consultation services to laboratories regarding analytical procedures and protocol interpretation, and to law firms for litigation support.

Provided services to firms involving audits of environmental analytical laboratories to determine analytical capability, particularly for compliance with NYSDEC ASP and AFCEE requirements.

Guest speaker on a panel discussing Data Review/Compliance and Usability, for an analysis workshop for the New York Association of Approved Environmental Laboratories, 1993.

Adirondack Environmental Services: June 1987 - August 1989

Senior mass spectroscopist for AES. Responsible for GC/MS analyses of environmental samples by USEPA and NYSDEC protocols, development of the GC/MS laboratory, initiating the instrumental and computer operations from the point of installation, and for implementing the procedures and methodologies for Contract Laboratory Protocol.

CompuChem Laboratories: May 1982 - January 1987

Managed a GC/MS production laboratory; developed, implemented, and supervised QA/QC criteria at three different levels of review; and was responsible for the development and production of the analysis of environmental and clinical samples. Directed a staff of 23 technical and clerical personnel, and managed the extraction and GC/MS labs and data review operations.

Research Triangle Institute (RTI): December 1979 - May 1982

Worked as an analytical research chemist responsible for development of analytical methods for the EPA Federal Register at RTI. This involved analysis of biological and environmental samples for priority pollutants, primarily relating to wastewaters and to human sampling studies. Method development included modification and interfacing of the initially developed Tekmar volatile purge apparatus to GC/MS, development and refinement of methods for entrapment and concentration of the air medium for subsequent volatile analysis, and the analysis and resolution/ identification of individual PCB congeners within Aroclor mixtures by capillary column and mass spectra.

Guardsman Chemical Company: February 1977 - November 1979

Performed all quality control functions for the manufacturing plant. Performed research and development on coatings and dyes.

Almay Cosmetics: May 1976 - December 1976

Product evaluation chemist. Responsible for analytical QC of manufactured products.

Publication

Pellizzzari, E.D., Moseley, M.A., Cooper, S.D., Harry, J.V., Demian, B., & Mullin, M. D. (1985). Recent Advances in the Analysis of Polychlorinated Biphenyls in Environmental and Biological Media. *Journal of Chromatography*, 334(3) 277-314.

PROFESSIONAL PROFILE

CONTACT INFORMATION

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209 Shafter Street
Islandia, NY 11749

EDUCATION

BS, Civil Engineering,
Manhattan College, 1991
ME, Environmental Engineering,
Manhattan College, 1994

PROFESSIONAL LICENSES

Professional Engineer in New York

Noelle M. Clarke, PE

Principal Engineer

EXPERIENCE SUMMARY

Thirty-two years' experience: Principal Engineer/Senior Engineer at Remedial Engineering, P.C./Roux; Project Engineer at Camp Dresser & McKee.

TECHNICAL SPECIALTIES

Feasibility studies, pilot testing, remedial design, implementation, construction management, and startup evaluations for remediation of soil, groundwater, soil vapor and sediment. Phase I/Phase II Environmental Site Assessments (ESA). Extensive experience at brownfields redevelopment sites, former industrial facilities, and public works facilities. Evaluation and design of storm water drainage systems. Evaluation, design, and construction management for new and existing wastewater treatment processes.

REPRESENTATIVE PROJECTS

- Principal Engineer providing due diligence support for real estate transactions on multiple projects in the New York metropolitan area. Projects have included multi-family housing (both affordable and market rate), retail/ commercial, community services and industrial properties. Services have included Phase I and Phase II ESAs.
- Principal Engineer for a Brownfield redevelopment of a property adjacent to a dry cleaning solvent distribution facility in Brooklyn, New York under the NYSDEC BCP. The site was previously a warehouse built on a former freight railyard that serviced the dry cleaning solvent facility. Offloading spillage on site and migration from the offsite facility resulted in significant soil, groundwater, and vapor contamination with chlorinated VOCs. The site was developed into multifamily housing with first floor retail use. Pre-remediation and posts-remediation Phase I ESAs were prepared by Roux. The remedy, as summarized in the Remedial Action Work Plan, consisted of soil hot spot removal, a physical barrier to limit on site groundwater migration, a permeable reactive wall to treat groundwater and mitigate offsite migration, and a sub slab depressurization system. Roux, under the direction of Ms. Clarke, provided full-time oversight of the remediation and prepared the Final Engineering Report and Site management Plan. The Certificate of Completion for the Site was obtained in October 2015 and Roux is currently providing post-remediation monitoring services.
- Principal Engineer for a Brownfield redevelopment in Brooklyn, New York at a mixed-use multifamily housing/neighborhood retail complex with a former onsite dry cleaner under the NYSDEC BCP. There is soil, groundwater, and vapor contamination from chlorinated VOCs from the former onsite dry cleaner, as well as groundwater contamination from offsite dry cleaners. The remedy, described in the Remedial Action Work Plan prepared by Roux, consisted of hot spot soil removal, *in situ* groundwater treatment and a sub slab depressurization system for vapor mitigation in the existing buildings. The NYSDEC accepted the Final Engineering Report prepared by Roux and the Site received a Certificate of Completion from NYSDEC in 2016 and Roux is currently providing post-remediation monitoring services.
- Principal Engineer for a complex dredging project for a major petroleum company on the Allegheny River in New York. The goal of the project was to remove 1,000 tons of petroleum impacted sediments from the river. Work included Site investigation, remedial investigation, alternatives evaluation, remedial design, planning and extensive regulatory permitting with multiple federal, state, and local agencies. The remediation work was completed in 2021.

- Principal engineer for the investigation and remediation of a former petroleum refinery located in Olean, New York under the NYSDEC BCP. The work included site investigation and preparation of an Alternatives Analysis Report (to document analysis of engineering options and remedy recommendation), Remedial Action Work Plan and remedial design documents to address the environmental impacts associated with the historical operations. The selected remedy includes excavation of shallow soil, in-situ stabilization of 25,000 cubic yards of deep petroleum impacted soil and capping. The work is being completed in phases beginning in 2022, with an anticipated completion date of 2024.
- Principal Engineer for the alternatives evaluation, remedy selection, regulatory negotiation, preparation of design documents (drawings, specifications, and permit applications) and permitting for all remedial components in support of redevelopment at a former metals manufacturing site in Staten Island, New York under the NYSDEC Voluntary Cleanup Program (VCP). The remedy included dredging and onsite disposal of stream sediments; consolidation and capping of fill material across the site; in-place abandonment of the Site's former sewer system; installation of drainage swales for storm water management; and wetland bank stabilization and mitigation/restoration. Required permits and regulatory approvals for the project included a Joint Permit from the USACE and NYSDEC; a NYSDEC SPDES equivalency permit for discharge of treated water to the Arthur Kill, a New York State Department of State Coastal Management Program (CMP) Federal Consistency Assessment; a New York City Waterfront Revitalization Program Consistency Assessment, a modification of topography authorization from New York City Department of City Planning; and a New York City Department of Environmental Protection permit for temporary discharge to a combined sewer. Also required by the USACE and National Marine Fisheries, was preparation of an Essential Fish Habitat Study, in support of the Joint Permit application. Permitting activities included preparation of the various permit applications, forms and supporting documentation, as well as follow up meetings and correspondence to finalize the authorizations.
- Principal Engineer for the design, bidding, contractor selection, and remedial construction phase at a former metals manufacturing facility in Staten Island under the NYSDEC VCP. Responsibilities included finalizing biddable construction documents, issuing to bidders, preparing addenda, and evaluating bids for presentation to the client. Following contractor selection Roux was heavily involved in coordinating with the client, regulators, and contractor for mobilization to the site in late 2006. During the construction Ms. Clarke provided support to the onsite construction manager regarding field changes, design revisions to account for unexpected conditions and contractor questions. The Final Engineering Report summarizing the construction activities was accepted by NYSDEC.
- Principal-in-Charge of an investigation and remediation project at a former petroleum refinery and current distribution facility located in Buffalo, New York. The site entered the NYSDEC BCP in 2006. Roux completed the BCP application and supported the application process. The work included assessing and remediating the potential environmental impacts associated with historical Site operations. These activities have included preparing multiple work plans and directing the activities of another consultant performing the fieldwork and preparing reports of results for field investigations including soil boring and sampling, well installation and groundwater sampling, aquifer pump testing, and groundwater/separate phase modeling. An in situ chemical oxidation system was designed, installed, and was operated as an IRM to remediate an area of free product and impacted groundwater discharging to the Buffalo River in OU-4.
- For the same petroleum Site in Buffalo, New York, multiple Alternatives Analysis Reports (to document analysis of engineering options and remedy recommendation), Remedial Action Work Plans and remedial design documents have been prepared to address the environmental impacts associated with the five Operable Units (OU) on the Site. Remedial construction for OU-1 was completed in 2007 and included excavation and disposal of impacted soil. The Final Construction Certification Report for OU-1 was accepted by the NYSDEC. The Alternatives Analysis Report and Remedial Design for OU-4 were submitted and approved by NYSDEC. The remedy for OU-4 included excavation and onsite consolidation of river sediments and site soil, stabilization of 1,400 linear feet of river embankment using tiered slopes, rip rap, and reinforced bioengineering, slurry wall groundwater containment, low permeability capping, a stormwater collection system and constructed wetland treatment for stormwater. Various vegetative measures were incorporated into the design in order to promote vegetative growth and enhance wildlife habitats. The remedial construction was completed in 2013 and 2014 and preparation of the Final Construction Completion Report was completed in 2015. The Alternatives Analysis Reports for OU-2 and OU-3 were submitted to NYSDEC. For OU-2, bench scale studies of stabilization/solidification agents were completed and evaluated for treatment of lead and petroleum impacted soil. In addition, field pilot studies of multiple options to treat petroleum impacted soils were completed and evaluated. Design of a stormwater collection system for portions of OU-2 and OU-3 was completed in 2010 and construction was completed in 2014 under the direction of Ms. Clarke.

- For the same petroleum terminal in Buffalo, New York, the work also included performing activities related to the operation of the remediation systems at the Site. These activities have included preparing a feasibility study work plan for improving water management systems at the site; preparing a work plan, directing the field work, and preparing an evaluation summary report for startup and testing of a portion of the groundwater extraction system at the Site; and assisting in preparation of plans to upgrade the existing treatment facilities at the Site.
- For the same petroleum terminal in Buffalo, New York, the work also included preparation of design documents and a completion report for in-place closure of the site's former in-ground oil water separator. In addition, a vapor enhanced extraction pilot study work plan was prepared and implemented at the site for recovery of separate-phase product in one portion of the site located adjacent to the Buffalo River. The results of the VER pilot testing, along with the results of chemical oxidation pilot testing conducted at the site, have been summarized in a Remedial Action Selection report, which recommended implementation of chemical oxidation in this portion of the site. A conceptual plan for implementation of chemical oxidation was submitted with the selection document. The work also included maintaining contact with regulatory agencies regarding the status of activities at the Terminal; preparing compliance monitoring reports for submittal to the regulatory agencies; overall project coordination; and budget management and tracking.
- Principal Engineer for the investigation, design, and implementation of a soil remediation project at a 4-acre former oil terminal in Cold Spring Harbor, New York under the NYSDEC spills program. The remedy completed included excavation and offsite disposal of approximately 20,000 tons of petroleum contaminated and/or hazardous lead contaminated soil in accordance with the future use of the site under an Environmental Easement. Additional activities completed by Roux at the site included asbestos remediation followed by building demolition, UST removal, and cesspool remediation. Roux prepared a Final Engineering Report, which was accepted by NYSDEC and resulted in the closure of the spill number for the Site.
- Principal Engineer for the investigation, design, and implementation of a soil remediation project at a portion of a former oil terminal in Sag Harbor, New York. The remedy completed included excavation and offsite disposal of approximately 2,000 tons of petroleum contaminated soil from beneath an active public roadway under the NYSDEC spills program. The remedy included extensive traffic control and coordination with Village of Sag Harbor officials, dewatering, water treatment, temporary water discharge of treated water to Sag Harbor and restoration of the public roadway in accordance with the Village of Sag Harbor Department of Public Works requirements. Roux prepared a Final Engineering Report, which was accepted by NYSDEC and resulted in the closure of the spill number for the Site.
- Project Manager for preparation of a work plan, direction the field activities and preparation of a summary report for investigation of the storm-water collection system at a petroleum terminal in Buffalo, New York. The objectives of the storm sewer investigation were to: prepare a detailed map of the Site's sewer system; re-establish connections that may have become blocked by debris; investigate the structural integrity of the storm sewers; locate areas of groundwater infiltration and assess infiltration rate and quality; assess wet and dry-weather flow and quality; and identify areas contributing surface water to the collection system, including hydrologic modeling using TR-55. Based on the results of the investigation, several improvements to the sewer system were recommended, including eliminating inlets to the system in areas of the site where no active operations currently take place and rehabilitation and/or installation of new sewers to restore flow by gravity to the treatment system.
- Principal Engineer for the investigation, remedial design, construction oversight and operation and maintenance of a bioventing and soil vapor extraction system at the Site of a diesel UST failure in Brooklyn. A free product recovery system was also designed, installed, and operated by Roux. Investigation activities included the use of the sonic drilling technique to advance twelve wells to 85 feet below grade through cobbles and boulders for delineation of separate phase product, soil, and groundwater impacts. Eight wells were converted to combination biovent/SVE wells. Design included specification of SVE and biovent blowers, piping, valves, and an automatic control system. Product only pumps were also designed and installed in three wells. Approximately 2,000 gallons of product were recovered by the two systems and the spill was closed by NYSDEC in 2011.
- Principal Engineer for a Brownfield redevelopment in Staten Island, New York of a former retail service station site under the NYSDEC BCP. There is soil, groundwater, and vapor contamination from petroleum-related constituents in the vicinity of the former gasoline piping and pump island (the petroleum source area), as well as historic fill across the entire site. The remedy, described in the Remedial Action Work Plan prepared by Roux, consisted of a sealed sheet pile containment wall around the petroleum source area, a Site Cover System across the entire site, comprised of concrete building slab/walkways, asphalt parking areas and limited landscaped areas and a sub-slab depressurization system to prevent vapor intrusion into the proposed retail building. A certificate of completion from NYSDEC was obtained in 2020.

- Project Manager for the remedial design at a Superfund Site in Nanuet, New York for the New York State Department of Environmental Conservation. The work included preparation of a preliminary design report, which evaluated two alternatives for handling hazardous soils and sediments at the site contaminated with volatile organic compounds. Each alternative was evaluated on the basis of technical feasibility, cost, and schedule for implementation. Based upon this evaluation, off-site disposal was recommended over on-site treatment. The report presented a site-wide conceptual plan for remediation, including soil/sediment excavation, staging and sampling; stream diversion; excavation dewatering; temporary on-site groundwater treatment; and long term monitoring. Duties also included managing and tracking all project budgets and serving as the main client contact.
- Principal Engineer for the design and specification of a large-scale (750 scfm) soil vapor extraction (SVE) pilot system with thermal oxidation off-gas treatment for a client in Brazil. Responsibilities included equipment sizing and specification, selection of materials of construction, SVE well and equipment layout, description of general startup procedures and preparation of a pilot test work plan. The pilot test work plan included a description of the pilot test operating procedures to be followed, operating parameters to be monitored and data to be collected and analyzed. The work also included conducting the pilot test activities and generating a report that included plans for expanding the SVE system across the Site. The work also included technical support for evaluating and optimizing system performance.
- Project Manager for a storm sewer study at the former metals manufacturing facility in Staten Island, New York as part of the Voluntary Cleanup Program for the Site to identify contaminated infiltration sources, provide an accurate site drainage map, and verify contributing areas to each outfall. The investigation included field inspections, surveying, dye testing, and sampling during varying tidal conditions. The storm sewer map prepared was used for future sewer closure and site redevelopment planning.
- Principal engineer for the design of a new storm water collection system for a metals manufacturing site in Staten Island, New York under the NYSDEC VCP. The design included evaluation and hydrologic modeling of the system using the USG Soil Conservation Service TR-55 hydrologic analysis model, inlet structure and pipe sizing and layout, outfall design and specification of materials and methods of construction for all system components.
- Principal-in-Charge of the operation, maintenance, monitoring and reporting activities at multiple active and former petroleum storage and distribution terminals located in New York for a large petroleum company. The work includes operation, maintenance, and performance/compliance monitoring services at the sites that currently have active remediation systems installed and monitoring, sampling, and reporting services at sites without systems. The remediation systems include groundwater extraction and treatment, free product recovery, bio-sparging, and soil vapor extraction/air sparging. At these sites, Roux is responsible for: maintaining and troubleshooting the various system components to reduce downtime to the extent possible; repairing and/or replacing equipment as needed; coordinating the upgrading of the electrical systems, as needed, to meet current building code requirements; expanding systems to meet regulatory requirements, as needed; optimizing system performance; collecting performance monitoring samples and data to track the efficiency of the treatment systems; and collecting compliance monitoring data.
- Principal Engineer for at multiple petroleum terminals in New York State for groundwater quality and surface water quality sampling and monitoring well gauging as required by the New York State Department of Environmental Conservation, as well as quarterly reporting for all sites. The work has also included collection of soil quality data at several sites and performance of an electromagnetic survey to support the divestiture and redevelopment of one of these sites. Based on these results, soil removal activities were performed at one of the former terminals in order to obtain regulatory closure of the site. Roux successfully completed the remedial activities to the satisfaction of the regulator and received closure for the client of the open spill number. Regulatory closure of another of these former terminals was obtained based upon the results of ongoing groundwater monitoring and reporting.
- Project Engineer for design of a 2.6-mgd groundwater treatment system at the Fireman's Training Center for Nassau County Department of Public Works on Long Island. The work included design of air strippers, exhaust stacks, liquid-phase GAC treatment units, and all chemical feed and storage facilities, including unit sizing, selection of materials of construction, equipment layout, and coordination with other disciplines. The work also included development of the "mass balance" for the facility.
- Task leader in charge of overseeing a bioventing pilot study conducted by a subconsultant, to treat contaminated vadose zone soils at the Fireman’s Training Center site in Nassau County, New York. The work included development of a preliminary design report for the full-scale implementation of bioventing at the site based upon the results of the pilot study.
- Project Engineer for the design, specification, construction, and operation of an air sparging and soil vapor extraction pilot at

the Long Island terminal of a large petrochemical distributor. The pilot was designed to treat contaminated ground water and vadose zone soils resulting from a one-million-gallon gasoline spill at the site. The work included development of the field sampling program and sampling and evaluation of various parameters to determine the pilot's radius of influence and effectiveness. The work also included performing data analysis and preparation of the pilot study report, which recommended full scale implementation of air sparging at the site. The site-wide implementation of air sparging and expansion of the site's existing vapor extraction system at the same Long Island petrochemical terminal was also part of the work. Responsibilities included design, specification, and layout of all mechanical equipment, vapor extraction, and air sparging wells and new vapor extraction/air sparging piping.

- Task leader responsible for investigating alternatives for the treatment of gasoline contaminated off-gas from air stripping operations a Long Island petrochemical terminal. Based on this evaluation, biofiltration was selected for piloting. Responsibilities included design of a pilot unit; development of sampling and data collection procedures; construction oversight and "troubleshooting" for the unit; coordination of data collection activities; and compilation and analysis of the pilot data.
- Project Engineer for the design of a 0.50-mgd groundwater treatment facility at a Long Island petrochemical terminal. Responsibilities included the design, specification, and layout of mechanical equipment, including the air stripping tower, vapor phase granular activated carbon off-gas treatment, centrifugal blowers, ductwork, influent pump, and concrete wet well. Responsible for shop drawing review during the construction phase.
- Project Manager for an investigation at a gasoline service station with soil and groundwater contamination. Responsible for reviewing and evaluating the work of another consultant that performed the soil and groundwater sampling and conducted remedial activities at the site including investigation summary reports; remedial designs; remediation progress reports; correspondence with regulators; and plans for future work at the Site. The work also included mapping the groundwater flow patterns in the area of the service station and mapping the areal and vertical extent of the groundwater contamination. Responsible for project coordination and budget management and tracking.
- Project Manager for the field investigation, feasibility evaluation, and remedial design at Superfund Site in Spring Valley, New York for the New York State Department of Environmental Conservation. The work included development of a work plan and site operations plan. The field investigations included Geoprobe soil borings; groundwater monitoring well installation; groundwater sampling; aquifer pump testing; and vapor extraction pilot testing. Work also included conducting the field operations for the vapor extraction pilot and producing a summary report of the field investigation results. The report presented an evaluation of the cost and feasibility of several alternatives for remediation of the site. It recommended reducing the level of effort of the remediation presented in the Record of Decision, based on lower levels of contamination encountered during the investigation. Duties also included project coordination, budget management and tracking, and development of subcontract agreements.
- Project Engineer for upgrades to the Spring Creek Auxiliary Water Pollution Control Plant for the City of New York. The work included the evaluation, design, and specification of a two-stage odor control system, chemical storage and feed facilities and new effluent disinfection system.
- Project Engineer responsible for preparation of design documents for the replacement of the sodium hypochlorite pumps and piping at the Mamaroneck Wastewater Treatment Plant for Westchester County Department of Environmental Facilities in New York.
- Project Engineer for design of upgrades to the New Rochelle Wastewater Treatment Facility for Westchester County Department of Environmental Facilities in New York. Designed upgrades to the main influent pump station, including rehabilitation of the existing influent pumps and replacement of the magnetic drives with new variable frequency drives. Responsibilities also included design of a submersible automatic duplex sump pump system, new primary sludge pumps and piping and new primary and secondary settling tank equipment. The work also included assisting the County during the bidding and contractor selection phase and preparing addenda to the contract documents.
- Project Manager for the construction of upgrades to the New Rochelle Wastewater Treatment Facility. Responsibilities included overseeing the shop drawing logging and distribution process; reviewing mechanical equipment shop drawings; addressing contractor questions regarding the contract documents; and coordinating with the resident engineer in the field and the electrical and general contractors.
- Project Engineer for the performance evaluation of the Harriman Wastewater Treatment Plant for the Orange County Department of Environmental Facilities and Services. Responsibilities included documentation of the existing conditions at the plant and evaluation of the historical and current performance of the plant with respect to its potential for expansion. A summary report was prepared, which included evaluations of the existing plant processes with respect to

standard design criteria, typical design practices and receiving water considerations. This summary report served as the basis for the facilities plan prepared as the next phase of the project.

- Project Engineer for the facilities plan for the upgrade of the Harriman Wastewater Treatment Plant. Responsibilities included evaluation of alternatives for expanding the plant's treatment capacity. A report was prepared, which recommended the conversion of the existing oxidation ditches to sequencing batch reactors (SBR) in order to increase the plant's treatment capacity to 6.0 mgd within the limited space available on the site.
- Project Engineer for the Gates-Chili-Ogden Pump Station and Force main design for Monroe County, New York. The design consisted of a new 36 mgd wet pit/dry pit pump station, influent sewer, and force main. Responsibilities included evaluating influent pumping conditions, and design of the influent sewer, manual influent bar racks and a duplex automatic submersible sump pump system for the station.
- Project Manager for the Flow Augmentation Needs Study (FANS) for Suffolk County Department of Public Works, New York. Responsibilities included coordinating and implementing the annual wetland monitoring effort for collection of data to characterize the vegetation communities and surface water and groundwater conditions at four freshwater wetland sites in Suffolk County. Duties also included maintaining a database of all vegetation data collected; developing and refining equations to characterize the groundwater table and wetlands vegetation in all monitoring areas; evaluating potential impacts of sewering on sensitive wetlands; and evaluating the need for any mitigation of these sites as triggered by vegetation changes correlated to groundwater drawdown. Responsibilities also included coordinating the production of a draft and final annual monitoring report summarizing the findings of the program.

PRESENTATIONS

Sparging Targets Submerged Residual Saturation Contamination, written with D. Bennett and L. Buchanan. Presented at the 66th New York Water Environment Federation Association Annual Meeting, New York, New York, February 1994.

Suffolk County Wetlands – Flow Augmentation Needs Study, written with M. A. Taylor and R. Southard. In Proceedings of the Annual Meeting, Hydrology and Hydrogeology of Urban and Urbanizing Areas. American Institute of Hydrology, April 1996.

APPENDIX J

Request for Import/Reuse Fill Material Form

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

Request to Import/Reuse Fill or Soil

This form is based on the information required by DER-10, Section 5.4(e) and 6NYCRR Part 360.13. Use of this form is not a substitute for reading the applicable regulations and Technical Guidance document.

SECTION 1 – SITE BACKGROUND

The allowable site use is: Choose an item

Have Ecological Resources been identified? Choose an item

Is this soil originating from the site? Choose an item

How many cubic yards of soil will be imported/reused? Choose an item

If greater than 1000 cubic yards will be imported, enter volume to be imported:

SECTION 2 – MATERIAL OTHER THAN SOIL

Is the material to be imported gravel, rock or stone? Choose an item

Does it contain less than 10%, by weight, material that passes a size 100 sieve? Choose an item

Is this virgin material from a permitted mine or quarry? Choose an item

Is this material recycled concrete or brick from a DEC registered processing facility? Choose an item

SECTION 3 - SAMPLING

Provide a brief description of the number and type of samples collected in the space below:

Example Text: 5 discrete samples were collected and analyzed for VOCs. 2 composite samples were collected and analyzed for SVOCs, Inorganics & PCBs/Pesticides.

If the material meets requirements of DER-10 section 5.4(e)5 (other material), no chemical testing needed.

SECTION 3 CONT'D - SAMPLING

Provide a brief written summary of the sampling results or attach evaluation tables (compare to DER-10, Appendix 5):

Example Text: Arsenic was detected up to 17 ppm in 1 (of 5) samples; the allowable level is 16 ppm.

If Ecological Resources have been identified use the "If Ecological Resources are Present" column in Appendix 5.

SECTION 4 – SOURCE OF FILL

Name of person providing fill and relationship to the source:

Location where fill was obtained:

Identification of any state or local approvals as a fill source:

If no approvals are available, provide a brief history of the use of the property that is the fill source:

Provide a list of supporting documentation included with this request:

The information provided on this form is accurate and complete.

_____ _____

Signature Date

_____

Print Name

_____

Firm

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