

INTERIM REMEDIAL MEASURE WORK PLAN

**92 TO 98 NAGLE AVENUE
NEW YORK, NEW YORK
SITE NO: C231134**

OCTOBER 2021

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SITE NO: C231134
MAY 2021**

"I, Mr. David Hermantin, certify that I am currently a New York State registered professional engineer and that this Interim Remedial Measure Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the Department of Environmental Remediation Technical Guidance for Site Investigation and Remediation (DER-10) and that all activities were performed in full accordance with the DER-approved work plan and any DER-modifications."

Renu Engineering Technologies, P.C.



Dave Hermantin, P.E.
Principal



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1.0 INTRODUCTION

Renu Engineering Technologies, PC. (Renu), has prepared the following Interim Remedial Measure Work Plan (IRMWP) for the property located 92 to 98 Nagle Avenue, New York, New York (the site). The site is listed on the New York State Department of Environmental Conservation's (NYSDEC) Environmental Site Remediation Database under site code **C231134**.

The proposed work is being performed on behalf of 92-98 LLC., as part of their commitment to investigate and clean up the site under the NYSDEC Brownfield Cleanup Program (BCP). This work is being performed pursuant to the NYSDEC Brownfield Cleanup Agreement (BCA), executed on April 2, 2020 (Index No. C231134-03-20).

This IRMWP describes the proposed effort to remove the suspected source area(s) of contamination, identified in a December 2018 Phase II Environmental Site Assessment (ESA) by Merritt Environmental Consulting Corp (MECC), by removing the PCE and TCE impacted soils beneath the building slab beneath the former dry-cleaner lease area. The impacted soil will be removed to the extents feasible prior to performing a remedial investigation (under a work plan to be submitted separately). This approach has the potential to significantly reduce the environmental and human exposure risk to contaminants and minimize their movement to onsite and offsite media prior to developing a comprehensive remedial plan for the site.

1.1 Site Location and Current Usage

The Site is located at 92-98 Nagle Avenue, New York County, New York. The Site is identified as Block 2174 and Lot 93 on the New York City Tax Map. The Site is located in the Fort George section of Manhattan. The site is located at the northwest corner of the intersection of Nagle Avenue and Sickles Street. The property is bordered to the north by a residential building. The property is bordered to the east and west by a mixed-use building. The property is bordered to the south by a PS 152 Dyckman Valley Primary School.

The site location is depicted on Figure 1. The Subject Property is improved with a 6-story mixed-use building with a basement. The building has an estimated gross floor area of 70,323 square feet. The buildings occupy the majority of the parcel area. A portion of the first floor is occupied by eight (8) commercial spaces (Associated Medical Group, Deli/Grocery with no name, Splash Star Laundromat, Vargas Fabrics & Upholstery, PieZano Pizza, NYC Salad & Grill, and vacant spaces), while the remaining areas are occupied by sixty-eight (68) residential apartment units. Historically various dry-cleaning facilities operated at the Site (Ella Morris Cleaning & Dying, Nagle Cleaners & Dyers, Claret French Dry-Cleaning Inc., Care Cleaners and Top Hat Cleaners from at least the 1930's through 2003. When the property was purchased by 92-98 LLC in 2004 there were no active dry cleaners operating on the property.

The near surface geology in the Fort George section of Manhattan is similar to other heavily developed areas found in this area. The site and surrounding area surficial geology is generally considered “urban land” and is characterized by a non-homogenous distribution of soil and fill types. Excavation and backfilling for building foundations, utility conduits, railway systems, and other construction has resulted in a varied subsurface profile. No bedrock outcroppings are present at the site. Based on available information, bedrock is estimated at 10 to 20-feet below ground surface (bgs).

Based upon soil boring data collected during the 2018 Supplemental Investigation Report performed by Castleton, groundwater at the site was found at depths ranging from just below the slab to 1.75 feet below the basement floor. Site geology consisted of poorly sorted sands, gravels, pebbles, and silt. The nearest surface water body is the Harlem River to the east of the Subject Property. Local groundwater gradient is expected to follow surface topography. Groundwater flow near the Subject Property is expected to flow east, toward the Harlem River.

1.2 Description of Surrounding Property

The site and surrounding area are zoned as C1-4, which permits Commercial use. C1-4 districts are designated for are commercial overlays mapped within residence districts. Mapped along streets that serve local retail needs, the surrounding properties to the north and south of the Site are zoned residential.

The current zoning and land use of the site and surrounding area is depicted on Figure 2.

1.3 Proposed Interim Remedial Measure

Based on the site history, previous environmental investigations, and recent geophysical survey results, an IRM is proposed to address the suspected source area(s) of contamination at the site. Based on the investigations performed to date, it is suspected the release of CVOC contamination in the southeastern portions of the building. Removing the suspected source area, the impacted soil, will substantially reduce the potential continued threat to the environment and human exposure.

The proposed scope of work to implement the IRM includes the preparation of this IRMWP for NYSDEC review and approval and excavating/removing impacted soil/groundwater to the horizontal and vertical extents feasible. IRM methods will generally include “low-tech” methods such as excavation and vacuum extraction.

The suspected primary source areas are depicted on Figure 3.

1.4 Parties Performing the Remedy

The IRM and BCP cleanup effort will be performed by several organizations under contract to 92-98 LLC. A description of their roles and relationship is provided below:

- NYSDEC – Lead Regulatory Agency
- NYSDOH – Human Health Exposure regulations
- 92-98 LLC – NYSDEC BCP Participant
- Castleton Environmental Geologic Services, DPC – Qualified Environmental Professional. Castleton will provide overall project management, coordination with 92-98 LLC, NYSDEC and NYSDOH, and contractors, and provide environmental consulting and oversight during field efforts. Other responsibilities include but are not limited to:
 - Observation and documentation of field effort. Preparation and submission of weekly, monthly, etc. reports to NYSDEC and NYSDOH.
 - Daily scheduling of work activities.
 - Perform air quality monitoring during work activities.
 - Collection of endpoint soil and waste characterization samples.
 - Coordination with the remedial and waste transportation/disposal contractors.
 - Preparation of completion reports.
- Renu Engineering Technologies, P.C. – Engineer of Record. Contracted directly to 92-98 LLC.
 - Prepare work plans, design, and reports that require certification by a NYS licensed PE.
 - Provide field oversight and inspections to certify the work completed.
- PAL Environmental Services Corp. (PAL) – Environmental Contractor. Sub-contracted to Castleton.
 - Provide the manpower and machinery necessary to execute the IRM effort.
 - Obtain necessary permits prior to commencing work.
 - Establish appropriate work/exclusion zones.
 - Provide field supervision, technicians, and equipment operators.
 - Provide transportation and disposal of generated wastes.
- Innovative Recycling Technologies (IRT) – Waste Disposal Contractor. Sub-contracted to PAL.
 - Field inventorying, screening, and segregating of wastes.
 - Field packaging of compatible waste streams.
 - Review of waste characterization data.
 - Determination of appropriate disposal facilities and obtain disposal approvals.
 - Determine appropriate waste haulers/transporters. To be contracted directly to the volunteer.
- York Analytical Laboratories, Inc. – A NYSDOH ELAP certified laboratory that will provide analytical services in support of the project.

Resumes of personnel involved in the IRM are provided in Appendix A.

2.0 PREVIOUS ENVIRONMENTAL DOCUMENTATION

Previous environmental documents have been developed by others for the site which include:

2.1 Phase II Environmental Site Assessment – June 2018

The impacts to soil and groundwater were identified during the completion of a Phase II ESA (Focused Subsurface Site Investigation (FSSI)) performed by Merritt Environmental Consulting Corp (MECC) dated June 2018. The Phase II was performed in response to a Phase I ESA that identified a Site history of Dry cleaners occupying the property.

Subsurface testing included the characterization of soil and groundwater in the basement of the building in the vicinity of the former dry cleaner identified the presence of chlorinated volatile organic compounds (CVOCs), notably tetrachloroethylene (PCE) and trichloroethylene (TCE). The reported concentrations in soil and groundwater exceeded the applicable NYSDEC Standards, Criteria, and Guidance (SCGs) based on the current and reasonably anticipated use of the site.

2.2 Supplemental Investigation Report – December 2018

Based on the Phase II ESA FSSI performed by MECC dated June 2018, Castleton conducted additional subsurface testing including the characterization of soil and groundwater in the basement of the building in the vicinity of the former dry cleaner. The presence of chlorinated volatile organic compounds (CVOCs) was identified, notably tetrachloroethylene (PCE) and trichloroethylene (TCE). The reported concentrations in soil and groundwater exceeded the applicable NYSDEC Standards, Criteria, and Guidance (SCGs) based on the current and reasonably anticipated use of the site.

In soil, PCE was found at concentrations up to 16,000-mg/Kg, which is above its respective NYSDEC Part 375.6 Soil Cleanup Objective (SCO) for the Protection of Groundwater of 1.3-mg/Kg and Industrial Use SCO of 300-mg/Kg. TCE was found at concentrations of up to 2.3-mg/Kg, which is also above its respective NYSDEC Part 375.6 SCO for the Protection of Groundwater of 0.47-mg/Kg. Subsurface soil samples where CVOCs were identified were collected from within the building at a depth of 1.5 to 5-feet below ground surface (bgs).

The concentrations of CVOCs and the subsurface soil sample locations are depicted on Figure 3.

In groundwater, PCE was identified at concentration of up to 130,000-ug/L, TCE was identified at concentrations of up to 660-ug/L, and cis-1,2-dichloroethene was identified at concentrations of up to 800-ug/L. These concentrations of CVOCs are well above their respective NYSDEC Part 703.5 Ambient Groundwater (Class GA) standard of 5-ug/L. Besides these chemicals, multiple CVOCs were identified in groundwater samples collected throughout the site.

2.3 Soil Vapor Intrusion Investigation Report – July 2019

A soil vapor intrusion (SVI) investigation was conducted in April 2019. This work was performed pursuant to a NYSDEC Stipulation Agreement for DEC Site No. 231134 and the March 2019 SVI Investigation Work Plan dated March 2019.

The SVI investigation six sub-slab vapor, eight indoor ambient air quality samples, and one outdoor ambient air quality samples were collected. In addition, one indoor ambient air quality and one sub-slab vapor duplicate samples were collected for quality control.

Analytical results reported concentrations of TCE, PCE and Methylene chloride below the below AGVs in all the indoor air samples analyzed.

1,1,1-TCA, 1,1-dichloroethylene, carbon tetrachloride, and vinyl chloride were reported as non-detect in the seven sub-slab vapor samples. Cis-1,2-dichloroethylene was reported in one sub-slab vapor sample below its response threshold of 6 ug/m³. Cis-1,2-dichloroethylene was reported as non-detect in the remaining samples. Methylene chloride and PCE were non-detect or detected below the response threshold of 100 ug/m³ in all six sub-slab vapor samples. TCE vapor concentrations were reported as non-detect in five of the six sub-slab vapor samples. TCE was reported above the response threshold of 6 ug/m³ in sub-slab vapor sample SSV05 at a concentration of 6.3 ug/m³. A duplicate sample was collected at sub-slab vapor sample location SSV05 which reported a TCE concentration of 6.8 ug/m³. The results of the SVI are shown on Figure 4.

In accordance with the matrices contained in the NYSDOH guidance for SVI and based on the results of the SVI investigation, no further actions are recommended regarding SVI. A full SVI investigation was submitted to the NYSDEC in July 2019

3.0 PROPOSED INTERIM REMEDIAL MEASURE

The IRM recommendations for the site include, to the extent feasible, removing and disposing of impacted soil/material. The impacted soil/material will be removed to the extents feasible in order to minimize the potential spread of contamination. The soil/material removal effort will follow a sequenced excavation plan to remove site impacted soil to the surface of bedrock or the extents feasible.

The specific soil cleanup objectives (SCOs) the excavation of impacted soil/material will aim to achieve are the 6 NYCRR Part 375 Table 375-6.8(b) PGWSCOs for VOC contaminants. If endpoint sample analytical results do not meet specific SCOs for the site, and prior to backfilling, the top of soil/material where impact remains will be surveyed, and a demarcation layer will be installed, as detailed in Section 6.6 of this IRMWP.

Soil or fill material exhibiting detectable concentrations of CVOCs shall be classified as a hazardous waste. Therefore, this material must be segregated, managed, and disposed of as hazardous waste unless a “contained-in” determination is approved by the NYSDEC.

3.1 Soil Excavation and Disposal

Impact to soil and groundwater is suspected to have been a result of the historic use of the building. Soil will be screened for the presence of volatile organic compounds (VOCs) using a photoionization detector (PID). Impacted soil will be systematically excavated horizontally and vertically to feasible and practical extents based on field observations, intermediate soil characterization sampling and analysis, structural limitations, groundwater, bedrock, and/or the property boundary.

Based on the available soil and groundwater data, the maximum estimated area of the impacted soil/material excavation is approximately 1,800-square feet. Depending on the extent to which impacted soil/material is identified, excavation may extend to the surface of bedrock, estimated at approximately 3-feet to 5-feet below the building slab. As such, the maximum volume of impacted soil/material that may be excavated is approximately 300- cubic yards of soil/material.

The anticipated maximum extents of the excavation of impacted soil/material are depicted on Figure 5.

During excavation, soil will be screened with a PID. Confirmatory endpoint samples shall be collected and analyzed to determine if the limits of excavation meet the site specific SCOs or if additional excavation is needed. In accordance with DER-10 Section 5.4(b)(5), at a minimum, one bottom sample and one base-sidewall confirmatory endpoint sample will be collected from each excavation area. If the excavation area is greater than 900-square feet in area an additional bottom sample will be collected for every 900-square feet of area. Excavations greater than 30-linear feet in perimeter shall have an additional sidewall confirmatory endpoint sample for every 30-linear feet. If remedial excavation extends to the surface of bedrock, bottom endpoint samples shall not be collected.

For the purpose of this IRMWP, an estimated 8 confirmatory endpoint samples are anticipated to be collected and analyzed in accordance with NYSDEC 6 NYCRR Part 375. Each of the final endpoint samples shall be analyzed for Target Analyte List (TAL)/Target Compound List (TCL) analytes plus tentatively identified compounds (TICs) including emerging contaminants (1,4-dioxane and per and polyfluoroalkyl substances). A summary of the analytes and associated testing methods is provided below:

- Volatile Organic Compounds (VOCs) by USEPA Method 8260
- Semi-VOCs (SVOCs) by USEPA Method 8270
- Metals by USEPA Methods 6010/7473

- Polychlorinated Biphenyls (PCBs) by USEPA Method 8082
- Pesticides by USEPA Method 8081
- Herbicides by USEPA Method 8151
- Per and Polyfluoroalkyl Substances (PFAS) by USEPA Method 537m
- 1,4-Dioxane by USEPA Method 8270 SIM

The locations of the anticipated endpoint samples are depicted on Figure 5.

Prior to commencing soil removal, support of excavation (SOE) plans detailed shoring and support will be prepared by a New York State licensed Professional Engineer (PE) and for review by NYSDEC and approval by New York City Department of Building (NYCDOB), as applicable.

3.3 Anticipated IRM Schedule

Following the approval of the IRMWP, an estimated 4 to 6 weeks is anticipated for SOE plan production, approval, and permits. An additional 2 to 4 weeks is to complete the IRM including excavation and site restoration. Therefore, the estimated start date of the IRM is late January through February 2022 and is anticipated to complete during April – May 2022.

A conceptual project schedule is provided as Table 1.

4.0 ENGINEERING SPECIFICATIONS AND CONTROLS

Prior to commencing excavation and impacted soil removal, appropriate building and demolition permits shall be obtained. An SOE Plan will be prepared by New York State licensed engineer for NYDOB review and approval. Excavation activities are anticipated to take place entirely within the building space. As such, the SOE plan shall be designed to allow for the maximum extents of excavation feasible while ensuring the stability and integrity of the building structure.

Support, shoring, and excavation plans shall be prepared and submitted to DEC for review and approval.

5.0 SOIL AND MATERIALS MANAGEMENT PLAN

The following sections constitute the Soil/Materials Management Plan to ensure the proper handling, management, reuse, and disposal of excavated soil/material.

5.1 Material Excavation

The Remedial Engineer or a qualified environmental professional under his/her supervision will oversee all invasive work and the excavation and load-out of all excavated material.

The Participant and its contractors are solely responsible for safe execution of all invasive and other work performed under this Plan. 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 Remedial Action Work Plan is posed by utilities or easements on

the Site. The Participant and associated parties 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).

All primary contaminant sources (including but not limited hotspots) identified during Site Characterization, Remedial Investigation, 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 IRM Completion Report.

5.2 Soil Screening and Stockpiling Methods

Visual, olfactory and PID soil screening and assessment will be performed by a qualified environmental professional or experienced field geologist 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 IRM. Impacted soil will be segregated and stockpiled for disposal. Screening will be performed by qualified environmental professionals. Resumes 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 are provided in Appendix A.

Excavation is anticipated to take place exclusively within the building footprint. If upon exposing soil/material significant odors are encountered, impacted soil/material shall be either drummed or placed in lined and sealed roll-off containers eliminate the risk of exceeding the Health and Safety Plan (HASP) and Community Air Monitoring Plan (CAMP) VOC criteria. The use of a vacuum truck with heavy duty suction lines will be utilized for excavating the impacted soil/material. The soil/material will be transferred from the vacuum truck to lined roll off containers. No soil/material will be stockpiled on the Site.

5.3 Characterization of Excavated Material

The soil/material or other excavated media that is transported offsite for disposal will be sampled in accordance with the receiving facility, DER-10, and in compliance with applicable laws and regulations as described in the previous section. Soil/material that exhibits detectable concentrations of chlorinated solvents shall be managed and disposed of as hazardous waste unless a “contained-in” determination is approved by the NYSDEC.

5.4 Material Load Out and Transport

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.

Truck transport routes are depicted on Figure 6. 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 off- Site 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; [(g) community input [where necessary]]. All trucks loaded with Site materials will exit the vicinity of the Site using only these approved truck routes.

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.

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

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.

A contingency plan for odor control of trucks leaving the site with significant odors is included in Section 6.3 of this IRMWP.

Local streets where trucks exit the site shall be inspected daily for evidence of soil tracking off site premises. Cleaning of the adjacent roadways will be performed as needed to maintain a clean condition with respect to site derived materials.

5.5 Materials for Offsite Disposal

The following documentation will be prepared or obtained by the Remedial Engineer for each disposal destination used during this project to document that regulated material exported from the site conforms with applicable laws and regulations:

1. A letter (or equivalent) from the Remedial Engineer to each disposal facility describing the material to be disposed and requesting written acceptance of the material. This letter will state that material to be disposed is contaminated material generated at an environmental remediation Site in New York State. 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 (including Site Characterization data); and,

2. An acknowledgement from each disposal facility stating that it is in receipt of the correspondence (1, above) and is approved to accept the material.

Impacted soil/material or other waste excavated and removed from the site will be managed as regulated material and will be disposed of in accordance with applicable laws and regulations.

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 will be performed for offsite disposal in a manner required by the receiving facility and in conformance with its applicable permits. Waste characterization sampling and analytical methods, sampling frequency, analytical results, and QA/QC will be reported in an IRM completion report. A manifest system for offsite transportation or exported material will be employed and reported in the completion report. Hazardous wastes derived from onsite will be stored, transported, and disposed of in compliance with applicable laws and regulations.

5.6 Demarcation

After completion of impacted soil/material removal, if endpoint analytical results do not meet applicable SCOs, and prior to backfilling, the top of the residual soil/fill where impact remains, will be defined by placement of a demarcation layer. The demarcation layer will consist of geosynthetic fencing or equivalent material to be placed on the surface of residual soil/fill to provide an observable reference layer. A land survey will be performed of the top elevation of residual soil/fill before the placement of the demarcation barrier. The survey map will be presented in the IRM construction completion report. This demarcation will constitute the top of the site management horizon.

5.7 Import of Backfill from Offsite Sources

All materials proposed for import onto the Site will be approved by the Remedial Engineer and will be in compliance with provisions in this IRMWP prior to receipt at the Site.

Material from industrial sites, spill sites, other environmental remediation sites or other potentially contaminated sites will not be imported to the Site. Solid waste will not be imported onto the Site.

The IRM completion report will include the following certification by the Remedial Engineer: “I certify that all import of soils from off-Site, 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”.

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All imported soils will meet NYSDEC approved backfill or cover SCOs for this Site. These NYSDEC approved backfill or cover soil quality objectives are the lower of the protection of groundwater or the protection of public health soil cleanup objectives for commercial use as set forth in Table 375-6.8(b) of 6 NYCRR Part 375. Non-compliant soils will not be imported onto the Site without prior approval by NYSDEC. Nothing in the approved IRM work plan or its approval by NYSDEC should be construed as an approval for this purpose.

Soils that meet 'general fill' requirements under 6 NYCRR Part 360.13, but do not meet backfill or cover soil objectives for this Site, will not be imported onto the Site without prior approval by NYSDEC.

The following potential sources may be used pending attainment of backfill and cover SCOs:

- Clean soil from construction projects at non-industrial sites in compliance with applicable laws and regulations;
- Clean soil from roadway or other transportation-related projects in compliance with applicable laws and regulations;
- Clean recycled concrete aggregate (RCA) from facilities permitted or registered by NYSDEC.

Materials received for import to the site will be approved and will be in compliance with provisions in this work plan. The IRM completion report will report the source of the fill, evidence that an inspection was performed on the source, chemical sampling results, frequency of testing, and a site map indicating the locations where backfill or soil cover was placed.

Inspection of imported fill material will include visual, olfactory and PID screening for evidence of contamination. Materials imported to the site will be subject to inspection, as follows:

- Trucks with imported fill material will be in compliance with applicable laws and regulations and will enter the site at designated locations;
- Trucks entering the site with imported fill material will be secured with tight fitting covers;
- The representative is responsible to ensure that every truck load of imported material is inspected for evidence of contamination; and
- Fill material will be free of solid waste including pavement materials, debris, stumps, roots, and other organic matter, as well as ashes, oil, perishables or foreign matter.

Imported material will be properly pre-characterized. Once it is determined that the fill material meets imported backfill or cover SCOs, and lacks petroleum contamination, 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.

RCA will be imported from facilities permitted or registered by NYSDEC. The Remedial Engineer is responsible to ensure that the facility is compliant with 6NYCRR Part 360 registration and permitting requirements for the period of acquisition of RCA. RCA imported from compliant facilities will not require testing (provided the material meets the sieve analysis requirements under DER-10 section 5.4(e)(5)), unless required by NYSDEC under its terms for operation of the facility. RCA imported to the Site must be derived from recognizable and uncontaminated concrete and/or brick. RCA material is not acceptable for, and will not be used as, cover material.

5.9 Fluids Management

Liquids to be removed from the site, including dewatering fluids, will be handled, transported and disposed in accordance with applicable laws and regulations. Liquids discharged into the municipal sewer system will receive prior approval by the municipality. Discharge to the municipal sewer system will require permit from NYCDEP and sampling data demonstrating that the groundwater meets the municipality's discharge criteria. The dewatering fluid may be pretreated as necessary to meet the discharge criteria. If discharge to the sewer system is not appropriate, the dewatering fluids will be managed by transportation and disposal at an off-Site treatment facility.

Discharge of water generated during remedial construction to surface waters (i.e. a stream or river) is prohibited without a SPDES permit issued by NYSDEC.

6.0 CONTINGENCY PLAN

The following contingency plans are included to address the discovery of unknown structures or contaminated media during excavation, address the discovery and extraction of free-phase product, and trucks leaving the site with impacted soil/material exhibiting significant odors. If unanticipated circumstances are discovered during IRM activities that require special consideration and action, the NYSDEC project manager will be immediately notified.

6.1 Discovery of Unknown Structures or Contaminated Media

This contingency plan is developed to address the discovery of unknown structures or contaminated media during excavation. Identification of unknown contamination source areas during invasive site work will be promptly communicated to the NYSDEC project manager. Petroleum spills will be reported to the NYSDEC Spill Hotline. These findings will be included in the daily report. If previously unidentified contaminant sources are found during onsite remedial excavation or development-related excavation, sampling will be performed on contaminated source material and surrounding soils and reported to the NYSDEC project manager. Chemical analytical testing will be performed for TCL VOCs and semi-VOCs (SVOCs), pesticides/PCBs, TAL metals, and Emerging Contaminants, as appropriate.

6.2 Free-Phase Product Extraction Contingency

Based on soil and groundwater data from the previous investigations, free-phase product is not anticipated to be encountered at the groundwater interface. However, if encountered, this will be addressed by mechanical extraction including pumping and vacuum recovery, absorption, and proper disposal. The need for dedicated product recovery wells is not anticipated as part of this IRM. The duration and frequency product extraction will be determined based on field conditions and judgment of the Remedial Engineer with concurrence from the NYSDEC.

A remedial design as a separate submittal shall be prepared and certified by a NYS Licensed PE if this contingency plan is implemented.

6.3 Trucks Leaving the Site with Significant Odors Contingency

Waste material that exhibits significant odors shall be contained in such a way to prevent odors from emanated from trucks during transportation to the disposal facility. Material generated during excavation that is to be removed from the site will be placed into sealed totes in the work zone. The totes will then be transferred to an area adjacent to the work zone where another dedicated machine will transfer the totes into trucks for offsite disposal. This goal of this approach is to remove/minimize the possibility of impacted waste material from being dispersed outside of the workzone (e.g. sidewalk, roadways, etc.).

7.0 COMMUNITY AIR MONITORING

A Community Air Monitoring Plan (CAMP) is required during all intrusive activities. The IRM activities are expected to take place exclusively within the building space, fugitive dust and vapors are not anticipated to migrate offsite. Real-time air monitoring for VOCs and particulates will be performed during ground intrusive activities.

Actions to protect building occupants will include establishing a self-contained, negative pressure work enclosure with proper emission controls encompassing the work area(s). Individuals not directly involved with the planned work must be absent from the enclosures in which the intrusive work will occur. Monitoring shall be consistent with the guidance *Special Requirements for Work within 20-feet of Potentially Exposed Individuals or Structures*. The locations of exhaust vents and discharge points, as well as potential vapor pathways relative to adjoining rooms and/or spaces, shall be understood and monitoring stations established accordingly. When possible, exhaust fans or other engineering controls be used to create negative air pressure within the work area during intrusive activities shall be used and shall be vented outside the building. If negative pressure workspaces are established, the CAMP shall be mindful that exhausted air may require monitoring and/or appropriate treatment prior to discharge.

Because the Site will be occupied during the IRM activities, an enhanced CAMP will be implemented as described above, include a negative pressure work enclosure, and continuous air monitoring around the work zone.

The DER-10 generic and enhanced CAMP document is included as Appendix B.

8.0 ODOR, DUST, AND NUISANCE CONTROL

The following sections summarize the steps taken to mitigate odors, dust, and nuisance control. The NYSDEC project manager shall be immediately notified of all dust and/or odor complaints.

8.1 Odor Control

Necessary means will be employed to prevent on- and off-site odor 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) use of foams to cover exposed odorous soils. If odors develop and cannot otherwise be controlled, additional means to eliminate odor nuisances will include: (d) direct load-out of soils to trucks for off-Site disposal; and (e) use of chemical odorants in spray or misting systems.

This odor control plan is capable of controlling emissions of nuisance odors. 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. Implementation of all odor controls, including halt of work, will be the responsibility of the Remedial Engineer.

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 on-Site 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.

8.2 Dust Control

Dust management during invasive onsite work will include, at a minimum:

- Use of a dedicated water spray methodology for roads, excavation areas and stockpiles.
- Use of properly anchored tarps to cover stockpiles.
- Use of gravel or recycled concrete aggregate on egress and other roadways to provide a clean and dust-free road surface.

This dust control plan is capable of controlling emissions of dust. If nuisance dust emissions are identified, work will be halted and the source of dusts will be identified and corrected. Work will not resume until all nuisance dust emissions have been abated.

8.3 Nuisance Control

Noise control will be exercised during the remedial program. Remedial work will conform, at a minimum, to local noise control standards.

Rodent control will be provided, during the remedial program, as necessary, to prevent nuisances.

9.0 SITE RESTORATION

9.1 Import of Backfill

The excavation will be backfilled with clean, uncontaminated imported soil that meets the lower of the NYSDEC 6 NYCRR Part 375-6.8 Protection of Groundwater SCOs or the Commercial SCOs.

The imported soil will be from an approved source/facility and will be evaluated by the Remedial Engineer to ensure:

1. That a segregated stockpile for number tons (number cubic yards) is properly maintained at the source and will not be comingled with any other material prior to importing the soil material at the Site;
2. That the material does not include any solid waste (*C&D from a NYSDEC registration facility may be allowed for backfill under certain circumstances per DER-10 section 5.4 and Part 360-13*);
3. That screening for evidence of contamination by visual, olfactory and PID soil screening practices prior to testing at the source as well as upon importing to the Site for grading is completed; and
4. That a maximum five-part composite sample will be collected from the segregated stockpile at the source at a minimum frequency of one sample per 250 cubic yards and analyzed for the following Full List parameters:
 - SVOCs by EPA Method 8270D (rev. 2007)
 - Pesticides by EPA Method 8081B (rev. 2000)
 - PCBs by EPA Method 8082A (rev. 2000)
 - TAL Metals by EPA Method 6010C (rev. 2007)
 - Emerging Contaminants (PFAS via EPA Method 537 modified with isotope dilution analysis)
5. That discrete samples will be collected from the segregated stockpile at the source at a minimum frequency as specified in DER-10 Table 5.4(e)10 and analyzed for the following parameters:
 - VOCs by EPA Method 8260C (rev. 2006)

A highly visible demarcation barrier (i.e., orange geo-synthetic material or equivalent) will be installed beneath the clean soil/fill surface cover. A vapor barrier will be installed beneath new concrete will be restored to match the surrounding floor and cap the excavation. The vapor barrier selected will meet the American Society for Testing Materials (ASTM) E-1745 Class A, B, & C Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.

The IRM completion report will include documentation of the imported soil cover including invoices, truck transport slips, number of tons (number of cubic yards), PE-stamped site plan with areas of the soil cover, and photographs documenting the importing and grading across the site.

9.2 Replacement of Groundwater Monitoring Wells

If during IRM excavation activities, any of the existing monitoring wells are destroyed or are no longer usable, they will be replaced in-kind following the completion of backfilling and restoration.

10.0 QUALITY ASSURANCE/QUALITY CONTROL

QA/QC procedures will be used to provide performance information with regard to accuracy, precision, sensitivity, representation, completeness, and comparability associated with the sampling and analysis for this investigation where applicable during the IRM. Field QA/QC procedures will be used (1) to document that samples are representative of actual conditions at the Site and (2) identify possible cross-contamination from field activities or sample transit. Laboratory QA/QC procedures and analyses will be used to demonstrate whether analytical results have been biased either by interfering compounds in the sample matrix, or by laboratory techniques that may have introduced systematic or random errors to the analytical process. QA/QC procedures shall meet at a minimum ASP-B protocol.

- Endpoint samples collected will adhere to the specified QA/QC procedures and results will be validated by a third-party data validator.

A site-specific Quality Assurance Project Plan (QAPP) is provided in Appendix C.

11.0 REPORTING

Regular progress reports are required and shall be prepared and submitted to the NYSDEC during site activities and include:

- Daily reports will be prepared and submitted to the NYSDEC and NYSDOH by noon the following day, and will include photographs, summary of the work completed, locations of the work and quantities of material imported and exported, summary of complaints, and notable site conditions.
- Monthly reports shall be prepared and submitted to the NYSDEC and NYSDOH on the 10th day of the following month. Monthly reports will summarize progress made during the reporting period.
- Following the completion of the IRM, an IRM Construction Completion Report (CCR) will be prepared to document the results of the IRM. The completion report shall document the results of the IRM and include material removed from the site. The CCR provides the documentation that the remedial work required under this IRM work plan has been

completed and has been performed in compliance with this plan. The CCR 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 CCR will include PE-certified as-built drawings for all constructed elements, calculation and manufacturer documentation for treatment systems, certifications, manifests, and bills of lading. The CCR will provide a description of any changes in the IRM from the elements provided in this IRM work plan and associated design documents. The CCR 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 IRM. The CCR will provide test results demonstrating that all mitigation and remedial systems are functioning properly. The CCR will be prepared in conformance with DER-10. In addition, analytical results will be prepared in the NYSDEC Electronic Data Deliverables (EDD) format and submitted/approved for inclusion in the NYSECs EQulS database.

12.0 HEALTH AND SAFETY PLAN (HASP)

A site-specific HASP has been prepared for the site. The Site Safety Coordinator will be Joseph Chiappetta. Investigative work performed under this Work Plan will be in full compliance with applicable health and safety laws and regulations, including Site and OSHA worker safety requirements and HAZWOPER requirements. Confined space entry, if any, will comply with OSHA requirements and industry standards and will address potential risks. The parties performing the investigation work will ensure that performance of work is in compliance with the HASP and applicable laws and regulations.

All field personnel involved in investigation activities will participate in training required under 29 CFR 1910.120, including 40-hour hazardous waste operator training and annual 8-hour refresher training. Site Safety Officer will be responsible for maintaining workers training records.

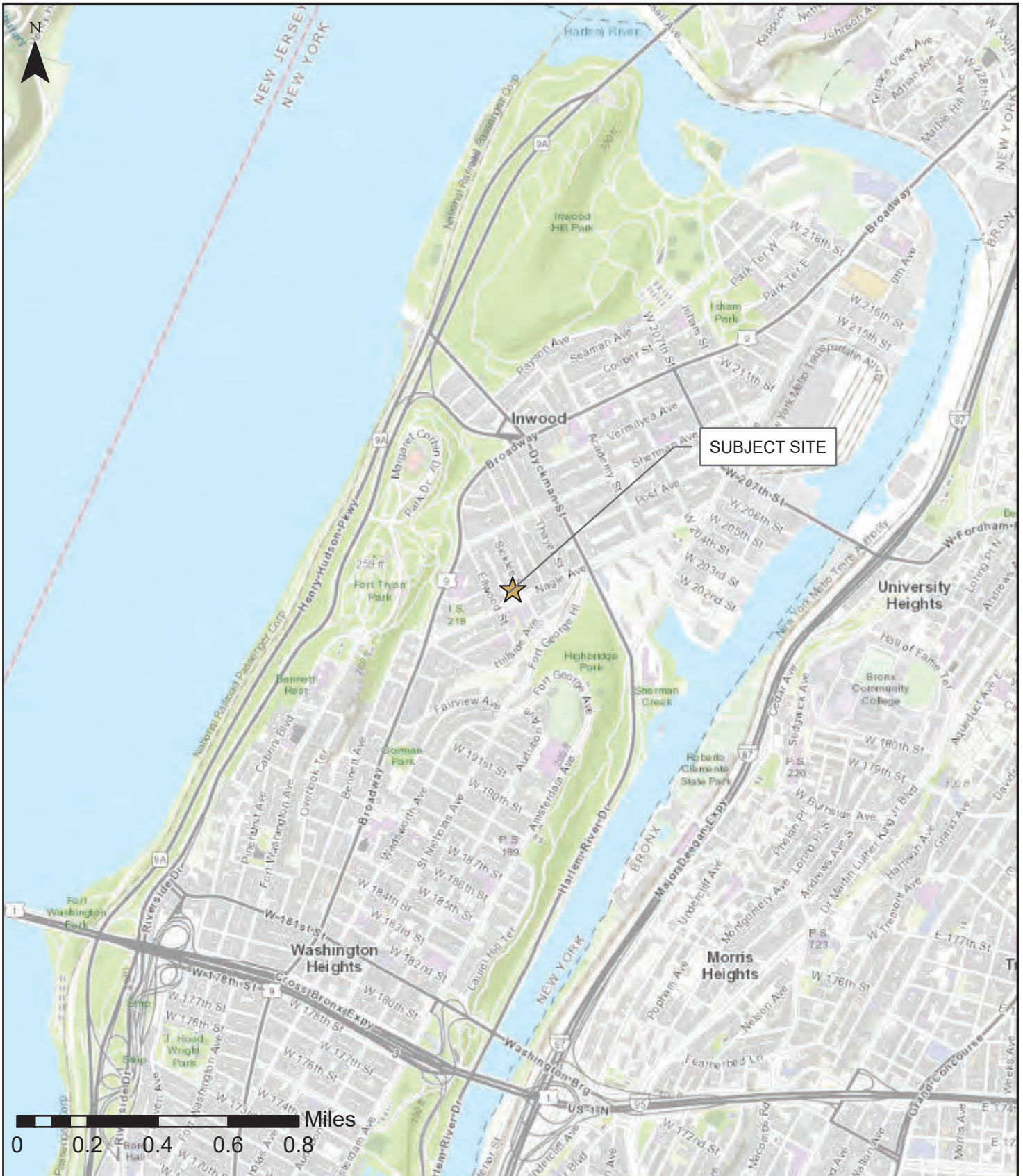
Personnel entering any exclusion zone will be trained in the provisions of the HASP and be required to sign a HASP acknowledgment. Site-specific training will be provided to field personnel. Additional safety training may be added depending on the tasks performed. Emergency telephone numbers will be posted at the site location before any work begins. A safety meeting will be conducted before each shift begins. Topics to be discussed include task hazards and protective measures (physical, chemical, environmental); emergency procedures; PPE levels and other relevant safety topics. Meetings will be documented in a log-book or specific form. Potential on-site chemicals of concern include VOCs. Information fact sheets for each contaminant group and/or MSDS' are included in the HASP.

RENU Engineering Technologies, PC

An emergency contact sheet with names and phone numbers for all pertinent project personnel as well as regulatory hotline information is included in the HASP. That document will define the specific project contacts for use in case of emergency.

The site-specific HASP is included as Appendix D.

Figures




CASTLETON
 ENVIRONMENTAL
 P: 631-482-1818
 F: 631-321-4349
 E: info@castletonenv.com
 www.castletonenv.com

Site Location
 92-98 Nagle Ave
 New York, New York

| | |
|----------------|----------|
| PROJECT: | NJBM1801 |
| DATE: | 3/7/2019 |
| DRAWN BY: | BB |
| APPROVED BY: | FPC |
| FIGURE: | 1 |



Subject Site
 Parcel Boundaries

0 75 150 225 300 Feet

PREPARED FOR:
92-98 LLC
1270 Broadway, Suite 803
New York, NY 10001

PROJECT: NJBM1801
DATE: 4/8/2019
SCALE: AS SHOWN
DRAWN BY: BB
APPROVED BY: FPC

Zoning
92-98 Nagle Avenue
New York, NY

FIGURE:
2



| Sample ID | SB04 (0.5-1) | |
|--------------------------|------------------------|---|
| Sampling Date | 10/29/2018 10:00:00 AM | |
| Client Matrix | Soil | |
| Compound | Result | Q |
| Volatile Organics, 8260 | mg/Kg | |
| Dilution Factor | 100 | |
| Acetone | 0.0260 | |
| cis-1,2-Dichloroethylene | 0.00300 | U |
| Tetrachloroethylene | 3 | D |
| Trichloroethylene | 0.00300 | U |

| Sample ID | SB03 (1-1.5) | | SB03 (2-2.5) | |
|--------------------------|-----------------------|---|-----------------------|---|
| Sampling Date | 10/29/2018 9:30:00 AM | | 10/29/2018 9:35:00 AM | |
| Client Matrix | Soil | | Soil | |
| Compound | Result | Q | Result | Q |
| Volatile Organics, 8260 | mg/Kg | | mg/Kg | |
| Dilution Factor | 500 | | 200 | |
| Acetone | 0.0650 | | 0.00700 | U |
| cis-1,2-Dichloroethylene | 0.00480 | U | 0.00350 | U |
| Tetrachloroethylene | 9.300 | D | 2.200 | D |
| Trichloroethylene | 0.00480 | U | 0.00350 | U |

| Sample ID | SB05 (1-1.5) | | SB05 (3.5-4) | |
|--------------------------|-----------------------|---|-----------------------|---|
| Sampling Date | 10/29/2018 1:30:00 PM | | 10/29/2018 1:35:00 PM | |
| Client Matrix | Soil | | Soil | |
| Compound | Result | Q | Result | Q |
| Volatile Organics, 8260 | mg/Kg | | mg/Kg | |
| Dilution Factor | 1 | | 100 | |
| Acetone | 0.0390 | | 0.490 | U |
| cis-1,2-Dichloroethylene | 0.00250 | U | 0.240 | U |
| Tetrachloroethylene | 0.0900 | | 0.240 | U |
| Trichloroethylene | 0.00250 | U | 0.240 | U |

| Compound | NYSDEC Part 375 Unrestricted Use Soil Cleanup Objectives | NYSDEC Part 375 Restricted Use Soil Cleanup Objectives - Residential | NYSDEC Part 375 Restricted Use Soil Cleanup Objectives - Commercial |
|---|--|--|---|
| Volatile Organics, 8260 - Comprehensive | mg/Kg | mg/Kg | mg/Kg |
| Acetone | 0.05 | 100 | 500 |
| cis-1,2-Dichloroethylene | 0.25 | 100 | 500 |
| Tetrachloroethylene | 1.3 | 19 | 150 |
| Trichloroethylene | 0.47 | 21 | 200 |

NOTES:
 Any Regulatory Exceedances are color coded by Regulation
 Yellow highlight exceeds NYSDEC Part 375 Unrestricted Use Soil Cleanup Objectives (SCOs)
 Orange highlight exceeds NYSDEC Part 375 Restricted Residential Use SCOs
 Green highlight exceeds NYSDEC Part 375 Commercial Use SCOs
 Grey highlight - data reporting limit exceeds standards
 D=result is from an analysis that required a dilution
 J=analyte detected at or above the MDL (method detection limit) but below the RL (Reporting Limit) - data is estimated
 U=analyte not detected at or above the level indicated



| Sample ID | B1 (1.5) | |
|-------------------------|----------|---|
| Sampling Date | 6/4/2018 | |
| Client Matrix | Soil | |
| Compound | Result | Q |
| Volatile Organics, 8260 | mg/Kg | |
| Dilution Factor | 0.865 | |
| Tetrachloroethylene | 0.0028 | |

| Sample ID | SB01 (1-1.5) | | SB01 (4-4.5) | |
|--------------------------|-----------------------|---|-----------------------|---|
| Sampling Date | 10/29/2018 9:15:00 AM | | 10/29/2018 9:20:00 AM | |
| Client Matrix | Soil | | Soil | |
| Compound | Result | Q | Result | Q |
| Volatile Organics, 8260 | mg/Kg | | mg/Kg | |
| Dilution Factor | 1 | | 1 | |
| Acetone | 0.0680 | | 0.00670 | J |
| cis-1,2-Dichloroethylene | 0.00220 | U | 0.00230 | U |
| Tetrachloroethylene | 0.00720 | | 0.0270 | |
| Trichloroethylene | 0.00220 | U | 0.00230 | U |

| Sample ID | B3 (1.5) | |
|-------------------------|----------|---|
| Sampling Date | 6/4/2018 | |
| Client Matrix | Soil | |
| Compound | Result | Q |
| Volatile Organics, 8260 | mg/Kg | |
| Dilution Factor | 0.904 | |
| Tetrachloroethylene | 0.036 | |

| Sample ID | B2 (1.5) | |
|-------------------------|----------|---|
| Sampling Date | 6/4/2018 | |
| Client Matrix | Soil | |
| Compound | Result | Q |
| Volatile Organics, 8260 | mg/Kg | |
| Dilution Factor | 0.98 | |
| Tetrachloroethylene | 0.0086 | |

| Sample ID | SB07 (2.5-3) | | SB07 (4.5-5) | |
|--------------------------|-----------------------|----|-----------------------|---|
| Sampling Date | 10/29/2018 1:05:00 PM | | 10/29/2018 1:00:00 PM | |
| Client Matrix | Soil | | Soil | |
| Compound | Result | Q | Result | Q |
| Volatile Organics, 8260 | mg/Kg | | mg/Kg | |
| Dilution Factor | 10000 | | 10000 | |
| Acetone | 0.520 | U | 0.00340 | U |
| cis-1,2-Dichloroethylene | 0.940 | D | 0.00170 | U |
| Tetrachloroethylene | 16.000 | DE | 3.400 | D |
| Trichloroethylene | 2.300 | D | 0.00170 | U |

| Sample ID | SB06 (1-1.5) | | SB06 (2-2.5) | |
|--------------------------|-----------------------|---|-----------------------|----|
| Sampling Date | 10/29/2018 1:55:00 PM | | 10/29/2018 2:00:00 PM | |
| Client Matrix | Soil | | Soil | |
| Compound | Result | Q | Result | Q |
| Volatile Organics, 8260 | mg/Kg | | mg/Kg | |
| Dilution Factor | 100 | | 100 | |
| Acetone | 0.650 | U | 0.460 | U |
| cis-1,2-Dichloroethylene | 0.320 | U | 0.230 | U |
| Tetrachloroethylene | 0.320 | U | 0.300 | JD |
| Trichloroethylene | 0.320 | U | 0.230 | U |

Sickless Street

Nagle Avenue

Sump

Aboveground Storage Tank

- MECC - June 2018
- Soil Boring
 - Soil Boring/Temp. Well
- Castleton - October 2018
- Soil Boring
 - Soil Boring/Monitoring Well
 - Subject Site
 - Proposed Area of Excavation

PREPARED FOR:
 92-98 LLC
 1270 Broadway, Suite 803
 New York, NY 10001

PROJECT: NJBM1801
 DATE: 11/22/2019
 SCALE: AS SHOWN
 DRAWN BY: BB
 APPROVED BY: FPC

Contamination Identified in Soil
 92-98 Nagle Avenue
 New York, NY

FIGURE: 3



P: 631-482-1818
 F: 631-321-4349
 E: info@castletonenv.com
 www.castletonenv.com

| Sample ID | IAQ03 | |
|--|------------|---|
| Sampling Date | 4/12/2019 | |
| Client Matrix | Indoor Air | |
| Compound | Result | Q |
| Volatile Organics, EPA TO15 Full List | | |
| Carbon tetrachloride | 0.400 | D |
| 1,1-Dichloroethylene | 0.0800 | U |
| cis-1,2-Dichloroethylene | 0.0800 | U |
| Trichloroethylene | 0.110 | U |
| Methylene chloride | 2.900 | D |
| 1,1,1-Trichloroethane | 0.440 | U |
| Tetrachloroethylene | 1.300 | D |
| Vinyl Chloride | 0.0510 | U |

| Sample ID | SSV06 | IAQ06 | | |
|--|------------|------------|--------|---|
| Sampling Date | 4/12/2019 | | | |
| Client Matrix | Soil Vapor | Indoor Air | | |
| Compound | Result | Q | Result | Q |
| Volatile Organics, EPA TO15 Full List | | | | |
| Carbon tetrachloride | 2.300 | U | 0.400 | D |
| 1,1-Dichloroethylene | 1.500 | U | 0.0780 | U |
| cis-1,2-Dichloroethylene | 1.500 | U | 0.0780 | U |
| Trichloroethylene | 2 | U | 0.110 | U |
| Methylene chloride | 10 | U | 1.700 | D |
| 1,1,1-Trichloroethane | 8 | U | 0.430 | U |
| Tetrachloroethylene | 37 | D | 0.800 | D |
| Vinyl Chloride | 0.940 | U | 0.0500 | U |

| Sample ID | OAQ01 | |
|--|-------------|---|
| Sampling Date | 4/12/2019 | |
| Client Matrix | Outdoor Air | |
| Compound | Result | Q |
| Volatile Organics, EPA TO15 Full List | | |
| Carbon tetrachloride | 0.440 | D |
| 1,1-Dichloroethylene | 0.0880 | U |
| cis-1,2-Dichloroethylene | 0.0880 | U |
| Trichloroethylene | 0.120 | U |
| Methylene chloride | 8.700 | D |
| 1,1,1-Trichloroethane | 0.480 | U |
| Tetrachloroethylene | 0.300 | D |
| Vinyl Chloride | 0.0560 | U |

| Sample ID | SSV01 | IAQ01 | | |
|--|------------|------------|--------|---|
| Sampling Date | 4/12/2019 | | | |
| Client Matrix | Soil Vapor | Indoor Air | | |
| Compound | Result | Q | Result | Q |
| Volatile Organics, EPA TO15 Full List | | | | |
| Carbon tetrachloride | 0.550 | U | 0.450 | D |
| 1,1-Dichloroethylene | 0.350 | U | 0.0780 | U |
| cis-1,2-Dichloroethylene | 0.350 | U | 0.0780 | U |
| Trichloroethylene | 0.470 | U | 0.130 | D |
| Methylene chloride | 5 | D | 13 | D |
| 1,1,1-Trichloroethane | 1.900 | U | 0.430 | U |
| Tetrachloroethylene | 4 | D | 1.500 | D |
| Vinyl Chloride | 0.220 | U | 0.0500 | U |

| Sample ID | SSV03 | |
|--|------------|---|
| Sampling Date | 4/12/2019 | |
| Client Matrix | Soil Vapor | |
| Compound | Result | Q |
| Volatile Organics, EPA TO15 Full List | | |
| Carbon tetrachloride | 1.200 | U |
| 1,1-Dichloroethylene | 0.790 | U |
| cis-1,2-Dichloroethylene | 0.790 | U |
| Trichloroethylene | 1.100 | U |
| Methylene chloride | 5.500 | U |
| 1,1,1-Trichloroethane | 4.300 | U |
| Tetrachloroethylene | 1.300 | U |
| Vinyl Chloride | 0.510 | U |

| Sample ID | SSV02 | IAQ02 | | |
|--|------------|------------|--------|---|
| Sampling Date | 4/12/2019 | | | |
| Client Matrix | Soil Vapor | Indoor Air | | |
| Compound | Result | Q | Result | Q |
| Volatile Organics, EPA TO15 Full List | | | | |
| Carbon tetrachloride | 0.860 | U | 0.470 | D |
| 1,1-Dichloroethylene | 0.540 | U | 0.0920 | U |
| cis-1,2-Dichloroethylene | 0.540 | U | 0.0920 | U |
| Trichloroethylene | 0.730 | U | 0.120 | U |
| Methylene chloride | 8 | D | 9.400 | D |
| 1,1,1-Trichloroethane | 3 | U | 0.500 | U |
| Tetrachloroethylene | 0.930 | U | 0.560 | D |
| Vinyl Chloride | 0.350 | U | 0.0590 | U |

| Sample ID | SSV04 | IAQ04 | | |
|--|------------|------------|--------|---|
| Sampling Date | 4/12/2019 | | | |
| Client Matrix | Soil Vapor | Indoor Air | | |
| Compound | Result | Q | Result | Q |
| Volatile Organics, EPA TO15 Full List | | | | |
| Carbon tetrachloride | 1 | U | 0.460 | D |
| 1,1-Dichloroethylene | 0.640 | U | 0.0810 | U |
| cis-1,2-Dichloroethylene | 0.640 | U | 0.0810 | U |
| Trichloroethylene | 0.860 | U | 0.110 | U |
| Methylene chloride | 11 | D | 4.300 | D |
| 1,1,1-Trichloroethane | 3.500 | U | 0.450 | U |
| Tetrachloroethylene | 1.700 | D | 0.560 | D |
| Vinyl Chloride | 0.410 | U | 0.0520 | U |

| Sample ID | IAQ08 | |
|--|------------|---|
| Sampling Date | 4/12/2019 | |
| Client Matrix | Indoor Air | |
| Compound | Result | Q |
| Volatile Organics, EPA TO15 Full List | | |
| Carbon tetrachloride | 0.440 | D |
| 1,1-Dichloroethylene | 0.0770 | U |
| cis-1,2-Dichloroethylene | 0.0770 | U |
| Trichloroethylene | 0.100 | U |
| Methylene chloride | 3.200 | D |
| 1,1,1-Trichloroethane | 0.430 | U |
| Tetrachloroethylene | 0.580 | D |
| Vinyl Chloride | 0.0500 | U |

| Sample ID | SSV05 | IAQ05 | | |
|--|------------|------------|--------|---|
| Sampling Date | 4/12/2019 | | | |
| Client Matrix | Soil Vapor | Indoor Air | | |
| Compound | Result | Q | Result | Q |
| Volatile Organics, EPA TO15 Full List | | | | |
| Carbon tetrachloride | 2.600 | U | 0.400 | D |
| 1,1-Dichloroethylene | 1.700 | U | 0.0900 | U |
| cis-1,2-Dichloroethylene | 1.700 | U | 0.0900 | U |
| Trichloroethylene | 6.300 | D | 0.120 | U |
| Methylene chloride | 12 | U | 3.900 | D |
| 1,1,1-Trichloroethane | 9.100 | U | 0.500 | U |
| Tetrachloroethylene | 75 | D | 1.100 | D |
| Vinyl Chloride | 1.100 | U | 0.0580 | U |

| Compound | NYSDOH SVI Guidance Decision Matrix | NYSDOH SVI Guidance Lower Limit | NYSDOH SVI Guidance Upper Limit |
|--------------------------|-------------------------------------|---------------------------------|---------------------------------|
| Carbon tetrachloride | | | |
| 1,1-Dichloroethylene | | | |
| cis-1,2-Dichloroethylene | A | 6 | 60 |
| Trichloroethylene | | | |
| Methylene chloride | | | |
| 1,1,1-Trichloroethane | B | 100 | 1,000 |
| Tetrachloroethylene | | | |
| Vinyl Chloride | C | 6 | 60 |

NOTES:
 Yellow highlight exceeds NYSDOH Decision Matrix thresholds.
 D=result is from an analysis that required a dilution
 U=analyte not detected at or above the level indicated



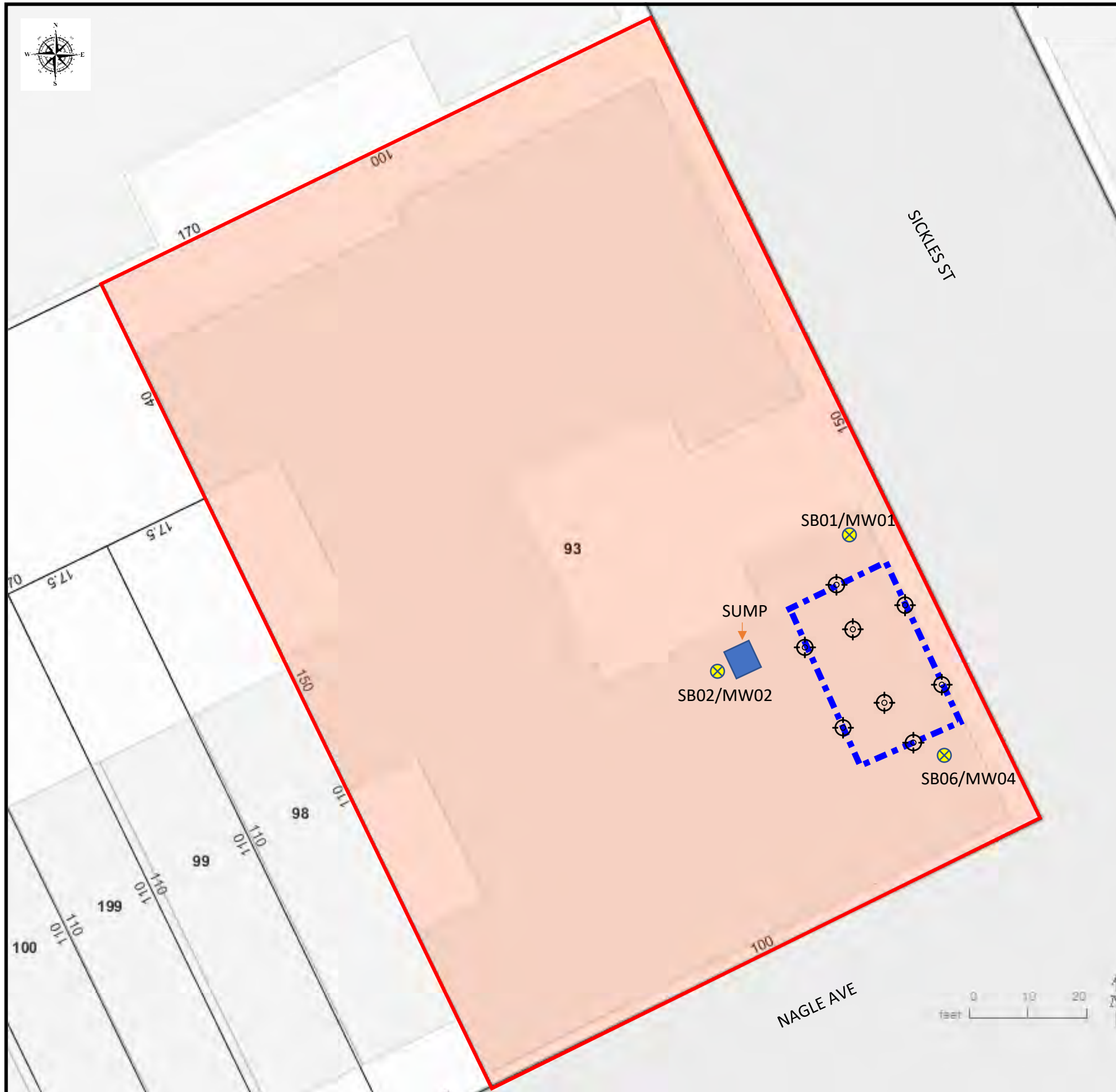
- Outdoor Air
- Sub Slab Vapor
- Indoor Air
- Site Feature - Poly
- Site Boundary

PREPARED FOR:
 92-98 LLC
 1270 Broadway, Suite 803
 New York, NY 10001

PROJECT: NJBM1901
 DATE: 11/25/2019
 SCALE: AS SHOWN
 DRAWN BY: BB
 APPROVED BY: FPC

Contamination Identified in Soil Vapor
 92-98 Nagle Ave
 New York, NY

FIGURE:
 4



Legend

- Site Boundary
- ⊗ Soil Boring Location
- ⊗ Soil Boring/Monitoring Well Location
- Proposed Excavation
- ⊗ End point sample location

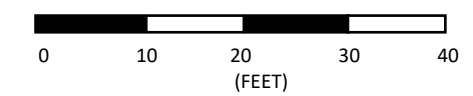
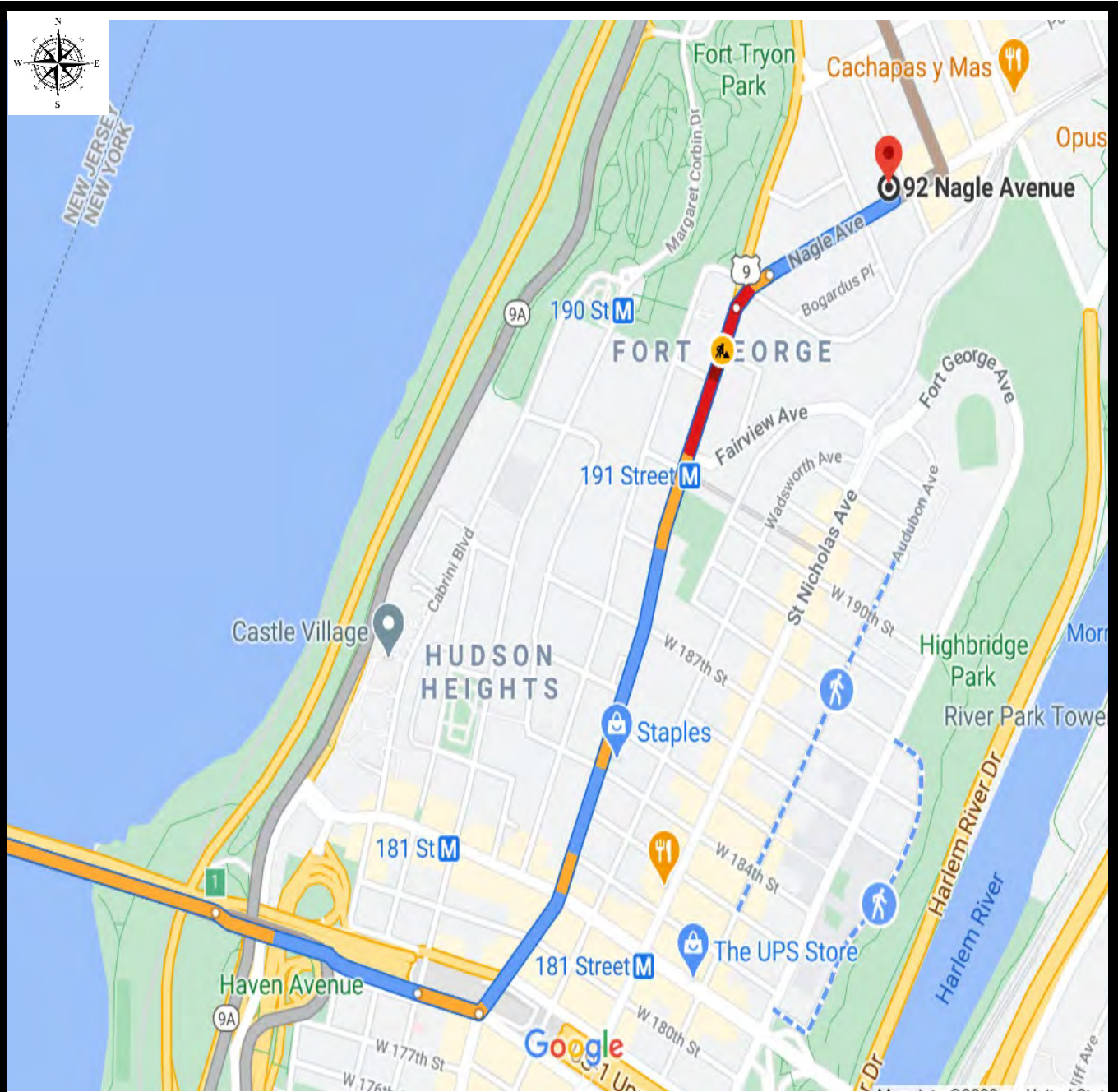


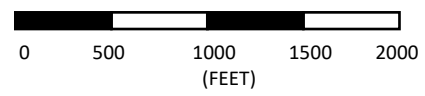
Figure 5 – Extents of Remedial Excavation and Endpoint Samples

92 to 98 Nagle Avenue
New York, New York





Map data ©2018 Google



Directions

- Head southwest on Nagle Ave toward Ellwood St
- Slight left onto Broadway/Juan Rodriguez Way
- Turn right onto W 179th St
- Take the G W Bridge ramp on the left to I-95 S/New Jersey

**Figure 6 –
Inbound/Outbound Truck
Routes**

**92-96 Nagle Avenue
New York, New York**





| Compound | TOGS 1.1.1 | MW01 | |
|--------------------------|------------|--------------|---|
| Acetone | 50 | 1.200 | J |
| cis-1,2-Dichloroethylene | 5 | 2.500 | |
| Tetrachloroethylene | 5 | 7.800 | |
| Trichloroethylene | 5 | 3.900 | |

| Compound | TOGS 1.1.1 | MW05 | |
|---------------------------|------------|----------------|----|
| 1,1,1,2-Tetrachloroethane | 5 | 24 | JD |
| cis-1,2-Dichloroethylene | 5 | 800 | D |
| Tetrachloroethylene | 5 | 130,000 | D |
| Trichloroethylene | 5 | 590 | D |
| Vinyl Chloride | 2 | 89 | D |

| Compound | TOGS 1.1.1 | MW02 | |
|--------------------------|------------|-----------|---|
| Acetone | 50 | 9 | |
| Chloroform | 7 | 0.52 | |
| cis-1,2-Dichloroethylene | 5 | 0.77 | |
| Tetrachloroethylene | 5 | 33 | |
| Trichloroethylene | 5 | 0.56 | |
| Vinyl Chloride | 2 | 0.39 | J |

| Compound | TOGS 1.1.1 | MW03 | |
|--------------------------|------------|-----------|---|
| Acetone | 50 | 1.400 | J |
| Chloromethane | 5 | 0.800 | |
| cis-1,2-Dichloroethylene | 5 | 0.230 | J |
| Tetrachloroethylene | 5 | 21 | |
| Trichloroethylene | 5 | 0.200 | J |

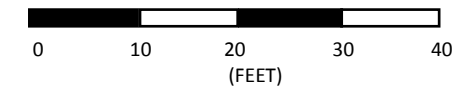
| Compound | TOGS 1.1.1 | MW04 | |
|----------------------------|------------|--------------|---|
| Chloroform | 7 | 0.500 | |
| cis-1,2-Dichloroethylene | 5 | 3.700 | |
| Tetrachloroethylene | 5 | 3,100 | D |
| trans-1,2-Dichloroethylene | 5 | 0.290 | J |
| Trichloroethylene | 5 | 4.600 | |

Legend

- Site Boundary
- ⊗ Monitoring Well Location

Notes

- Analytical Results reported in parts per billion (ppb)
- TOGS 1.1.1 = NYSDEC TOGS 1.1.1 Ambient Water Quality Standards and Guidance Values
- Yellow highlight shows exceedances of standards and guidance values



**Figure 7 – Groundwater Analytical Results
VOC Concentrations
October 29, 2018**

92 to 98 Nagle Avenue
New York, New York





| Compound | TOGS 1.1.1 | MW01 |
|--------------------------|------------|------|
| Chloroform | 7 | 1 |
| cis-1,2-Dichloroethylene | 5 | 2.1 |
| Tetrachloroethylene | 5 | 10 |
| Trichloroethylene | 5 | 3.2 |

| Compound | TOGS 1.1.1 | MW02 |
|--------------------------|------------|------|
| Chloroform | 7 | 0.52 |
| cis-1,2-Dichloroethylene | 5 | 0.77 |
| Tetrachloroethylene | 5 | 44 |
| Trichloroethylene | 5 | 0.35 |

| Compound | TOGS 1.1.1 | MW03 |
|--------------------------|------------|------|
| cis-1,2-Dichloroethylene | 5 | 0.27 |
| Tetrachloroethylene | 5 | 3.6 |
| Trichloroethylene | 5 | 0.28 |

| Compound | TOGS 1.1.1 | MW04 |
|--------------------------|------------|------|
| Chloroform | 7 | 1.4 |
| cis-1,2-Dichloroethylene | 5 | 2.3 |
| Tetrachloroethylene | 5 | 120 |
| Trichloroethylene | 5 | 1.3 |

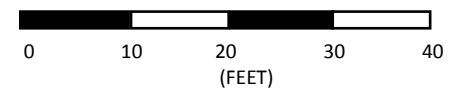
| Compound | TOGS 1.1.1 | MW05 |
|----------------------------|------------|---------|
| 1,1,1,2-Tetrachloroethane | 5 | 11 |
| 1,1,1-Trichloroethane | 5 | 14 |
| 1,1,2-Trichloroethane | 1 | 200 |
| 1,1-Dichloroethane | 5 | 0.96 |
| 1,1-Dichloroethylene | 5 | 0.56 |
| 1,2-Dichloropropane | 1 | 3.2 |
| 2-Butanone | 50 | 140 |
| Acetone | 50 | 48 |
| Bromochloromethane | 5 | 54 |
| Chlorobenzene | 5 | 0.52 |
| Chloroethane | 5 | 28 |
| Chloroform | 7 | 1.5 |
| cis-1,2-Dichloroethylene | 5 | 630 |
| Isopropylbenzene | 5 | 0.78 |
| Methyl acetate | ~ | 21 |
| Tetrachloroethylene | 5 | 110,000 |
| Toluene | 5 | 0.4 |
| trans-1,2-Dichloroethylene | 5 | 4.4 |
| Trichloroethylene | 5 | 660 |
| Vinyl Chloride | 2 | 35 |

Legend

- Site Boundary
- Monitoring Well Location

Notes

- Analytical Results reported in parts per billion (ppb)
- TOGS 1.1.1 = NYSDEC TOGS 1.1.1 Ambient Water Quality Standards and Guidance Values
- Yellow highlight shows exceedances of standards and guidance values



**Figure 8 – Groundwater Analytical Results
VOC Concentrations
November 19, 2018**

92 to 98 Nagle Avenue
New York, New York



Tables

**Table 1
Conceptual IRM Schedule**

| Week | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |
|---|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| SOE Plan Production, Approval, and Permitting | | | | | | | | | | | | | | | | |
| Site Surveying (Subsurface) | | | | | | | | | | | | | | | | |
| Execute IRM (Excavation, Endpoint Sampling, and Restoration) | | | | | | | | | | | | | | | | |

| Week | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 |
|--|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Submit IRM Completion Report | | | | | | | | | | | | | | | | |
| Approval of IRM Completion Report | | | | | | | | | | | | | | | | |

Appendix A

RENU Engineering Technologies, PC

PO Box 239, Georgetown, CT 06829 | 203.664.1312 | info@renuet.com

August 15, 2019

Dave Hermantin, P.E. has been working on hydrogeologic and environmental remedial projects in New York State since 2003. With a Bachelors of Science in Civil Engineering, Mr. Hermantin's undergraduate electives were all based on environmental and hydrogeologic engineering studies. Dave's graduate degree is in Environmental Engineering with a focus on Hydrogeology and environmental fate and transport. Mr. Hermantin has been a professional engineer in New York State since 2008.

Education

Undergraduate: Manhattan College: 1993 – 1997, Bachelor of Science Civil Engineering

Graduate: Manhattan College: 2003 – 2007; Master of Engineering, Environmental Engineering

Work Experience

October 2017 - Current - RENU Engineering Technologies, P.C.: Position, Principal

Environmental Consulting includes the evaluation of environmental conditions on commercial properties, design of environmental controls to prevent the migration of subsurface contaminants off site and into building envelopes.

May 2007 – October 2017 – P.W. Grosser Consulting Engineer & Hydrogeologist, P.C. (PWGC) (Bohemia NY/Shelton CT): Position, Senior Project Manager/Branch Office Manager

As an employee of PWGC, Dave was responsible for the project management of dozens of environmental projects performed on the behalf of private and municipal owners who were required to comply with several authorities of jurisdiction (AHJ) regulations and requirements, including 6 NYCRR PART 375 and DER-10. AHJ's include; Suffolk County Department of Health Services (SCDHS), Nassau County Department of Health (NCDH), New York City Department of Environmental Protection (NYCDEP), New York City Office of Environmental Remediation (NYCOER), the New York State Department of Environmental Conservation (NYSDEC), New York State Department of Health (NYSDOH) and the Connecticut Department of Energy and Environmental Protection (CTDEEP).

Over the ten years with PWGC, Dave reported directly to the company senior vice president, who is currently company president, Paul Boyce, PE. Mr. Boyce was the engineer designated at the company engineer of record for most environmental projects. Dave's responsibilities included work on; site investigations ranging from Phase II environmental investigations, supplemental investigations, through

remedial work planning and remedial measure development. Mr. Hermantin was also responsible for coordination and execution of remediation plans and the installation and operation of remedial systems. At the completion of implementation of remedial measures Mr. Hermantin was responsible for the assembly of several final engineering reports which were signed off by Mr. Boyce. Mr. Hermantin was the engineer of record for several NYC OER site remediations.

The projects were largely driven by real estate transactions or legacy sites owned by corporations or municipalities and Suffolk County. Projects remediation goals were very often driven by NYSDEC Part 375 and the DER-10. The majority of these projects were related to the remediation of sub-surface soil and groundwater contamination. The most prevalent contaminants were BTEX compounds, metals, and chlorinated solvents.

The following are a list of projects and a brief summary of the scope Mr. Hermantin was responsible for performing, coordinating with environmental staff and managing junior engineering staff:

BAE Systems, Greenlawn NY: NYSDEC Site Number: 1-52-005: This project was a voluntary remediation of soil gases on a listed site. Work included the production of sub-slab vapor sampling and mitigation plans which resulted in the design and installation of a sub-slab vapor mitigation system. The system was monitored as required in approved plans.

Former Brighton Cleaners located at 3140 Coney Island Avenue, Brooklyn New York: NYSDEC Site Number: C224157: The work included evaluation of site contaminant delineation. Chlorinated solvents were identified and excavated to delineated extents of the property. Remaining soil was suspected to be a source of vapor in the sub-surface and the AHJ decided that the remedial engineering controls work would include the design of a dual sub-surface vapor recovery and sub-slab vapor mitigation system. An intricate system of horizontal recovery wells was design and installed through out the site and foundation elements. The system was constructed and operated and the site was successfully. The site management plan (SMP) was executed and site was provided a certificate of completion leading to the construction and redevelopment of the property.

Former Green Bus Facility, 626 Wortman Avenue, Brooklyn NY: NYSDEC Spill #92-112117: This 4 acre site was included a fueling station and mechanical service facility which were identified as the source of a large petroleum plume on site. The site contamination extents were monitored through a very extensive network of monitoring wells. The remedial measure include quarterly vacuum extraction of product and the site had a 300 foot long 15 foot deep product recovery trench that includes three dual phase water/product recovery wells which recovered product, remediated up to 50gpm of groundwater in an air-stripper, and returned remediated water to the local site groundwater. The system

recovered over 5,000 gallons of product from the site in its first several years of operation. The system was monitored and dramatically improved the site conditions.

20-42 Bay Shore Road, Bay Shore New York Site Remediation: AHJ – SCDHS: Site investigations identified chlorinated solvents in the soil and groundwater beneath a dry-cleaning facility located within the property. Following underground injection control cleanouts it was determined by continued investigation that there was residual contamination in the former location of dry-cleaning equipment. After the repair of the existing slab on grade floor slab, a combination sub-slab vapor extraction system/sub-slab vapor mitigation system was installed to reduce concentrations of contaminants in a source beneath the building and control vapors beneath the building slab. The work plan was executed successfully, the system both recovered residual product, reducing measured concentrations in groundwater and within the soil matrix as well as controlled vapors beneath the building slab. The system vapor recovery and treatment system effluent was permitted by the New York State Department of Air Resources (NYS DAR).

30 Dunton Avenue Deer Park NY, Former Dry Cleaning Facility: AHJ – SCDHS: A Phase II investigation led to a site investigation which identified chlorinated solvent soil and groundwater contamination. The property was redeveloped in coordination with the site remediation. The remediation included the installation of environmental controls in the way of a sub-slab vapor mitigation system which successfully provided a negative pressure throughout the subsurface of the 5,000 square foot facility.

May 2005 – May 2007, ARCADIS (Melville, NY)

Prior to working with PWGC, from 2005 to 2007, Mr. Hermantin worked with ARCADIS (Melville, NY). While at ARCADIS Mr. Hermantin held the title of Project Engineer and was involved with several projects which included the delineation of subsurface and surface contaminants, including metals, BTEX compounds and chlorinated solvents.

His worked included groundwater monitoring and modeling of large regional groundwater plumes associated with Lockheed Martin (former Uni-Sys) sites in Great Neck NY, and Northrop Grumman Bethpage, NY site. Mr. Hermantin was also the project engineer on several sites which reduced chlorinated solvents utilizing advanced bioremediation techniques. One project in New York was located in Melville at the former New York Twist Drill site.

March 2003 – May 2005, H2M Group (Melville, NY)

Prior to working with ARCADIS, Mr. Hermantin worked for H2M Group as a project Engineer. Mr. Hermantin worked on the design of several municipal water supply and treatment systems. He also

performed groundwater modeling of regional groundwater contaminant plumes on behalf of municipal groundwater suppliers.

Frank P Castellano

1/1/2019

Principal and Founder



After 23 years leading one of the region's most accomplished and diverse environmental consulting firms, Mr. Castellano has founded Castleton Environmental, Inc. to focus on providing high value environmental consulting services specifically geared to the commercial lending and real estate investment/management industries. Leveraging his many years of experience, Mr. Castellano has earned a reputation for developing strategic approaches to the environmental challenges of complex real estate transactions and portfolio management. These approaches enable the transactions to proceed to closing while managing the risks of the involved stakeholders.

Contact Mr. Castellano at frank@castletonenv.com

PROFESSIONAL EXPERIENCE

Castleton Environmental, Inc. Founded 2015
Babylon, NY

PW Grosser Consulting, Inc., 1992 – 2015 - Last position held – Sr. Vice President/COO
Bohemia, NY

H2M Group 1989-1992 - Last position held – Field Hydrogeologist
Melville, NY

EDUCATION

Adelphi University

Master of Science – Hydrogeology, 1993

State University of New York at Oneonta

Bachelor of Science – Water Resources, 1989



CERTIFICATIONS/QUALIFICATIONS

NYS Professional Geologist, (License No. 000705)
Environmental Professional per 40 CFR 312.10(b)
Licensed Professional Geologist, PA
Licensed Real Estate Sales Professional, NY
OSHA Health & Safety HAZWOPER

AREAS OF EXERTISE

Real Property Transactions
Environmental Program Management
Real Estate Portfolio Management
Hazardous Waste Investigation and Cleanup
Environmental Risk Management

AFFILIATIONS

Long Island Association of Professional Geologists, Member
Long Island Business Development Council, Board Member
Long Island Real Estate Group, Member

NOTABLE ASSIGNMENTS

GTJ REIT Portfolio Management

Mr. Castellano serves as the primary environmental consulting resource to a large Real Estate Investment Trust with holdings in suburban New York, New Jersey, Connecticut and Maryland. Working directly alongside the REIT management team, Mr. Castellano provides environmental due diligence guidance beginning at the contract negotiation phase through closing on new acquisitions. Providing Phase I and II Environmental Site Assessment support, Property Condition Assessments and evaluation of potential liabilities, Mr. Castellano works as part of the team to minimize risk while continuing to help the team add assets to their portfolio. Routine management of the portfolio requires Mr. Castellano's support during tenant lease negotiations, compliance activities and debt re-positioning.

Paramount Assets Portfolio Management

Mr. Castellano serves as a trusted environmental resource to the management team of this real estate company, comprised largely of urban commercial and retail buildings throughout New Jersey. Navigating New Jersey's complex environmental regulatory framework, Mr. Castellano assists this client with pre-acquisition due diligence as well as compliance with the Industrial Site Recovery Act (ISRA).

Phase II Environmental Assessments

For over 20 years, Mr. Castellano has been performing Phase II Environmental Site Assessments for a variety of private real estate clients and lending institutions. For these projects, Mr. Castellano utilizes his knowledge of various field sampling and testing techniques to meet the desired objective of characterizing potential environmental risks. Based on the Phase II findings, Mr. Castellano develops strategies to remedy identified problems and/or manage risks. The ultimate goal for every Phase II is to develop the appropriate strategy to advance the transaction while protecting the interests of those involved. Based on the quality of his work, Mr. Castellano has established many long-standing client relationships due to his ability to deliver clarity to real estate transactions mired in environmental turbidity.

PUBLICATIONS

Case Studies Using USCG Oil Identification System for Petroleum Spill Source Identification (Petroleum Hydrocarbons & Organic Chemicals in Ground Water, Conference, TX, 1993)

Intrusive Investigative Techniques for the Identification of DNAPL (Geology of LI/NY; LIAPG 1996)

Surface Water, Sediment & Fishery Survey, Nassau County Ponds (Geology of LI/NY 1997)

Not Just a Chemical Interaction: Complementary Roles of the Geologist & Engineer on Hazardous Waste Remediation Project (Geology of LI/NY 1997)

MTBE in Ground Water Cleanup Technology and Costs (NYIT – Emerging Problems for the New Century 2002)

DOE Brookhaven National Laboratory Transuranic & Legacy Waste Disposal (Waste Management 05 Conference, Tucson, AZ)

Is Your Real Estate Giving You the Vapors? A Look at Soil Vapor Intrusion Regulations and their Impact on Real Estate Transactions (Society of Chief Appraisers NY Conference, Oct 2018)

Joseph Chiappetta, LSRP

12/1/2018

Senior Project Manager



As Senior Project Manager at Castleton, Joseph Chiappetta leverages his more than 19 years of experience in the Environmental Consulting Industry to serve the needs of the firm's clients. He has directed over \$2 billion in environmental projects at over 1,000 client locations across 22 states and 7 countries. His areas of expertise include: environmental due diligence; brownfields redevelopment; soil, groundwater and sediment investigation and remediation; underground storage tank compliance; hazardous waste management; and regulatory compliance. As an expert witness, he has testified successfully in court and been deposed on multiple matters involving environmental and regulatory compliance issues. Mr. Chiappetta has designed creative, cost effective solutions to a variety of complex environmental problems and has served as an effective liaison between clients and regulatory agencies. Mr. Chiappetta has successfully negotiated closure of numerous Superfund, ISRA, BUST, and MOA cases. He has been involved with numerous USEPA superfund and NJDEP Hazardous Discharge Site Remediation Fund (HDSRF) Sites. He has sat on Brownfield's Development Area (BDA) Steering Committee and has served as a consultant to several superfund potentially responsible parties (PRP) groups.

Contact Mr. Chiappetta at jchiappetta@castletonenv.com

PROFESSIONAL EXPERIENCE

| | |
|---|---|
| Castleton Environmental, Inc. New York, NY | November 2018 – Present – Sr. Project Manager |
| Advanced GeoServices, Inc. Fair Lawn, NJ | July 2014 – November 2018 – Regional Manager |
| PetroScience, Inc. Glen Rock, NJ | October 2012-July 2014– LSRP Practice Leader |



Hydro Environmental Technologies
(HETI) June 2011 – October 2012 – Regional Manager
Beachwood, NJ

GEI Consultants, Inc. November 2008- April 2011- Project Manager
Montclair, NJ

Dresdner Robin January 2005 – November 2008 -Project Manager
Jersey City, NJ

Whitestone Associates January 2003 - January 2005 - Sr Environmental Specialist
Warren, NJ

Leggette, Brashears & Graham, Inc
(LBG) May 1999 – January 2003 – Environmental Scientist I & II
Ramsey, NJ

EDUCATION

Allegheny College

Bachelor of Science – Geological Sciences, 1999

Florida Institute of Technology

Master of Business Administration – Project Management, 2018

CERTIFICATION/LICENSES

Licensed Site Remediation Professional (LSRP) (License # 576769)
NJDEP certified Subsurface Evaluator and UST Closure (License # 207173)
OSHA HAZWOPER 40-Hr; OSHA HAZWOPER 8-hr
OSHA HAZWOPER Site Supervisor
First Aid and CPR

AREAS OF EXERTISE

Environmental Program Management
Hazardous Waste Investigation and Cleanup
Environmental & Regulatory Compliance

AFFILIATIONS

Licensed Site Remediation Professional Association
Commerce and Industry Association of New Jersey



NOTABLE ASSIGNMENTS

Site Assessments and Investigations

Mr. Chiappetta has served as a Senior Project Manager responsible for hundreds of properties in support of land acquisition or transfer. Support includes Phase I Environmental Site Assessments, Work Plans, Phase II Site Assessment Reports, Investigation Summaries/Remedial Plans, and Remedial Cost Estimates. Responsibilities include cost proposal development, budget and technical tracking, the coordination of soil, groundwater, indoor air, soil vapor, and performing site characterizations. He serves as the liaison with the client, contractors, and state and local officials.

Remedial Investigations and Remedial Actions

Mr. Chiappetta has served as Senior Project Manager/Lead Investigator responsible for the management of several USEPA Superfund and Emergency Cleanup Sites, as well as New Jersey Hazardous Discharge Site Remediation Fund (HDSRF) Sites. Mr. Chiappetta has investigated and remediated over a dozen former manufactured gas plant (MGP) throughout the United States; and managing the environmental liability/facility compliance for 250 commercial petroleum service stations and facilities impacted by chemical usage involving a major oil company. Mr. Chiappetta has investigated and remediated RCRA and TSCA hazardous wastes including projects requiring the removal of over 200,000 cubic yards of soils and contaminated sediments. Mr. Chiappetta has designed and implemented numerous In-situ chemical oxidation (ISCO) treatments, permeable reactive barriers, Zero-Valent Iron application, bio-augmentation injections and Ozone treatment systems. Mr. Chiappetta has designed and implemented numerous complex Vapor Intrusion investigations and installations of Vapor mitigations systems.

Licensed Site Remediation Professional (LSRP)

Mr. Chiappetta was among the first individuals to be issued a license by the State of New Jersey under its Licensed Site Remediation Professional (LSRP) program. Mr. Chiappetta has served as a Licensed Site Remediation Professional on over 100 Sites including several Industrial Site Recovery Act (ISRA) sites. Mr. Chiappetta has issued over 50 Response Action Outcome (RAO) under the LSRP program. Mr. Chiappetta is a member of the Licensed Site Remediation Professional Association and serves as a member of the LSRPA Risk Management & Loss Prevention Committee.

Brian Barth

1/14/2019

Senior Project Manager



Mr. Barth's ten-years of experience performing a wide variety of environmental projects allows him to effectively support our client's diverse needs and goals. His areas of expertise include conducting environmental site assessments for due diligence, remedial investigations and site characterization, executing federal, state, and local remedial actions, construction support and oversight, treatment system installation and operation, feasibility studies, and environmental mapping and modeling. Mr. Barth has extensive experience implementing geographic information systems, remote sensing, database development, and analysis techniques to better understand complex problems and help derive practical project solutions.

Contact Mr. Barth at bbarth@castletonenv.com

PROFESSIONAL EXPERIENCE

Castleton Environmental, DPC. Jan 2018 – Present – Sr. Project Manager
Babylon, NY

P.W. Grosser Consulting, Inc. Sep 2008 – Jan 2018 – Project Manager
Bohemia, NY

New York Institute of Technology Jan 2012 – Dec 2016 – Adjunct Professor
Manhattan, NY

EDUCATION

New York Institute of Technology

Master of Science – Environmental Technology, May 2012

State University at Albany

Bachelor of Science – Environmental Science, May 2008



CERTIFICATIONS

Environmental Professional per 40 CFR 312.10(b)
Geographic Information Systems and Spatial Analysis
OSHA HAZWOPER 40-Hr; OSHA HAZWOPER 8-Hr
OSHA Construction Site Safety 10-Hr
NYCOER Turbo Training
NYSDEC Endorsed Erosion and Sediment Control

AREAS OF EXPERTISE

Environmental Program Management
Site Assessment, Characterization, and Cleanup
Data Management, Analysis, and Interpretation
Environmental & Regulatory Compliance
Multi-Media Sampling

AFFILIATIONS

Long Island Association of Professional Geologists, Member
New York State GIS Association / GISMO
Long Island GIS Association

NOTABLE ASSIGNMENTS

Site Assessments and Investigation

Mr. Barth has performed numerous environmental site investigations supporting real estate transactions and due diligence for a variety of clients. Support included performing Phase I and Phase II Environmental Site Assessments, developing work plans, cost estimates and project schedules, sample collection, documentation, data interpretation and dissemination, and reporting. Based upon the results, Mr. Barth can navigate the project through the myriad of post Phase II actions that may be necessary to ultimately meet the client's goals and objectives.

Remedial Program Management and Site Development

Mr. Barth has been responsible for and supported the investigation and management of several remedial actions in support of site re-development. Often, these activities are performed under regulatory oversight or as volunteers to ensure compliance with applicable regulations and guidance. Besides navigating the complexity of federal, state, and local programs, voluntary efforts rely heavily on his construction and site re-development experience to develop appropriate site characterization and soil management plans. Mr. Barth has investigated and remediated sites that require soil excavation and disposal, long-term groundwater remediation, soil vapor extraction, and in-situ chemical treatments.



Environmental Studies and Analysis

Mr. Barth has unique experience implementing geographic information systems, database and system development, remote sensing, GPS, and surface and subsurface modeling techniques to a broad range of projects. Using a variety of vector and raster-based toolsets to map, analyze, and visualize complex spatial patterns, Mr. Barth has applied these skills to numerous complex projects including largescale superfund and brownfield remediation, groundwater contour and contaminant mapping, fate and transport, nitrogen load to groundwater, sewer feasibility studies, invasive species removal and management, bathymetric surveys, energy siting, and construction and mining support. These skills help our clients better understand the phenomena impacting a site and helps make informed decisions on how to advance a project towards its ultimate goals.

Arthur P. Baldwin

448 Reade Ave Lindenhurst
New York, NY 11757
abaldwin@palcorp.com

Background:

Mr. Baldwin has been actively involved in the pricing, management and oversight of environmental remediation projects for the over 30 years. His experience, knowledge and employers of this type of work are as follows.

2008 to Present

Company:

PAL Environmental Services
Long Island City, New York
Director of Environmental Services

Manage and coordinate all land based soil, tank, chemical and petroleum related projects, Geoprobe soil borings and well installations the hiring of qualified personnel and the purchase of the appropriate equipment to perform these services. Maintain and development of working relationships with clients

1994 – 2008

Company:

Trade-Winds Environmental Services
Holtsville. New York
Director of Environmental Services

Manage and coordinate all land and sea soil, tank, chemical and petroleum related projects, Geoprobe soil borings and well installations, maintain OSRO, BOA and equipment for use on US Coast Guard and major oil Company water based spills and the hiring of qualified personnel and the purchase of the appropriate equipment to perform these services. Maintain and development of working relationships with clients

1983-1994

Company:

Fenley and Nicole 1983-1994

Bay Shore, New York

Health and Safety Officer and Director of the Spill Division

Respond on a 24/7 bases of petroleum and chemical spills
Coordination of tank removals, vacuum trucks, guzzler, heavy
equipment and manpower to perform these services. Maintain and
development of working relationships with clients

Certifications:

40 Hour HAZWOPER

8 hour First Responder

Confined Space Entry

CPR & Standard First Aid Instructor American Red Cross

Hazardous Communication Train-the-Trainer Compliance

Hazardous Waste management & Executive Overview

The Safe Transportation of Hazardous Waste

How to Comply With Department of Transportation Drug Testing

How to Comply with Hazardous Waste Laws

Hazardous Materials Transportation

30 Hour OSHA Construction Safety and Health

Projects:

Keyspan Energy response contract, respond 24/7 to PCB and
Non-PCB spills.

Agencies: DEC

New York State DEC Emergence Response Contract #D100870
24/7 spill response.

Agencies: DEC

Governor Pataki's NYC office, Biological clean up and
decontamination of suspect Antrax.

Agencies: DEP and OEM

Extra-Space Prince Street Brooklyn, NY Biological clean up,
decontamination, transportation and disposal of naturally occurring
Antrax.

**Agencies: DEP, DEC, OEM, DOT, NYS Health Department &
Florida Health department.**

Douglas Bay Inland and Waterway spill clean-up, supply boats, booms, skimmers and labor to clean up bunker oil.

Agencies: DEC

Eckloff Marine, Providence RI Waterway spill clean-up, supply boats, booms, skimmers and labor to clean up bunker oil.

Agencies: Rhode Island DEP and US Coast Guard

Garnner Marine "The Julie N" Portland Maine: Waterway spill clean-up, supply boats, booms, skimmers and labor to clean up bunker oil.

Agencies: Maine DEP and US Coast Guard

United State Coast Guard: Governors Island excavation and disposal, backfilling of lead contaminated soil.

Agencies: US Coast Guard & DEC

Hand Battery, Nyack New York. Lead contaminated soil excavation and disposal.

Agencies: DEC Albany

Hexagon Laboratories, Bronx, NY Above Ground and Below Ground tank removal, remove and dispose of chemicals, asbestos, demo of building and disposal of non-hazardous and hazardous liquids.

Agencies: DEC Albany

Long Island Railroad 24/7 emergency response to spills, crime scenes, fuel and chemical spills and regular maintenance of tanks and oil water separators clean up of mercury for numerous facilities.

Agencies: DEC and EPA

More Projects Upon Request

MICHAEL BALDWIN

203 East 2nd Street
Deer Park, NY 11729
Phone: (516)779-5234
BaldwinM05@yahoo.com

OBJECTIVE:

To secure a management position with a well established organization which will provide the opportunity for me to utilize my significant industry knowledge and skills to our mutual benefit leading to a lasting relationship.

EXPERIENCE:

2009
to
Present

PAL Environmental Services
Project Manager

LIC, NY

Manage the disposal of non-hazardous and hazardous materials for our spill division which includes waste characterization, waste profiling, determining cost effective disposal methods, coordinating transportation and disposal of waste, filing NYSDEC Hazardous Waste Reports, and managing our NYSDEC Waste Transporter Permit.

Over-site of environmental projects including commercial, industrial, government and private facilities.

Plan and schedule project timelines and milestones using appropriate tools.

2002
to
2009

Trade-Winds Environmental Restoration, Inc.
Project Manager

Holtsville, NY

Manage the disposal of non-hazardous and hazardous materials for our spill division which includes waste characterization, waste profiling, determining cost effective disposal methods, coordinating transportation and disposal of waste, filing NYSDEC Hazardous Waste Reports, and managing our NYSDEC Waste Transporter Permit.

Over-site of environmental projects including commercial, industrial, government and private facilities.

Estimate the resources and participants needed to achieve project goals.

Plan and schedule project timelines and milestones using appropriate tools.

Build, develop, and grow all business relationships vital to the success of the project.

Interaction with all government agencies involved with environmental cleanup and emergency response.

First responder on numerous environmental emergencies.

Managed ground zero 9/11 clean-up projects.

Involvement with evaluating field personnel performance and hiring of new field personnel.

1996
to
2002

Trade-Winds Environmental Restoration, Inc.
Project Foreman

Holtsville, NY

Managed field crews and assured safe, quality and professional services.

Communicated with clients and government agencies, as necessary.

Filed daily reports which included project scope of work, equipment and materials inventory, field crew hours and sub-contractor duties

Assisted with field training of new field technicians.

EDUCATION:

1994

Queens University of Charlotte
Bachelor's Degree Business Administration

Charlotte, NC

CERTIFICATIONS:

Certified OSHA 40 Hour Hazwoper Training.

Certified 8 Hour First Responder Training.

Certified Respiratory Protection.

Certified OSHA Confined Space Entry Training.

Certified IIRCR Water Damage Restoration Technician.

Certified Drieaz University Water Damage Restoration.

Certified Georgia Institute of Technology Hazmat Technician.

New York State Licensed Wildlife Rehabilitator.

Certified BG4 Level II SCBA Rebreather training.

United States Coast Guard Captain's License.

PROJECTS:

Keyspan Energy Facilities and Properties: Emergency Response services, 1999 to present. Oil Spill Clean Up and Environmental Remediation services at Keyspan Facilities and Properties. Emergency Response 24 hours / 7 days to spills and releases of chemicals. Cleanup of transformer oil spills, PCB oil spills, and contaminated soils.

Oil Spill Clean Ups for NYS DEC: Emergency Response Contract # D100870. Contract duration is ongoing. Oil Spill Clean Up and removal of leaking underground oil storage tanks in response to NYS DEC spill response. Emergency Response 24 hours / 7 days to spills and NYS DEC concerns. Emergency response to marine oil spills on the north and south shores of Long Island.

Governor Pataki's NYC Office, 633 Third Avenue, New York City: Biological clean up and decontamination services performed October 2001. Clean up of Anthrax contamination in government office from receipt of contaminated mail. Decontamination of office area and contents.

Douglaston Bay inland waterway fuel oil spill: Clean up of inland waterway fuel oil spill performed February 2001 to April 2001. Clean up of inland waterway fuel oil spill originating from property along west shore of Douglaston Bay.

Eckloff Marine, Providence, Rhode Island, water way spill, 2/21/96. The spill consisted of 800,000 gallons of number 2 fuel oil spilt over Moonstone Beach.

United Sates Coast Guard, Governors Island, New York. Excavation, transportation and disposal of lead contaminated soil, then subsequent backfill of the excavated area.

Hand Battery, Nyack, New York. Lead contaminated soil removal throughout the community (17 individually owned private residences).

Hexagon Laboratories, Bronx, New York. Aboveground and underground storage tank removal, chemical clean-up, asbestos removal, building demolition, and disposal of hazardous and non-hazardous waste.

Long Island Railroad, Five Year Contract, for spill response, disposal of hazardous and non-hazardous wastes, liquid and solid. Maintenance of oil/water separators.

“The Julie N,” Portland, Maine, Casco Bay / Portland Harbor, waterway spill, 9/29/96 - 11/6/96 Deployment of boats and harbor booms.

References:

Furnished upon request.

Appendix B

Community Air Monitoring Plan

92 TO 98 NAGLE AVENUE

NEW YORK, NEW YORK

SITE NO: C231134

OCTOBER 2020

Prepared for: Mr. Andrew Bullaro
B&B First Holdings LLC.
334 Faile Street
Bronx, New York 10474
Incr1934@gmail.com

**COMMUNITY AIR MONITORING PLAN
92 TO 98 NAGLE AVENUE
NEW YORK, NEW YORK
SITE NO: C231134**

OCTOBER 2020

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Appendices

Appendix A – New York State Department of Health Generic Community Air Monitoring Plan

RENU Engineering Technologies, PC

1.0 INTRODUCTION

Renu Engineering Technologies, PC. (Renu), has prepared this Community Air Monitoring Plan (CAMP) for the property located 92 to 98 Nagle Avenue, New York, New York (the site). The site is listed on the New York State Department of Environmental Conservation's (NYSDEC) Environmental Site Remediation Database under site code **C231134**.

The proposed work is being performed on behalf of on behalf of 92-98 LLC., as part of their commitment to investigate and clean up the site under the NYSDEC Brownfield Cleanup Program (BCP). This work is being performed pursuant to the NYSDEC Brownfield Cleanup Agreement (BCA), executed on April 2, 2020 (Index No. C231134-03-20).

This CAMP describes the methods to be used for the real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter(s) of designated work areas (exclusion zones) when certain activities are in progress at contaminated sites.

The CAMP will follow the procedures outlined in New York State Department of Health (NYSDOH) *Generic Community Air Monitoring Plan*, contained in DER-10/Technical Guidance for Site Investigation and Remediation, May 2010, a copy of which is included in Appendix A.

2.0 Community Air Monitoring

Real-time air monitoring for particulate levels at the perimeter of the exclusion zone or work area will be performed during work activities. Continuous monitoring will be performed for all ground intrusive activities and during the handling of contaminated or potentially contaminated media. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pit excavation or trenching.

Particulate concentrations will be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring will be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment will be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m³) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques will be employed. Work will continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m³ above the upwind level and provided that no visible dust is migrating from the work area.

- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m³ above the upwind level, work will be stopped and a re-evaluation of activities initiated. Work will resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m³ of the upwind level and in preventing visible dust migration.

3.0 Odor, Dust, and Nuisance Control

3.1 Odor Control

Necessary means will be employed to prevent on- and off-Site odor 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) use of foams to cover exposed odorous soils. If odors develop and cannot otherwise be controlled, additional means to eliminate odor nuisances will include: (d) direct load-out of soils to trucks for off-Site disposal; and (e) use of chemical odorants in spray or misting systems.

This odor control plan is capable of controlling emissions of nuisance odors. 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. Implementation of all odor controls, including halt of work, will be the responsibility of the representative's preparing the Completion Report.

3.2 Dust Control

Dust management during invasive on-Site work will include, at a minimum:

- Use of a dedicated water spray methodology for roads, excavation areas and stockpiles.
- Use of properly anchored tarps to cover stockpiles.
- Exercise extra care during dry and high-wind periods.
- Use of gravel or recycled concrete aggregate on egress and other roadways to provide a clean and dust-free road surface.

This dust control plan is capable of controlling emissions of dust. If nuisance dust emissions are identified, work will be halted and the source of dusts will be identified and corrected. Work will not resume until all nuisance dust emissions have been abated. Implementation of dust controls, including halt of work, will be the responsibility of the representative's responsible for preparing the Remedial Closure Report.

3.3 Nuisance Control

Noise control will be exercised during the remedial program. Remedial work will conform, at a minimum, to local noise control standards. Rodent control will be provided, during Site clearing and grubbing, and during the remedial program, as necessary, to prevent nuisances.

Appendix A

Appendix 1A

New York State Department of Health Generic Community Air Monitoring Plan

Overview

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical-specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for VOCs and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate DEC/NYSDOH staff.

Continuous monitoring will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. "Periodic" monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or

overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions, particularly if wind direction changes. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

1. If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

2. If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

3. If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

4. All 15-minute readings must be recorded and be available for State (DEC and NYSDOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed $150 \text{ mcg}/\text{m}^3$ above the upwind level and provided that no visible dust is migrating from the work area.

2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than $150 \text{ mcg}/\text{m}^3$ above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within $150 \text{ mcg}/\text{m}^3$ of the upwind level and in preventing visible dust migration.

3. All readings must be recorded and be available for State (DEC and NYSDOH) and County Health personnel to review.

December 2009

Appendix 1B

Fugitive Dust and Particulate Monitoring

A program for suppressing fugitive dust and particulate matter monitoring at hazardous waste sites is a responsibility on the remedial party performing the work. These procedures must be incorporated into appropriate intrusive work plans. The following fugitive dust suppression and particulate monitoring program should be employed at sites during construction and other intrusive activities which warrant its use:

1. Reasonable fugitive dust suppression techniques must be employed during all site activities which may generate fugitive dust.
2. Particulate monitoring must be employed during the handling of waste or contaminated soil or when activities on site may generate fugitive dust from exposed waste or contaminated soil. Remedial activities may also include the excavation, grading, or placement of clean fill. These control measures should not be considered necessary for these activities.
3. Particulate monitoring must be performed using real-time particulate monitors and shall monitor particulate matter less than ten microns (PM10) with the following minimum performance standards:
 - (a) Objects to be measured: Dust, mists or aerosols;
 - (b) Measurement Ranges: 0.001 to 400 mg/m³ (1 to 400,000 :ug/m³);
 - (c) Precision (2-sigma) at constant temperature: +/- 10 :g/m³ for one second averaging; and +/- 1.5 g/m³ for sixty second averaging;
 - (d) Accuracy: +/- 5% of reading +/- precision (Referred to gravimetric calibration with SAE fine test dust (mmd= 2 to 3 :m, g= 2.5, as aerosolized);
 - (e) Resolution: 0.1% of reading or 1g/m³, whichever is larger;
 - (f) Particle Size Range of Maximum Response: 0.1-10;
 - (g) Total Number of Data Points in Memory: 10,000;
 - (h) Logged Data: Each data point with average concentration, time/date and data point number
 - (i) Run Summary: overall average, maximum concentrations, time/date of maximum, total number of logged points, start time/date, total elapsed time (run duration), STEL concentration and time/date occurrence, averaging (logging) period, calibration factor, and tag number;
 - (j) Alarm Averaging Time (user selectable): real-time (1-60 seconds) or STEL (15 minutes), alarms required;
 - (k) Operating Time: 48 hours (fully charged NiCd battery); continuously with charger;
 - (l) Operating Temperature: -10 to 50° C (14 to 122° F);
 - (m) Particulate levels will be monitored upwind and immediately downwind at the working site and integrated over a period not to exceed 15 minutes.
4. In order to ensure the validity of the fugitive dust measurements performed, there must be appropriate Quality Assurance/Quality Control (QA/QC). It is the responsibility of the remedial party to adequately supplement QA/QC Plans to include the following critical features: periodic instrument calibration, operator training, daily instrument performance (span) checks, and a record keeping plan.
5. The action level will be established at 150 ug/m³ (15 minutes average). While conservative,

Appendix 1A

New York State Department of Health Generic Community Air Monitoring Plan

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December 2009

Appendix 1B

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 - (c) Precision (2-sigma) at constant temperature: +/- 10 :g/m³ for one second averaging; and +/- 1.5 g/m³ for sixty second averaging;
 - (d) Accuracy: +/- 5% of reading +/- precision (Referred to gravimetric calibration with SAE fine test dust (mmd= 2 to 3 :m, g= 2.5, as aerosolized);
 - (e) Resolution: 0.1% of reading or 1g/m³, whichever is larger;
 - (f) Particle Size Range of Maximum Response: 0.1-10;
 - (g) Total Number of Data Points in Memory: 10,000;
 - (h) Logged Data: Each data point with average concentration, time/date and data point number
 - (i) Run Summary: overall average, maximum concentrations, time/date of maximum, total number of logged points, start time/date, total elapsed time (run duration), STEL concentration and time/date occurrence, averaging (logging) period, calibration factor, and tag number;
 - (j) Alarm Averaging Time (user selectable): real-time (1-60 seconds) or STEL (15 minutes), alarms required;
 - (k) Operating Time: 48 hours (fully charged NiCd battery); continuously with charger;
 - (l) Operating Temperature: -10 to 50° C (14 to 122° F);
 - (m) Particulate levels will be monitored upwind and immediately downwind at the working site and integrated over a period not to exceed 15 minutes.
4. In order to ensure the validity of the fugitive dust measurements performed, there must be appropriate Quality Assurance/Quality Control (QA/QC). It is the responsibility of the remedial party to adequately supplement QA/QC Plans to include the following critical features: periodic instrument calibration, operator training, daily instrument performance (span) checks, and a record keeping plan.
5. The action level will be established at 150 ug/m³ (15 minutes average). While conservative,

Appendix C

QUALITY ASSURANCE PROJECT PLAN

92 TO 98 NAGLE AVENUE

NEW YORK, NEW YORK

SITE NO: C231134

OCTOBER 2020

Prepared for: Mr. Nathan Benelyahou
NJB Management Corp.
1270 Broadway, Suite #803
New York, NY 10001
Landlord.NJB@gmail.com

**QUALITY ASSURANCE PROJECT PLAN
92 TO 98 NAGLE AVENUE
NEW YORK, NEW YORK
SITE NO: C231134
OCTOBER 2020**

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RENU Engineering Technologies, PC

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Figure 1 – Site Location

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Appendix A – Field Activities Plan

Appendix B – Personnel Resumes

Appendix C – York Analytical NYSDOH ELAP Certificate

Appendix D – Laboratory SOP for PFAS/1,4-Dioxane and Analytical Method Information

RENU Engineering Technologies, PC

1.0 INTRODUCTION

Renu Engineering Technologies, PC. (Renu), has prepared this Quality Assurance Project Plan (QAPP) for the property located 92 to 98 Nagle Avenue, New York, New York (the site). The site is listed on the New York State Department of Environmental Conservation's (NYSDEC) Environmental Site Remediation Database under site code **C231134**.

The proposed work is being performed on behalf of 92-98 LLC., as part of their commitment to investigate and clean up the site under the NYSDEC Brownfield Cleanup Program (BCP). This work is being performed pursuant to the NYSDEC Brownfield Cleanup Agreement (BCA), executed on April 2, 2020 (Index No. C231134-03-20).

This QAPP provides a general overview of the measure to be employed during the field investigation and remedial activities at the site. Specific procedures for the various tasks to be performed are included in the Field Activities Plan included in Appendix A.

The site location is depicted on Figure 1.

2.0 PROJECT SCOPE

The scope of this QAPP is to provide Quality Assurance/Quality Control (QA/QC) procedures during the proposed Interim Remedial Measure (IRM). The goal of the IRM is to remove the suspected source area(s) of contamination, identified in a December 2018 Phase II Environmental Site Assessment (ESA) by Merritt Environmental Consulting Corp (MECC), by removing the PCE and TCE impacted soils beneath the building slab beneath the former dry-cleaner lease area. The impacted soil will be removed to the extents feasible prior to performing a remedial investigation (under a work plan to be submitted separately). This approach has the potential to significantly reduce the environmental and human exposure risk to contaminants and minimize their movement to onsite and offsite media prior to developing a comprehensive remedial plan for the site.

The purpose and scope of this QAPP is to provide guidance and procedures intended to ensure data derived during the IRM activities are of sufficient quality to be relied upon for its intended use. The goals of this QAPP include ensuring QA/QC measures are met and include:

- Accuracy
- Precision
- Sensitivity
- Representation
- Completeness
- Comparability (Where applicable during the IRM)

A site plan depicting the proposed excavation areas is provided as Figure 2.

3.0 PROJECT TEAM

The QAPP shall be implemented by several organizations and personnel under contract to B&B as listed below:

- Project Manager – Castleton – Joseph Chiappetta (Sr. Project Consultant)
- Quality Assurance Officer (QAO) – Renu – Dave Hermantin (Principal)
- Field Staff – Castleton – Sarah Heyne (Staff Scientists)
- Data Validator – Laboratory Data Consultants, Inc. (LDC) of Carlsbad, California.

Personnel resumes are included as Appendix B.

3.1 Environmental Laboratory Accreditation Program

An ELAP-certified laboratory will be used for all sample analyses. The laboratory will follow the following QA/QC protocols. All samples will be delivered to the laboratory within 24 hours of sample collection. Samples will be received by laboratory personnel, who will inspect the sample cooler(s) to check the integrity of the custody seals. The cooler(s) will then be opened, the samples unpackaged, and the information on the chain-of-custody form examined. If the shipped samples match those described on the chain-of-custody form, the laboratory sample custodian will sign and date the form on the next “Received” blank and assume responsibility for the samples. If problems are noted with the sample shipment, the laboratory custodian will sign the form and record problems in the “Remarks” box. The custodian will then immediately notify the Project Manager so appropriate follow-up steps can be implemented on a timely basis.

A record of the information detailing the handling of a particular sample through each stage of analysis will be maintained by the laboratory. The record will include:

- Job reference, sample matrix, sample number, and date sampled;
- Date and time received by laboratory, holding conditions, and analytical parameters;
- Extraction date, time and extractor’s initials (if applicable), analysis date, time, and analyst’s initials; and
- QA batch number, date reviewed, and reviewer’s initials.

The selected ELAP approved for this project: York Analytical Laboratories, Inc. (York) of Stratford, Connecticut.

The York Analytical New York State Department of Health (NYSDOH) ELAP Certification is included as Appendix C.

4.0 DATA QUALITY USABILITY OBJECTIVES

The overall data quality objectives of this QAPP is to collect and derive data that is of reliable and documented quality for its intended purpose. Specific to the proposed IRM, the specific objectives include collected representative soil endpoint samples of sufficient frequency and distribution to characterize the quality of soil and material relative to site specific Soil Cleanup Objectives (SCOs). By implementing appropriate QA/QC procedures for the endpoint sample collection, laboratory analysis, and validation will help ensure the analytical results are accurate and of documented quality which can be relied upon for decision making for future investigation and remediation activities.

5.0 SAMPLING AND DECONTAMINATION PROCEDURES

Field QA/QC will include the following procedures:

- Calibration of field equipment, including PID, daily;
- Use of dedicated and/or disposable field sampling equipment;
- Proper decontamination when non-disposable field equipment is utilized;
- Proper sample handling and preservation;
- Proper sample chain of custody documentation; and
- Completion of report logs.

The above procedures will be executed as follows:

- Disposable sampling equipment, including acetate sleeves, latex gloves, and disposable bailers (or sample tubing), will be used to minimize cross-contamination between samples;
- For each of the parameters analyzed, a sufficient sample volume will be collected to adhere to the specific analytical protocol, and provide sufficient sample for reanalysis if necessary;

Samples will be analyzed prior to the expiration of the respective holding time for each analytical parameter to ensure the integrity of the analytical results.

QA/QC procedures will be used to provide performance information regarding field procedures to:

- document that samples are representative of actual conditions at the Site and
- identify possible cross-contamination from field activities or sample transit.

Specific laboratory QA/QC procedures and analyses will be used to:

- demonstrate whether analytical results have been biased either by interfering compounds in the sample matrix, or
- by laboratory techniques that may have introduced systematic or random errors to the analytical process.

Sample handling in the field will conform to appropriate sample custody procedures. Field custody procedures include proper sample identification, chain-of-custody forms, and packaging and shipping procedures. Sample labels will be attached to all sampling canisters before field activities begin to ensure proper sample identification. Each label will identify the site and sample location.

A summary of the field and laboratory QA/QC procedures is provided below. Detailed procedures are presented in the Field Activities Plan included as Appendix A.

5.1 Endpoint Soil Sampling Procedures

For the purpose of this QAPP, the sampling matrix considered during IRM activities includes soil endpoint samples from excavation sidewalls and bottoms. A standard method of shallow soil sampling using either disposable soil sampling spoons or a properly decontaminated stainless-steel hand auger that allows for the recovery of representative samples for laboratory analysis. Specifically:

- Prepare a dedicated disposal plastic sheet, aluminum foil, or properly decontaminated stainless-steel bowl adjacent to the sampling area (may not use plastic sheet or aluminum foil for PFAS sampling);
- Use a dedicated disposal spoon or properly decontaminated stainless-steel hand auger to retrieve a soil sample from the desired location and depth;
- Place the collected soil on the plastic, foil, or bowl;
- Monitor and record volatile organic compound (VOC) concentrations from the collected soil using a photoionization detector (PID);
- Collect samples in appropriate laboratory supplied glassware for the intended chemical analysis and place in a cooler on ice for delivery to the laboratory;
- Place excess soil back in the borehole or excavation;
- Properly decontaminate non-dedicated disposal sampling equipment;
- Record sample identification, observations, etc. in the project field notebook.

5.2 Decontamination Procedures

To ensure that cross-contamination or outside contamination is not introduced to samples and/or data, the following cleaning procedure will apply for non-dedicated sampling equipment prior to and between sample collection locations.

- Thoroughly clean equipment using a laboratory-grade (Liquinox) solution and scrubbing to remove visual contamination (Liquinox will not be used for the decontamination of 1,4-dioxane sample equipment);
- Rinse with water until soap is removed;
- Allow to dry before next use;
- If equipment is not to be used immediately, wrap in aluminum foil.

5.3 Chain of Custody Procedures

After each sample is collected and appropriately identified, the following information will be recorded on the chain-of-custody form:

- sample identification;
- date and time of sample collection;
- sampling depth;
- identity of samplers;
- sampling methods and devices;
- soil vapor purge volumes;
- volume of soil vapor extracted;
- if canisters used, vacuum of canisters before and after samples collected,
- apparent moisture content (dry, moist, saturated, etc.) of the sampling zone; and
- chain of custody protocols and records used to track samples from sampling point to analysis.

The sampler will sign and date the “Relinquished” blank space prior to removing one copy of the custody form and sealing the remaining copies of the form in a Ziploc plastic bag. The canisters will be picked up by a laboratory representative from the Site or hand delivered to the laboratory.

5.4 Field Logs and Reports

Field logs and borings logs will be completed throughout the course of this investigation. A field log will be completed daily which will describe all field activities including:

- Project number, name, manager, and address;
- The date and time;
- The weather conditions;
- On-site personnel and associated affiliations;
- Description of field activities; and
- Pertinent sample collection information including sample identification numbers, description of samples, location of sampling points, number of samples taken, method of sample collection and any factors that may affect its quality, time of sample collection, name of collector, and field screening results.

6.0 SAMPLING FOR EMERGING CONTAMINANTS UNDER NYSDEC PART 375

As part of the NYSDECs requirement, sampling of the emerging contaminants including 1,4-Dioxane and per and poly-fluoroalkyl substances (PFAS) will be performed during the IRM.

6.1 Specific Guidelines for PFAS

Soil endpoint samples collected will be analyzed by LC-MC/MS for PFAS using methodologies based on EPA method 537.1 and include the 21 PFAS compounds listed below:

| Group | Chemical Name | Abbreviation |
|--|--|---------------|
| Perfluoroalkyl sulfonates | Perfluorobutanesulfonic acid | PFBS |
| | Perfluorohexanesulfonic acid | PFHxS |
| | Perfluoroheptanesulfonic acid | PFHpS |
| | Perfluorooctanesulfonic acid | PFOS |
| | Perfluorodecanesulfonic acid | PFDS |
| Perfluoroalkyl carboxylates | Perfluorobutanoic acid | PFBA |
| | Perfluoropentanoic acid | PFPeA |
| | Perfluorohexanoic acid | PFHxA |
| | Perfluoroheptanoic acid | PFHpA |
| | Perfluorooctanoic acid | PFOA |
| | Perfluorononanoic acid | PFNA |
| | Perfluorodecanoic acid | PFDA |
| | Perfluoroundecanoic acid | PFUA/PFUdA |
| | Perfluorododecanoic acid | PFDoA |
| | Perfluorotridecanoic acid | PFTriA/PFTrDA |
| | Perfluorotetradecanoic acid | PFTA/PFTeDA |
| Fluorinated Telomer Sulfonates | 6:2 Fluorotelomer sulfonate | 6:2 FTS |
| | 8:2 Fluorotelomer sulfonate | 8:2 FTS |
| Perfluorooctanesulfonamides | Perfluorooctanesulfonamide | FOSA |
| Perfluorooctanesulfonamidoacetic acids | N-methyl perfluorooctanesulfonamidoacetic acid | N-MeFOSAA |
| | N-ethyl perfluorooctanesulfonamidoacetic acid | N-EtFOSAA |

6.2 PFAS Reporting Limits

Reporting limits for PFAS soil are to be 2 ng/L (ppt) and 1 ug/kg (ppb), respectively. If contract labs or work plans submitted by responsible parties indicate that they are not able to achieve these reporting limits for the entire list of 21 PFAS, site-specific decisions will need to be made by the DEC project manager in consultation with the DEC remedial program chemist.

The laboratory SOP for PFAS and method detection limits are included as Appendix D.

6.3 PFAS Specific Sampling Procedures

Sampling for PFAS via EPA Method 537 can be challenging due to the prevalence of these compounds in many consumer and sampling specific products. The following sampling procedures and guidelines are necessary to ensure the usability of PFAS analytical results:

- Clothing or boots should not contain Gore-Tex (wet weather gear made of polyurethane and PVC only);
- All safety boots should be made from polyurethane and PVC;
- No materials containing Tyvek;
- Do not use fabric softener on field clothing;

- Do not use cosmetics, moisturizers, hand cream, or other related products the morning of the sampling event;
- Do not use unauthorized sunscreen or insect repellent;
- All sample containers made of HDPE or polypropylene;
- Caps are unlined and made of HDPE or polypropylene (no Teflon lined caps);
- Equipment decontamination must utilize PFAS-free water onsite for sample equipment;
- Only Alconox and/or Liquinox can be used as decontamination materials;
- Food or drinks must be left in the staging areas;
- Sample for PFAS first, other containers/methods may have PFAS present on containers/equipment;
- Field equipment must not contain Teflon;
- Sampling materials must be made from stainless-steel, HDPE, acetate, silicon, or polypropylene;
- No waterproof field books;
- No plastic clipboards, binders, or spiral notebooks;
- No adhesives
- No sharpies/permanent markers. Must use regular ball point pens;
- No use of aluminum foil;
- Keep PFAS samples in a separate cooler filled with regular ice only (do not use chemical ice packs).
- Sampler must wash hands before wearing nitrile gloves to limit contamination during sampling.

6.4 Specific Guidelines for 1,4-Dioxane

Soil endpoint samples collected will be analyzed for 1,4-Dioxane using EPA Method 8270 SIM in order to achieve the minimum method reporting limit of 0.1 mg/Kg. Liquinox will not be used for decontamination during sampling for 1,4-dioxane.

7.0 ANALYTICAL METHODS/QUALITY ASSURANCE

To assess the adequacy of the soil endpoint samples collected and decontamination procedures performed in the field, QA/QC samples shall be collected and analyzed throughout the field sampling program. In general, QA/QC samples shall confirm that the procedures performed in the field are consistent and acceptable. QA/QC samples must include trip blanks, field blanks, blind duplicates, matrix spike (MS), and matrix spike duplicate (MSD).

The anticipated sample matrices collected for the purpose of this IRM and QAPP include soil endpoint samples. The types and frequencies of endpoint samples, field QA/QC samples are provided in the table below:

RENU Engineering Technologies, PC

| QA/QC Samples | Frequency |
|---------------------------------------|--------------------------------------|
| Field/Equipment Blanks | 1 per day / matrix |
| Trip Blanks | 1 per cooler |
| Analytical Parameters | In accordance with 6 NYCRR Part 375. |
| Minimum reporting Limits | In accordance with 6 NYCRR Part 375 |
| MS/MSD Samples to be Collected | 1 each per 20 samples/matrix |
| Duplicate and Blind Duplicate Samples | 1 each per 20 samples/matrix |

Notes:

*Number of soil endpoint samples based on maximum extent of excavation anticipated. Actual number of soil endpoint samples shall be determined based on actual extents of excavation and DER-10.

**Aqueous samples not anticipated as part of this IRM effort.

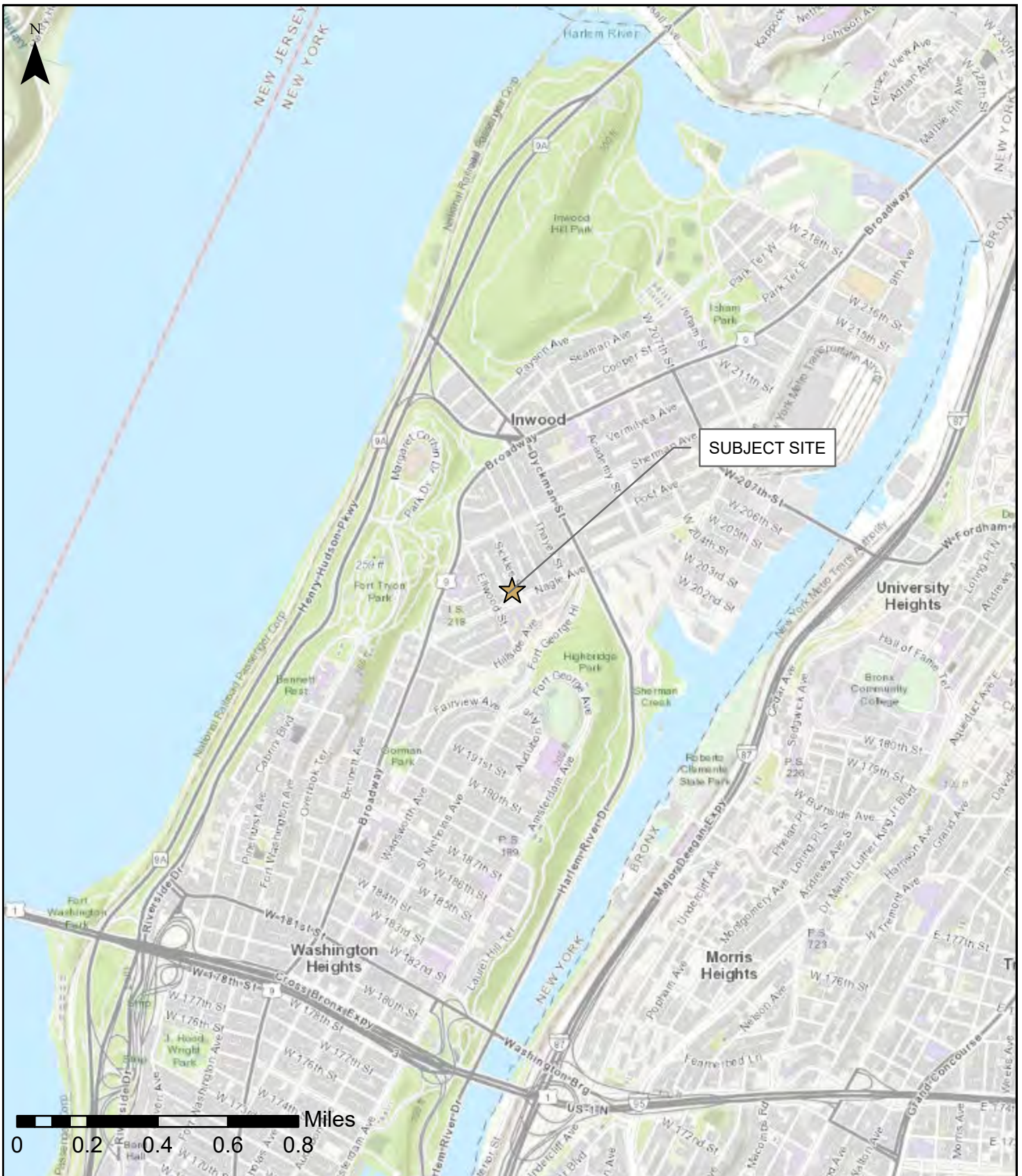
The following table summarizes the sample preservation methods, analytical methods, container volumes and types, and sample holding times per matrix:

| Analyte Group | EPA Method(s) | Holding Time | Preservatives | Volume |
|------------------------|---------------|---|--|--|
| Volatile Organics | 8260 | 48 hours to freeze 14 days to analysis | Terracore: MeOH DI Water Unpreserved. | (1) 45ml VOA (2) 45ml VOA (1) 45ml VOA |
| Semi Volatile Organics | 8270 | 14 days | Ice | 4oz jar |
| Pesticides | 8081 | 14 days | Ice | 4oz jar |
| PCBs | 8082 | 14 days | Ice | 4oz jar |
| Herbicides | 8151 | 14 days | Ice | 4oz jar |
| PFAS | 537.1 | 14 days | Ice | (1) 250ml HDPE |
| 1,4-Dioxane | 8270 SIM | 48 hours to freeze 14 days to analysis | Terracore: MeOH DI Water Unpreserved. | (1) 45ml VOA (2) 45ml VOA (1) 45ml VOA |
| Metals | 6010/6020 | 6 months (total) 28 days (Hg) | Ice | 2oz jar |

8.0 DATA USABILITY SUMMARY REPORT

A Category B Data Usability Summary Report (DUSR) will be prepared by a third-party contractor. This will present the results of data validation, including a summary assessment of laboratory data packages, sample preservation and chain of custody procedures, and a summary assessment of precision, accuracy, representativeness, comparability, and completeness for each analytical method.

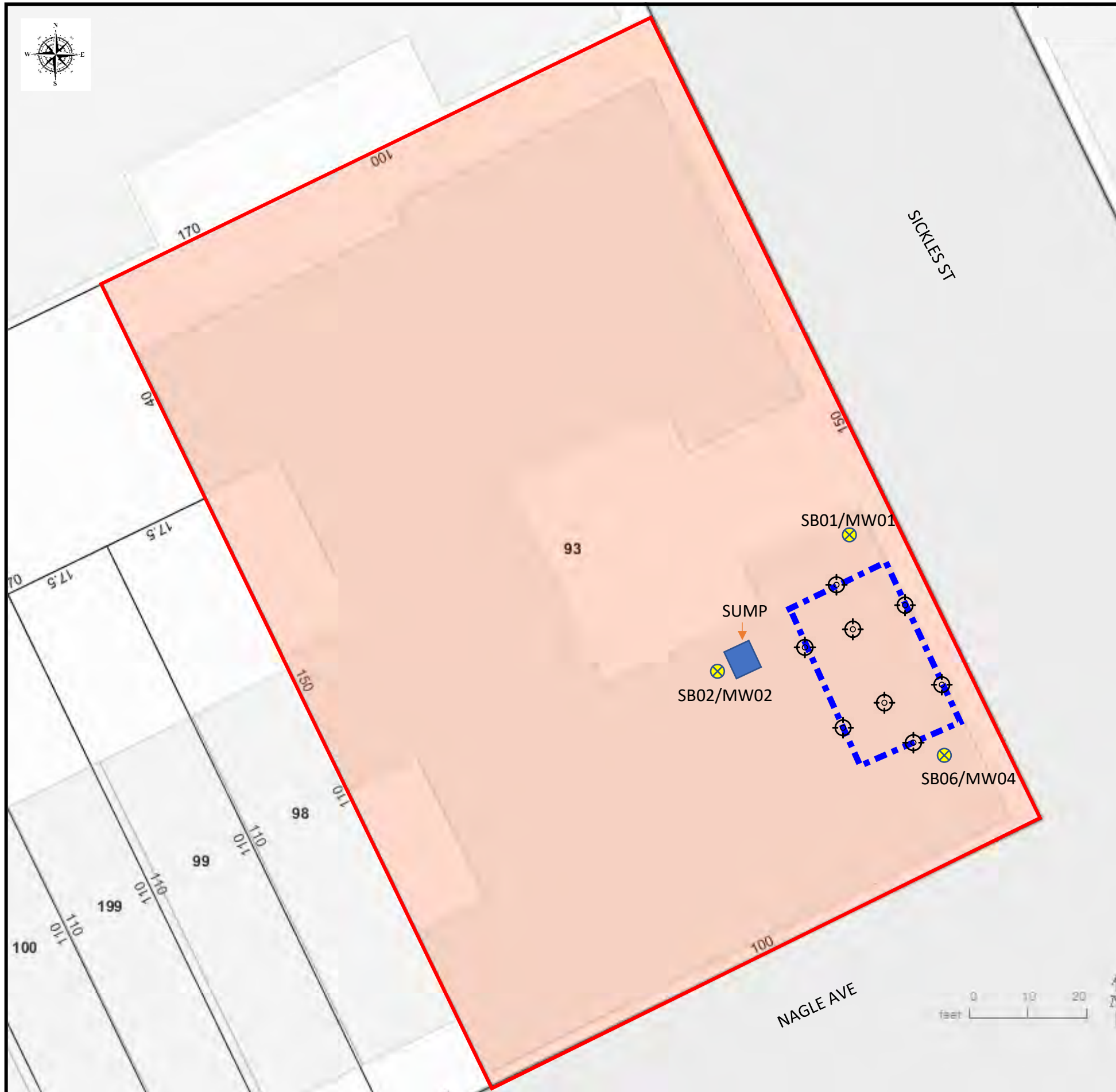
Figures









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 P: 631-482-1818
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Site Location
 92-98 Nagle Ave
 New York, New York

| | |
|----------------|----------|
| PROJECT: | NJBM1801 |
| DATE: | 3/7/2019 |
| DRAWN BY: | BB |
| APPROVED BY: | FPC |
| FIGURE: | 1 |



Legend

-  Site Boundary
-  Soil Boring Location
-  Soil Boring/Monitoring Well Location
-  Proposed Excavation
-  End point sample location

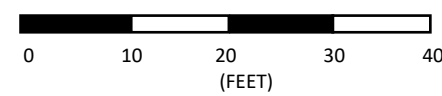


Figure 2 – Extents of Remedial Excavation and Endpoint Samples

92 to 98 Nagle Avenue
New York, New York



Appendix A

FIELD ACTIVITIES PLAN

**92 TO 98 NAGLE AVENUE
NEW YORK, NEW YORK
SITE NO: C231134**

OCTOBER 2020

Prepared for: Mr. Nathan Benelyahou
NJB Management Corp.
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New York, NY 10001
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**FIELD ACTIVITIES PLAN
FOR
REMEDIAL INVESTIGATIONS
MARCH 2020**

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Appendices

Appendix A – Field Forms and Logs

Appendix B – Laboratory SOP for PFAS/1,4-Dioxane and Analytical Method Information

1.0 INTRODUCTION

RENU Engineering Technologies, PC (RENU), has prepared this Field Activity Plan (FAP) which is designed to provide detailed step-by-step procedures for the field activities associated with work activities for Remedial Investigations. It will serve as the field procedures manual to be strictly followed by all RENU personnel. Adherence to these procedures will ensure the quality and defensibility of the field data collected. In addition to the field procedures outlined in this document, all personnel performing field activities must do so in compliance with: (1) the Quality Assurance/Quality Control measures outlined in the existing Quality Assurance Project Plan; (QAPP); (2) the appropriate Health and Safety guidelines found in the existing Health and Safety Plan (HASP); and (3) the scope of work outlined in the Project Work Plan.

2.0 MOBILIZATION

A mobile decontamination trough or temporary decontamination pad will be available at the site to decontaminate equipment used for the subsurface investigations. The decontamination pad will be of sufficient size to allow equipment and materials to be cleaned as needed for the various tasks.

Prior to each field phase, proposed sampling locations will be staked, labeled and flagged prior to sampling. Utilities in areas designated for intrusive activities will be cleared through Dig Safely New York, at <http://www.digsafelynewyork.com>. Vehicle access routes to drilling and boring locations shall be determined and cleared prior to field activities.

If overhead electric is nearby, field staff will coordinate with Consolidated Edison Company of New York, Inc. to arrange rubber bumper protection on the overhead wires. The contact for Con Edison is (347) 672-3236; CustC2@coned.com

3.0 SUBSURFACE INVESTIGATION

3.1 General Program

The subsurface investigation programs under the various Project Work Plans will provide information that will assist in geologic, geotechnical, hydrogeological and chemical site interpretation. Proposed investigation locations are described in the Project Work Plans. Typical field procedures for the various activities are described below.

3.2 Surface Soil Sampling

Summary: If areas of exposed surface soil are present, representative soil samples will be collected for chemical analysis of the target compounds.

Procedure:

1. Remove any vegetation and the upper two inches of soil.
2. Using a disposable or decontaminated trowel, excavate soils down to a maximum depth of six inches and place the soil in a decontaminated steel bowl. Collect a sufficient quantity of soil as needed for the intended chemical analyses.
3. Place the desired quantity of soil for the volatile organic compound (VOC) analysis directly into the appropriate laboratory-supplied container.
4. Homogenize the remaining soil and place in the appropriate laboratory-supplied containers.
5. All sample bottles will be labeled in the field using a waterproof permanent marker.
6. Surface soil samples will be placed on ice and shipped overnight to the laboratory under chain of custody (COC) control.

3.3 Test Pit Excavation

Summary: Test pits allow for visual inspection and sample collection directly from the subsurface.

Procedure:

1. Decontaminate backhoe bucket prior to excavation.
2. Maneuver backhoe into position.
3. Remove subsurface materials in 1-foot lifts. Conduct continuous air monitoring with appropriate air monitoring equipment as indicated in the HASP. Screen soil with photoionization detector (PID) and place excavated soil on plastic sheeting adjacent to test pit.
4. Upon completion of test pit, visually inspect the soil horizons for discoloration, perched water zones or staining and photo document the test pit.
5. Record the following information in the fieldbook for each test pit:
 - The total length and width of the excavation
 - The depth and thickness of distinct soil or lithologic units
 - A lithologic description of each unit
 - A description of any man-made materials or apparent impacted soil encountered
 - A Test Pit Log sheet will be completed for each test pit (Appendix A).
6. Collect necessary soil samples. The excavator will collect a sample from a specific horizon and bring the sample to the ground surface. No personnel will enter the excavation to collect samples. The sampler will remove approximately 2 inches of soil from the outside of the soil sample prior to collecting the sample to prevent cross contamination of the sample.
7. Soil samples will be placed on ice and shipped overnight to the laboratory under COC control.
8. The test pit will be backfilled with excavated material immediately after the required information has been recorded and the samples collected. The first soils out should be

the last soils in when filling the test pit. Soils will be compacted in 1-foot lifts using the excavator bucket. No test pits will be left open overnight.

9. Decontaminate sampling equipment and excavator bucket.

3.4 Vac-Tron® Utility Clearance

Summary: Excavation with a Vac-Tron® unit allows for excavation near subsurface utilities with reduced chance of impacting the utilities.

Procedure:

1. Excavate a two-foot square by approximately five-foot deep area manually using post-hole diggers, pry bars, soil knives, and/or hand digging, along with the Vac-Tron® unit.
2. After the location is cleared for drilling, the hole will be backfilled flush with the sidewalk using the excavated spoils (small rocks and debris removed) and if necessary, temporarily patched with blacktop patch or concrete.
3. Excavated material not returned to the hole will be drummed along with the monitoring well boring spoils for proper disposal.

3.5 Hollow-Stem Auger Drilling Procedures

Summary: A standard method of subsurface drilling which enables the recovery of representative subsurface samples for identification and laboratory testing.

Procedure:

1. Hollow stem augers (HSAs), drill rods, and the drill rig will be thoroughly decontaminated prior to initial borehole installation and between each borehole at the centralized decontamination area. All decontamination liquids will be collected and placed in DOT-approved 55-gallon drums.
2. The drill rig will be inspected for oil leaks and any leaks reported prior to starting drilling operations.
3. Advance the boring by rotating and advancing the HSAs to the desired depth. The borings will be advanced incrementally to permit continuous or intermittent subsurface soil sampling, as required.
4. Remove center plug from the HSAs and collect a split spoon sample per the method stipulated by the project geologist or hydrogeologist.

References: *American Society for Testing and Materials (ASTM) Standard Practice for Soil Exploration and Sampling by Auger Borings D1452/D1452M-16, and Standard Test Method for Standard Penetration Test (SPT) and Split Barrel Sampling of Soils D1586-11.*

3.6 Rotosonic Drilling Procedures

Summary: Rotosonic Drilling (aka. Sonic Drilling, Rotosonic, Rotary Sonic, Sonicore or Resonant Sonic Drilling) is a subsurface drilling method that employs the use of high frequency mechanical vibrations to take continuous core samples of overburden and most bedrock formations using a

dual cased drill string. Rotasonic drilling is also used to advance casing in the ground for the installation of monitoring wells and other purposes.

Procedure:

1. Core barrel and outer casing will be decontaminated prior to advancing boreholes.
2. The core barrel (core barrels are typically 5, 10 or 20 feet in length) is attached to the drill head. The boring is advanced by rotating the core barrel incrementally to the desired depth. The borings will be advanced incrementally to permit continuous subsurface soil sampling.
3. Once the core barrel is driven to its incremental depth (i.e., 5, 10 or 20 feet), the drill head is disconnected from the core barrel and connected to the outer casing. The outer casing is then driven down over the core barrel. Note: A small amount of water may be used during the driving of the outer casing to flush materials from the annular space between the core barrel and the outer casing.
4. The drill head is disconnected from the outer casing and reattached to the core barrel. The core barrel is brought to the surface and a clear polyethylene tube is attached to the end of the core barrel. The drive head is vibrated which extrudes the soil sample into the polyethylene tube.
5. The core barrel is reinserted into the outer casing and the boring is advanced to the desired depth by repeating Steps 2 through 4.
6. Split the sample lengthwise and screen the soil with a PID for volatile organic vapors
7. Document all properties and sample locations in the field notebook, and later on the Boring Log form (Appendix A).

Reference: *ASTM Standard Practice for Sonic Drilling for Site Characterization and the Installation of Subsurface Monitoring Devices D6914/D6914M-16.*

3.7 NX-Rock Coring Procedures

Summary: NX-Coring is a standard method of subsurface drilling which enables the recovery of bedrock cores for identification.

Procedure:

1. Advance the boring into the bedrock by core drilling using an NX-size, double-tube, swiveltube core barrel. Continue drilling until core blockage occurs or until the net length of the core barrel has been drilled.
2. Remove the core barrel from the hole and disassemble it as necessary to remove the core. Reassemble the core barrel and return it to the hole. Resume coring.
3. Place recovered core in the core box with the upper (surface) end of the core at the upper-left corner of the core box. Fit fractured, bedded, or jointed pieces of core together as they naturally occurred.
4. Label core box with borehole ID, date, time, and depth interval of core.
5. The following observations will be recorded from the rock core:

- Core recovery percent
- Color
- Rock classification
- Rock hardness
- Rock fractures, including descriptions of natural breaks
- Rock Quality Designation (RQD)

RQD = $\frac{\text{Sum of core lengths} > 4''}{\text{Total length of core run}} \times 100\%$

Reference: *ASTM Standard Practice for Rock Core Drilling and Sampling of Rock for Site Exploration D2113-14.*

3.8 Wash/Mud Rotary Drilling Procedures

Summary: Wash/mud rotary drilling is a method of subsurface drilling wherein a drilling fluid (water or drill mud) is circulated through the drill string and drill bit, and up through HSAs or casing, if present, to flush cuttings out of the borehole and lubricate drilling tools.

Procedure:

1. Connect drilling water supply pump to drill string.
2. Advance the boring by spinning the drill bit the desired distance into the subsurface.
3. Use a recirculating system to collect and separate cuttings rising out of the borehole.
4. Note rate of drilling and volume of water/mud lost down the borehole.

Reference: *ASTM Standard Guide for Use of Direct Rotary Drilling with Water-Based Drilling Fluid for Geoenvironmental Exploration and the Installation of Subsurface Water Quality Monitoring Devices1 D5783-95.*

3.9 Air Rotary Drilling Procedures

Summary: Air rotary drilling is a method of subsurface drilling wherein compressed air is circulated through the drill string and drill bit, and up through HSAs or casing, if present, to flush cuttings out of the borehole and lubricate drilling tools.

Procedure:

1. Connect air compressor discharge hose to drill string.
2. Advance the boring by spinning the drill bit the desired distance into the subsurface.
3. Use a cyclone system to collect and containerize cuttings rising out of the borehole.
4. Note rate of drilling down the borehole.

Reference: *ASTM Standard Guide for Use of Direct Air Rotary Drilling for Geoenvironmental Exploration and the Installation of Subsurface Water-Quality Monitoring Devices1 D5782-95.*

3.10 Split-Spoon Sampling Procedures

Summary: Split-spoon sampling is a standard method of soil sampling to obtain representative samples for identification and laboratory testing as well as to serve as a measure of resistance of soil to sampler penetration. Split-spoon samples will be collected during boring advancement at continuous 2 foot intervals.

Procedure:

1. Measure the sampling equipment lengths to ensure that they conform to specifications. Confirm the weight of the hammer (140 pounds.).
2. Clean out the HSAs to the bottom depth prior to sampling. Select additional components as required (i.e., leaf spring core retainer for clays or a sand trap for non-cohesive sands).
3. Lower the decontaminated 2-inch outside diameter (O.D.) split-spoon to the bottom of the HSAs and check the depth against length of the rods and the split-spoon.
4. Attach the drive head and hammer to the drill rods without the weight of the hammer resting on the rods.
5. Lower the weight and allow the split-spoon to settle up to 6 inches below the bottom of the HSAs. If it settles more, consider use of another type of sampler.
6. Mark four 6-inch intervals on the drill rods relative to a drive reference point on the rig. With the split-spoon resting on the bottom of the hole, drive the split-spoon with the 140-pound hammer falling freely over its 30-inch fall until 24 inches have been penetrated or 50 blows have applied in any 6-inch interval.
7. Record the number of blows required to drive the split-spoon 6 inches into the overburden. Determine the "N" value by adding the blows for the 6-to 12-inch and 12-to 18-inch interval of each sample attempt.
8. After penetration is complete, remove the split-spoon sampler.
9. Open the split-spoon to determine the percent recovery, and describe the soil.
10. Split the sample lengthwise and screen the soil with a PID for volatile organic vapors.
11. Document all properties and sample locations in the field notebook, and later on the Boring Log form (Appendix A).

Reference: *ASTM Standard Test Method for Standard Penetration Test (SPT) and Split-Barrel Sampling of Soils D1586-11.*

3.10.1 Unified Soil Classification System

Soils are classified for engineering purposes according to the Unified Soil Classification System (USCS) adopted by the U.S. Army Corps of Engineers and U.S. Department of the Interior Bureau of Reclamation. Soil properties that form the basis for the USCS are:

- Percentage of gravel, sand, and fines;
- Shape of the grain-size distribution curve; and
- Plasticity and compressibility characteristics.

According to this system, all soils are divided into three major groups: coarse-grained, fine-grained, and highly-organic (peaty). The boundary between coarse-grained and fine-grained soils is taken to be the 200-mesh sieve (0.074 mm). In the field the distinction is based on whether the individual particles can be seen with the unaided eye. If more than 50% of the soil by weight is judged to consist of grains that can be distinguished separately, the soil is considered to be coarse-grained.

The coarse-grained soils are divided into gravelly (G) or sandy (S) soils, depending on whether more or less than 50% of the visible grains are larger than the No. 4 sieve (3/16 inch).

They are each divided further into four groups:

- W: Well graded; fairly clean (<5% finer than 0.074 mm)
- P: Poorly graded (gap-graded); fairly clean (<5% finer than 0.074mm)
- C: Clayey (>12% finer than 0.074mm); plastic (clayey) fines. Fine fraction above the A- line with plasticity index above 7.
- M: Silty (>12% finer than 0.074 mm); non-plastic or silty fines. Fine fraction below the A- line and plasticity index below 4.

The soils are represented by symbols such as GW or SP. Borderline materials are represented by a double symbol, as GW-GC.

The fine-grained soils are divided into three groups: inorganic silts (M), inorganic clays (C), and organic silts and clays (O). The soils are further divided into those having liquid limits lower than 50% (L), or higher than 50% (H).

The distinction between the inorganic clays (C), the inorganic silts (M), and organic soils (O) is made on the basis of a modified plasticity chart. Soils CH and CL are represented by points above the A-line, whereas soils OH, OL, and MH correspond to positions below the Aline. Soils ML, except for a few clayey fine sands, are also represented by points below the Aline. The organic soils O are distinguished from the inorganic soils M and C by their characteristic odor and dark color.

Reference: *ASTM Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System) D2487-17.*

3.10.2 Visual Identification

Soil samples collected during boring advancement will be visually identified. Soil properties required to define the USCS classification of a soil and other observed characteristics normally identified in describing a soil are defined below:

- Color

- Moisture conditions
- Grain size
 - Estimated maximum grain size
 - Estimated percent by weight of fines (material passing No. 200 sieve)
- Gradation
- Grain shape
- Plasticity
- Predominant soil type
- Secondary components of soil
- Classification symbol
- Other features such as:
 - organic, chemical, or metallic content;
 - compactness;
 - consistency;
 - cohesiveness near plastic limit;
 - dry strength; and
 - source - residual, or transported (aeolian, water borne, glacial deposit, etc.)

Reference: *ASTM Standard Practice for Description and Identification of Soils (Visual-Manual Procedure) D2488-17.*

3.11 Shelby Tube Sampling Procedures

Summary: Shelby (thin-wall) tube sampling is commonly used in cohesive soils (where splitspoon sampling results in an "N" value less than 15) to obtain relatively undisturbed samples. The thin-walled tube accepts the least frictional resistance as the soil moves up into the sampler. The sampler is advanced in a continuous and rapid motion without twisting on impact.

Procedure:

1. Clean borehole to the required sampling depth, using care not to disturb the material to be sampled during the cleaning process.
2. Prepare the sampler for use, verifying that the tube is round, smooth, not dented or scratched, rust-free, and that the cutting edge has been honed to proper dimensions.

3. Record dimensions of the sampler. Note that the length and diameter of the sampler can be varied depending on soil conditions.
4. Lower the sampler on the drill rods to the bottom of the hole.
5. Make a reference point on the drilling rig and measure a length on the rods equivalent to the sample tube length, minus 10% (this allows for slough in the hole).
6. Raise the water level in the hole to ground surface or above, if practical (this step likely may be omitted).
7. Push the sampler the required distance into the soil with continuous motion of consistent weight.
8. If the sampler cannot be advanced by pushing, note the length advanced and stop sampling.
9. Rotate the rods three revolutions, using a wrench to shear the sample. Allow the sampler to sit undisturbed for five minutes.
10. Withdraw the sampler slowly and pull rods evenly to retrieve the sample. Measure sample length and calculate recovery.
11. Clean out the rod end of the tube and discard disturbed slough. Trim cutting edge of the sampler. Use the cuttings for onsite description and, if required, a moisture content sample.
12. If sample length is recessed from either end, insert plug and seal with wax. If the tube is full, seal ends with caps and/or wax the ends, including the caps if possible.
13. Label the sample container and prepare sample for shipping and/or storage.
14. Store and transport sample(s) in an upright position.

Reference: *ASTM Standard Practice for Thin-Walled Tube Sampling of Fine-Grained Soils for Geotechnical Purposes D1587/D1587M-15.*

3.12 Direct Push Groundwater Sampling

Summary: A standard method of subsurface boring which enables the recovery of representative subsurface samples for groundwater screening.

Procedure:

1. A Screen Point Sampler 15 (SP15) groundwater sampler, or an equivalent unit, will be utilized to collect groundwater samples in direct push borings that intercept the groundwater table.
2. To collect groundwater samples, a clean sampler will be threaded onto the leading end of the probe rod and lowered or driven to the desired sampling interval (approximately 1 foot below the top of the water table). While the sampler is driven to depth, O-ring seals at the drive head and expendable drive point will provide a watertight system.
3. Once at the desired sampling depth, chase rods will be sent down-hole until the leading rod contacts the bottom of the sampler screen. The tool string will then be retracted while the screen is held in place by the chase rods. As the tool string is retracted, the expendable point is released from the sampler sheath. An O-ring on the screen head

maintains the seal at the top of the screen. As a result, any liquid entering the sampler during screen deployment must first pass through the screen.

4. The tool string and sheath may be retracted the full length of the screen or as little as a few inches if a small sampling interval is desired. The SP15 Sampler utilizes a screen with a standard slot size of 0.004 inches and an exposed length of 41 inches.
5. A minimum of 1 gallon of water will be purged from the sampler prior to sample collection with dedicated Teflon or polyethylene tubing of laboratory or food grade quality, and a check valve. The groundwater sample will be collected with dedicated Teflon or polyethylene tubing of laboratory or food grade quality, and a check valve.
6. Groundwater samples will be placed on ice and shipped to the laboratory under COC for analysis.
7. Upon the completion of the sampling, the sampler will be removed and the borehole will be backfilled with bentonite pellets and the surface will be repaired with similar material (i.e., concrete, asphalt or topsoil); and marked with spray paint.

Reference: *ASTM Standard Guide for Direct-Push Groundwater Sampling for Environmental Site Characterization D6001-05(2012)*.

3.13 Direct-Push Soil Sampling

Summary: A standard method of subsurface boring using hydraulically powered (static force plus percussion) soil-probing equipment that enables the recovery of representative subsurface samples for identification and laboratory testing.

Procedure:

1. Inspect the sampling equipment to ensure proper working condition.
2. Insert dedicated disposable acetate liner into the sampler and select additional components for the sampler as required (i.e., leaf spring core retainer for clays, or a sand trap for noncohesive sands).
3. Lower the sampler to the ground surface, or bottom of the hole previously made by the sampler, and check the depth against length of the rods and the sampler.
4. Attach the drive head assembly to the sample rods.
5. Push the sampler in increments up to 5 feet into the subsurface up to the desired depth with a hydraulic press.
6. Rotate the sampling rods clockwise and remove the sampler.
7. Split the sample lengthwise and screen the soil with a PID for volatile organic vapors.
8. Document all properties and sample locations in the field notebook, and later on the DirectPush Log form (Appendix A).
9. Abandon the direct-push boring by backfilling with bentonite pellets and hydrate with potable water or use concrete patch in impervious areas.

Reference: *ASTM Standard Guide for Direct Push Soil Sampling for Environmental Site Characterizations D6282/D6282M-14*.

3.13.1 Remote Direct-Push Soil Sampling

Summary: Standard equipment used for remote direct push sampling is the 420M Geoprobe® (or similar unit). This is a light weight and durable limited access machine designed to be deployed to hard-to-reach or limited access sampling locations. The machine is powered by a remote hydraulic source which is connected through auxiliary hydraulics.

Procedure:

1. Read and understand all safety, maintenance and operations instructions regarding this machine before beginning operations.
2. Maneuver the probe unit to place the probe foot near the desired probing location.
3. Position the power source near the unit leaving sufficient distance so as not to be in the way of probing activities.
4. The probe unit is intended for operations on level surfaces. Do not use on slopes greater than 2 degrees due to decreased stability.
5. Connect hydraulic hoses to probe unit and power source.
6. Start the engine of the hydraulic power source to allow engine and hydraulics to warm sufficiently and ensure there is adequate ventilation for exhaust fumes.
7. Make sure everyone is clear of any moving parts before engaging the hydraulics of the probe unit. Check the emergency stop button for proper operation. If the emergency stop button doesn't work, cease operations.
8. Anchor the probe derrick to floor or ground surface as needed based on conditions.
9. Insert dedicated disposable acetate liner into the sampler and select additional components for the sampler as required (i.e., leaf spring core retainer for clays, or a sand trap for noncohesive sands).
10. Lower the sampler to the ground surface, or bottom of the hole previously made by the sampler, and check the depth against length of the rods and the sampler.
11. Attach the drive head assembly to the sample rods.
12. Push the sampler in increments up to 5 feet into the subsurface up to the desired depth with a hydraulic press.
13. Rotate the sampling rods clockwise and remove the sampler. Split the sample lengthwise and screen the soil with a PID for volatile organic vapors.
14. Document all properties and sample locations in the field notebook, and later on the DirectPush Log form (Appendix A).
15. Abandon the direct-push boring by backfilling with bentonite pellets and hydrate with potable water or use concrete patch in impervious areas.

Reference: *ASTM Standard Guide for Direct Push Soil Sampling for Environmental Site Characterizations D6282/D6282M-14.*

3.14 Bucket Auger Sampling

Summary: A standard method of shallow subsurface boring using a bucket auger that enables the recovery of representative subsurface samples for identification and laboratory testing.

Procedure:

1. Remove stones, vegetation, debris etc. from the ground surface in the sampling area.
2. Lay a section of plastic sheet adjacent to the soil sampling location.
3. Use a clean (decontaminated) bucket auger, required extension rods and “T” handle to collect a soil sample from the desired depth.
4. Monitor VOCs in the ambient air during soil collection.
5. Turn the auger in a clockwise direction with the “T” handle to remove soil until the desired soil sampling depth is reached. Place the excavated soil on the adjacent plastic. If possible lay out the cuttings in stratigraphic order.
6. During auger advancement record observations made of the geologic features of the soil.
7. Stop advancing the auger when the top of the specified sampling depth has been reached. Decontaminate the auger.
8. Insert the auger into the borehole to the sample depth and collect the sample. Place sample on ice and ship overnight to the lab under COC custody.
9. Decontaminate the auger bucket and complete the preceding steps for sample collection from deeper depths.
10. When sampling is complete, place cuttings back in the borehole in the order in which they were removed if possible. Top off with hydrated bentonite pellets.

Reference: *ASTM Standard Practice for Sampling Soils and Contaminated Media with HandOperated Bucket Augers D6907-05(2016)*.

3.15 Soil Vapor Implant Installation

Summary: A method for construction of soil vapor implants within unconsolidated material, which enables acquisition of soil vapor samples for laboratory testing. The soil vapor implants will be installed using the procedures described below.

Procedure:

1. Implants shall be 6 inches in length (e. g., Geoprobe® AT86 series) and are to be constructed of double woven stainless steel wire screen. Implants shall have a pore diameter of 0.0057 inch, which is equivalent to a 0.007 slot well screen. The bottom of the implants must have a post run tubing (PRT) style thread; the same fitting style used with Geoprobe® PRT vapor sampling tools. The top connection with the Teflon or polyethylene tubing shall be stainless steel Swagelok® or clamp fitting to prevent leakage during sample collection. The connection to the sampling Summa® canister shall be made through the use of 1/8th inch ID Teflon or polyethylene tubing.

2. Once the rods have been advanced to the desired depth, attach appropriate tubing to the implant to be installed. Allow at least 48 inches of tubing length longer than the required depth of the implant. Cover or plug the end of the tubing.
3. Remove the pull cap from the rods and lower the implant and tubing down inside the diameter of the rods until the implant hits the top of the Anchor/Drive Point. Note the length of the tubing to ensure proper depth has been reached.
4. Rotate tubing counterclockwise while exerting a gentle downward force to engage the PRT threads. Pull up on the tubing lightly to test the connection. DO NOT cut excess tubing.
5. Position a probe rod pull plate or manual probe rod jack on the top of the probe rod. Exert downward pressure on the tubing while pulling the probe rods up. Pull up about 12 inches.
6. Thread excess tubing through the bottom of a funnel and position funnel over top of probe rod. The funnel will be used to facilitate installation of sand into the borehole around the screened portion of the implant.
7. Pour sand into the funnel and down the inside diameter of the probe rods around the outside of the tubing and around the screen of the implant. Use tubing to “stir” sand into place. [NOTE: sand and bentonite can only be installed in the vadose zone (unsaturated zone above the water table)].
8. Lift up an additional 18 to 24 inches and insert a bentonite slurry above beads or sand.
9. Pull remaining rods out of the hole and complete with bentonite slurry.
10. Cut any excess tubing to allow approximately 8 to 12 inches to extend above the ground surface. Plug the tubing with a cap or plug.
11. Install a protective casing (road box) over the tubing and set it into concrete.
12. Document well construction in the field notebook and later on a Soil Vapor Implant Construction Detail diagram (Appendix A).

Reference: *ASTM Standard Practice for Active Soil Gas Sampling in the Vadose Zone for Vapor Intrusion Evaluations. D7663-12.*

3.16 Soil Vapor Implant Sampling

Summary: The soil vapor implants will not be sampled until a minimum of 24-hoRENU after installation has passed. To collect representative soil vapor samples, soil vapor implant tubing must be adequately sealed to prevent ambient air from being sampled. A helium tracer gas will be used to verify the integrity of the soil vapor implant seal. The soil vapor implants must be purged prior to sampling. Sampling should commence immediately after purging.

Procedure:

1. Inspect the existing tubing. Check for any signs of cracks, clogging or any other characteristics that may impact the collection of a representative sample.
2. Apply a bentonite slurry to the ground surface in an approximate 2-ft diameter circle. Place an approximately 2 ft. by 2 ft. square of plastic sheeting over the bentonite slurry.

Poke a hole, only as large as needed for the sampling tube to penetrate the plastic. Seal the plastic sheeting/tube interface with a small amount of bentonite slurry.

3. Place an enclosure over the well head, run well tubing through in the top outlet. Use plumber's putty to seal the interface between the tubing and the top of the enclosure.
4. Seal enclosure at the ground surface with a bentonite slurry.
5. Connect helium (99.999%) cylinder to side port of enclosure.
6. Release enough helium to displace any ambient air in enclosure. Continue flushing the inside of the enclosure with helium gas.
7. Connect the tubing to the vacuum pump. Use only new Teflon or HDPE tubing if needed for length and new silicone tubing for leak free unions. Do not reuse any tubing between sample locations.
8. Purge the soil vapor implant; remove one to three volumes of soil vapor. Flow rates for purging and sampling must not exceed 0.2 liters per minute (L/min) to minimize outdoor air infiltration during purging/sampling. Record start and stop time on the Summa Canister Sampling Field Data Sheet (Appendix A). Verify air is being drawn from the monitoring well by placing finger on the vacuum pump outlet tube to check for positive pressure. Helium cylinder should be open during the purge time, enough to cause a positive pressure within the enclosure.
9. After purging completed, disconnect the vacuum pump from the tubing.
10. Connect the Mark Helium Detector (Model 9822) to soil vapor implant tubing. Obtain readings. Absence of helium (< 10%) assures that the implant seal is competent and ambient air is not entering the soil vapor implant.

Using Flow Controllers Without a Built in Pressure Gauge:

1. Attach the pressure gauge provided by the laboratory to the Summa® canister, open valve completely, record reading on the Summa Canister Sampling Field Data Sheet (Appendix A), close valve completely, and remove the pressure gauge. If the canister does not show an initial vacuum of approximately 25 inches of mercury (in. Hg), do not use. Record the canister's serial number on the Summa Canister Sampling Field Data Sheet. Assign sample identification to the canister identification tag and record on the COC (Appendix A), and the Summa Canister Sampling Field Data Sheet.
2. Attach flow controller provided by the laboratory to the Summa® canister inlet (one for each Summa® canister). Do not reuse flow controllers between locations. Each flow controller is pre-set by the laboratory to collect the sample over a one hour period.
3. Attach tubing from the soil vapor implant to the flow controller on the Summa® canister. All tubing used in this step should be the same tubing that Project Work Plans used in the purging process.
4. Open canister valve to initiate sample collection and record start time and date on the canister identification tag and on the Summa Canister Sampling Field Data Sheet.
5. The helium cylinder should remain open during sampling set-up to cause a positive pressure in the enclosure. Because of the one-hour sampling time, more than one location may be sampled at the same time (with staggered starting times). When you are

ready to move onto the next location, stop the flow of the helium with the valve on the regulator, and seal ports on the enclosure to maintain the helium atmosphere within the enclosure.

6. After one hour, close the Summa® canister valve completely. Record the time on the Summa Canister Sampling Field Data Sheet.
7. Disconnect tubing.
8. Remove the flow controller, attach the pressure gauge to the Summa® canister, open valve completely, record reading, close valve completely, and remove the pressure gauge. Record the pressure reading on the Summa Canister Sampling Field Data Sheet. There should still be a slight vacuum in the Summa® canister. If no vacuum remains in the canister, do not send the canister for analysis. Retake the sample using the same procedure with a fresh canister.
9. If the canister does not show a significant net loss in vacuum after sampling, evaluate and document the problem. If necessary, use another Summa® canister to recollect the sample and contact the project manager immediately.
10. Connect the helium detector to soil vapor implant tubing. Obtain and record reading. Absence of helium (< 10%) assures that the conduit seal is competent and ambient air is not entering the soil vapor implant.
11. Ship canister standard overnight, with COC to the laboratory for analyses by USEPA Method TO-15 for VOCs with a minimum-reporting limit of 1 µg/m³.

Using Flow Controllers With a Built in Pressure Gauge:

1. Attach the flow controller provided by the laboratory to the Summa® canister inlet (you must have one for each canister). Do not reuse flow controllers between locations. Each flow controller is pre-set by the laboratory to collect the sample over a one hour period. Record the canister's serial number on the Summa Canister Sampling Field Data Sheet. Assign sample identification to the canister identification tag and record on the COC and the Summa Canister Sampling Field Data Sheet.
2. Attach tubing from the soil vapor implant to the flow controller on the Summa® canister. All tubing used in this step should be the same tubing that Project Work Plans used in the purging process.
3. Open Summa® canister valve completely and record the time and pressure on the Summa Canister Sampling Field Data Sheet. If the canister does not show an initial vacuum of approximately 25 in. Hg, do not use.
4. The helium cylinder should remain open during sampling set-up to cause a positive pressure in the enclosure. Because of the one hour sampling time, more than one location may be sampled at the same time (with staggered starting times). When you are ready to move onto the next location, stop the flow of the helium with the valve on the regulator, and seal ports on the enclosure to maintain the helium atmosphere within the enclosure.
5. After one hour, close the Summa® canister valve completely and record the time and pressure on the Summa Canister Sampling Field Data Sheet. There should still be a slight

vacuum in the Summa® canister. If no vacuum remains in the canister, do not send the canister for analysis. Retake the sample using the same procedure with a fresh canister.

6. If the canister does not show a significant net loss in vacuum after sampling, evaluate and document the problem. If necessary, use another Summa® canister to recollect the sample and contact the project manager immediately.
7. Connect the helium detector to soil-gas conduit tubing. Obtain and record readings. Absence of helium (< 10%) assures that the conduit seal is competent and ambient air is not entering the soil-gas conduit.
8. Disconnect tubing.

Reference: *ASTM Standard Practice for Active Soil Gas Sampling in the Vadose Zone for Vapor Intrusion Evaluations. D7663-12.*

3.17 Soil Vapor Implant Decommissioning Procedures

Procedure:

At each location the following will occur:

1. The soil vapor implant will be removed;
2. The flush-mount protective casing will be backfilled with concrete; and,
3. The concrete filled flush-mount protective casing will be removed during sidewalk flag replacement (See Section 3.29).

3.18 Disposal of Drill Cuttings and Soil Boring Spoils

Summary: Disposal of boring spoils will be performed in accordance with New York State Department of Environmental Conservation Technical and Administrative Guidance Memorandum (TAGM) HWR-89-4032, November 21, 1989.

Procedure:

1. Spoils will be stored on site in 1A2 open head 55-gallon steel drums.
2. These drums will be addressed in accordance with the protocols outlined in Section 3.30.

3.19 Groundwater Monitoring Well Construction Procedures

3.19.1 Overburden Monitoring Well Construction Procedures

Summary: A method for construction of groundwater monitoring wells within unconsolidated material, which enables monitoring of groundwater elevation and acquisition of groundwater samples for laboratory testing. The groundwater monitoring wells and piezometers will be installed during this investigation using the procedures described below.

Procedure:

1. Advance subsurface boring to the desired depth by means of hollow-stem auger drilling.
2. While boring, collect split spoon samples on a continuous basis to geologically log the boring.

3. Remove center plug from augers and verify borehole depth using weighted measuring tape.
4. Add washed and graded medium sand as needed to base of borehole.
5. Insert the well screen and riser pipe into borehole through the hollow stem augers. Cap the riser to prevent well construction materials from entering the well.
6. Add sand to screen section of well while slowly removing augers. Sand pack should extend at least two feet above the top of the screen section. Measure with a tape.
7. Slowly add bentonite pellet seal to borehole as augers are slowly removed. The bentonite seal should extend at least two feet above the top of the sand pack section. Measure with tape.
8. Note: The rate of removal of the auger from the borehole should closely follow the rate that the sand pack and bentonite pellets fill the borehole.
9. If bentonite seal is placed above the groundwater level within the borehole, add water to the borehole to hydrate the bentonite pellets. Allow pellets to hydrate for at least 30 minutes.
10. Mix cement/bentonite grout per Manufacturer's specifications.
11. Add grout to borehole through tremie pipe or hose from the top of the bentonite seal to the ground surface.
12. Remove remaining augers from the borehole.
13. Top off grout in borehole. Grout should extend to approximately two feet below ground surface.
14. Cut well-riser pipe to about three feet above the ground surface for stickup type wells. Flush-mount well risers should be cut off just below surface grade.
15. Backfill the remaining two feet of the borehole with concrete.
16. Install a protective casing over the well riser pipe and set it into the concrete backfill.
17. Lock the protective casing cover.
18. Document well construction in the field notebook and later on a Well Construction Detail diagram (Appendix A).

Reference: *ASTM Standard Practice for Design and Installation of Groundwater Monitoring Wells D5092/D5092M-16.*

3.19.2 Bedrock Monitoring Well Construction Procedures

Summary: A method for construction of monitoring wells within bedrock, which enables monitoring of groundwater elevation and acquisition of groundwater samples for laboratory testing.

Procedure:

1. Collect soil samples while advancing to the top of bedrock. Follow the procedures in Sections 3.5 (HSA drilling), 3.6 (Rotasonic drilling), 3.10 (split-spoon sampling), or 3.13 (direct-push sampling) as applicable for field conditions.

2. Measure the depth to the top of bedrock from the ground surface using a weighted measuring tape.
3. At these boring locations collect a 3- to 5-foot NX- rock core sample from the top of rock.
4. Ream the core hole to approximately 8-inches in diameter.
5. Install a 6-inch carbon steel casing into the borehole and set it at least 3 feet into the bedrock. The casing should extend to the ground surface.
6. Remove the HSAs or casing and grout the annular space between the steel casing and borehole wall. Mix grout following procedures in Section 3.19.3. Allow grout to cure for at least 24 hours before continuing the boring.
7. Collect NX-rock core samples to desired depth in 5- or 10-foot increments. After coring, ream the core hole to approximately 6-inches in diameter.
8. Insert a riser cap (J-plug) into the well riser. Install an 8-inch curb box around the well casing by cementing the protective curb box around the well casing. Install lock on Jplug and seal the curb box.
9. Document well construction details in the field notebook and transfer the data onto the Bedrock Monitoring Well Construction Detail form (Appendix A).

Reference: *ASTM Standard Practice for Design and Installation of Groundwater Monitoring Wells D5092/D5092M-16.*

3.19.3 Monitoring Well Abandonment Procedures

Well abandoning will be performed in accordance with New York State Department of Environmental Conservation (NYSDEC) CP-43, using the following steps:

1. Each well will be tremie grouted from the bottom of the well to within five feet of the ground surface to ensure a continuous grout column. Grout slurry composition should be the following:
 - 1.5 to 3.0 percent by weight - Bentonite (Quick Gel)
 - 40 to 60 percent by weight - Cement (Portland Type I)
 - 40 to 60 percent by weight - Water
2. The well casing will be removed at a depth of five feet below grade (if possible) and the outer protective casing "stick-up" and/or flush-mount curb box will be removed only after the well has been properly filled with grout.
3. A metal marker (PK Survey Spike) will be embedded in the top of the grout to indicate the location of the former monitoring well.
4. The uppermost five feet of the borehole will be filled with approved/clean backfill or topsoil.
5. The surface of the borehole will be restored to the condition of the area surrounding the borehole (crushed stone, asphalt, etc.). If the surrounding surface is a concrete sidewalk flag that flag will be replaced in accordance with Section 3.29 of this plan.
6. The solid waste should be handled in accordance with Section 3.30 of this plan.
7. Document well construction details in the field notebook and transfer the data onto the Well Decommissioning Record form (Appendix A).

Reference: *NYSDEC CP-43: Groundwater Monitoring Well Decommissioning Policy, November 3, 2009. ASTM Standard Guide for Decommissioning of Groundwater Wells, Vadose Zone Monitoring Devices, Boreholes, and Other Devices for Environmental Activities D5299/D5299M-17.*

3.19.4 Plugging/Abandoning Borehole and Grout Mixing Procedures

Summary: Boreholes that are not completed as monitoring wells, will be sealed (plugged) prior to abandonment to prevent downhole contamination. In addition, the annular space in monitoring wells need to be sealed after the installation of the sand pack and bentonite seal to prevent any downward migration of surface water into the well. Sealing can be achieved by backfilling the borehole with bentonite below the water table (hole plug or pellets) and/or with a cement/bentonite grout above the water table. The backfill material will be introduced from bottom to top using either a tremie pipe or the drill rods. Shallow borings will be sealed with bentonite (hole plug or pellets) the entire length of the boring.

Procedure:

1. Determine most suitable seal materials. Grout specifications generally have mixture ratios as follows:
 - Grout Slurry Composition (Percent Weight) 1.5 to 3.0 percent - Bentonite (Quick Gel)
 - 40 to 60 percent - Cement (Portland Type I)
 - 40 to 60 percent - Water
2. Calculate the volume of the borehole based on the bit or auger head diameter plus 10 percent and determine the volume of grout to be emplaced. Generally, the total mixed volume is the borehole volume plus 20 percent.
3. Identify the equipment to be used for preparing and mixing of the grout. Ensure the volume of the tanks to be used for mixing has been measured adequately. Document these volumes.
 - Identify the source of the water to be used for the grout and determine its suitability for use. In particular, water with high sulfate or chloride levels, or heated water, should not be used. These types of waters can cause operational difficulties or modify the set-up for the grout.
4. Identify the equipment to be used for emplacing the grout. Ensure that the pump to be used has adequate pressure to enable complete return to surface.
5. Identify the volumes to be pumped at each stage or in total if only one stage is to be used.
6. Prepare the borehole plugging plan and discuss the plan and activities with the drilling contractor prior to beginning any mixing activities.
7. Begin mixing the grout to be emplaced.
8. Record the type and amount of materials used during the mixing operation. Ensure that the ratios are within specification tolerance.

9. Begin pumping the grout through the return line bypass system to confirm that all pump and surface fittings are secure.
10. Initiate downhole pumping. Record the times and volumes emplaced on the form.
11. Document the borehole is completely filled with grout.
12. Clear and clean the surface near the borehole. Level the ground to about the pre-existing grade. Add grout or cement as necessary to the area near the borehole.

Note: On occasion, there may be some settling of the grout, which takes place over several days. If this settling occurs, the natural soil from the immediate vicinity is used to put the level at grade. A follow-up check at each site should be made within one week to 10 days of completion. Document the visit and describe any action taken.

3.20 Groundwater Monitoring Well Development Procedures

Summary: Following completion of groundwater monitoring well installation, each monitoring well will be developed by pumping until the discharged water is relatively sediment free and the indicator parameters (pH, temperature, and specific conductivity) have reached steady state. Developing the monitoring well not only removes any sediment but also may improve the hydraulic properties of the formation. The effectiveness of the development measures will be closely monitored in order to keep the volume of discharged water to the minimum necessary to obtain sediment-free samples. A portable turbidimeter will be used to monitor effectiveness of development. A turbidity reading of < 50 Nephelometric Turbidity Units (NTU) and steady state pH, temperature, and specific conductivity readings will be used as a guide for discontinuing well development.

Procedure:

1. An appropriate monitoring well development method should be selected, depending on water level depth, well productivity, and sediment content of water. Monitoring well development options include: (a) manual pumping; and (b) powered suction-lift or hydrolift pumping.
2. Equipment should be assembled, decontaminated (if necessary), and installed in the well. Care should be taken not to introduce contaminants to the equipment during installation.
3. Monitoring well development should proceed by repeated removal of water from the well until the discharged water is relatively sediment-free. All development waters will be containerized. Effectiveness of development should be monitored at regular intervals using a portable turbidimeter and water quality meter. Volume of water removed and turbidity, pH, temperature, and conductivity measurements will be recorded on a Well Development/Purging Log form (Appendix A).
4. Monitoring well development will be discontinued when the turbidity of the discharged water is below 50 NTU and the other indicator parameters have stabilized.

Reference: *ASTM Standard Practice for Design and Installation of Groundwater Monitoring Wells D5092/D5092M-16.*

3.21 Monitoring Well and Soil Vapor Implant Inspection and Maintenance

Summary: Periodic inspection and maintenance of monitoring well protective casings are required to keep the wells in good condition. The following procedure should be employed whenever the monitoring wells are opened for gauging and sampling.

Procedure:

1. Use the Monitoring Well Inspection Form or Soil Vapor Implant Inspection Form (Appendix A) to record the conditions of the various components of the monitoring well and protective casing including lock/hasp, hinge/lid, J-plug, gasket seal, and security bolts.
2. Coat security bolts with never seize to prevent seizure in the cast iron flush mount curb boxes.
3. Replace security bolts of the hexagonal head type with bolts that have pentagonal heads (5 sided) at the earliest opportunity. Pentagonal type bolts help prevent unauthorized access to the wells.
4. In wells, record depth to water, depth to bottom, and depths to the top and bottom of any light non-aqueous phase liquid (LNAPL) and dense non-aqueous phase liquid (DNAPL) layers.
5. Record any maintenance performed on the well and stencil as needed.
6. All sections of the inspection form should be completed and photographs taken before and after inspection and maintenance.

3.21.1 Road Box Replacement Procedures

Summary: Often during an inspection, it is determined that a monitoring well's road box is damaged and needs to be replaced. The following procedure should be employed whenever a road box is replaced.

Procedure:

1. Cut the pavement with a jackhammer and hand-excavate the surrounding soil to a depth of approximately 1 ft. below ground surface (bgs). If the surrounding surface is covered with asphalt instead of concrete, then hand cut the asphalt.
2. Any concrete (or asphalt) cuttings will be placed in a 1A2 open head 55-gallon steel drum.
3. Remove the damaged road box and install the new road box. The damaged road box will be placed in a 1A2 open head 55-gallon steel drum.
4. Backfill around the newly installed road box with the excavated soil, leaving enough room for a concrete pad/asphalt patch.
5. Construct a 2 ft. by 2 ft. square concrete pad/asphalt patch surrounding the new road box.
6. If using concrete in freezing temperatures, an anti-freeze agent will be added to the cement mixture and the concrete pad will be covered with a sheet of plastic to prevent the pad from freezing and cracking.

7. An orange cone will be placed near the monitoring well to prevent vehicles from driving over the newly repaired road box.
8. The drums will be addressed in accordance with the protocols outlined in Section 3.30.

3.22 Hydraulic Conductivity Testing

Summary: Hydraulic conductivity tests (slug tests) may be performed in newly installed wells. During any slug testing, gauging of fluid levels will be performed using a data logger/pressure transducer, and stainless steel slugs. Since the water table is shallow, only rising head (slug-out) tests will be performed. This test will consist of inserting a 'slug' of known volume into the well/piezometer, allowing the water level in to return to a steady state, removing the slug allowing the water level to return to static conditions. The transducer/data logger will record changes in water level. This data will be analyzed using the methods of Bouwer and Rice (1976) and Bouwer (1989).

Slug testing is a rapid and inexpensive procedure for estimating the horizontal hydraulic conductivity of an aquifer material screened by a monitoring well. Equipment consists of dedicated/disposable nylon rope, decontaminated stainless steel slug and a data logger/pressure transducer, and a water level indicator.

Procedure:

1. Measure dimensions of the slug to be used to displace water in the monitor and predetermine the volume of water, which will be displaced, and corresponding initial water level change, which will occur by adding or removing the slug.
2. Record initial water level in the wells (static water level).
3. Lower the pre-cleaned data logger/pressure transducer into wells to the wells bottom. Pull transducer up one foot.
4. Insert slug into well, below water table, with nylon rope. Allow water level in well to return to static condition.
5. Simultaneously initiate data logger/pressure transducer and rapidly remove the slug from the wells.
6. Monitor water level recovery in well with data logger/pressure transducer until static water level has been regained.
7. Download data logger/pressure transducer and record data in field notebook. Review data to verify slug test Project Work Plans successful.
8. Remove equipment from well and decontaminate.
9. Analyze data in office using computer.

3.23 Groundwater Sampling

Summary: To collect representative groundwater samples, groundwater wells must be adequately purged prior to sampling. New monitoring wells will not be purged until 72 hours after installation. Purging will require the removal of three to five volumes of standing water in rapidly recharging wells and at least one volume from wells with slow recharge rates. Shallow

wells in which the screen intersects the water table should require a minimum amount of purging since the groundwater would flow through the screen and not be entrapped in the casing. Deeper wells should be purged more thoroughly since they may be located in confined aquifers and water may rise up into the casing. A thorough purging would require the removal of several volumes of this trapped water to ensure that representative groundwater is brought into the well for sampling. Sampling should commence immediately after purging as soon as adequate recharge has occurred.

3.23.1 Standard Monitoring Well Purging Procedure

Procedure:

1. The well cover will be unlocked and carefully removed to avoid having any foreign material enter the well. The interior of the riser pipe will be monitored for organic vapors using PID. If a reading of greater than 5 ppm is recorded, the well will be vented until levels are below 5 ppm before purging begins.
2. Using an electronic water level detector, the water level below top of casing will be measured. Knowing the total depth of the well, it will be possible to determine the volume of water in the well. The end of the probe will be soap-and-water-washed and deionized-water rinsed between wells.
3. Calibrate field instruments (e.g., pH, specific conductance, PID, turbidity).
4. Purge the required water volume (i.e., until stabilization of pH, temperature, specific conductivity, and turbidity). New dedicated equipment will be used for each well.
5. Purge well until the water quality parameters have stabilized. The stabilization criteria are: specific conductivity - 3% full scale range; pH - 0.10 pH unit; temperature - 0.2°C, and turbidity <50 NTU.
6. Purging of three well volumes is not necessary if the indicator parameters are stable. However, at least one (1) well volume must be purged before sampling can begin. During purging, it is permissible to by-pass the flow cell until the groundwater has cleared.
7. Indicator parameters of pH, conductivity, dissolved oxygen, oxygen/reduction potential, turbidity, and temperature must be measured continuously using the flow cell.
8. Well purging data are to be recorded in the field notebook and on the Well Purge Log (Appendix A).
9. Dispose of sampling equipment as per Section 3.30.

3.23.2 Low Flow Sampling Procedures

Summary: To collect representative groundwater samples, monitoring wells must be adequately purged prior to sampling. Low volume sampling equipment and procedures will be used to purge the wells and retrieve groundwater samples. Purging will require the removal of one to three volumes of standing water by pumping at a rate of less than one (1) liter per minute. Drawdown must not exceed ten percent of the standing water column. Sampling should commence immediately after purging.

Procedure: Monitoring well purging will be completed using the low-flow purging technique as follows:

1. The well cover will be unlocked and carefully removed to avoid having any foreign material enter the well. The interior of the riser pipe will be monitored for organic vapors using PID. If a reading of greater than 5 ppm is recorded, the well will be vented until levels are below 5 ppm before purging begins.
2. Using an electronic interface probe/water level detector, the water level below top of casing will be measured. The depth of the well will be measured to determine the volume of water in the well. The bottom of the well will also be checked for DNAPL using the interface probe/water level indicator. The end of the probe will be decontaminated between wells.
3. Calibrate field instruments (e.g., pH, specific conductance, PID, turbidity).
4. Purge the required water volume (i.e., until stabilization of pH, temperature, specific conductivity, and turbidity) using a low-flow pump (e.g., Solinst or Geopump) and dedicated HDPE tubing. New dedicated tubing will be used for each well.
5. Purge the well until the water quality parameters have stabilized. The stabilization criteria are: specific conductivity - 3% full-scale range; pH - 0.10 pH unit; dissolved oxygen – 10%, Turbidity – 10% and oxidation/reduction (redox) potential - +/- 10 units.
6. Purging of three well volumes is not necessary if the indicator parameters are stable. However, at least one (1) well volume must be purged before sampling can begin. During purging, it is permissible to by-pass the flow cell until the groundwater has cleared.
7. Indicator parameters of pH, conductivity, dissolved oxygen, oxidation/reduction (redox) potential, turbidity, and temperature must be measured continuously using the flow cell.
8. Well purging data are to be recorded in the field notebook and on the Low Flow Purge Log (Appendix A).

3.23.3 Sample Collection Procedures

Procedure:

1. After well purging is completed, a sample will be collected into the appropriate containers.
2. Direct water flow toward the inside wall of the sample container to minimize volatilization. Fill volatile sample containers so no headspace (air bubbles) is present. If containers are pre-preserved, do not overfill sample containers. Note if effervescence is observed.
3. All sample bottles will be labeled in the field using a waterproof permanent marker (Section 7.0).
4. Samples will be collected into sample bottles (containing required preservatives) and placed on ice in coolers for processing (preservation and packing) prior to shipment to the analytical laboratory. A chain-of-custody record will be initiated. The analytical laboratory will certify that the sample bottles are analyte-free prior to shipping.
5. Remove pump and disconnect valves and tubing, as necessary. If a submersible pump Project Work Plans used, it must be decontaminated prior to and between each use.

Clean pump by flushing 10 gallons of potable water through the pump. Rinse with deionized water after flushing the pump.

6. Well sampling data are to be recorded in the field notebook and on the Well Purging Log (Appendix A).

Reference: *ASTM Standard Practice for Design and Installation of Groundwater Monitoring Wells D5092/D5092M-16*.

3.23.4 Sampling Through LNAPL

Procedure:

1. Measure the depth and thickness of the LNAPL layer per Section 3.25.
2. The groundwater sample from below the product will be collected through a 1-inch ID tremie pipe immersed below the LNAPL layer.
3. Insert a slip cap or similar device (i.e., J-plug) to plug the end of the 1" ID PVC pipe, and attach a tether to the device so it can be retrieved from the well after sampling is complete. The pipe will be lowered into the well and additional sections of 1" ID PVC pipe will be added as necessary.
4. Lower the 1" ID PVC pipe into the well with the slip cap/J-plug inserted in the bottom of the pipe. The bottom of the pipe should be lowered through and at least 2' below the bottom of the LNAPL layer.
5. Brace the 1" ID pipe at the surface so it cannot fall further into the 2" well casing.
6. Smaller diameter rods or a weighted section of steel pipe attached to a rope will be used to push the slip cap off the end of the 1" ID PVC pipe. The attached tether will allow retrieval of the J-plug when the 1" tubing is retrieved from the well at the conclusion of sampling.
7. Proceed with sampling the well by inserting purging and sampling tubing through the 1" tubing.
8. When sampling is finished remove the 1" tubing and slip cap from the well. The 1" ID PVC pipe will be partially coated with LNAPL and should be discarded. The slip cap can be decontaminated or discarded.

3.23.5 Sampling LNAPL or DNAPL

Summary: When conducting groundwater sampling from monitoring wells, LNAPL and DNAPL may be collected. The following procedure will be used to collect samples of LNAPL and DNAPL.

Procedure:

1. Measure the depth and thickness of the LNAPL/DNAPL layer per Section 3.25.
2. Using a disposable Teflon or Teflon lined bailer attached to disposable poly twine, lower the bailer so the bottom of the bailer is at the same depth as the bottom of the LNAPL/DNAPL layer.
3. Upon reaching its target depth, raise the bailer with the LNAPL/DNAPL product and place the product in the laboratory supplied containers.

4. Repeat steps 2 and 3 until the laboratory supplied containers are full or there is no more product to remove.
5. Upon completion of the sampling, place the used bailer and twine in a 1A2 open head 55gallon steel drum.

3.24 Water Level Monitoring Procedures

Summary: Determination of groundwater depths in monitoring wells is necessary to calculate required purge volumes prior to groundwater sampling. Determination of groundwater depths in piezometers is necessary to determine the direction of groundwater flow.

Water levels in monitoring wells scheduled to be sampled during the field work will be measured using an electronic water level indicator. Initially, measurements will be taken following well development until the well has recovered to anticipated static conditions. Water levels will also be measured in the piezometers as specified in the Project Work Plan. Water level measurement procedures are presented below.

Procedure:

1. Clean the water level probe and the lower portion of cable following standard decontamination procedures (Section 6.0) and test water level meter to ensure that the batteries are charged.
2. Lower the probe slowly into the monitoring well until the audible alarm indicates water.
3. Read the depth to the nearest hundredth of a foot from the graduated cable using the V-notch on the riser pipe as a reference point.
4. Repeat the measurement for confirmation and record the water level.
5. Remove the probe from the well slowly, drying the cable and probe with a clean "Chem Wipe" or paper towel.
6. Replace the well cap and lock protective cap in place.
7. Decontaminate the water level meter (Section 6.0) if additional measurements are to be taken.

Reference: *ASTM Standard Test Method for Determining Subsurface Liquid Levels in a Borehole or Monitoring Well (Observation Well) D4750-87(2001)*.

3.25 LNAPL/DNAPL Water Level Monitoring Procedures

Summary: When conducting groundwater measurement from monitoring wells, the presence and thickness of LNAPL and DNAPL will be monitored. The following procedure will be used to determine the presence and thickness of LNAPL and DNAPL. LNAPLs, Light Non-Aqueous Phase Liquids (Lighter than water) are typically measured using an oil/water interface meter.

Procedure:

1. To meet safety requirements and protect electronics from damage, always ground the meter by attaching the ground clamp to the metal well casing.

2. Before beginning any measurement, check the electronics and battery condition by pressing the 'START/OFF' button. A brief tone and red light indicates the meter is functional. A flashing green light indicates the meter is on. NOTE: The meter will automatically shut off after 10 min to conserve battery life and will have to be turned back on.
3. Lower the probe end into the well and slowly lower until water or LNAPL is contacted. A steady tone and light indicates a non-conductive liquid (e.g. product). An intermittent tone and light indicates a conductive liquid (e.g. water).
4. For floating product (LNAPL), take the air/product interface measurement on the way into the liquid and the water/product interface on the way up. When passing through product into water, some product may adhere to the probe sensors due to surface tension. Therefore, when water is detected below the product, the probe should be raised and lowered rapidly in a short vertical motion to remove any product that may have been carried down with the probe.
5. The water/product interface should then be measured as the probe is raised very slowly back up. Once the interface is detected the probe can be raised and lowered in small increments to precisely determine the interface.
6. Repeat measurements to confirm water/product interface.
7. To determine the thickness of product, subtract the water/product interface from the product/air interface.
8. To determine if there is any sinking product (DNAPL) in the well, continue lowering the probe slowly. If steady signals activate, determine the top of the sinking layer by reading directly from the tape. Continue lowering the probe slowly until the tape slackens when the well bottom is reached. Read the level directly from the tape and subtract one from the other to determine thickness.
9. Upon completion of readings clean the tape and the probe.

3.26 Indoor Air Investigation

Indoor air investigations will generally include the following tasks at each residence: 1) conducting interviews with homeowners using air quality questionnaires provided by the New York State Department of Health (NYSDOH) (Appendix A); 2) conducting a brief survey of household chemicals present and evaluating their potential to affect air sample results; 3) collecting one indoor air sample each from the breathing zones of the first floor and basement areas, and; (4) collecting one soil vapor sample from beneath the basement concrete slab. In addition, one or two outdoor air samples will be collected from the residential sampling area for each day that sampling is taking place.

3.26.1 Indoor Air Quality Survey and Questionnaire

Once the homeowners have been contacted by the NYSDEC and/or NYSDOH, appointments will be made to conduct homeowner/occupant interviews and building inventory of household chemicals. Questionnaire and Building Inventory forms provided by the NYSDOH (Appendix A) will be used. Once the questionnaires have been completed, a brief inventory of household

chemicals stored in the basement area will be prepared. The inventory will consist of a general description of areas where chemicals are stored and the types and approximate numbers of chemicals present. During this inventory, a ppbRAE photo ionization detector (PID) should be used to measure the presence of volatile organic compounds (VOCs) in those areas where the chemicals are found. Also during the inventory, a handout will be provided to the residents that list home activities that should be avoided prior to and during the air sampling. The general procedures to be followed during the surveys are summarized below:

- Identify all areas on the basement level that may be used for storage of chemical containers. Also record the general types and approximate quantities of chemicals stored and VOCs present in the atmosphere in the areas of chemical storage.
- Other potential sources that may influence air quality testing that should be noted and scanned with the PID include: new construction/remodeling/painting, new carpeting, and freshly drycleaned clothing.

3.26.2 Sub-Slab Air Sampling Procedures

One sub-slab air sample will be collected at each sampled residence. As directed by the NYSDEC, additional samples (up to a total of three) may be collected at some of the residences. A minimum of one sub-slab sample at each residence will be tested for an adequate surface seal before and after testing using the helium tracer gas test procedures outlined below.

The sub-slab air sampling procedures are summarized below:

1. Select and prepare the sub-slab sample collection point by observing the condition of the building floor slab for apparent penetrations such as concrete floor cracks, floor drains, or sump holes. The floor conditions will be noted and a potential location of a subsurface probe will be selected. The location will ideally be central to the building, and away from the foundation walls, apparent penetrations and buried pipes. Review all locations with the Homeowner prior to drilling any hole! Photograph and document all sample locations.
2. In locations where bare concrete is available, drill a 5/8-inch diameter hole about one-inch (1") into the concrete using an electric hammer drill. Extend the hole through the remaining thickness of the slab using a ½ -inch drill bit. Lengthen the hole about three inches (3") beyond the sub-slab using the drill bit.
3. Remove the concrete dust within the 5/8-inch drilled hole and around the hole using wire brushes and a brush and dust pan, then dabbing the surface with Sculpey brand clay, or equivalent substance (see below).
4. Insert a 5/8-inch outside diameter (OD) by ¼-inch inside diameter (ID) rubber stopper onto and three-inches beyond the end of a 1/4-inch OD by 1/8-inch ID Teflon tube. Insert the Teflon tube into the 5/8-inch hole so the stopper is seated into the top of the ½-inch drilled hole.

5. Seal the annular space between the 5/8-inch hole and the Teflon tubing with white Sculpey Brand modeling clay (or equivalent). Bring the clay above the floor's surface and around the tubing in a volcano-like shape.
6. In locations where only linoleum tile is available, AND THE OWNER AGREES, drill a small (1/4-inch best) hole through the tile and slab. Place the sample tubing into the hole and seal to the floor with clay.
7. Purge the sampling tube by connecting the Teflon tubing to the inlet of an air-sampling pump (GilAir 300 or 500) with 3/8-inch OD silicone tubing, and connecting a 1 liter (L) Tedlar bag to the outlet of the pump with silicone tubing. Purge approximately one liter (1L) of gas from the subsurface probe into the Tedlar bag, using the air-sampling pump. Analyze the 1L Tedlar bag containing the sub-slab purged air with a gas detector that records the concentrations of CH₄, CO₂ and O₂. Record the purge times (start and stop) and the gas concentrations on a Summa Canister Sampling Field Data Sheet (Appendix A). Purging flow rates must not exceed 0.2 L/min.
8. Assign sample identification to the Summa[®] canister identification tag and record on chain of custody (COC), and the Summa Canister Sampling Field Data Sheet. Also record the Summa[®] canister's serial number on the Summa Canister Sampling Field Data Sheet.
9. Remove brass plug from canister fitting.
10. Attach a pre-calibrated/certified 24-hour flow controller, and particulate filter to the Summa[®] canister. Record the regulator serial number on the Summa Canister Sampling Field Data Sheet.
11. Attach the sample tube to the Summa[®] canister using a ¼-inch Swagelok[®] nut with appropriate ferrules, via the flow controller/particulate filter assembly.
12. Open canister valve to initiate sample collection and record sample start time, date and initial vacuum on the canister identification tag and on the Summa Canister Sampling Field Data Sheet. If the canister does not show sufficient vacuum (generally less than 25" Hg), do not use. Take a digital photograph of canister setup and surrounding area. Include in the photograph a dry erase board or similar display which presents sample ID and date.
13. After 24 hour, record sample end time and canister pressure on the Summa Canister Sampling Field Data Sheet, and close valve.
14. Disconnect the Teflon tubing and remove flow controller/particulate filter assembly from canister. Seal canister with brass plug.
15. Seal the hole in the basement slab with hydraulic cement patch.
16. Ship samples with COCs, overnight, to a NYSDOH approved laboratory, for TO-15 analysis.

Using Helium Tracer Gas to Test Floor Seals.

1. Drill the concrete floor and attach and seal the Teflon sample tubing to the floor as described above.
2. Place a 2-quart (or similar size) bucket over the floor seal after threading the Teflon sample tube through a hole in the top of the bucket. Seal the tube to the bucket with clay.

3. The bucket should also have a hole in the top for the injection of helium gas. An additional hole should be present in the side, near the bottom, to measure the concentration of helium gas in the bucket.
4. Connect helium (99.999%) cylinder tubing to the top port of bucket enclosure and seal with clay or other sealing material. Insert a helium detector probe to the bottom port of the bucket.
5. Release enough helium to displace any ambient air in the bucket until the concentration of helium reaches a minimum of 90%. Maintain this minimum concentration by testing with a helium detector. The helium cylinder should be open during the purge time to cause a slight positive pressure within the enclosure.
6. Connect the sample tubing to a GilAir vacuum pump or equivalent using 3/8-inch O.D. silicone tubing. Connect a 1-liter Tedlar bag to the outlet of the pump using silicone tubing and collect a 1-liter sample. Analyze the Tedlar bag for helium using a helium detector, and record the results on the Summa Canister Sampling Field Data Sheet. Also analyze the Tedlar bag for the presence of methane, H₂S, CO₂ and O₂ and record the result on the Summa Canister Sampling Field Data Sheet. A concentration of helium 10% or greater indicates a poor seal of the sample tubing to the basement floor. The tubing must be resealed to the floor and another helium test conducted.
7. Purging flow rates must not exceed 0.2 L/min.
8. After purging, remove the bucket enclosure and assign sample identification to the Summa[®] canister identification tag and record on the COC, and the Summa Canister Sampling Field Data Sheet. Also record the Summa[®] canister's serial number on the Summa Canister Sampling Field Data Sheet.
9. Connect the 1/4-inch Teflon OD sample tubing to the Summa[®] canister regulator inlet using a 1/4-inch Swagelok[®] nut with appropriate ferrules. Open the canister valve to initiate sample collection and record the start time and date and beginning vacuum on the canister identification tag and on the Summa Canister Sampling Field Data Sheet. If the canister does not show sufficient vacuum (generally less than 25" Hg), do not use.
10. After 24 hours, record sample end time and final vacuum on the Summa Canister Sampling Field Data Sheet and close the valve.
11. Disconnect the Teflon tubing from the Summa[®] canister and remove the flow controller/particulate-filter assembly from canister. Seal canister with brass plug.
12. Thread the Teflon sample tubing through the bucket enclosure and conduct a helium tracer gas test as described above. After purging, test the concentration of helium in the 1 liter Tedlar bag and record on the Summa Canister Sampling Field Data Sheet.
13. Remove the sample tubing, stopper and clay from the hole in the basement slab and seal with hydraulic cement patch.
14. Ship the samples, with COCs, overnight to Air Toxics, or other selected lab, for TO-15 analysis.

3.26.3 Indoor Air and Outdoor Air Sampling Procedure

Sampling procedures for the indoor samples and outdoor air sample are summarized below:

1. Place the basement and first floor Summa® canisters at breathing height in a high traffic location. The breathing height is defined as three to six feet above the floor. Place the outdoor air sample at least 2 to three feet above the ground.
2. Record the canister's serial number on the Summa Canister Sampling Field Data Sheet.
3. Assign sample identification to the canister identification tag (see Section 7.0 below) and record on the COC and the Summa Canister Sampling Field Data Sheet.
4. Remove brass plug from canister fitting.
5. Attach a pre-calibrated/certified 24-hour flow controller and particulate filter to the Summa® canister, open valve completely to initiate sampling, and record the sample start time and date, and beginning vacuum reading on the canister identification tag and the Summa Canister Sampling Field Data Sheet. Also record the regulator serial number on the Summa Canister Sampling Field Data Sheet. If the canister does not show sufficient vacuum (generally less than 25" Hg), do not use.
6. Take a digital photograph of canister setup and surrounding area. Include a dry erase board or similar display which presents sample ID and date.
7. After 24 hours, record end time and pressure on the Summa Canister Sampling Field Data Sheet, and close valve.
8. Disconnect flow controller/particulate filter assembly from canister.
9. Seal canister with brass plug.
10. Ship canister standard overnight, with COC, to a NYSDOH approved laboratory, for TO15 analysis.

3.26.4 Quality Control

Field duplicates for structure samples (10 percent) will be collected by attaching the T-fitting supplied by the laboratory to two Summa® canisters with attached regulators. The inlet for the T-fitting will then be attached to the sub-slab sample tubing. Indoor air and outdoor air duplicates will also use T-fittings connected to two Summa® canisters. Tubing will not be required unless needed to raise the sampling point to the breathing zone. For sampling, both Summa® canister valves are opened and closed simultaneously.

3.26.5 Field Documentation

Field notebooks will be used during all on-site work. A dedicated field notebook will be maintained by the field technician overseeing the site activities. In addition to the notebook, any and all original sampling forms, purge forms and notebooks used during field activities will be submitted to the NYSDEC as part of the final report. Indoor air sampling procedures should be photo-documented.

The field sampling team will maintain sampling records that include the following data:

1. Sample Identification
2. Date and time of sample collection
3. Identity of samplers
4. Sampling methods and devices

5. Purge volumes (soil vapor)
6. Volume of soil vapor sample extracted
7. The Summa® canister vacuum before and after samples collected
8. Chain of Custody and shipping information

The proper completion of the following forms/logs will be considered correct procedure for documentation during the indoor air-sampling program:

1. Field Log Book - weather-proof hand-bound field book
2. Questionnaire and Building Inventory Form (Appendix A)
3. Summa Canister Sampling Field Data Sheet (Appendix A)
4. Chain of Custody Form (Appendix A)

Reference: *NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York.*

3.27 Removal of Underground Storage Tanks

3.27.1 General

The contractor shall furnish all labor, materials, tools and equipment and remove an underground storage tank.

3.27.2 Submittals

The following items shall be submitted to the RENU Project Manager for review and approval.

1. Detailed Work Plan: This plan shall be submitted by the Underground Storage Tank Contractor to RENU and will describe methods, equipment, and sequences of operations including, but not limited to:
 - Tank contents removal
 - Spill Prevention
 - Exploratory excavations
 - Tank purging procedure
 - Interior and exterior tank cleaning procedure
 - Wastewater Collection and Disposal
 - Removal or permanent closure of underground storage tank
 - Transportation and disposal of underground storage tank
 - Anticipated use, recycling or disposal of tank contents
2. Copies of manifests required to transport waste materials. These manifests shall be submitted within 24 hours following their preparation.
3. Documentation of acceptance of waste materials by a facility permitted to treat or dispose of those types of materials. These documentations shall be submitted no later than 7 days following a delivery of waste materials to the permitted facility.
4. Letters of acceptance from the permitted facility and haulers acknowledging agreement to accept the waste materials. These letters shall be submitted not more than 14 days before transporting waste materials.

3.27.3 Permit and License Requirements

1. Prior to the removal of the underground storage tank, all permits and licenses required to perform the work shall be obtained by the Contractor. Determining license and permit requirements shall be the responsibility of the Contractor.
2. The permit and notification requirements for underground storage tank removal or closure shall include, but not be limited to, the following:
 - a. Storage tanks greater than 1,100 gallons capacity must be registered with the NYSDEC. If the tank is being closed, and it is not currently registered, the tank must be registered by the contractor before proceeding with his removal or closure activities. Thirty (30) days prior to initiation of closure activities, the contractor shall notify the NYSDEC (Region 2) of the intent to remove or close a storage tank.
 - b. Storage tanks of 1,100 gallons or less do not require registration, or notification to the NYSDEC when closed unless a spill has occurred (see below).
 - c. The Contractor shall comply with the requirements of 6 NYCRR Part 612, 6 NYCRR Part 613, 6 NYCRR Part 614, NYSDEC Memo #1, and NYSDEC SPOTS No. 14.

3.27.4 Applicable Standards

The publications are referenced by basic designation only and shall be the latest published version.

- American Petroleum Institute (API)
 - API Publ 1628 A Guide to the Assessment and Remediation of Underground Petroleum Releases
 - API Publ 2015 Safe Entry and Cleaning of Petroleum Storage Tanks, Planning and Managing Tank Entry from Decommissioning through Recommissioning
 - API Publ 2217 Guidelines for Confined Space Work in the Petroleum Industry
 - API Publ 2219 Safe Operating Guidelines of Vacuum Trucks in Petroleum Service
 - API Publ 2003 Protection Against Ignitions Arising out of Static, Lightning and Stray Currents
- American Society for Testing and Materials (ASTM)
 - ASTM C94/C94M-17 Standard Specifications for Ready-Mixed Concrete
- Code of Federal Regulations (CFR)
 - CFR 40 Part 260 Hazardous Waste Management System: General
 - CFR 50 Part 261 Identification and Listing of Hazardous Waste
 - CFR 40 Part 262 Standards Applicable to Generators of Hazardous Waste
 - CFR 40 Part 263 Standards Applicable to Transporters of Hazardous Waste
 - CFR 40 Part 264 Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

- CFR 40 Part 265 Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
- CFR 40 Part 266 Standards for the Management of Specific Hazardous Waste and Specific Types of Hazardous Waste Management Facilities
- CFR 40 Part 268 Land Disposal Restrictions
- CFR 40 Part 280 Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks
- USEPA
 - USEPA SW-846 Test Methods for Evaluating Solid Waste, Physical/Chemical Methods
- New York City Fire Department
 - FP Directive 3-73 Division of Fire Protection
- NYSDEC
 - 6 NYCRR Part 357.6 Remedial Program Soil Cleanup Objectives
 - 6 NYCRR Part 612 Registration of Petroleum Storage Facilities
 - 6 NYCRR Part 613 Handling and Storage of Petroleum
 - 6 NYCRR Part 614 Standards for New and Substantially Modified Petroleum Storage Facilities
 - NYSDEC CP-51 Soil Cleanup Guidance Policy
 - NYSDEC SPOTS No.14 NYSDEC Spill Prevention Operations Technology Series (SPOTS) Document No. 14: Site Assessments at Bulk Storage Facilities
 - 6 NYCRR Part 372 Hazardous Waste Manifest System and Related Standards for Generators, Transporters and Facilities

3.27.5 Removal or Permanent Closure of Underground Storage Tanks

The procedures for removing the tank shall include, but not be limited to, the following:

1. All product that can be pumped out shall be removed.
2. Products shall be drained and flushed from the piping into the tanks.
3. Remaining liquid shall be removed from the tanks.
4. If the tank does not have manholes; the Contractor shall excavate in accordance with Section 3.3 and provide access to the tank upon completion of purging activities.
5. All piping and gauge lines, with the exception of any vent lines, shall be disconnected and capped.
6. The tank storage systems, including all tanks and piping, shall be purged of flammable vapors in accordance with Section 3.27.8.
7. The interior of the tank shall be cleaned with a high pressure rinse.
8. As shown on the Contract Drawings, tanks shall be removed and disposed corresponding to the New York State Department of Transportation (NYSDOT) Standard Specifications.
9. For method of cutting tanks, see API RP 2015.

10. The vent lines shall be capped at the tanks, cut flush at the roof and capped or removed and disposed of.
11. All openings to the tanks including, but not limited, to fill boxes, manholes and gauge boxes shall be filled with concrete flush with the finished floor.

3.27.6 Site Assessment

1. General: The Contractor shall perform a site assessment to determine if there is any contamination present at the site. The site assessment shall be conducted in accordance with NYSDEC SPOTS No. 14.
2. Equipment: The Contractor shall select the means and methods for performing drilling/sampling operations. The Contractor is solely responsible for determining the adequacy of his equipment to perform the intended work. If the Contractor's equipment is not adequate to perform the work, the Contractor shall replace it with suitable equipment at no additional cost to the NYSDEC.
3. Sampling Procedure-Tank Removed: In general, RENU will direct the Contractor to collect a minimum of five (5) soil samples in accordance with API Publ 1628 from any area around the removed tank that appears to be visually contaminated. Soil samples from the material surrounding piping will be taken at 20-foot intervals and at dispensers and fill boxes. If there are no visible areas of contaminated soil, then the Contractor shall collect 1 sample from each sidewall of the excavation and 2 samples from the bottom of the excavation. All samples collected for contamination will be screened using a PID. The samples showing the highest PID readings shall be sent to the lab for analysis.
4. If groundwater is within 5 feet of the bottom of the tank excavation, a ground water sample shall be collected.
5. Lab Analysis: Samples collected for analysis shall be sent to the RENU' standby laboratory. For tanks containing gasoline or solvents, the sample shall be analyzed for VOC's via USEPA method 8260C. For tanks containing diesel fuel or heating oil, samples will be analyzed via USEPA method 8270B.

3.27.7 Notification of Spills

1. Petroleum spills and most hazardous materials spills must be reported to DEC Hotline (1800-457-7362) within 2 hours of discovery.
2. Clean closure of excavated Underground Storage Tanks do not require notification to DEC if 1,100 gallons or less in size regardless of contents.
3. Clean closure of tanks of any size that stored motor fuels (gasoline or diesel) must be reported to the NYC Fire Department. The Contractors shall prepare an affidavit of permanent closure for each facility within 7 days of tank closure. The affidavit shall state the Contractor method of tank closure. The affidavit shall be prepared in a form acceptable to the New York City Fire Department and signed by the Contractors licensed underground storage tank system installer. The affidavit shall be submitted to the New York City Fire Department, Buried Tank Unit, Room 412, and 250 Livingston Street, Brooklyn, New York.

3.27.8 Tank Contents Removal and Disposal

1. General: The Contractor shall furnish all labor, materials, tools and equipment, and remove and dispose all industrial waste, as required by the Contract Documents.
2. Submittals: The following items shall be submitted to the Construction Manager for review and approval in accordance with Section 3.27.2.
 - a. A detailed work plan describing the Contractor's proposed methods, equipment and sequence of operations for the removal and disposal of industrial waste from the site. The proposed procedures shall provide for safe conduct of the work and careful removal and disposal of materials.
 - b. Copies of the analytical test results performed for disposal within five (5) working days after receipt of the results.
 - c. Removal of Industrial waste
 - i. Salvageable Fuels: All salvageable fuels shall be transferred by the Contractor to other tanks designated by the Construction manager. If storage capacity is not available, then salvageable fuels become property of the Contractor for beneficial use or disposal.
 - ii. B. Sludge Materials and Contaminated Water: Sludge and contaminated water shall be collected in new or reconditioned 55-gallon drums or roll-off containers. Drums or containers shall be sealed (water-tight) to prevent rain infiltration and leakage of sludge or water. Chemical sampling and analyses of sludge and contaminated water shall be conducted by the Contractor in accordance with environmental regulatory requirements, as approved by the Construction Manager. Drums or containers shall be labeled in accordance with federal and state regulations.
3. Excavated and Demolished Materials: Excavated and demolished materials shall be collected in new or reconditioned rolloff containers or similar means as proposed by the Contractor and approved by the Construction Manager. Containers shall be sealed (water-tight) to prevent rain infiltration and leakage. Chemical sampling and analysis of the collected materials shall be conducted by the Contractor in accordance with environmental regulatory requirements, as approved by the Construction manager. Containers shall be labeled in accordance with federal and state regulations.
4. Flammable Vapors: Storage tank systems, including all tanks and piping, shall be purged of flammable vapors. If steam is to be used for either purging or cleaning a tank or other equipment, the steam discharge nozzle and all conductive insulated objects subject to impingement or condensation shall be bonded to the tank or be grounded to prevent static charge build-up on the nozzle of the steam jet. An affidavit of such purging, signed by the Contractor's licensed underground system installer, shall be filed by the Contractor with the Commissioner of the City's Fire Department, Division of Fire Prevention.

3.27.9 Disposal of Industrial Waste

1. All waste materials shall be disposed of in accordance with the requirements of the USEPA, NYSDEC, and New York City Department of Environmental Protection (NYCDEP).
2. Storage of Waste materials at the site will not be permitted.

3.28 DNAPL Removal/Recovery

Summary: Some monitoring wells have DNAPL. As part of routine site maintenance, DNAPL may be recovered from these wells. Follow all health and safety requirements in the HASP (URS, May 2017). The following procedure will be used to remove DNAPL.

Procedure:

1. Measure the depth and thickness of the DNAPL layer per Section 3.25.
2. Bailer Method:
 - a. Using a disposable bailer attached to disposable nylon twine, lower the bailer so the bottom of the bailer is at the same depth as the bottom of the DNAPL layer.
 - b. Upon reaching its target depth, raise the bailer with the DNAPL product and place the product in a 1A2 open head 55-gallon steel drum.
 - c. Repeat steps a through b until there is no more product to remove.
 - d. Upon completion of the removal, place the used bailer and twine in a separate 1A2 open head 55-gallon steel drum.
 - e. These drums will be addressed in accordance with the protocols outlined in Section 3.30.
3. Peristaltic Pump Method (to be used if the bottom of the DNAPL layer is less than 25 feet below grade):
 - a. Using disposable poly tubing, place one end at the bottom of the DNAPL layer, and the other end in a 1A2 open head 55-gallon steel drum, with a piece of disposable silicone tubing in the middle, attached to the pump head.
 - b. Turn on the pump, and keep pumping until there is no more DNAPL product in the pump's effluent.
 - c. Upon completion of the removal, place the used tubing in a separate 1A2 open head 55-gallon steel drum.
 - d. These drums will be addressed in accordance with the protocols outlined in Section 3.30.
4. Waterra Pump Method:
 - a. Attach a foot valve to one end of disposable poly tubing and place that end at the bottom of the DNAPL layer. Connect the remainder of the tubing to the Waterra pump, with the effluent
 - b. Turn on the pump, and keep pumping until there is no more DNAPL product in the pump's effluent.
 - c. Upon completion of the removal, place the used tubing in a separate 1A2 open head 55-gallon steel drum.

- d. These drums will be addressed in accordance with the protocols outlined in Section 3.30.

3.28.1 Surfactant Enhanced DNAPL Recovery

Summary: Surfactant Enhanced Product Recovery (SEPR) technology uses a reagent to mobilize DNAPL, typically a surfactant. The surfactant reduces surface tension between the DNAPL and the groundwater and promotes the formation of micelles that emulsifies the DNAPL, making it more mobile. Follow all health and safety requirements in the approved HASP and subsequent addendums (URS, May 2017). The following procedure will be used to remove DNAPL via SEPR technology.

Procedure:

1. Mix the surfactant solution in accordance with the proportions recommended by the Vendor.
2. Inject the solution into an upgradient well using a transfer pump at approximately 1 to 2 gallons per minute.
3. Groundwater and emulsified DNAPL will be recovered in the downgradient well by pumping out the well contents using peristaltic pump or Waterra hydrolift pump methods discussed above, at the rate of 1 to 2 gallons per minute, into a 1A2 open head 55-gallon steel drum.
4. Nearby wells will be closely monitored for the presence of DNAPL. Based on field observations, these wells may also be pumped or bailed for DNAPL recovery.
5. This process will continue as specified in the approved site-specific project work plan.
6. Upon completion of the removal, place the used tubing in a separate 1A2 open head 55gallon steel drum.
7. These drums will be addressed in accordance with the protocols outlined in Section 3.30.

3.29 Sidewalk Flag Replacement

Summary: If a sidewalk flag is damaged during investigation activities (i.e., drilling, etc.), the City of New York requires that it be replaced in accordance with NYSDOT standards.

Procedure:

Prior to removal of a sidewalk flag, the Flag Replacement Contractor will cut the perimeter of each flag to be replaced using a water-cooled pavement saw to reduce fugitive dust. The flags will be demolished, removed and disposed of by the Contractor. New flags will be replaced in kind with the surrounding flags. All work will be performed in accordance with Section 608 of NYSDOT Standard Specifications of May 6, 2010, specifically all sections that pertain to Portland concrete sidewalks and driveways. At locations where expansion joints were installed, the expansion joints will be covered with a non-shrinking/pliable sealant.

Details on each sidewalk flag replacement will be documented in Daily Construction Report forms (Appendix A).

3.30 Investigation Derived Waste Handling

Summary: Investigation Derived Waste (IDW) generated during field activities include, but is not limited to, the following:

- Purge water;
- Poly sheeting;
- Spent macrocore liners;
- PPE; and
- Drill cutting and soil boring spoils.

This IDW must be placed in 1A2 open head 55-gallon steel drums pending shipment off site for disposal.

Procedure:

Segregation

Drummed IDW is to be divided into the following categories:

- Drill cuttings and soil boring spoils (see Section 3.18);
- Purgewater from monitoring well development/sampling and DNAPL product; and,
- Solid waste other than drill cuttings and boring spoils (i.e., spent poly tubing, PPE, etc.).

Generator ID

Any IDW generated is assigned a specific USEPA Generator ID Number based on its origin. The table below identifies the USEPA Generator ID for each Work Assignment (WA).

| Site | USEPA Generator ID Number |
|--|---------------------------|
| Former Goodman Brothers Steel Drum Co. Site (WA #41) | TBD |

Hazardous/Non-Hazardous Classification

Any liquid waste generated is classified a listed hazardous waste under USEPA waste codes D0039 (DNAPL product – tetrachloroethylene) and/or F002 (spent halogenated solvents). The remaining waste generated from this project is presumed not to be a hazardous waste as defined in 40 CFR Part 261. Therefore, hazardous waste characterization sampling for disposal will only be performed if necessary.

Manifests

Waste manifests must accompany the IDW during shipment off site for disposal. For nonhazardous waste, a non-hazardous waste manifest must be completed. For hazardous waste, a Uniform Hazardous Waste Manifest (USEPA Form 8700-22) must be completed, along with a Land Disposal Restriction Notification Form 1. All IDW manifests must be signed by the generator or their agent.

4.0 FIELD DOCUMENTATION

Field notebooks will be used during all on-site work. A dedicated field notebook will be maintained by the field technician overseeing the site activities. In addition to the notebook, any and all original sampling forms, purge forms and notebooks used during field activities will be submitted as part of the final report.

The field sampling team will maintain a sample log sheet summarizing the following data:

1. Sample Identification
2. Date and time of sample collection
3. Sampling depth
4. Identity of samplers
5. Sampling methods and devices
6. Purge volumes (groundwater)
7. Groundwater purge parameters
8. Chain of custody and shipping information

Each subsurface boring will be logged in a bound field notebook during drilling by the supervising geologist. Field notes will include descriptions of subsurface materials encountered during drilling, sample numbers, and types of samples recovered from the borehole. Additionally, the geologist will note time and material expenditures for later verification of contractor invoices.

Upon completion of daily drilling activities, the geologist will complete the daily drilling record form and initiate chain-of-custody on any samples collected for chemical laboratory testing. Following completion of the drilling program, the geologist will transfer field notes onto standard forms for the Site Characterization Report.

On a weekly basis the project geologist will submit a summary report to the project manager containing at a minimum the following: (1) a summary of the daily drilling records; (2) progress report on field activities; and (3) a record of site visitors.

The supervising geologist will log the time and material expenditures for later verification of contractor invoices. Upon completion of daily drilling activities, the geologist will complete the Daily Drilling Record form. Following completion of the program, the geologist will transfer field notes onto standard forms for the investigation report.

The proper completion of the following forms/logs will be considered correct procedure for documentation during the drilling program:

1. Field Log Book - weather-proof hard-bound field book
2. Daily Drilling Records (Appendix A)
3. Boring Logs (Appendix A)
4. Overburden Monitoring Well Construction Detail Diagrams (Appendix A)

5.0 SURVEYING AND MAPPING

Project surveying will provide data necessary to plot groundwater monitoring wells, piezometers, and soil-gas monitoring well locations on the existing base map. All surveying will be performed under the supervision of a New York State licensed land surveyor, following the requirements of the Work Plan, and the HASP.

Control for this project shall be based upon site control which has been established for prior work. This control is referenced to the New York State plane coordinate System and North American vertical Datum of 1988 (NAVD 88).

6.0 SAMPLING EQUIPMENT CLEANING PROCEDURES

Summary: To assure that no outside contamination will be introduced into the samples/data, thereby invalidating the samples/data, the following cleaning protocols will apply for all equipment used to collect samples/data during the field investigations.

Procedure:

1. Thoroughly clean equipment with laboratory-grade soap and water, until all visible contamination is gone.
2. Rinse with water, until all visible evidence of soap is removed.
3. Rinse several times with deionized water.
4. Air dry before using.
5. If equipment will not be used immediately, wrap in aluminum foil.
6. Geoprobe equipment will be brush cleaned between locations.

7.0 SAMPLE LABELING

Summary: In order to prevent misidentification and to aid in the handling of environmental samples collected during the field investigation, the following procedures will be used:

Soil and Groundwater Sample Procedure:

1. Affixed to each sample container will be a non-removable (when wet) label. The following information will be written on each label with permanent marker:
 - Site name
 - Sample identification
 - Project number
 - Date/time
 - Sampler's initials
 - Sample preservation
 - Analysis required

2. Each sample of each matrix will be assigned a unique identification alpha-numeric code. An example of this code and a description of its components are presented below:

Examples

- MW-1
MW-1 = Monitoring Well 1
- SG-1
SG-1 = Soil Gas Monitoring Well 1

List of Abbreviations

Monitor Type

- PZ = Piezometer
- MW = Monitoring Well

Sample Type

| | | |
|-----|---|------------------------|
| SO | = | Soil |
| GW | = | Groundwater |
| SG | = | Soil-gas |
| AB | = | Ambient Blank |
| TB | = | Trip Blank |
| RB | = | Rinse Blank |
| FD | = | Field Duplicate |
| MS | = | Matrix Spike |
| MSD | = | Matrix Spike Duplicate |

Vapor Intrusion Samples Procedure:

Each indoor air sample will have the following information placed on the laboratory supplied sample label:

- Site name
- Sample identification – see below
- Date/time
- Sampler's initials
- Analysis required – TO-15

The serial number of the canister and regulator used during sampling will also be noted on the Summa® canister identification tag and on the COC.

8.0 SAMPLE SHIPPING

Summary: Proper documentation of sample collection and the methods used to control these documents are referred to as chain-of-custody procedures. Chain-of-custody procedures are

essential for presentation of sample analytical chemistry results as evidence in litigation or at administrative hearings held by regulatory agencies. Chain-of-custody procedures also serve to minimize loss or misidentification of samples and to ensure that unauthorized persons do not tamper with collected samples.

The procedures used in this Remedial Design follow the chain-of-custody guidelines outlined in NEIC Policies and Procedures, prepared by the National Enforcement Investigations Center (NEIC) of the U.S. Environmental Protection Agency Office of Enforcement.

Procedure:

1. The chain-of-custody (COC) record (Appendix A) should be completely filled out, with all relevant information.
2. The original COC goes with the samples. It should be placed in a Ziploc bag and taped inside the sample cooler. The sampler should retain a copy of the COC.
3. Place inert cushioning material such as vermiculite or bubble-wrap in the bottom of the cooler.
4. Place the bottles in the cooler in such a way that they do not touch (use cardboard dividers or bubble-wrap).
5. Wrap VOA vials securely in bubble-wrap and tape. Place them in the center of the cooler.
6. With the exception of Summa® canisters, pack the cooler with ice in doubled Ziploc plastic bags.
7. Pack the cooler with cushioning material.
8. Tape the drain shut.
9. Wrap the cooler completely with strapping tape at two locations securing the lid. Do not cover any labels.
10. Place the lab address on top of cooler. For out-of-town laboratory, add the following: Put "This side up" labels on all four sides and "Fragile" labels on at least two sides. Affix numbered custody seals on front right and left of cooler. Cover seals with wide, clear tape.
11. Summa® canisters are shipped in the same boxes the laboratory used for shipping.
12. Ship samples via overnight carrier the same day that they are collected. Samples (except Summa® canisters) must be maintained at 4 degrees Celsius (C) \pm 2°C throughout the shipping duration.

9.0 FIELD SAMPLING INSTRUMENTATION

Rented field sampling equipment will require no maintenance beyond decontamination between sampling locations. Calibration procedures for electronic instruments can be found in the equipment operating manuals.

Maintenance procedures for the common instrumentation that will be used during field investigations are discussed in the equipment operating manuals. A copy of the manufacturer's

operating manual for each instrument will be kept with the instrument or the operator. All field sampling equipment will be calibrated as recommended by the manufacturer. The calibration procedures and results will be recorded in the field notebook.

9.1 Preventative Maintenance

Table 9-1 presents the field instrumentation preventative maintenance summary. In case of an emergency, the equipment rental vendor, and/or the instrument manufacturer will be contacted.

**TABLE 9-1
FIELD INSTRUMENTATION PREVENTATIVE MAINTENANCE SUMMARY**

| Instrument | Maintenance Details |
|--------------------------|---|
| Photoionization Detector | Initiate factory checkout and calibration, yearly or when malfunctioning or after changing UV light source. Wipe down readout unit after each use. Clean UV light source window every month or as use and site conditions dictate. Clean the ionization chamber monthly. Recharge battery after each use. |
| TVA | Initiate factory checkout and calibration, yearly or when malfunctioning or after changing UV light source. Wipe down readout unit after each use. Check probe cable and Teflon tubing prior to and after each use. Inspect H ₂ tank prior to filling and recharge battery after each use. |
| Micropurge Flow Cell | Calibrate the required parameters using appropriate factory-supplied standards and buffers on a daily basis. Store the sonde (probe) in a 2M KCl solution at the end of each work day. Factory calibrate annually. |
| LaMotte Turbidity Meter | Replace 9 volt battery when necessary. Clean lamp after each days use. Clean turbidity tubes after each reading and replace tubes when discoloration of glass occurs. |
| TSI DustTrak | Perform a zero check before each use. Clean inlet every 350 hours. Clean 2.5 μm calibration impactor before every use. Replace internal filters every 350 hours at 1 mg/m ³ , or when indicated by the main screen filter error indicator. Every year, return to the factory for cleaning and calibration, including the replacement of the internal HEPA filters. |

10.0 SAMPLING FOR EMERGING CONTAMINANTS UNDER NYSDEC PART 375

As part of the NYSDECs requirement, sampling of the emerging contaminants including 1,4-Dioxane and per and poly-fluoroalkyl substances (PFAS) will be performed during the RI.

10.1 Specific Guidelines for PFAS

Soil endpoint samples collected will be analyzed by LC-MC/MS for PFAS using methodologies based on EPA method 537.1 and include the 21 PFAS compounds listed below:

| Group | Chemical Name | Abbreviation |
|--|--|---------------|
| Perfluoroalkyl sulfonates | Perfluorobutanesulfonic acid | PFBS |
| | Perfluorohexanesulfonic acid | PFHxS |
| | Perfluoroheptanesulfonic acid | PFHpS |
| | Perfluorooctanesulfonic acid | PFOS |
| | Perfluorodecanesulfonic acid | PFDS |
| Perfluoroalkyl carboxylates | Perfluorobutanoic acid | PFBA |
| | Perfluoropentanoic acid | PFPeA |
| | Perfluorohexanoic acid | PFHxA |
| | Perfluoroheptanoic acid | PFHpA |
| | Perfluorooctanoic acid | PFOA |
| | Perfluorononanoic acid | PFNA |
| | Perfluorodecanoic acid | PFDA |
| | Perfluoroundecanoic acid | PFUA/PFUdA |
| | Perfluorododecanoic acid | PFDoA |
| | Perfluorotridecanoic acid | PFTriA/PFTrDA |
| | Perfluorotetradecanoic acid | PFTA/PFTeDA |
| Fluorinated Telomer Sulfonates | 6:2 Fluorotelomer sulfonate | 6:2 FTS |
| | 8:2 Fluorotelomer sulfonate | 8:2 FTS |
| Perfluorooctanesulfonamides | Perfluorooctanesulfonamide | FOSA |
| Perfluorooctanesulfonamidoacetic acids | N-methyl perfluorooctanesulfonamidoacetic acid | N-MeFOSAA |
| | N-ethyl perfluorooctanesulfonamidoacetic acid | N-EtFOSAA |

10.2 PFAS Reporting Limits

Reporting limits for PFAS soil are to be 2 ng/L (ppt) and 1 ug/kg (ppb), respectively. If contract labs or work plans submitted by responsible parties indicate that they are not able to achieve these reporting limits for the entire list of 21 PFAS, site-specific decisions will need to be made by the DEC project manager in consultation with the DEC remedial program chemist.

The laboratory SOP for PFAS and method detection limits are included as Appendix B.

10.3 PFAS Specific Sampling Procedures

Sampling for PFAS via EPA Method 537 can be challenging due to the prevalence of these compounds in many consumer and sampling specific products. The following sampling procedures and guidelines are necessary to ensure the usability of PFAS analytical results:

- Clothing or boots should not contain Gore-Tex (wet weather gear made of polyurethane and PVC only);
- All safety boots should be made from polyurethane and PVC;
- No materials containing Tyvek;
- Do not use fabric softener on field clothing;
- Do not use cosmetics, moisturizers, hand cream, or other related products the morning of the sampling event;
- Do not use unauthorized sunscreen or insect repellent;
- All sample containers made of HDPE or polypropylene;
- Caps are unlined and made of HDPE or polypropylene (no Teflon lined caps);
- Equipment decontamination must utilize PFAS-free water onsite for sample equipment;
- Only Alconox and/or Liquinox can be used as decontamination materials;
- Food or drinks must be left in the staging areas;
- Sample for PFAS first, other containers/methods may have PFAS present on containers/equipment;
- Field equipment must not contain Teflon;
- Sampling materials must be made from stainless-steel, HDPE, acetate, silicon, or polypropylene;
- No waterproof field books;
- No plastic clipboards, binders, or spiral notebooks;
- No adhesives
- No sharpies/permanent markers. Must use regular ball point pens;
- No use of aluminum foil;
- Keep PFAS samples in a separate cooler filled with regular ice only (do not use chemical ice packs).
- Sampler must wash hands before wearing nitrile gloves to limit contamination during sampling.

10.4 Specific Guidelines for 1,4-Dioxane

Soil endpoint samples collected will be analyzed for 1,4-Dioxane using EPA Method 8270 SIM in order to achieve the minimum method reporting limit of 0.1 mg/Kg. Liquinox will not be used for decontamination during sampling for 1,4-dioxane.

APPENDIX A

FORMS AND LOGS



CASTLETON

ENVIRONMENTAL

Soil Test Pit Field Log Form

Project Number:

Client:

Address:

Castleton Representative:

Date:

Time On-site:

Time Off-site:

Contractor:

Weather Conditions:

Date:

Test Pit ID:

Method of Excavation:

Time:

Surface Cover:

| <u>Depth (feet)</u> | <u>Texture / Composition</u> | <u>Consistency</u> | <u>Color</u> | <u>Mottles / Contamination Features</u> | <u>Structure / Fill</u> | <u>Comments</u> |
|-------------------------|----------------------------------|--------------------|--------------|---|-----------------------------|-----------------|
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Notes:

Castleton Environmental

Project Number: _____

Site: _____

Date: _____

Weather: _____

Scope of Work: _____

| Sample ID | | | | | | |
|--|--|--|--|--|--|--|
| Can ID | | | | | | |
| Regulator ID | | | | | | |
| Can Size | | | | | | |
| Indoor(IN), Background (BK), Sub-Slab (SS) | | | | | | |
| Flow Controller readout (ml/min) | | | | | | |
| Can Pressure Start ("Hg) - LAB | | | | | | |
| Can Pressure Start ("Hg) - FIELD | | | | | | |
| Can Pressure End ("Hg) | | | | | | |
| Start Time | | | | | | |
| End Time | | | | | | |
| Temperature Start (°F) | | | | | | |
| Temperature End (°F) | | | | | | |
| Sub-Slab Sampling | | | | | | |
| Slab Thickness (") | | | | | | |
| Water present | | | | | | |
| PID Readings (PPM) | | | | | | |
| Helium in Sub-Slab Sample (ppm) | | | | | | |
| Sample Tube Purge, Gillian Pump (min) (1/4" tubing Volume - 5.43 ml/ft) | | | | | | |

Sampling Notes: _____



CASTLETON

ENVIRONMENTAL

Project Number:

Client:

Address:

Castleton Representative:

Date:

Time On-site:

Time Off-site:

Contractor:

Site Status:

Current Condition of Site:

Site No. : _____ Site Name : _____

Date: _____ Time: _____

Structure Address : _____

Preparer's Name & Affiliation : _____

Residential ? Yes No Owner Occupied ? Yes No Owner Interviewed ? Yes No

Commercial ? Yes No Industrial ? Yes No Mixed Uses ? Yes No

Identify all non-residential use(s) : _____

Owner Name : _____ Owner Phone : () _____ - _____

Secondary Owner Phone : () _____ - _____

Owner Address (if different) : _____

Occupant Name : _____ Occupant Phone : () _____ - _____

Secondary Occupant Phone : () _____ - _____

Number & Age of All Persons Residing at this Location : _____

Additional Owner/Occupant Information : _____

Describe Structure (style, number floors, size) : _____

Approximate Year Built : _____ Is the building Insulated? Yes No

Lowest level : Slab-on-grade Basement Crawlspace

Describe Lowest Level (finishing, use, time spent in space) : _____

Floor Type: Concrete Slab Dirt Mixed : _____

Floor Condition : Good (few or no cracks) Average (some cracks) Poor (broken concrete or dirt)

Sumps/Drains? Yes No Describe : _____

Identify other floor penetrations & details : _____

Wall Construction : Concrete Block Poured Concrete Laid-Up Stone

Identify any wall penetrations : _____

Identify water, moisture, or seepage: location & severity (sump, cracks, stains, etc) : _____

Heating Fuel : Oil Gas Wood Electric Other : _____

Heating System : Forced Air Hot Water Other : _____

Hot Water System : Combustion Electric Boilermate Other: _____

Clothes Dryer : Electric Gas Where is dryer vented to? _____

If combustion occurs, describe where air is drawn from (cold air return, basement, external air, etc.) : _____

Fans & Vents (identify where fans/vents pull air from and where they vent/exhaust to) : _____

Describe factors that may affect indoor air quality (chemical use/storage, unvented heaters, smoking, workshop):

Attached garage ? Yes No Air fresheners ? Yes No

New carpet or furniture ? Yes No What/Where ? _____

Recent **painting** or **staining** ? Yes No Where ? : _____

Any **solvent** or **chemical-like** odors ? Yes No Describe : _____

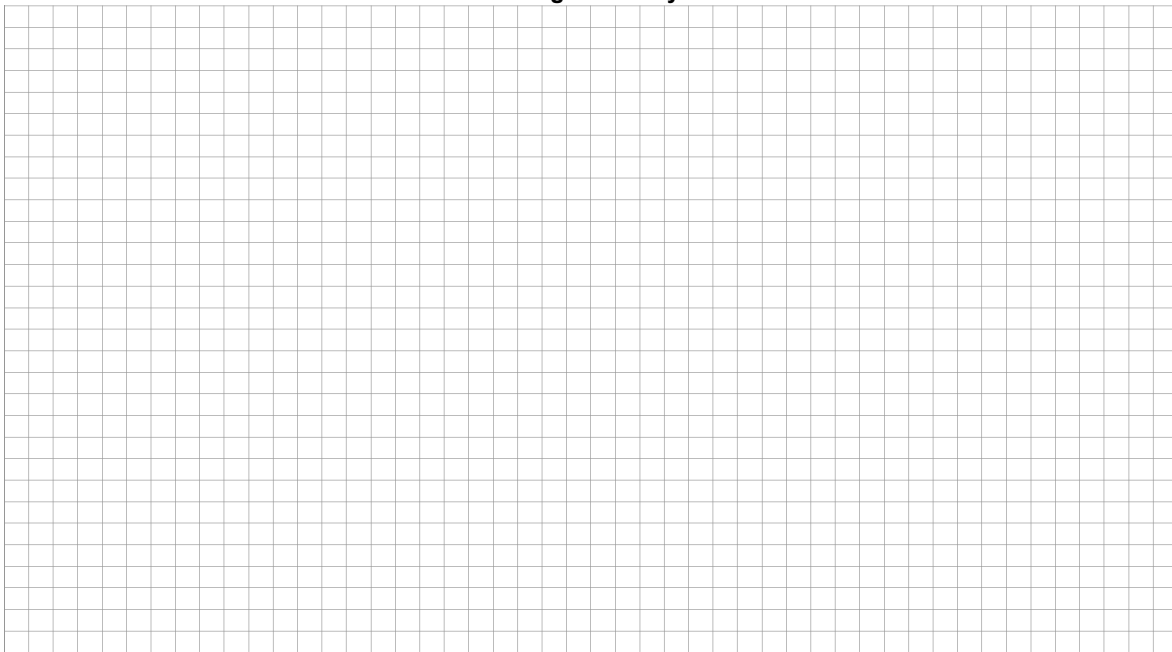
Last time **Dry Cleaned** fabrics brought in ? _____ What / Where ? _____

Do any building occupants use solvents at work ? Yes No Describe : _____

Any testing for Radon ? Yes No Results : _____

Radon System/Soil Vapor Intrusion Mitigation System present ? Yes No If yes, describe below

Lowest Building Level Layout Sketch



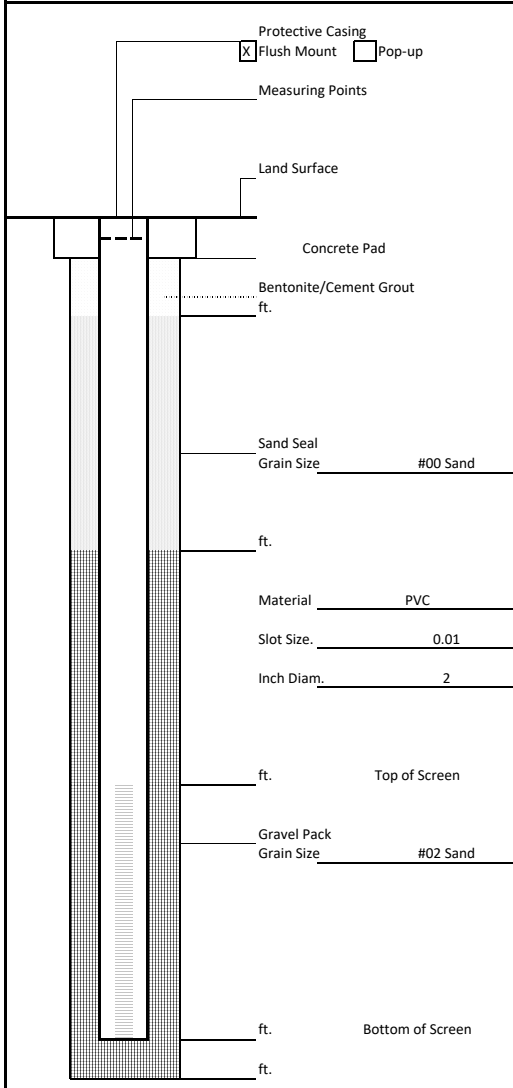
- Identify and label the locations of all sub-slab, indoor air, and outdoor air samples on the layout sketch.
- Measure the distance of all sample locations from identifiable features, and include on the layout sketch.
- Identify room use (bedroom, living room, den, kitchen, etc.) on the layout sketch.
- Identify the locations of the following features on the layout sketch, using the appropriate symbols:

| | | | |
|---------------|-------------------|----------|--|
| B or F | Boiler or Furnace | o | Other floor or wall penetrations (label appropriately) |
| HW | Hot Water Heater | xxxxxxx | Perimeter Drains (draw inside or outside outer walls as appropriate) |
| FP | Fireplaces | ##### | Areas of broken-up concrete |
| WS | Wood Stoves | ● SS-1 | Location & label of sub-slab vapor samples |
| W/D | Washer / Dryer | ● IA-1 | Location & label of indoor air samples |
| S | Sumps | ● OA-1 | Location & label of outdoor air samples |
| @ | Floor Drains | ● PFET-1 | Location and label of any pressure field test holes. |



Monitoring Well

Construction Log



Well No. _____

Project _____

Surveyor _____

Measuring Point Elevation _____

Installation Date _____

Pumping Duration _____

Well Purpose _____

Hydrogeologist _____

Company Name _____

Notes _____

Note: Drawing is not to scale.
 Depths are given in feet below land surface.

APPENDIX B

LAB SOP FOR PFAS/1,4 DIOXANE



Standard Operating Procedure - Summary PFAS in Groundwater, Surface water and Soils

1.0 Summary

Target PFAS compounds are prepared and analyzed using EPA Method 537.1 modified. Aqueous and Soil samples are fortified with isotopic surrogates of the target PFAS compounds, extracted and concentrated to a known volume. The extracts are then analyzed employing LC-MSMS techniques.

Each preparation batch (per matrix) includes a preparation blank, lab control sample (blank spike), sample matrix spike and matrix spike duplicate and up to 20 samples.

2.0 Sample Preparation

Sample preparation involves extraction/clean-up and final concentration to a known volume before analysis. Isotopic surrogates are added to all preparation batch samples/QC.

2.1 Aqueous Samples

A known volume of sample is spiked with isotopic surrogates and extracted using Solid Phase Extraction (SPE) techniques. The SPE tubes are eluted with solvent and the eluant is then concentrated using nitrogen evaporation to a final volume of 1.0 mL. The final concentrated extract is fortified with Internal Standard and analyzed by LC-MSMS.

2.2 Soil Samples

A known weight of sample is fortified with isotopic surrogates, mixed then extracted in methanolic potassium hydroxide employing vortex mixing, followed by orbital shaking and finally ultrasonic extraction.

The extract is centrifuged and the supernatant solvent is quantitatively poured off and a small volume of PFAS free water is added to the solvent. The solvent mixture is evaporated using nitrogen evaporation and the remaining aqueous extract is brought to a known volume with PFAS free water.

The aqueous extract is then pH adjusted to 6-8 using glacial acetic acid and the resulting aqueous solution is extracted using SPE techniques. The SPE tube is eluted with solvent and the eluant is then concentrated using nitrogen evaporation to a final volume of 2.0 mL. The final concentrated extract is fortified with Internal Standard and analyzed by LC-MSMS.

3.0 Analysis

Analysis is conducted utilizing an Agilent Infinity 1290 HPLC system interfaced to an Agilent 6470AAR LC-MSMS with an Agilent Jet Stream-ElectroSpray Ionization (AJS-ESI) interface. The system is operated in the dynamic MRM (multiple reaction monitoring) mode for specific PFAS target isotopes and native analogs.

Where possible, multiple MRM transitions are used for targets and isotopes. Some species only exhibit single MRM transitions. Precursors and product ions are used for Quantitative and Qualitative purposes respectively.

3.1 Initial Calibration

The LC-MSMS is calibrated with 7 standards of a total of 40 isotopes and analog target PFAS compounds. Calibration is conducted from 0.25 to 20 ng/mL. Calibration employs internal standard techniques and either average response factor or quadratic regression is used depending upon the best calibration model based upon accuracy across the calibration range.

3.2 Continuing Calibration Verification

Each analytical sequence includes an opening continuing calibration verification (CCV) and a CCV after every 10 injections and at the end of the analysis sequence.

The CCV acceptance criteria are $\pm 30\%$ of the expected value. Internal Standard areas are acceptable when -50% to +50% of the average response in the initial calibration.

3.3 Isotopic Surrogates (Isotope Dilution Analytes (IDA))

18 IDAs are utilized for this procedure. These isotopes are used to correct for recovery of detected target analog PFAS compounds through the preparation/analysis processes. The recovery limits currently are 25-150 % recovery and these limits are adjusted based upon laboratory determined control limits when sufficient data points per matrix are available.

3.4 Method Blanks (MBLK)

Each preparation batch includes a laboratory method blank. Any result greater than the Reporting Limit or 2 ng/L (aqueous) or 0.5 ug/kg (soil) is "B" flagged according with the exception of any detection of PFOA, PFOS or PFNA above the RL will require re-extraction of the batch.

3.5 Blank Spike (LCS)

Each preparation batch includes and BS/LCS. Recoveries are calculated and based upon isotope dilution. Recovery acceptance limits are 50-150% with RPD of 30% for a BSD if performed.

3.6 Matrix Spike/Matrix Spike Duplicates (MS/MSD)

Each preparation batch includes and MS/MSD pair. Recoveries are calculated and based upon isotope dilution. Recovery acceptance limits are 25-150% with RPD of 35% for samples.

4.0 Data Review and Reporting

All quantitation reports and LIMS output files are generated using the Agilent Mass Hunter reporting programs. The Quant reports include all Quantitative data and MRM transition data which are reviewed. The LIMS output file is in a format that allows upload to Element LIMS.

Isotope Dilution calculations are performed using our custom PFAS.mdb program which automatically uploads to the LIMS output file for upload to Element LIMS.


Once uploaded to ELEMENT, any exceptions/outliers are noted, flagged and set to reviewed.

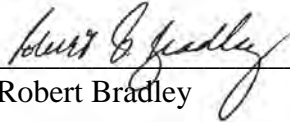
All data reported are isotopically corrected for all QC and samples.


5.0 Revision History

May 1, 2019 Revision 1.0 First Issue

6.0 Approvals:

Laboratory Director 
Ben Gulizia

Corp. Technical Director 
Robert Bradley

Corp. QA Officer 
Sarah Widomski

Appendix B

RENU Engineering Technologies, PC

PO Box 239, Georgetown, CT 06829 | 203.664.1312 | info@renuet.com

August 15, 2019

Dave Hermantin, P.E. has been working on hydrogeologic and environmental remedial projects in New York State since 2003. With a Bachelors of Science in Civil Engineering, Mr. Hermantin's undergraduate electives were all based on environmental and hydrogeologic engineering studies. Dave's graduate degree is in Environmental Engineering with a focus on Hydrogeology and environmental fate and transport. Mr. Hermantin has been a professional engineer in New York State since 2008.

Education

Undergraduate: Manhattan College: 1993 – 1997, Bachelor of Science Civil Engineering

Graduate: Manhattan College: 2003 – 2007; Master of Engineering, Environmental Engineering

Work Experience

October 2017 - Current - RENU Engineering Technologies, P.C.: Position, Principal

Environmental Consulting includes the evaluation of environmental conditions on commercial properties, design of environmental controls to prevent the migration of subsurface contaminants off site and into building envelopes.

May 2007 – October 2017 – P.W. Grosser Consulting Engineer & Hydrogeologist, P.C. (PWGC) (Bohemia NY/Shelton CT): Position, Senior Project Manager/Branch Office Manager

As an employee of PWGC, Dave was responsible for the project management of dozens of environmental projects performed on the behalf of private and municipal owners who were required to comply with several authorities of jurisdiction (AHJ) regulations and requirements, including 6 NYCRR PART 375 and DER-10. AHJ's include; Suffolk County Department of Health Services (SCDHS), Nassau County Department of Health (NCDH), New York City Department of Environmental Protection (NYCDEP), New York City Office of Environmental Remediation (NYCOER), the New York State Department of Environmental Conservation (NYSDEC), New York State Department of Health (NYSDOH) and the Connecticut Department of Energy and Environmental Protection (CTDEEP).

Over the ten years with PWGC, Dave reported directly to the company senior vice president, who is currently company president, Paul Boyce, PE. Mr. Boyce was the engineer designated at the company engineer of record for most environmental projects. Dave's responsibilities included work on; site investigations ranging from Phase II environmental investigations, supplemental investigations, through

remedial work planning and remedial measure development. Mr. Hermantin was also responsible for coordination and execution of remediation plans and the installation and operation of remedial systems. At the completion of implementation of remedial measures Mr. Hermantin was responsible for the assembly of several final engineering reports which were signed off by Mr. Boyce. Mr. Hermantin was the engineer of record for several NYC OER site remediations.

The projects were largely driven by real estate transactions or legacy sites owned by corporations or municipalities and Suffolk County. Projects remediation goals were very often driven by NYSDEC Part 375 and the DER-10. The majority of these projects were related to the remediation of sub-surface soil and groundwater contamination. The most prevalent contaminants were BTEX compounds, metals, and chlorinated solvents.

The following are a list of projects and a brief summary of the scope Mr. Hermantin was responsible for performing, coordinating with environmental staff and managing junior engineering staff:

BAE Systems, Greenlawn NY: NYSDEC Site Number: 1-52-005: This project was a voluntary remediation of soil gases on a listed site. Work included the production of sub-slab vapor sampling and mitigation plans which resulted in the design and installation of a sub-slab vapor mitigation system. The system was monitored as required in approved plans.

Former Brighton Cleaners located at 3140 Coney Island Avenue, Brooklyn New York: NYSDEC Site Number: C224157: The work included evaluation of site contaminant delineation. Chlorinated solvents were identified and excavated to delineated extents of the property. Remaining soil was suspected to be a source of vapor in the sub-surface and the AHJ decided that the remedial engineering controls work would include the design of a dual sub-surface vapor recovery and sub-slab vapor mitigation system. An intricate system of horizontal recovery wells was design and installed through out the site and foundation elements. The system was constructed and operated and the site was successfully. The site management plan (SMP) was executed and site was provided a certificate of completion leading to the construction and redevelopment of the property.

Former Green Bus Facility, 626 Wortman Avenue, Brooklyn NY: NYSDEC Spill #92-112117: This 4 acre site was included a fueling station and mechanical service facility which were identified as the source of a large petroleum plume on site. The site contamination extents were monitored through a very extensive network of monitoring wells. The remedial measure include quarterly vacuum extraction of product and the site had a 300 foot long 15 foot deep product recovery trench that includes three dual phase water/product recovery wells which recovered product, remediated up to 50gpm of groundwater in an air-stripper, and returned remediated water to the local site groundwater. The system

recovered over 5,000 gallons of product from the site in its first several years of operation. The system was monitored and dramatically improved the site conditions.

20-42 Bay Shore Road, Bay Shore New York Site Remediation: AHJ – SCDHS: Site investigations identified chlorinated solvents in the soil and groundwater beneath a dry-cleaning facility located within the property. Following underground injection control cleanouts it was determined by continued investigation that there was residual contamination in the former location of dry-cleaning equipment. After the repair of the existing slab on grade floor slab, a combination sub-slab vapor extraction system/sub-slab vapor mitigation system was installed to reduce concentrations of contaminants in a source beneath the building and control vapors beneath the building slab. The work plan was executed successfully, the system both recovered residual product, reducing measured concentrations in groundwater and within the soil matrix as well as controlled vapors beneath the building slab. The system vapor recovery and treatment system effluent was permitted by the New York State Department of Air Resources (NYS DAR).

30 Dunton Avenue Deer Park NY, Former Dry Cleaning Facility: AHJ – SCDHS: A Phase II investigation led to a site investigation which identified chlorinated solvent soil and groundwater contamination. The property was redeveloped in coordination with the site remediation. The remediation included the installation of environmental controls in the way of a sub-slab vapor mitigation system which successfully provided a negative pressure throughout the subsurface of the 5,000 square foot facility.

May 2005 – May 2007, ARCADIS (Melville, NY)

Prior to working with PWGC, from 2005 to 2007, Mr. Hermantin worked with ARCADIS (Melville, NY). While at ARCADIS Mr. Hermantin held the title of Project Engineer and was involved with several projects which included the delineation of subsurface and surface contaminants, including metals, BTEX compounds and chlorinated solvents.

His worked included groundwater monitoring and modeling of large regional groundwater plumes associated with Lockheed Martin (former Uni-Sys) sites in Great Neck NY, and Northrop Grumman Bethpage, NY site. Mr. Hermantin was also the project engineer on several sites which reduced chlorinated solvents utilizing advanced bioremediation techniques. One project in New York was located in Melville at the former New York Twist Drill site.

March 2003 – May 2005, H2M Group (Melville, NY)

Prior to working with ARCADIS, Mr. Hermantin worked for H2M Group as a project Engineer. Mr. Hermantin worked on the design of several municipal water supply and treatment systems. He also

performed groundwater modeling of regional groundwater contaminant plumes on behalf of municipal groundwater suppliers.

Frank P Castellano

1/1/2019

Principal and Founder



After 23 years leading one of the region's most accomplished and diverse environmental consulting firms, Mr. Castellano has founded Castleton Environmental, Inc. to focus on providing high value environmental consulting services specifically geared to the commercial lending and real estate investment/management industries. Leveraging his many years of experience, Mr. Castellano has earned a reputation for developing strategic approaches to the environmental challenges of complex real estate transactions and portfolio management. These approaches enable the transactions to proceed to closing while managing the risks of the involved stakeholders.

Contact Mr. Castellano at frank@castletonenv.com

PROFESSIONAL EXPERIENCE

Castleton Environmental, Inc. Founded 2015
Babylon, NY

PW Grosser Consulting, Inc., 1992 – 2015 - Last position held – Sr. Vice President/COO
Bohemia, NY

H2M Group 1989-1992 - Last position held – Field Hydrogeologist
Melville, NY

EDUCATION

Adelphi University

Master of Science – Hydrogeology, 1993

State University of New York at Oneonta

Bachelor of Science – Water Resources, 1989



CERTIFICATIONS/QUALIFICATIONS

NYS Professional Geologist, (License No. 000705)
Environmental Professional per 40 CFR 312.10(b)
Licensed Professional Geologist, PA
Licensed Real Estate Sales Professional, NY
OSHA Health & Safety HAZWOPER

AREAS OF EXERTISE

Real Property Transactions
Environmental Program Management
Real Estate Portfolio Management
Hazardous Waste Investigation and Cleanup
Environmental Risk Management

AFFILIATIONS

Long Island Association of Professional Geologists, Member
Long Island Business Development Council, Board Member
Long Island Real Estate Group, Member

NOTABLE ASSIGNMENTS

GTJ REIT Portfolio Management

Mr. Castellano serves as the primary environmental consulting resource to a large Real Estate Investment Trust with holdings in suburban New York, New Jersey, Connecticut and Maryland. Working directly alongside the REIT management team, Mr. Castellano provides environmental due diligence guidance beginning at the contract negotiation phase through closing on new acquisitions. Providing Phase I and II Environmental Site Assessment support, Property Condition Assessments and evaluation of potential liabilities, Mr. Castellano works as part of the team to minimize risk while continuing to help the team add assets to their portfolio. Routine management of the portfolio requires Mr. Castellano's support during tenant lease negotiations, compliance activities and debt re-positioning.

Paramount Assets Portfolio Management

Mr. Castellano serves as a trusted environmental resource to the management team of this real estate company, comprised largely of urban commercial and retail buildings throughout New Jersey. Navigating New Jersey's complex environmental regulatory framework, Mr. Castellano assists this client with pre-acquisition due diligence as well as compliance with the Industrial Site Recovery Act (ISRA).

Phase II Environmental Assessments

For over 20 years, Mr. Castellano has been performing Phase II Environmental Site Assessments for a variety of private real estate clients and lending institutions. For these projects, Mr. Castellano utilizes his knowledge of various field sampling and testing techniques to meet the desired objective of characterizing potential environmental risks. Based on the Phase II findings, Mr. Castellano develops strategies to remedy identified problems and/or manage risks. The ultimate goal for every Phase II is to develop the appropriate strategy to advance the transaction while protecting the interests of those involved. Based on the quality of his work, Mr. Castellano has established many long-standing client relationships due to his ability to deliver clarity to real estate transactions mired in environmental turbidity.

PUBLICATIONS

Case Studies Using USCG Oil Identification System for Petroleum Spill Source Identification (Petroleum Hydrocarbons & Organic Chemicals in Ground Water, Conference, TX, 1993)

Intrusive Investigative Techniques for the Identification of DNAPL (Geology of LI/NY; LIAPG 1996)

Surface Water, Sediment & Fishery Survey, Nassau County Ponds (Geology of LI/NY 1997)

Not Just a Chemical Interaction: Complementary Roles of the Geologist & Engineer on Hazardous Waste Remediation Project (Geology of LI/NY 1997)

MTBE in Ground Water Cleanup Technology and Costs (NYIT – Emerging Problems for the New Century 2002)

DOE Brookhaven National Laboratory Transuranic & Legacy Waste Disposal (Waste Management 05 Conference, Tucson, AZ)

Is Your Real Estate Giving You the Vapors? A Look at Soil Vapor Intrusion Regulations and their Impact on Real Estate Transactions (Society of Chief Appraisers NY Conference, Oct 2018)

Joseph Chiappetta, LSRP

12/1/2018

Senior Project Manager



As Senior Project Manager at Castleton, Joseph Chiappetta leverages his more than 19 years of experience in the Environmental Consulting Industry to serve the needs of the firm's clients. He has directed over \$2 billion in environmental projects at over 1,000 client locations across 22 states and 7 countries. His areas of expertise include: environmental due diligence; brownfields redevelopment; soil, groundwater and sediment investigation and remediation; underground storage tank compliance; hazardous waste management; and regulatory compliance. As an expert witness, he has testified successfully in court and been deposed on multiple matters involving environmental and regulatory compliance issues. Mr. Chiappetta has designed creative, cost effective solutions to a variety of complex environmental problems and has served as an effective liaison between clients and regulatory agencies. Mr. Chiappetta has successfully negotiated closure of numerous Superfund, ISRA, BUST, and MOA cases. He has been involved with numerous USEPA superfund and NJDEP Hazardous Discharge Site Remediation Fund (HDSRF) Sites. He has sat on Brownfield's Development Area (BDA) Steering Committee and has served as a consultant to several superfund potentially responsible parties (PRP) groups.

Contact Mr. Chiappetta at jchiappetta@castletonenv.com

PROFESSIONAL EXPERIENCE

| | |
|---|---|
| Castleton Environmental, Inc. New York, NY | November 2018 – Present – Sr. Project Manager |
| Advanced GeoServices, Inc. Fair Lawn, NJ | July 2014 – November 2018 – Regional Manager |
| PetroScience, Inc. Glen Rock, NJ | October 2012-July 2014– LSRP Practice Leader |



Hydro Environmental Technologies
(HETI) June 2011 – October 2012 – Regional Manager
Beachwood, NJ

GEI Consultants, Inc. November 2008- April 2011- Project Manager
Montclair, NJ

Dresdner Robin January 2005 – November 2008 -Project Manager
Jersey City, NJ

Whitestone Associates January 2003 - January 2005 - Sr Environmental Specialist
Warren, NJ

Leggette, Brashears & Graham, Inc
(LBG) May 1999 – January 2003 – Environmental Scientist I & II
Ramsey, NJ

EDUCATION

Allegheny College

Bachelor of Science – Geological Sciences, 1999

Florida Institute of Technology

Master of Business Administration – Project Management, 2018

CERTIFICATION/LICENSES

Licensed Site Remediation Professional (LSRP) (License # 576769)
NJDEP certified Subsurface Evaluator and UST Closure (License # 207173)
OSHA HAZWOPER 40-Hr; OSHA HAZWOPER 8-hr
OSHA HAZWOPER Site Supervisor
First Aid and CPR

AREAS OF EXERTISE

Environmental Program Management
Hazardous Waste Investigation and Cleanup
Environmental & Regulatory Compliance

AFFILIATIONS

Licensed Site Remediation Professional Association
Commerce and Industry Association of New Jersey



NOTABLE ASSIGNMENTS

Site Assessments and Investigations

Mr. Chiappetta has served as a Senior Project Manager responsible for hundreds of properties in support of land acquisition or transfer. Support includes Phase I Environmental Site Assessments, Work Plans, Phase II Site Assessment Reports, Investigation Summaries/Remedial Plans, and Remedial Cost Estimates. Responsibilities include cost proposal development, budget and technical tracking, the coordination of soil, groundwater, indoor air, soil vapor, and performing site characterizations. He serves as the liaison with the client, contractors, and state and local officials.

Remedial Investigations and Remedial Actions

Mr. Chiappetta has served as Senior Project Manager/Lead Investigator responsible for the management of several USEPA Superfund and Emergency Cleanup Sites, as well as New Jersey Hazardous Discharge Site Remediation Fund (HDSRF) Sites. Mr. Chiappetta has investigated and remediated over a dozen former manufactured gas plant (MGP) throughout the United States; and managing the environmental liability/facility compliance for 250 commercial petroleum service stations and facilities impacted by chemical usage involving a major oil company. Mr. Chiappetta has investigated and remediated RCRA and TSCA hazardous wastes including projects requiring the removal of over 200,000 cubic yards of soils and contaminated sediments. Mr. Chiappetta has designed and implemented numerous In-situ chemical oxidation (ISCO) treatments, permeable reactive barriers, Zero-Valent Iron application, bio-augmentation injections and Ozone treatment systems. Mr. Chiappetta has designed and implemented numerous complex Vapor Intrusion investigations and installations of Vapor mitigations systems.

Licensed Site Remediation Professional (LSRP)

Mr. Chiappetta was among the first individuals to be issued a license by the State of New Jersey under its Licensed Site Remediation Professional (LSRP) program. Mr. Chiappetta has served as a Licensed Site Remediation Professional on over 100 Sites including several Industrial Site Recovery Act (ISRA) sites. Mr. Chiappetta has issued over 50 Response Action Outcome (RAO) under the LSRP program. Mr. Chiappetta is a member of the Licensed Site Remediation Professional Association and serves as a member of the LSRPA Risk Management & Loss Prevention Committee.

[ADR](#)[Validation](#)[Software](#)[Training](#)[Consulting](#)[Clients](#)[Contact](#)

Key LDC Staff

LDC Staff

Richard M. Amano

Position: Principal Chemist

Experience: Mr. Amano has over 30 years of combined environmental laboratory, QA/QC, laboratory auditing, and data validation experience. Prior to founding LDC in 1991, he directed two major laboratories; Analytical Technologies, Inc. (San Diego) and Brown and Caldwell. His experience includes oversight and direction of major QA/QC and data validation efforts for Superfund sites, DOE sites, Navy RI/FS projects, Army Corps of Engineers investigations, and AFCEE projects. He also has overseen several laboratory audits for major analytical testing programs.

Specifically, Mr. Amano has over 15 years experience with the validation of organic, inorganic, and radiochemical analyses using USEPA CLP (including Region III) functional guidelines and other applicable guidance documents.

Scott Denzer

Position: Technical Director/Principal Chemist

Experience: Mr. Denzer has over 27 years combined experience in environmental sampling, analyses, data validation, quality assurance, laboratory auditing, software design, implementation and training. Mr. Denzer's experience includes sampling, analysis and data validation in support of Federal and State programs, including the Clean Water Act, the Clean Air Act, CERCLA, RCRA, and NIOSH.

Mr. Denzer has performed data verification, review and data validation for numerous Department of Defense projects, commercial projects, and is familiar with program-specific requirements as well as the Uniform Federal Policy for Quality Assurance Project Plans, the EPA Data Quality Objective Process, requirements of the Safe Drinking Water Act, the National Laboratory Accreditation Program, and quality control requirements of various analytical methods.

Prior to his experience at LDC and the Guam Environmental Protection Agency, Mr. Denzer held laboratory positions including GC Pesticides supervisor, GC chemist, and section leader. As Technical Director and Principal Chemist with Laboratory Data Consultants, Inc., Mr. Denzer currently oversees special data validation and software development projects and provides technical support to contractors by performing laboratory audits and technical review of Quality Assurance documents under various programs.

Erlinda Rauto

Position: Senior Chemist/QA Officer, 1993 to present

Experience: Ms. Rauto has over 20 years combined environmental laboratory, QA/QC, and data validation experience. Her experience includes performance of data validation in the GC, trace metals, and wet chemistry areas for major Federal projects. Her laboratory experience includes hands-on CLP and EPA ICP/GFAA analysis, pesticide/PCBs and wet chemistry analysis. Specifically, Ms. Rauto has over 11 years organic data validation and assessment experience using USEPA (including Region III) functional guidelines and other applicable documents.

As a senior chemist with Laboratory Data Consultants, Inc., Ms. Rauto specializes in the data validation and compliance screening of gas chromatography organic analyses. This validation includes EPA CLP, SW-846, and EPA Water and Wastewater methods. Over the past eight years, Ms. Rauto has performed USEPA Level 3 and Level 4 (including NFESC Level C and D) validation for projects including Southwest Division CLEAN 1 (Jacobs Engineering/IT Corporation/CH2M Hill), Southwest Division CLEAN 2 (Bechtel National), Pacific Northwest Division CLEAN (URS Greiner), Southern Division CLEAN (ABB Environmental), Atlantic Division CLEAN (EA Engineering), Southwest Division RAC (OHM Remediation), Pacific Division CLEAN (Earth Tech), DOE Atomic City (Jacobs Engineering Group), Army Corps of Engineers, Travis AFB (CH2M Hill), Army Corps of Engineers, Camp Navajo (Tetra Tech), AFCEE Mather AFB (Montgomery Watson), AFCEE Pease AFB (Bechtel Environmental), AFCEE England AFB (Law Environmental), Army

Corps of Engineers, Hawthorne Army Depot (Tetra Tech), Army Corps of Engineers, Fort Ord (Harding Lawson), Nevada Test Site (IT Corp), and AFCEE Beale AFB (Law/Crandall, Inc.).

Stella V. Cuenco

Position: Senior Chemist, 1996 to present

Experience: Ms. Cuenco has over 14 years combined environmental laboratory and data validation experience. Her experience includes performance of data validation in the GC and GC/MS areas for major Federal projects. Her laboratory experience includes hands-on CLP and EPA analysis of GC and GC/MS volatile organic compounds. Specifically, Ms. Cuenco has over 10 years organic data validation experience using USEPA (including Region III) functional guidelines and other applicable documents.

As senior chemist with Laboratory Data Consultants, Inc., Ms. Cuenco specializes in the data validation and contract compliance screening of gas chromatography-mass spectrometry analyses. She has a thorough knowledge and understanding of gas chromatography-mass spectrometry methods referenced in EPA CLP, SW-846, EPA 500 and 600 series documents. She has performed data validation under EPA Region IX ESAT.

Pei Geng

Position: Senior Chemist, 1996 to Present

Experience: Ms. Geng has over 15 years combined environmental laboratory and data validation experience. Her experience includes performance of data validation in the GC and GC/MS areas for major Federal projects. Her laboratory experience includes hands-on CLP and EPA analysis of GC and GC/MS volatile organic compounds. Specifically, Ms. Geng has over 8 years organic data validation experience using USEPA CLP (including Region III) functional guidelines and other applicable documents.

As a senior chemist with Laboratory Data Consultants, Inc., Ms. Geng specializes in the data validation and contract compliance screening of gas chromatography-mass spectrometry analyses as well as gas chromatography analyses. She has a thorough knowledge and understanding of gas chromatography and gas chromatography-mass spectrometry methods referenced in EPA CLP, SW-846, EPA 500 and 600 series documents. She has performed data validation under EPA Region IX ESAT.

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Appendix C

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER



Expires 12:01 AM April 01, 2020
Issued April 01, 2019
Revised April 30, 2019

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MR. KRZYSZTOF TRAFALSKI
YORK ANALYTICAL LABORATORIES, INC. (II)
132-02 89TH AVENUE SUITE 217
RICHMOND HILL, NY 11418

NY Lab Id No: 12058

*is hereby APPROVED as an Environmental Laboratory in conformance with the
National Environmental Laboratory Accreditation Conference Standards (2003) for the category
ENVIRONMENTAL ANALYSES POTABLE WATER
All approved analytes are listed below:*

Perfluorinated Alkyl Acids

| | |
|-------------------------------------|---------|
| Perfluorooctanesulfonic acid (PFOS) | EPA 537 |
| Perfluorooctanoic acid (PFOA) | EPA 537 |



Serial No.: 60182

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Appendix D

Analytical Method Information
PFAS Target compounds by LC/MS-MS

Dept.: PFAS

| Analyte | MDL | Reporting Limit | Surrogate %R | Duplicate RPD | Matrix Spike %R | Matrix Spike RPD | Blank Spike / LCS %R | Blank Spike / LCS RPD |
|---|-------|-----------------|-------------------------|---------------|--------------------------------------|------------------|----------------------|-----------------------|
| PFAS, NYSDEC Target List in Water (EPA 537m) | | | | | Units: ng/L | | | |
| Preservation: Cool 4°C | | | | | Hold Time to Analysis 28 days | | | |
| Container: 10_250mL Plastic Cool to 4° C | | | | | Hold Time to Extr. 14 days | | | |
| | | | Amount Required: | 250 mL | | | | |
| 1H,1H,2H,2H-Perfluorodecanesulfonic aci | 0.877 | 2.00 ng/L | | 30 | 25 - 150 | 35 | 50 - 130 | 30 |
| 1H,1H,2H,2H-Perfluorooctanesulfonic aci | 1.16 | 5.00 ng/L | | 30 | 25 - 150 | 35 | 50 - 130 | 30 |
| surr: d3-N-MeFOSAA | | | 25 - 150 | | | | | |
| surr: d5-N-EtFOSAA | | | 25 - 150 | | | | | |
| surr: M2-6:2 FTS | | | 25 - 150 | | | | | |
| surr: M2-8:2 FTS | | | 25 - 150 | | | | | |
| surr: M2PFTeDA | | | 10 - 150 | | | | | |
| surr: M3PFBS | | | 25 - 150 | | | | | |
| surr: M3PFHxS | | | 25 - 150 | | | | | |
| surr: M4PFHpA | | | 25 - 150 | | | | | |
| surr: M5PFHxA | | | 25 - 150 | | | | | |
| surr: M6PFDA | | | 25 - 150 | | | | | |
| surr: M7PFUdA | | | 25 - 150 | | | | | |
| surr: M9PFNA | | | 25 - 150 | | | | | |
| MPFOA | | 0.100 ng/L | | | | | | |
| N-EtFOSAA | 0.436 | 2.00 ng/L | | 30 | 25 - 150 | 35 | 50 - 130 | 30 |
| N-MeFOSAA | 0.364 | 2.00 ng/L | | 30 | 25 - 150 | 35 | 50 - 130 | 30 |
| surr: Perfluoro-1-[13C8]octanesulfonamid | | | 10 - 150 | | | | | |
| surr: Perfluoro-1-[13C8]octanesulfonic aci | | | 25 - 150 | | | | | |
| Perfluoro-1-decanesulfonic acid (PFDS) | 0.491 | 2.00 ng/L | | 30 | 25 - 150 | 35 | 50 - 130 | 30 |
| Perfluoro-1-heptanesulfonic acid (PFHpS) | 0.418 | 2.00 ng/L | | 30 | 25 - 150 | 35 | 50 - 130 | 30 |
| Perfluoro-1-octanesulfonamide (FOSA) | 0.877 | 2.00 ng/L | | 30 | 25 - 150 | 35 | 50 - 130 | 30 |
| Perfluorobutanesulfonic acid (PFBS) | 0.436 | 2.00 ng/L | | 30 | 25 - 150 | 35 | 50 - 130 | 30 |
| Perfluorodecanoic acid (PFDA) | 0.493 | 2.00 ng/L | | 30 | 25 - 150 | 35 | 50 - 130 | 30 |
| Perfluorododecanoic acid (PFDoA) | 0.611 | 2.00 ng/L | | 30 | 25 - 150 | 35 | 50 - 130 | 30 |
| Perfluoroheptanoic acid (PFHpA) | 0.447 | 2.00 ng/L | | 30 | 25 - 150 | 35 | 50 - 130 | 30 |
| Perfluorohexanesulfonic acid (PFHxS) | 0.494 | 2.00 ng/L | | 30 | 25 - 150 | 35 | 50 - 130 | 30 |
| Perfluorohexanoic acid (PFHxA) | 0.442 | 2.00 ng/L | | 30 | 25 - 150 | 35 | 50 - 130 | 30 |
| surr: Perfluoro-n-[1,2-13C2]dodecanoic ac | | | 25 - 150 | | | | | |
| surr: Perfluoro-n-[13C4]butanoic acid (MF | | | 25 - 150 | | | | | |
| surr: Perfluoro-n-[13C5]pentanoic acid (M | | | 25 - 150 | | | | | |
| surr: Perfluoro-n-[13C8]octanoic acid (M8 | | | 25 - 150 | | | | | |
| Perfluoro-n-butanoic acid (PFBA) | 1.01 | 2.00 ng/L | | 30 | 25 - 150 | 35 | 50 - 130 | 30 |
| Perfluorononanoic acid (PFNA) | 0.361 | 2.00 ng/L | | 30 | 25 - 150 | 35 | 50 - 130 | 30 |
| Perfluorooctanesulfonic acid (PFOS) | 0.472 | 2.00 ng/L | | 30 | 25 - 150 | 35 | 50 - 130 | 30 |
| Perfluorooctanoic acid (PFOA) | 0.360 | 2.00 ng/L | | 30 | 25 - 150 | 35 | 50 - 130 | 30 |
| Perfluoropentanoic acid (PFPeA) | 0.511 | 2.00 ng/L | | 30 | 25 - 150 | 35 | 50 - 130 | 30 |
| Perfluorotetradecanoic acid (PFTA) | 0.701 | 2.00 ng/L | | 30 | 25 - 150 | 35 | 50 - 130 | 30 |
| Perfluorotridecanoic acid (PFTrDA) | 0.660 | 2.00 ng/L | | 30 | 25 - 150 | 35 | 50 - 130 | 30 |
| Perfluoroundecanoic acid (PFUnA) | 0.534 | 2.00 ng/L | | 30 | 25 - 150 | 35 | 50 - 130 | 30 |

Analytical Method Information
PFAS Target compounds by LC/MS-MS

Dept.: PFAS

| Analyte | MDL | Reporting Limit | Surrogate %R | Duplicate RPD | Matrix Spike %R | RPD | Blank Spike / LCS %R | RPD |
|--|--------|-----------------|--------------|---------------|--------------------------------------|-----|----------------------|-----|
| PFAS, NYSDEC Target List in Soil (EPA 537m) | | | | | Units: ug/kg | | | |
| Preservation: Cool 4°C | | | | | Hold Time to Analysis 28 days | | | |
| Container: 10_250mL Plastic Cool to 4° C | | | | | Hold Time to Extr. 14 days | | | |
| Amount Required: 250 mL | | | | | | | | |
| 1H,1H,2H,2H-Perfluorodecanesulfonic aci | 0.344 | 0.750 ug/kg | | 30 | 25 - 150 | 35 | 50 - 130 | 30 |
| 1H,1H,2H,2H-Perfluorooctanesulfonic aci | 0.521 | 0.750 ug/kg | | 30 | 25 - 150 | 35 | 50 - 130 | 30 |
| surr: d3-N-MeFOSAA | | | 25 - 150 | | | | | |
| surr: d5-N-EtFOSAA | | | 25 - 150 | | | | | |
| surr: M2-6:2 FTS | | | 25 - 150 | | | | | |
| surr: M2-8:2 FTS | | | 25 - 150 | | | | | |
| surr: M2PFTeDA | | | 10 - 150 | | | | | |
| surr: M3PFBS | | | 25 - 150 | | | | | |
| surr: M3PFHxS | | | 25 - 150 | | | | | |
| surr: M4PFHpA | | | 25 - 150 | | | | | |
| surr: M5PFHxA | | | 25 - 150 | | | | | |
| surr: M6PFDA | | | 25 - 150 | | | | | |
| surr: M7PFUdA | | | 25 - 150 | | | | | |
| surr: M9PFNA | | | 25 - 150 | | | | | |
| MPFOA | | | | | | | | |
| N-EtFOSAA | 0.109 | 0.750 ug/kg | | 30 | 25 - 150 | 35 | 50 - 130 | 30 |
| N-MeFOSAA | 0.0910 | 0.750 ug/kg | | 30 | 25 - 150 | 35 | 50 - 130 | 30 |
| surr: Perfluoro-1-[13C8]octanesulfonamid | | | 10 - 150 | | | | | |
| surr: Perfluoro-1-[13C8]octanesulfonic aci | | | 25 - 150 | | | | | |
| Perfluoro-1-decanesulfonic acid (PFDS) | 0.177 | 0.750 ug/kg | | 30 | 25 - 150 | 35 | 50 - 130 | 30 |
| Perfluoro-1-heptanesulfonic acid (PFHpS) | 0.198 | 0.750 ug/kg | | 30 | 25 - 150 | 35 | 50 - 130 | 30 |
| Perfluoro-1-octanesulfonamide (FOSA) | 0.455 | 0.750 ug/kg | | 30 | 25 - 150 | 35 | 50 - 130 | 30 |
| Perfluorobutanesulfonic acid (PFBS) | 0.109 | 0.750 ug/kg | | 30 | 25 - 150 | 35 | 50 - 130 | 30 |
| Perfluorodecanoic acid (PFDA) | 0.123 | 0.750 ug/kg | | 30 | 25 - 150 | 35 | 50 - 130 | 30 |
| Perfluorododecanoic acid (PFDoA) | 0.110 | 0.750 ug/kg | | 30 | 25 - 150 | 35 | 50 - 130 | 30 |
| Perfluoroheptanoic acid (PFHpA) | 0.112 | 0.750 ug/kg | | 30 | 25 - 150 | 35 | 50 - 130 | 30 |
| Perfluorohexanesulfonic acid (PFHxS) | 0.106 | 0.750 ug/kg | | 30 | 25 - 150 | 35 | 50 - 130 | 30 |
| Perfluorohexanoic acid (PFHxA) | 0.111 | 0.750 ug/kg | | 30 | 25 - 150 | 35 | 50 - 130 | 30 |
| surr: Perfluoro-n-[1,2-13C2]dodecanoic ac | | | 25 - 150 | | | | | |
| surr: Perfluoro-n-[13C4]butanoic acid (MF | | | 25 - 150 | | | | | |
| surr: Perfluoro-n-[13C5]pentanoic acid (M | | | 25 - 150 | | | | | |
| surr: Perfluoro-n-[13C8]octanoic acid (M8 | | | 25 - 150 | | | | | |
| Perfluoro-n-butanoic acid (PFBA) | 0.278 | 0.750 ug/kg | | 30 | 25 - 150 | 35 | 50 - 130 | 30 |
| Perfluorononanoic acid (PFNA) | 0.0900 | 0.750 ug/kg | | 30 | 25 - 150 | 35 | 50 - 130 | 30 |
| Perfluorooctanesulfonic acid (PFOS) | 0.118 | 0.750 ug/kg | | 30 | 25 - 150 | 35 | 50 - 130 | 30 |
| Perfluorooctanoic acid (PFOA) | 0.0900 | 0.750 ug/kg | | 30 | 25 - 150 | 35 | 50 - 130 | 30 |
| Perfluoropentanoic acid (PFPeA) | 0.211 | 0.750 ug/kg | | 30 | 25 - 150 | 35 | 50 - 130 | 30 |
| Perfluorotetradecanoic acid (PFTA) | 0.192 | 0.750 ug/kg | | 30 | 25 - 150 | 35 | 50 - 130 | 30 |
| Perfluorotridecanoic acid (PFTrDA) | 0.132 | 0.750 ug/kg | | 30 | 25 - 150 | 35 | 50 - 130 | 30 |
| Perfluoroundecanoic acid (PFUnA) | 0.133 | 0.750 ug/kg | | 30 | 25 - 150 | 35 | 50 - 130 | 30 |



Standard Operating Procedure - Summary PFAS in Groundwater, Surface water and Soils

1.0 Summary

Target PFAS compounds are prepared and analyzed using EPA Method 537.1 modified. Aqueous and Soil samples are fortified with isotopic surrogates of the target PFAS compounds, extracted and concentrated to a known volume. The extracts are then analyzed employing LC-MSMS techniques.

Each preparation batch (per matrix) includes a preparation blank, lab control sample (blank spike), sample matrix spike and matrix spike duplicate and up to 20 samples.

2.0 Sample Preparation

Sample preparation involves extraction/clean-up and final concentration to a known volume before analysis. Isotopic surrogates are added to all preparation batch samples/QC.

2.1 Aqueous Samples

A known volume of sample is spiked with isotopic surrogates and extracted using Solid Phase Extraction (SPE) techniques. The SPE tubes are eluted with solvent and the eluant is then concentrated using nitrogen evaporation to a final volume of 1.0 mL. The final concentrated extract is fortified with Internal Standard and analyzed by LC-MSMS.

2.2 Soil Samples

A known weight of sample is fortified with isotopic surrogates, mixed then extracted in methanolic potassium hydroxide employing vortex mixing, followed by orbital shaking and finally ultrasonic extraction.

The extract is centrifuged and the supernatant solvent is quantitatively poured off and a small volume of PFAS free water is added to the solvent. The solvent mixture is evaporated using nitrogen evaporation and the remaining aqueous extract is brought to a known volume with PFAS free water.

The aqueous extract is then pH adjusted to 6-8 using glacial acetic acid and the resulting aqueous solution is extracted using SPE techniques. The SPE tube is eluted with solvent and the eluant is then concentrated using nitrogen evaporation to a final volume of 2.0 mL. The final concentrated extract is fortified with Internal Standard and analyzed by LC-MSMS.

3.0 Analysis

Analysis is conducted utilizing an Agilent Infinity 1290 HPLC system interfaced to an Agilent 6470AAR LC-MSMS with an Agilent Jet Stream-ElectroSpray Ionization (AJS-ESI) interface. The system is operated in the dynamic MRM (multiple reaction monitoring) mode for specific PFAS target isotopes and native analogs.

Where possible, multiple MRM transitions are used for targets and isotopes. Some species only exhibit single MRM transitions. Precursors and product ions are used for Quantitative and Qualitative purposes respectively.

3.1 Initial Calibration

The LC-MSMS is calibrated with 7 standards of a total of 40 isotopes and analog target PFAS compounds. Calibration is conducted from 0.25 to 20 ng/mL. Calibration employs internal standard techniques and either average response factor or quadratic regression is used depending upon the best calibration model based upon accuracy across the calibration range.

3.2 Continuing Calibration Verification

Each analytical sequence includes an opening continuing calibration verification (CCV) and a CCV after every 10 injections and at the end of the analysis sequence.

The CCV acceptance criteria are $\pm 30\%$ of the expected value. Internal Standard areas are acceptable when -50% to +50% of the average response in the initial calibration.

3.3 Isotopic Surrogates (Isotope Dilution Analytes (IDA))

18 IDAs are utilized for this procedure. These isotopes are used to correct for recovery of detected target analog PFAS compounds through the preparation/analysis processes. The recovery limits currently are 25-150 % recovery and these limits are adjusted based upon laboratory determined control limits when sufficient data points per matrix are available.

3.4 Method Blanks (MBLK)

Each preparation batch includes a laboratory method blank. Any result greater than the Reporting Limit or 2 ng/L (aqueous) or 0.5 ug/kg (soil) is "B" flagged according with the exception of any detection of PFOA, PFOS or PFNA above the RL will require re-extraction of the batch.

3.5 Blank Spike (LCS)

Each preparation batch includes and BS/LCS. Recoveries are calculated and based upon isotope dilution. Recovery acceptance limits are 50-150% with RPD of 30% for a BSD if performed.

3.6 Matrix Spike/Matrix Spike Duplicates (MS/MSD)

Each preparation batch includes and MS/MSD pair. Recoveries are calculated and based upon isotope dilution. Recovery acceptance limits are 25-150% with RPD of 35% for samples.

4.0 Data Review and Reporting

All quantitation reports and LIMS output files are generated using the Agilent Mass Hunter reporting programs. The Quant reports include all Quantitative data and MRM transition data which are reviewed. The LIMS output file is in a format that allows upload to Element LIMS.

Isotope Dilution calculations are performed using our custom PFAS.mdb program which automatically uploads to the LIMS output file for upload to Element LIMS.


Once uploaded to ELEMENT, any exceptions/outliers are noted, flagged and set to reviewed.

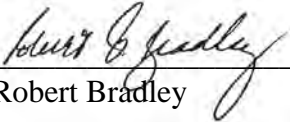
All data reported are isotopically corrected for all QC and samples.


5.0 Revision History

May 1, 2019 Revision 1.0 First Issue

6.0 Approvals:

Laboratory Director 
Ben Gulizia

Corp. Technical Director 
Robert Bradley

Corp. QA Officer 
Sarah Widomski

Appendix D

HEALTH AND SAFETY PLAN

**92 TO 98 NAGLE AVENUE
NEW YORK, NEW YORK
SITE NO: C231134**

OCTOBER 2021

Prepared for: Mr. Nathan Benelyhou
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**HEALTH AND SAFETY PLAN
92 to 98 NAGLE AVENUE
NEW YORK, NEW YORK
OCTOBER 2021
CASTLETON PROJECT NUMBER: NJBM2001**

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1.0 STATEMENT OF COMMITMENT

This Health and Safety Plan (HASP) has been prepared to ensure that workers are not exposed to chemical, biological and physical hazards during the planned Phase II Environmental Site Assessment to be performed the site located at 92 to 98 Nagle Avenue, New York, New York. Castleton Environmental Geologic Services DPC (Castleton) policy is to minimize the possibility of work-related exposure through awareness and qualified supervision, health and safety training, medical monitoring, use of appropriate personal protective equipment, and the following activity specific safety protocols contained in this HASP. Castleton has established a guidance program to implement this policy in a manner that protects personnel to the maximum reasonable extent.

This HASP, which applies to persons present at the site actually or potentially exposed to safety or health hazards, describes emergency response procedures for actual and potential physical, biological and chemical hazards. This HASP is also intended to inform and guide personnel entering the work area or exclusion zone. Persons are to acknowledge that they understand the potential hazards and the contents of this Health and Safety policy.

2.0 INTRODUCTION

2.1 Purpose

This HASP addresses the minimum health and safety practices that will be employed by site workers participating in RI activities at the project site located at 92 to 98 Nagle Avenue, New York, New York.

The HASP takes into account the specific hazards inherent to the site and presents the minimum requirements which are to be met by Castleton, its' subcontractors, and other on-site personnel in order to avoid and, if necessary, protect against health and/or safety hazards. Castleton subcontractors will have the option of adopting this HASP or developing their own site-specific document. If a subcontractor chooses to prepare their own HASP, it must meet the minimum requirements as detailed in this HASP and must be made available to Castleton.

Activities performed under this HASP will comply with applicable parts of Occupational Safety and Health Administration (OSHA) Regulations, primarily 29 CFR Parts 1910 and 1926 and all other applicable federal, state, and local regulations. Modifications to the HASP may be made with the approval of the Castleton Health and Safety Manager (HSM) and/or Project Manager (PM). A copy of this HASP will be maintained on-site during all work activities.

Refusal to comply with the HASP or violation of any safety procedures by field personnel may result in their immediate removal from the site following consultation with the HSM and the Field Team Leader (FTL).

2.2 Scope

This HASP addresses the potential hazards related to the RI activities. The primary RI activities include the following:

- Site Mobilization/Demobilization;
- Soil and Groundwater Sampling, and
- Monitoring Well/Vapor Point Installation

The potential hazards associated with this scope are listed below and are discussed in more detail in this HASP after the project organization and responsibilities section.

- Chemical Hazards
- Biological Hazards
- Physical Hazards

2.3 Application

The HASP applies to all personnel involved in the above tasks who wish to gain access to active work areas, including but not limited to:

- Castleton employees and subcontractors;
- Client representatives; and
- Federal, state or local representatives.

3.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

This section specifies the project organization and responsibilities.

3.1 Project Manager

- Participates in major incident investigations;
- Ensures that the HASP has all of the required approvals before site work is conducted; and
- Has the overall project responsibility for project health and safety.

3.2 Field Team Leader (FTL)/ Site Health and Safety Officer (SHSO)

- Ensures that the HASP is implemented in conjunction with the Health and Safety Manager (HSM);
- Ensures that field work is scheduled with adequate equipment to complete the job safely;
- Enforces site health and safety rules;
- Ensures that proper personal protective equipment is utilized;
- Ensures that the HSM is informed of project changes that require modifications to the HASP;
- Ensures that the procedure modifications are implemented;
- Investigates incidents;
- Conducts the site safety briefing;
- Reports to HSM to provide summaries of field operations and progress; and

- Acts as Emergency Coordinator.

3.3 Health and Safety Manager

- Provides for the development of the HASP;
- Serves as the primary contact to review health and safety matters that may arise;
- Approves individuals who are assigned SHSO responsibilities;
- Coordinates revisions of this HASP with field personnel; and
- Assists in the investigation of major accidents.

3.4 Site Personnel

- Report any unsafe or potentially hazardous conditions to the FTL/SHSO;
- Maintain knowledge of the information, instructions and emergency response actions contained in this HASP; and
- Comply with rules, regulations and procedures as set forth in this HASP and any revisions.

4.0 SITE HISTORY AND PROJECT DESCRIPTION

4.1 Project Background

This HASP has been prepared by Castleton in response to the remedial investigation work required to satisfy the environmental testing protocol related to the site.

4.2 Site Location and Description

The site is located at 92-98 Nagle Avenue, New York, New York and is identified as Block 2174 and Lot 93. Currently, the site is improved with one multi-story mixed use residential/commercial building. Retail/commercial units are restricted to the ground floor of the building. The site building contains a full basement and was constructed in 1927 on a 0.345 acre-parcel.

5.0 POTENTIAL HAZARDS OF THE SITE

This section presents an assessment of the chemical, biological, and physical hazards that may be encountered during the tasks specified under Section 1.0. Additional information can be found in Appendix A - Safety Data Sheets or in Appendix B - Activity Hazard Analyses.

5.1 Chemical Hazards

Potential on-site chemicals of concern include VOCs (tetrachloroethylene).

The chemicals identified above may have an effect on the central nervous system, entering the body through the respiratory system and dermal exposure. Acute exposure symptoms may include skin irritation. Specific information on the chemicals can be found in Table 5-1.

Table 5-1 Chemical Hazards

| COMPOUND | CAS# | OSHA PEL | ROUTES OF EXPOSURE | SYMPTOMS OF EXPOSURE | TARGET ORGANS |
|----------|------|------------------------------|-------------------------------------|---|--|
| VOCs | | TWA 100 mg/m ³ | Inhalation Ingestion Skin/Eye | Irritation eyes, nose, throat; headache, dizziness, central nervous system depression; dermatitis | Eyes, skin, respiratory system, central nervous system |

Abbreviations

C = Ceiling limit, not to be exceeded

OSHA = Occupational Safety and Health Administration

CNS = Central Nervous System

ppm = parts per million

PEL=Permissible Exposure Limit

TWA = Time-weighted average (8 hours)

5.2 Biological Hazards

Work will be performed in a developed area of New York, New York. During the course of the project, there is potential for workers to come into contact with biological hazards such as animals, insects and plants. The Activity Hazard Analyses found in Appendix B includes specific hazards and control measures for each task, if applicable.

5.2.1 *Animals*

The Site is located in a predominantly developed area. It is possible that dogs, cats, rats and mice may be present. Workers shall use discretion and avoid all contact with animals.

5.2.2 *Insects*

Insects, such as mosquitoes, ticks, bees and wasps may be present during certain times of the year. Workers will be encouraged to wear repellents and PPE, if deemed necessary, when working in areas where insects are expected to be present.

During the months of April through October, particular caution must be exercised to minimize exposure to deer ticks and the potential for contracting Lyme disease. Specific precautionary work practices that are recommended include the following:

- Cover your body as much as possible. Wear long pants and long sleeved shirts. Light color clothing makes spotting of ticks easier.
- Try to eliminate possible paths by which the Deer Tick may reach unprotected skin. For example, tuck bottoms of pants into socks or boots and sleeves into gloves. (Duct tape may be utilized to help seal cuffs and ankles). If heavy concentrations of ticks or insects are anticipated or encountered, Tyvek coveralls may be utilized for added protection when the potential for heat stress is not a concern.

- Conduct periodic and frequent, (e.g., hourly), surveys of your clothing for the presence of ticks. Remove any tick, save it and report to the clinic with the tick.
- Use insect /tick repellents that contain the chemical DEET (n,n-Diethyltoluamide). Apply repellents in accordance with manufacturers' recommendations. These repellents are readily available and include such brands as Deep Woods OFF and Maximum Strength OFF.

5.2.3 *Plants*

Poison ivy, sumac and oak may be present on site. The FTL/SHSO should identify the susceptible individuals. Worker shall avoid all contact with these plants.

5.3 **Physical Hazards**

Most safety hazards are discussed in the Activity Hazard Analyses (AHA) in Appendix B for the different phases of the project. In addition to the AHAs, general work rules and other safety procedures are described in Section 10 of this HASP.

5.3.1 *Temperature Extremes*

Heat Stress

Heat stress is a significant potential hazard, which is greatly exacerbated with the use of PPE in hot environments. The potential hazards of working in hot environments include dehydration, cramps, heat rash, heat exhaustion, and heat stroke.

Cold Stress

At certain times of the year, workers may be exposed to the hazards of working in cold environments. Potential hazards in cold environments include frostbite, trench foot or immersion foot, hypothermia as well as slippery surfaces, brittle equipment, and poor judgment.

Castleton's Heat/Cold Stress Protocols are specified in Appendix C.

5.3.2 *Steam, Heat and Splashing*

Exposure to steam/heat/splashing hazards can occur during steam cleaning activities. Splashing can also occur during well development and sampling activities. Exposure to steam/heat/splashing can result in scalding/burns, eye injury, and puncture wounds.

5.3.3 *Noise*

Noise is a potential hazard associated with the operation of heavy equipment, drill rigs, pumps and engines. Workers will wear hearing protection while in the work zone when these types of machinery are operating.

5.3.4 Fire and Explosion

When conducting excavation or drilling activities, the opportunity of encountering fire and explosion hazards may exist from encountering underground utilities, from the use of diesel engine equipment, and other potential ignition sources. During dry periods there is an increased chance of forest and brush fires starting at the job site. If these conditions occur no smoking will be permitted at the site and all operations involving potential ignition sources will be monitored continuously (fire watch).

5.3.5 Manual Lifting/Material Handling

Manual lifting of heavy objects may be required. Failure to follow proper lifting technique can result in back injuries and strains. Back injuries are a serious concern as they are the most common work place injury, often resulting in lost or restricted work time, and long treatment and recovery periods.

5.3.6 Slips, Trips and Falls

Working in and around the site will pose slip, trip and fall hazards due to slippery surfaces that may be oil covered, or from rough terrain, surfaces that are steep inclines, surfaced debris, or surfaces which are wet from rain or ice. Falls may result in twisted ankles, broken bones, head trauma or back injuries.

5.3.7 Heavy Equipment Operation

A Geoprobe/drill rig be used where required. Working with or near heavy equipment poses many potential hazards, including electrocution, fire/explosion, being struck by or against, or pinched/caught/crushed by, and can result in serious physical harm.

5.3.8 Electrocution

Encountering underground utilities may pose electrical hazards to workers. Additionally, overhead electrical lines can be a concern during drilling operations. Potential adverse effects of electrical hazards include burns and electrocution, which could result in death.

6.0 ACTIVITY HAZARD ANALYSES

The Activity Hazard Analysis (AHA) is a systematic way of identifying the potential health and safety hazards associated with major phases of work on the project and the methods to avoid, control and mitigate those hazards. The AHAs will be used to train work crews in proper safety procedures during phase preparatory meetings.

AHAs have been developed by Castleton for the following phases of work:

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1. Site Mobilization/Demobilization;
2. Soil and Groundwater Sampling; and
3. Monitoring Well/Vapor point installation

Copies of these AHAs are included in Appendix B of this HASP.

7.0 PERSONAL PROTECTIVE EQUIPMENT

The personal protective equipment (PPE) specified in Table 7-1 represents the hazard analysis and PPE selection required by 29 CFR 1910.132. Specific information on known potential hazards can be found under Section 4.0 and Appendix B - Activity Hazard Analyses. For the purposes of PPE selection, the HSM and FTL/SHSO are considered competent persons. The signatures on the approval page of the HASP constitute certification of the hazard assessment. For activities not covered by Table 7-1, the FTL/SHSO will conduct the hazard assessment, select the PPE, and document changes in the appropriate field logs. PPE selection will be made in consultation with the HSM.

Modifications for initial PPE selection may also be made by the FTL/SHSO in consultation with the HSM and changes documented accordingly. If major modifications occur, the HSM will notify the PM.

7.1 PPE Abbreviations

HEAD PROTECTION

HH = Hard Hat

HEARING PROTECTION

EP = ear plugs

EM = ear muffs

HAND PROTECTION

Cot = cotton

But = Butyl

LWG = Leather Work Gloves

Neo = Neoprene

Nit = Nitrile

Sur = Surgical

EYE/FACE PROTECTION

APR = Full Face Air Purifying
Respirator

MFS = Mesh Face shield

PFS = Plastic Face shield

SG = ANSI approved safety
glasses with side shields

BODY PROTECTION

WC = work clothes

Cot Cov = Cotton Coveralls

Poly = Polyethylene coated
Tyvek® coveralls

Saran = Saranex coated
coveralls

Tyvek® = Uncoated Tyvek®
coveralls

FOOT PROTECTION

Neo = Neoprene

OB = Overboot

Poly = polyethylene coated boot

Rub = rubber slush boots

STB = Leather work boots with steel
toe

RESPIRATORY PROTECTION

APR = Full-face air purifying
respirator with organic vapor
cartridges

ASR = Full face air supplied
respirator with escape bottle

SCBA = Self-contained breathing
apparatus

7.2 Hazard Assessment for Selection of Personal Protective Equipment

The initial selection of personal protective equipment for each task was done by performing a hazard assessment taking into consideration the following:

- Potential chemical and physical present;
- Work operations to be performed;
- Potential routes of exposure;
- Concentrations of contaminants present; and
- Characteristics, capabilities and limitations of PPE and any hazard that the PPE presents or magnifies.

A review of the analytical data from previous sampling events indicates that VOCs identified in Table 5-1 are the primary contaminants of concern.

The exposure routes for these chemicals are inhalation, skin absorption, skin/eye contact and ingestion. Chemical protective gloves will be required for all activities that involve sample handling and the likelihood for skin contact. The proper use of PPE and strict adherence to decontamination and personal hygiene procedures will effectively minimize skin contact and ingestion as potential routes of exposure.

Table 7-1
Personal Protective Equipment Selection

7.3 Respirator Cartridge Change-Out Schedule

A respirator cartridge change-out schedule has been developed in order to comply with 29 CFR. If the use of respirators is necessary, the respirator cartridge change-out schedule for this project

| TASK | HEAD | EYE/FACE | FEET | HANDS | BODY | HEARING | RESPIRATOR |
|--|------|----------|------|-------------------------------|-------------------------|---------|--|
| Mobilization/ Demobilization | HH | SG | STB | WG | WC | None | None |
| Monitoring Well / Vapor Point Installation | HH | SG | STB | WG, Nit & Sur as needed | WC, Tyvek® as needed | None | None initially APR if action levels exceeded |
| Soil and groundwater sampling | HH | SG | STB | WG, Nit & Sur as needed | WC, Tyvek® as needed | None | None initially APR if action levels exceeded |
| Decontamination | HH | SG | STB | Nit + Sur | WC, Tyvek® as needed | None | None initially APR if action levels exceeded |

will be as follows:

1. Cartridges shall be removed and disposed of at the end of each shift, when cartridges become wet or wearer experiences breakthrough, whichever occurs first; and
2. If the humidity exceeds 85%, then cartridges shall be removed and disposed of after 4 hours of use.

Respirators shall not be stored at the end of the shift with contaminated cartridges left on. Cartridges shall not be worn on the second day, no matter how short of time period they were used the day before.

The schedule was developed based on the following scientific information and assumptions:

- Analytical data that is available regarding site contaminants;
- Using the Rule of Thumb provided by the AIHA;
- All of the chemicals have boiling points greater than 70°C;
- Total airborne concentration of contaminants is anticipated to be less than 200 ppm;

- The humidity is expected to be less than 85%; and
- Desorption of the contaminants (including those with poor warning properties) after partial use of the chemical cartridge can occur after a short period (hours) without use (eg, overnight) and result in a non-use exposure.

The following is a partial list of factors that may affect the usable cartridge service life and/or the degree of respiratory protection attainable under actual workplace conditions. These factors have been considered when developing the cartridge change-out schedule.

Type of contaminant(s);

- Contaminant concentration;
- Relative humidity;
- Breathing rate; Temperature; Changes in contaminant concentration, humidity, breathing rate and temperature;
- Mixtures of contaminants;
- Accuracy in the determination of the conditions;
- The contaminant concentration in the workplace can vary greatly. Consideration must be given to the quality of the estimate of the workplace concentration;
- Storage conditions between multiple uses of the same respirator cartridges. It is recommended that the chemical cartridges be replaced after each work shift. Contaminants adsorbed on a cartridge can migrate through the carbon bed without airflow;
- Age of the cartridge;
- Condition of the cartridge and respirator;
- Respirator and cartridge selection respirator fit;
- Respirator assembly, operation, and maintenance;
- User training, experience and medical fitness;
- Warning properties of the contaminant; and
- The quality of the warning properties should be considered when establishing the chemical cartridge change schedule. Good warning properties may provide a secondary or back-up indication for cartridge change-out.

8.0 AIR MONITORING

Air monitoring will be performed for protection for on-site workers and the downwind community (i.e., off-site receptors including residences, businesses, and on-site workers not directly involved in the remedial work) from potential airborne contaminant releases resulting from remedial activities at the site. Air monitoring will be used to help to confirm that the remedial work will not spread contamination off-site through the air. Site monitoring with a photoionization detector (PID) will be performed during any invasive activities.

Real-time monitoring for dust and VOCs will be conducted both within the work area, and along the site perimeter, during intrusive activities such as excavation activities.

9.0 ZONES, PROTECTION AND COMMUNICATION

9.1 Site Control

Site zones are intended to control the potential spread of contamination throughout the site and to assure that only authorized individuals are permitted into potentially hazardous areas. A three-zone approach will be utilized. It shall include an Exclusion Zone (EZ), Contamination Reduction Zone (CRZ) and a Support Zone (SZ). Specific zones shall be established on the work site when operations begin.

This project is a hazardous waste remediation project, and any person working in an area where the potential for exposure to site contaminants exists, will only be allowed access after providing the FTL/SHSO with proper training and medical documentation.

The zones are based upon current knowledge of proposed site activities. It is possible that the zone configurations may be altered due to work plan revisions. Should this occur, the work zone will be adjusted accordingly, and documented through use of a field-change request form.

The following shall be used for guidance in revising these preliminary zone designations, if necessary.

Support Zone - The SZ is an uncontaminated area that will be the field support area for most operations. The SZ provides for field team communications and staging for emergency response. Appropriate safety equipment will be located in this zone. Potentially contaminated personnel/materials are not allowed in this zone. The only exception will be appropriately packaged/decontaminated and labeled samples.

Contamination Reduction Zone - The CRZ is established between the EZ and the SZ. The CRZ contains the contamination reduction corridor and provides for an area for decontamination of personnel and portable hand-held equipment, tools and heavy equipment. A personnel decontamination area will be prepared at each exclusion zone. The CRZ will be used for EZ entry and egress in addition to access for heavy equipment and emergency support services.

Exclusion Zone - All activities, which may involve exposure to site contaminants, hazardous materials and/or conditions, should be considered an EZ. The FTL/SHSO may establish more than one EZ where different levels of protection may be employed or different hazards exist. The size

of the EZ shall be determined by the site HSO allowing adequate space for the activity to be completed, field members and emergency equipment.

9.2 Contamination Control

Decontamination areas will be established for drilling/sampling activities.

9.2.1 Personnel Decontamination Station

All personnel and portable equipment used in the EZ shall be subject to a thorough decontamination process, as deemed necessary by the FTL/SHSO. Sampling equipment shall be decontaminated. As necessary, all boots and gloves will be decontaminated using soap and water solution and scrub brushes or simple removal and disposal. All used respiratory protective equipment will be decontaminated daily and sanitized with appropriate sanitizer solution.

All drums generated as a result of sampling and decontamination activities will be marked and stored at a designated area at the site until the materials can be properly disposed of off-site.

All non-expendable sampling equipment will be decontaminated. This usually entails the use of Alconox, solvent and distilled/deionized water rinses to eliminate contaminants.

9.3 Communication

- Each team member will have a cell phone/radio for communication with the PM, HSO and other team members during field activities.
- Hand Signals - Hand signals shall be used by field teams, along with the buddy system. The entire field team shall know them before operations commence and their use covered during site- specific training. Typical hand signals are the following:

SIGNAL

Hand gripping throat
Grip on a partner's wrist or placement of both hands around a partner's waist.
Hands on top of head
Thumbs up
Thumbs down

MEANING

Out of air, can't breathe
Leave the area immediately, no debate.
Need assistance
Okay, I'm all right, I understand.
No, negative.

10.0 MEDICAL SURVEILLANCE PROCEDURES

All contractor and subcontractor personnel performing field work where potential exposure to contaminants exists at the site are required to have passed a complete medical surveillance examination in accordance with 29 CFR 1910.120(f).

10.1 Medical Surveillance Requirements

A physician's medical release for work will be confirmed by the HSM before an employee can work in the exclusion zone. The examination will be taken annually at a minimum and upon termination of hazardous waste site work if the last examination was not taken within the previous six months.

Additional medical testing may be required by the HSM in consultation with the Corporate Medical Consultant and the FTL/SHSO if an over-exposure or accident occurs, if an employee exhibits symptoms of exposure, or if other site conditions warrant further medical surveillance.

10.2 Medical Data Sheet

A medical data sheet is provided in Appendix D. This medical data sheet is voluntary and should be completed by all on-site personnel and will be maintained at the site. Where possible, this medical data sheet will accompany the personnel needing medical assistance. The medical data sheet will be maintained in a secure location, treated as confidential, and used only on a need-to-know basis.

11.0 SAFETY CONSIDERATIONS

11.1 General Health and Safety Work Practices

A list of general health and safety work practices is included as an included in Appendix E. The work rules will be posted in a conspicuous location at the site.

11.2 The Buddy System

At a minimum, employees shall work in groups of two in such a manner that they can observe each other and maintain line-of-sight for each employee within the work group. The purpose of the buddy system is to provide rapid assistance to employees in the event of an emergency.

11.3 Sample Handling

Personnel responsible for the handling of samples should wear the prescribed level of protection. Samples should be identified as to their hazard and packaged as to prevent spillage or breakage. Sample containers shall be decontaminated in the CRZ or EZ before entering a clean Support Zone area. Any unusual sample conditions, odors, or real-time readings should be noted. Laboratory personnel should be advised of sample hazard level and the potential contaminants present. This can be accomplished by a phone call to the lab coordinator and/or including a written statement with the samples reviewing lab safety procedures in handling, in order to assure that the practices are appropriate for the suspected contaminants in the sample.

11.4 Excavation

Excavations will be conducted in accordance with the requirements contained in 29 CFR 1926, Subpart P-Excavations. It provides for the designation of a "Competent Person" and general

requirements for safe excavating practices. The program also incorporates company standards for the monitoring of potentially hazardous atmospheres; protection from water hazards; analyzing and maintaining the stability of adjacent structures; daily competent person inspections; soil classification; sloping and benching; protective systems; and training.

The Competent Person will be the FTL or other designee with appropriate training and experience. The Competent Person will be assisted in his/her duties by other technical personnel such as the HSM, geologists, structural engineers and soils engineers.

12.0 DISPOSAL PROCEDURES

All discarded materials, waste materials or other objects shall be handled in such a way as to preclude the potential for spreading contamination, creating a sanitary hazard or causing litter to be left on site.

All potentially contaminated materials, e.g., clothing, gloves, etc., will be bagged or drummed as necessary, labeled and segregated for disposal. All non-contaminated materials will be collected and bagged for appropriate disposal as non-hazardous solid waste. Additional waste disposal procedures may be developed as applicable.

13.0 EMERGENCY RESPONSE PLAN

This section establishes procedures and provides information for use during a project emergency. Emergencies happen unexpectedly and quickly, and require an immediate response; therefore, contingency planning and advanced training of staff is essential. Specific elements of emergency support procedures which are addressed in the following subsections include communications, local emergency support units, preparation for medical emergencies, first aid for injuries incurred on site, record keeping, and emergency site evacuation procedures.

13.1 Responsibilities

13.1.1 Health and Safety Manager (HSM)

The HSM oversees and approves the Emergency Response/Contingency Plan and performs audits to determine that the plan is in effect and that all pre-emergency requirements are met. The HSM acts as a liaison to applicable regulatory agencies and notifies OSHA of reportable accidents.

13.1.2 Field Team Leader/Site Health and Safety Officer (FTL/HSO)

The FTL/SHSO is responsible for ensuring that all personnel are evacuated safely and that machinery and processes are shut down or stabilized in the event of a stop work order or evacuation. The FTL/SHSO is required to immediately notify the HSM of any fatalities or catastrophes (three or more workers injured and hospitalized) so that the HSM can ensure that OSHA is notified within the required time frame. The HSM will be notified of all OSHA recordable injuries, fires, spills, releases or equipment damage in excess of \$500 within 24 hours.

13.1.3 Emergency Coordinator

The Emergency Coordinator for the project is the FTL/SHSO.

The Emergency Coordinator shall make contact with Local Emergency Response personnel prior to beginning work on site. In these contacts the emergency coordinator will inform interested parties about the nature and duration of work expected on the site and the type of contaminants and possible health or safety effects of emergencies involving these contaminants. The emergency coordinator will locate emergency phone numbers and identify hospital routes prior to beginning work on site. The emergency coordinator shall make necessary arrangements to be prepared for any emergencies that could occur.

The Emergency Coordinator will implement the Emergency Response/Contingency Plan whenever conditions at the site warrant such action.

13.1.4 Site Personnel

Site personnel are responsible for knowing the Emergency Response/Contingency Plan and the procedures contained herein. Personnel are expected to notify the Emergency Coordinator of situations that could constitute a site emergency.

13.2 Communication

A variety of communication systems may be utilized during emergency situations. These are discussed in the following sections.

13.2.1 Hand Signals

Downrange field teams will employ hand signals where necessary for communication during emergency situations. Hand signals are found in Section 8.3.

13.2.2 Field Radios and Cell Phones

Castleton field personnel are provided cellular phones for site communication and emergency use.

13.3 Local Emergency Support Units

A route map from the site to the nearest hospital can be found in Appendix F. This map will be placed with the above emergency telephone numbers in all on-site vehicles.

13.4 Pre-Emergency Planning

Castleton will communicate directly with administrative personnel from the emergency room at the hospital to determine whether the hospital has the facilities and personnel needed to treat cases of trauma resulting from exposure to any of the contaminants expected to be found on the site.

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Instructions for finding the hospital will be posted conspicuously in the site office and in each site vehicle.

Before the field activities begin, the local emergency response personnel will be notified of the schedule for field activities and about the materials that are thought to exist on the site so that they will be able to respond quickly and effectively in the event of a fire, explosion, or other emergency. Before fieldwork on the site commences, each person who will be working there or observing the operations will complete a medical data sheet (Appendix D). These data sheets will be filled out during site-specific training and will be kept on the site.

In the event of an incident where a team member becomes exposed or suffers from an acute symptom of exposure to site materials and has to be taken to a hospital, a copy of his/her medical data sheet will be presented to the attending physician.

Table 13-1
Emergency Telephone Numbers

| Contact | Firm or Agency | Telephone Number |
|---|--------------------------------|------------------|
| Police | | 911 |
| Fire | | 911 |
| Hospital | New York Presbyterian Hospital | (866) 463-2778 |
| Ambulance | | 911 |
| Project Manager/Health and Safety Manager | Jessica Ferngren Castleton | (631) 416-2660 |
| Health & Safety Officer | Charles Lambert Castleton | (631) 416-4309 |
| Poison Control Center | | (800) 962-1253 |
| Chemtrec | | (800) 424-9300 |

13.5 Emergency Medical Treatment

The procedures and rules in this HASP are designed to prevent employee injury. However, should an injury occur, no matter how slight, it will be reported to the FTL/SHSO immediately. First aid equipment will be available on site at the following locations:

- First Aid Kit: Support Zone (or designated by FTL/SHSO upon arrival)
- Emergency Eye Wash: Support Zone (or designated by FTL/SHSO upon arrival)

During site-specific training, project personnel will be informed of the location of the first aid station(s) that has been set up. Unless they are in immediate danger, severely injured persons will not be moved until paramedics can attend to them. Some injuries, such as severe cuts and lacerations or burns, may require immediate treatment. Any first aid instructions that can be obtained from doctors or paramedics, before an emergency-response squad arrives at the site or before the injured person can be transported to the hospital, will be followed closely.

There will be at least two people with current First Aid and CPR certification on each active work shift. When personnel are transported to the hospital, the FTL/SHSO will provide a copy of the Medical Data Sheet to the paramedics and treating physician.

Only in non-emergency situations will an injured person be transported to the hospital by means other than an ambulance. A map and directions to the hospital can be found in Appendix F.

13.6 Emergency Site Evacuation Routes and Procedures

In order to mobilize the manpower resources and equipment necessary to cope with a fire or other emergency, a clear chain of authority will be established. The EC will take charge of all emergency response activities and dictate the procedures that will be followed for the duration of the emergency. The EC will report immediately to the scene of the emergency, assess the seriousness of the situation, and direct whatever efforts are necessary until the emergency response units arrive. At his/her discretion, the EC also may order the closure of the site for an indefinite period.

All project personnel will be instructed on proper emergency response procedures and locations of emergency telephone numbers during the initial site safety meeting. If an emergency occurs, including but not limited to fire, explosion or significant release of toxic gas into the atmosphere, an air horn will be sounded on the site. The horn will sound continuously for one blast, signaling that immediate evacuation of all personnel is necessary due to an immediate or impending danger. All heavy equipment will be shut down and all personnel will evacuate the work areas and assemble at the evacuation meeting point, which will be determined upon arrival at the site by the FTL/SHSO, prior to work beginning. This will then be conveyed to all crew members during the site-specific briefing.

The EC will give directions for implementing whatever actions are necessary. Any project team member may be assigned to be in charge of emergency communications during an emergency. He/she will attend the site telephone specified by the EC from the time the alarm sounds until the emergency has ended.

After sounding the alarm and initiating emergency response procedures, the EC will check and verify that access roads are not obstructed. If traffic control is necessary, as in the event of a fire or explosion, a project team member, who has been trained in these procedures and designated at the site safety meeting, will take over these duties until local police and fire fighters arrive.

The EC will remain at the site to provide any assistance requested by emergency-response squads as they arrive to deal with the situation. A map showing evacuation routes, meeting places and the location of emergency equipment will be posted in all trailers and used during site-specific training.

13.7 Fire Prevention and Protection

In the event of a fire or explosion, procedures will include immediately evacuating the site (air horn will sound for a single continuous blast), and notification of local fire and police departments. No personnel will fight a fire beyond the stage where it can be put out with a portable extinguisher (incipient stage).

13.8.1 Fire Prevention

Adhering to the following precautions will prevent fires:

- Good housekeeping and storage of materials;
- Storage of flammable liquids and gases away from oxidizers;
- No smoking in the exclusion zone or any work area;
- No hot work without a properly executed hot work permit;
- Shutting off engines to refuel;
- Grounding and bonding metal containers during transfer of flammable liquids;
- Use of UL approved flammable storage cans;
- Fire extinguishers rated at least 10 pounds ABC located on all heavy equipment, in all trailers and near all hot work activities; and
- Monthly inspections of all fire extinguishers.

13.8 Overt Chemical Exposure

The following are standard procedures to treat chemical exposures. Other, specific procedures detailed on the Safety Data Sheet or recommended by the Corporate Medical Consultant will be followed, when necessary.

SKIN AND EYE CONTACT: Use copious amounts of soap and water. Wash/rinse affected areas thoroughly, and then provide appropriate medical attention. Eyes should be rinsed for 15

minutes upon chemical contamination. Skin should also be rinsed for 15 minutes if contact with caustics, acids or hydrogen peroxide occurs.

INHALATION: Move to fresh air. Decontaminate and transport to hospital or local medical provider.

INGESTION: Decontaminate and transport to emergency medical facility.

PUNCTURE WOUND OR LACERATION: Decontaminate and transport to emergency medical facility.

13.9 Decontamination during Medical Emergencies

If emergency life-saving first aid and/or medical treatment is required, normal decontamination procedures may need to be abbreviated or postponed. The FTL/SHSO or designee will accompany contaminated victims to the medical facility to advise on matters involving decontamination, when necessary. The outer garments can be removed if they do not cause delays, interfere with treatment or aggravate the problem. Respiratory equipment must always be removed. Protective clothing can be cut away. If the outer contaminated garments cannot be safely removed on-site, a plastic barrier placed between the injured individual and clean surfaces should be used to help prevent contamination of the inside of ambulances and/or medical personnel. Outer garments may then be removed at the medical facility. No attempt will be made to wash or rinse the victim if his/her injuries are life threatening, unless it is known that the individual has been contaminated with an extremely toxic or corrosive material which could also cause severe injury or loss of life to emergency response personnel. For minor medical problems or injuries, the normal decontamination procedures will be followed.

13.10 Accident/Incident Reporting

As soon as first aid and/or emergency response needs have been met, the following parties are to be contacted by telephone:

- Health and Safety Manager;
- Project Manager; and
- The employer of any injured worker who is not a Castleton employee

Written confirmation of verbal reports are to be completed by the FTL/SHSO using the Incident Report Form and submitted within 24 hours. The incident report and investigation form is found in Appendix G. If the employee involved is not a Castleton employee, his employer will receive a copy of the report.

13.11 Adverse Weather Conditions

In the event of adverse weather conditions, the FTL/SHSO will determine if work can continue without potentially risking the safety of all field workers. Some of the items to be considered prior to determining if work should continue are:

- Potential for heat stress and heat-related injuries;
- Potential for cold stress and cold-related injuries;
- Treacherous weather-related working conditions (hail, rain, snow, ice, high winds);
- Limited visibility (fog);
- Potential for electrical storms;
- Earthquakes; and
- Other major incidents.

Site activities will be limited to daylight hours, or when suitable artificial light is provided, and acceptable weather conditions prevail. The FTL/SHSO will determine the need to cease field operations or observe daily weather reports and evacuate, if necessary, in case of severe inclement weather conditions.

13.12 Spill Control and Response

All small hazardous spills/environmental releases shall be contained as close to the source as possible. Whenever possible, the MSDS will be consulted to assist in determining the best means of containment and cleanup. For small spills, sorbent materials such as sand, sawdust or commercial sorbents should be placed directly on the substance to contain the spill and aid recovery. Any acid spills should be diluted or neutralized carefully prior to attempting recovery. Berms of earthen or sorbent materials can be used to contain the leading edge of the spills. Drains or drainage areas should be blocked. All spill containment materials will be properly disposed. An exclusion zone of 50 to 100 feet around the spill area should be established depending on the size of the spill. The following seven steps should be taken by the Emergency Coordinator:

- Determine the nature, identity and amounts of major spill components;
- Make sure all unnecessary persons are removed from the spill area;
- Notify appropriate response teams and authorities;
- Use proper PPE in consultation with the FTL/SHSO;
- If a flammable liquid, gas or vapor is involved, remove all ignition sources and use non-sparking and/or explosive proof equipment to contain or clean up the spill (diesel only vehicles, air operated pumps, etc.);
- If possible, try to stop the leak with appropriate material; and,
- Remove all surrounding materials that can react or compound with the spill.

13.13 Emergency Equipment

The following minimum emergency equipment shall be kept and maintained on-site:

- Industrial first aid kit;
- Burn kit and portable eye washes (one per field team);

- Fire extinguishers (one per work area); and
- Absorbent material /spill kit.

14.0 TRAINING

14.1 General Health and Safety Training

In accordance with Castleton corporate policy, and pursuant to 29 CFR 1910.120, hazardous waste site workers shall, at the time of job assignment, have received a minimum of 40 hours of initial health and safety training for hazardous waste site operations unless otherwise noted in the above reference. At a minimum, the training shall have consisted of instruction in the topics outlined in the standard.

Personnel who have not met the requirements for initial training shall not be allowed to work in any site activities in which they may be exposed to hazards (chemical or physical).

14.1.1 *Three Day Supervised On the Job Training*

In addition to the required initial hazardous waste operations training, each employee shall have received three days of directly supervised on-the-job training. This training will address the duties the employees are expected to perform.

14.2 Annual Eight-Hour Refresher Training

Annual eight-hour refresher training will be required of all hazardous waste site field personnel in order to maintain their qualifications for fieldwork. The training will cover a review of 1910.120 requirements and related company programs and procedures.

14.3 Site-Specific Training

Prior to commencement of field activities, all field personnel assigned to the project will have completed training that will specifically address the activities, procedures, monitoring, and equipment used in the site operations. It will include site and facility layout, hazards and emergency services at the site, and will highlight all provisions contained within this HASP. This training will also allow field workers to clarify anything they do not understand and to reinforce their responsibilities regarding safety and operations for their particular activity.

14.4 On-Site Safety Briefings

Project personnel and visitors will be given on-site health and safety briefings daily by the FTL/SHSO to assist site personnel in safely conducting their work activities. A copy of the Daily Briefing Sign-In Sheet is contained in Appendix H. The briefings will include information on new operations to be conducted, changes in work practices or changes in the site's environmental conditions, as well as periodic reinforcement of previously discussed topics. The briefings will also provide a forum to facilitate conformance with safety requirements and to identify performance deficiencies related to safety during daily activities or as a result of safety

inspections. The meetings will also be an opportunity to periodically update the crews on monitoring results. Prior to starting any new activity, a training session using the Activity Hazard Analysis will be held for crew members involved in the activity.

14.5 First Aid and CPR

The HSM will identify those individuals requiring first aid and CPR training to ensure that emergency medical treatment is available during field activities. It is anticipated that a minimum of one field person on-site at any one time will have first aid and CPR training. The training will be consistent with the requirements of the American Red Cross Association or American Heart Association. If none are available on-site, then the HSM shall be notified.

14.6 Supervisory Training

Supervisors and health and safety personnel shall have completed an additional eight hours of specialized training in accordance with 29 CFR 1910.120.

15.0 LOGS, REPORTS AND RECORDKEEPING

Changes to the HASP will be documented in the Health and Safety log book and as appropriate, the HSM and/or PM will be notified. Daily tailgate meetings will be documented in the H&S log book as well as personnel on-site.

15.1 Medical and Training Records

Copies or verification of training (40-hour, 8-hour, supervisor, site-specific training and documentation of three-day OJT) and medical clearance for hazardous waste site work and respirator use will be maintained on-site. Records for all subcontractor employees will also be kept on-site.

15.2 Incident Report and Investigation Form

The incident report and investigation form is to be completed for all accidents and incidents, including near misses. The form can be found in Appendix G.

15.3 Health and Safety Logbooks

The FTL/SHSO will maintain a logbook during site work. The daily site conditions, personnel, monitoring results and significant events will be recorded. The original logbooks will become part of the exposure records file.

RENU Engineering Technologies, PC

16.0 FIELD PERSONNEL REVIEW

This form serves as documentation that field personnel have read, or have been informed of, and understand the provisions of the HASP. It is maintained on site by the FTL/SHSO as a project record. Each field team member shall sign this section after site-specific training is completed and before being permitted to work on site.

I have read, or have been informed of, the Health and Safety Plan and understand the information presented. I will comply with the provisions contained therein.

| <i>Name (Print and Sign)</i> | <i>Date</i> |
|------------------------------|-------------|
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APPENDIX A SAFETY DATA SHEETS

SAFETY DATA SHEET

Creation Date 10-Dec-2009

Revision Date 23-Jan-2018

Revision Number 5

1. Identification

Product Name Tetrachloroethylene

Cat No. : AC445690000; ACR445690010; AC445690025; AC445691000

CAS-No 127-18-4
Synonyms Perchloroethylene

Recommended Use Laboratory chemicals.
Uses advised against Not for food, drug, pesticide or biocidal product use

Details of the supplier of the safety data sheet

Company

Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

Emergency Telephone Number

For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US**:001-201-796-7100 / **Europe**: +32 14 57 52 99
CHEMTREC Tel. No.**US**:001-800-424-9300 / **Europe**:001-703-527-3887

2. Hazard(s) identification

Classification

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

| | |
|--|-------------|
| Skin Corrosion/irritation | Category 2 |
| Serious Eye Damage/Eye Irritation | Category 2 |
| Skin Sensitization | Category 1 |
| Carcinogenicity | Category 1B |
| Specific target organ toxicity (single exposure) | Category 3 |
| Target Organs - Central nervous system (CNS). | |
| Specific target organ toxicity - (repeated exposure) | Category 2 |
| Target Organs - Kidney, Liver, Blood. | |

Label Elements

Signal Word

Danger

Hazard Statements

Causes skin irritation
Causes serious eye irritation
May cause an allergic skin reaction
May cause drowsiness or dizziness
May cause cancer
May cause damage to organs through prolonged or repeated exposure

**Precautionary Statements****Prevention**

Obtain special instructions before use
 Do not handle until all safety precautions have been read and understood
 Use personal protective equipment as required
 Wash face, hands and any exposed skin thoroughly after handling
 Contaminated work clothing should not be allowed out of the workplace
 Do not breathe dust/fume/gas/mist/vapors/spray
 Use only outdoors or in a well-ventilated area
 Wear protective gloves/protective clothing/eye protection/face protection

Response

IF exposed or concerned: Get medical attention/advice

Inhalation

IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing

Skin

IF ON SKIN: Wash with plenty of soap and water
 Take off contaminated clothing and wash before reuse
 If skin irritation or rash occurs: Get medical advice/attention

Eyes

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
 If eye irritation persists: Get medical advice/attention

Storage

Store locked up
 Store in a well-ventilated place. Keep container tightly closed

Disposal

Dispose of contents/container to an approved waste disposal plant

Hazards not otherwise classified (HNOC)

Toxic to aquatic life with long lasting effects

WARNING. Cancer - <https://www.p65warnings.ca.gov/>.

3. Composition/Information on Ingredients

| Component | CAS-No | Weight % |
|---------------------|----------|----------|
| Tetrachloroethylene | 127-18-4 | >95 |

4. First-aid measures

| | |
|-----------------------|---|
| General Advice | If symptoms persist, call a physician. |
| Eye Contact | Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get medical attention. |
| Skin Contact | Wash off immediately with plenty of water for at least 15 minutes. If skin irritation persists, call a physician. |
| Inhalation | Move to fresh air. If not breathing, give artificial respiration. Get medical attention if symptoms occur. |
| Ingestion | Clean mouth with water and drink afterwards plenty of water. |

| | |
|--|---|
| Most important symptoms and effects | None reasonably foreseeable. May cause allergic skin reaction. Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting: Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling of the hands and feet, dizziness, lightheadedness, chest pain, muscle pain or flushing |
| Notes to Physician | Treat symptomatically |

5. Fire-fighting measures

| | |
|---|--|
| Suitable Extinguishing Media | Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide. |
| Unsuitable Extinguishing Media | No information available |
| Flash Point | No information available |
| Method - | No information available |
| Autoignition Temperature | No information available |
| Explosion Limits | |
| Upper | No data available |
| Lower | No data available |
| Sensitivity to Mechanical Impact | No information available |
| Sensitivity to Static Discharge | No information available |

Specific Hazards Arising from the Chemical

Thermal decomposition can lead to release of irritating gases and vapors. Containers may explode when heated.

Hazardous Combustion Products

Chlorine Hydrogen chloride gas Phosgene

Protective Equipment and Precautions for Firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

| | | | |
|---------------|---------------------|--------------------|-------------------------|
| Health | Flammability | Instability | Physical hazards |
| 2 | 0 | 0 | N/A |

6. Accidental release measures

| | |
|----------------------------------|---|
| Personal Precautions | Use personal protective equipment. Ensure adequate ventilation. |
| Environmental Precautions | Do not flush into surface water or sanitary sewer system. |

Methods for Containment and Clean Up Soak up with inert absorbent material. Keep in suitable, closed containers for disposal.

7. Handling and storage

| | |
|-----------------|---|
| Handling | Wear personal protective equipment. Do not get in eyes, on skin, or on clothing. Ensure adequate ventilation. Avoid ingestion and inhalation. |
| Storage | Keep containers tightly closed in a dry, cool and well-ventilated place. Protect from sunlight. |

8. Exposure controls / personal protection

Exposure Guidelines

| Component | ACGIH TLV | OSHA PEL | NIOSH IDLH | Mexico OEL (TWA) |
|---------------------|------------------------------|---|---------------|--|
| Tetrachloroethylene | TWA: 25 ppm STEL: 100 ppm | (Vacated) TWA: 25 ppm (Vacated) TWA: 170 mg/m ³ Ceiling: 200 ppm TWA: 100 ppm | IDLH: 150 ppm | TWA: 100 ppm TWA: 670 mg/m ³ TWA: 200 ppm TWA: 1250 mg/m ³ STEL: 200 ppm STEL: 1340 mg/m ³ |

Legend

ACGIH - American Conference of Governmental Industrial Hygienists

OSHA - Occupational Safety and Health Administration

NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health

Engineering Measures

Use only under a chemical fume hood. Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment

Eye/face Protection

Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection

Long sleeved clothing.

Respiratory Protection

Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

| | |
|--|--|
| Physical State | Liquid |
| Appearance | Colorless |
| Odor | Characteristic, sweet |
| Odor Threshold | No information available |
| pH | No information available |
| Melting Point/Range | -22 °C / -7.6 °F |
| Boiling Point/Range | 120 - 122 °C / 248 - 251.6 °F @ 760 mmHg |
| Flash Point | No information available |
| Evaporation Rate | 6.0 (Ether = 1.0) |
| Flammability (solid,gas) | Not applicable |
| Flammability or explosive limits | |
| Upper | No data available |
| Lower | No data available |
| Vapor Pressure | 18 mbar @ 20 °C |
| Vapor Density | No information available |
| Density | 1.619 |
| Specific Gravity | 1.625 |
| Solubility | 0.15 g/L water (20°C) |
| Partition coefficient; n-octanol/water | No data available |
| Autoignition Temperature | No information available |
| Decomposition Temperature | > 150°C |
| Viscosity | 0.89 mPa s at 20 °C |
| Molecular Formula | C ₂ Cl ₄ |
| Molecular Weight | 165.83 |

10. Stability and reactivity

| | |
|---|--|
| Reactive Hazard | None known, based on information available |
| Stability | Stable under normal conditions. |
| Conditions to Avoid | Incompatible products. Excess heat. Exposure to moist air or water. |
| Incompatible Materials | Strong acids, Strong oxidizing agents, Strong bases, Metals, Zinc, Amines, Aluminium |
| Hazardous Decomposition Products | Chlorine, Hydrogen chloride gas, Phosgene |
| Hazardous Polymerization | Hazardous polymerization does not occur. |
| Hazardous Reactions | None under normal processing. |

11. Toxicological information

Acute Toxicity

Product Information Component Information

| Component | LD50 Oral | LD50 Dermal | LC50 Inhalation |
|---------------------|---------------------------|--------------------------|------------------------------|
| Tetrachloroethylene | LD50 = 2629 mg/kg (Rat) | LD50 > 10000 mg/kg (Rat) | LC50 = 27.8 mg/L (Rat) 4 h |

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation Irritating to eyes and skin

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

| Component | CAS-No | IARC | NTP | ACGIH | OSHA | Mexico |
|---------------------|----------|----------|------------------------|-------|------|--------|
| Tetrachloroethylene | 127-18-4 | Group 2A | Reasonably Anticipated | A3 | X | A3 |

IARC: (International Agency for Research on Cancer)

IARC: (International Agency for Research on Cancer)

Group 1 - Carcinogenic to Humans

Group 2A - Probably Carcinogenic to Humans

Group 2B - Possibly Carcinogenic to Humans

NTP: (National Toxicity Program)

Known - Known Carcinogen

Reasonably Anticipated - Reasonably Anticipated to be a Human Carcinogen

A1 - Known Human Carcinogen

A2 - Suspected Human Carcinogen

A3 - Animal Carcinogen

ACGIH: (American Conference of Governmental Industrial Hygienists)

ACGIH: (American Conference of Governmental Industrial Hygienists)

Mexico - Occupational Exposure Limits - Carcinogens

Mexico - Occupational Exposure Limits - Carcinogens

A1 - Confirmed Human Carcinogen

A2 - Suspected Human Carcinogen

A3 - Confirmed Animal Carcinogen

A4 - Not Classifiable as a Human Carcinogen

A5 - Not Suspected as a Human Carcinogen

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure Central nervous system (CNS)

STOT - repeated exposure Kidney Liver Blood

Aspiration hazard No information available

Symptoms / effects, both acute and delayed Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting: Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling of the hands and feet, dizziness, lightheadedness, chest pain, muscle pain or flushing

Endocrine Disruptor Information

| Component | EU - Endocrine Disruptors Candidate List | EU - Endocrine Disruptors - Evaluated Substances | Japan - Endocrine Disruptor Information |
|---------------------|--|--|---|
| Tetrachloroethylene | Group II Chemical | Not applicable | Not applicable |

Other Adverse Effects Tumorigenic effects have been reported in experimental animals.

12. Ecological information

Ecotoxicity

Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. The product contains following substances which are hazardous for the environment.

| Component | Freshwater Algae | Freshwater Fish | Microtox | Water Flea |
|---------------------|---|---|--|--|
| Tetrachloroethylene | EC50: > 500 mg/L, 96h (Pseudokirchneriella subcapitata) | LC50: 4.73 - 5.27 mg/L, 96h flow-through (Oncorhynchus mykiss) LC50: 11.0 - 15.0 mg/L, 96h static (Lepomis macrochirus) LC50: 8.6 - 13.5 mg/L, 96h static (Pimephales promelas) LC50: 12.4 - 14.4 mg/L, 96h flow-through (Pimephales promelas) | EC50 = 100 mg/L 24 h EC50 = 112 mg/L 24 h EC50 = 120.0 mg/L 30 min | EC50: 6.1 - 9.0 mg/L, 48h Static (Daphnia magna) |

Persistence and Degradability Insoluble in water Persistence is unlikely based on information available.

Bioaccumulation/ Accumulation No information available.

Mobility . Is not likely mobile in the environment due its low water solubility. Will likely be mobile in the environment due to its volatility.

| Component | log Pow |
|---------------------|-------------|
| Tetrachloroethylene | 2.53 - 2.88 |

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

| Component | RCRA - U Series Wastes | RCRA - P Series Wastes |
|--------------------------------|------------------------|------------------------|
| Tetrachloroethylene - 127-18-4 | U210 | - |

14. Transport information

DOT

UN-No UN1897
Proper Shipping Name TETRACHLOROETHYLENE
Hazard Class 6.1
Packing Group III

TDG

UN-No UN1897

| | |
|-------------------------|---------------------|
| Proper Shipping Name | TETRACHLOROETHYLENE |
| Hazard Class | 6.1 |
| Packing Group | III |
| IATA | |
| UN-No | UN1897 |
| Proper Shipping Name | TETRACHLOROETHYLENE |
| Hazard Class | 6.1 |
| Packing Group | III |
| IMDG/IMO | |
| UN-No | UN1897 |
| Proper Shipping Name | TETRACHLOROETHYLENE |
| Hazard Class | 6.1 |
| Subsidiary Hazard Class | P |
| Packing Group | III |

15. Regulatory information

All of the components in the product are on the following Inventory lists: X = listed

International Inventories

| Component | TSCA | DSL | NDSL | EINECS | ELINCS | NLP | PICCS | ENCS | AICS | IECSC | KECL |
|---------------------|------|-----|------|-----------|--------|-----|-------|------|------|-------|------|
| Tetrachloroethylene | X | X | - | 204-825-9 | - | | X | X | X | X | X |

Legend:

X - Listed

E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.

F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.

N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.

P - Indicates a commenced PMN substance

R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.

S - Indicates a substance that is identified in a proposed or final Significant New Use Rule

T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.

XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B)).

Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.

Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable

SARA 313

| Component | CAS-No | Weight % | SARA 313 - Threshold Values % |
|---------------------|----------|----------|-------------------------------|
| Tetrachloroethylene | 127-18-4 | >95 | 0.1 |

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act)

| Component | CWA - Hazardous Substances | CWA - Reportable Quantities | CWA - Toxic Pollutants | CWA - Priority Pollutants |
|---------------------|----------------------------|-----------------------------|------------------------|---------------------------|
| Tetrachloroethylene | - | - | X | X |

Clean Air Act

| Component | HAPS Data | Class 1 Ozone Depletors | Class 2 Ozone Depletors |
|---------------------|-----------|-------------------------|-------------------------|
| Tetrachloroethylene | X | | - |

OSHA Occupational Safety and Health Administration
Not applicable

CERCLA

This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

| Component | Hazardous Substances RQs | CERCLA EHS RQs |
|---------------------|--------------------------|----------------|
| Tetrachloroethylene | 100 lb 1 lb | - |

California Proposition 65 This product contains the following proposition 65 chemicals

| Component | CAS-No | California Prop. 65 | Prop 65 NSRL | Category |
|---------------------|----------|---------------------|--------------|------------|
| Tetrachloroethylene | 127-18-4 | Carcinogen | 14 µg/day | Carcinogen |

U.S. State Right-to-Know Regulations

| Component | Massachusetts | New Jersey | Pennsylvania | Illinois | Rhode Island |
|---------------------|---------------|------------|--------------|----------|--------------|
| Tetrachloroethylene | X | X | X | X | X |

U.S. Department of Transportation

Reportable Quantity (RQ): Y
 DOT Marine Pollutant Y
 DOT Severe Marine Pollutant N

U.S. Department of Homeland Security

This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

16. Other information

Prepared By Regulatory Affairs
 Thermo Fisher Scientific
 Email: EMSDS.RA@thermofisher.com

Creation Date 10-Dec-2009

Revision Date 23-Jan-2018

Print Date 23-Jan-2018

Revision Summary This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS

SAFETY DATA SHEET

Creation Date 03-Feb-2010

Revision Date 14-Jul-2016

Revision Number 2

1. Identification

Product Name Trichloroethylene

Cat No. : T340-4; T341-4; T341-20; T341-500; T403-4

Synonyms Trichloroethene (Stabilized/Technical/Electronic/Certified ACS)

Recommended Use Laboratory chemicals.

Uses advised against

Details of the supplier of the safety data sheet

Company

Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Emergency Telephone Number

CHEMTREC®, Inside the USA: 800-424-9300
CHEMTREC®, Outside the USA: 001-703-527-3887

2. Hazard(s) identification

Classification

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

| | |
|--|-------------|
| Skin Corrosion/irritation | Category 2 |
| Serious Eye Damage/Eye Irritation | Category 2 |
| Skin Sensitization | Category 1 |
| Germ Cell Mutagenicity | Category 2 |
| Carcinogenicity | Category 1A |
| Specific target organ toxicity (single exposure) | Category 3 |
| Target Organs - Central nervous system (CNS). | |
| Specific target organ toxicity - (repeated exposure) | Category 2 |
| Target Organs - Kidney, Liver, Heart, spleen, Blood. | |

Label Elements

Signal Word

Danger

Hazard Statements

Causes skin irritation
Causes serious eye irritation
May cause an allergic skin reaction
May cause drowsiness or dizziness
Suspected of causing genetic defects
May cause cancer
May cause damage to organs through prolonged or repeated exposure

**Precautionary Statements****Prevention**

Obtain special instructions before use
 Do not handle until all safety precautions have been read and understood
 Use personal protective equipment as required
 Wash face, hands and any exposed skin thoroughly after handling
 Contaminated work clothing should not be allowed out of the workplace
 Do not breathe dust/fume/gas/mist/vapors/spray
 Use only outdoors or in a well-ventilated area
 Wear protective gloves/protective clothing/eye protection/face protection

Response

IF exposed or concerned: Get medical attention/advice

Inhalation

IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing

Skin

IF ON SKIN: Wash with plenty of soap and water
 Take off contaminated clothing and wash before reuse
 If skin irritation or rash occurs: Get medical advice/attention

Eyes

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
 If eye irritation persists: Get medical advice/attention

Storage

Store locked up
 Store in a well-ventilated place. Keep container tightly closed

Disposal

Dispose of contents/container to an approved waste disposal plant

Hazards not otherwise classified (HNOC)

Harmful to aquatic life with long lasting effects

WARNING! This product contains a chemical known in the State of California to cause cancer, birth defects or other reproductive harm.

3. Composition / information on ingredients

| Component | CAS-No | Weight % |
|-------------------|---------|----------|
| Trichloroethylene | 79-01-6 | 100 |

4. First-aid measures

| | |
|-----------------------|---|
| General Advice | Show this safety data sheet to the doctor in attendance. Immediate medical attention is required. |
| Eye Contact | Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. In the case of contact with eyes, rinse immediately with plenty of water and seek medical advice. |
| Skin Contact | Wash off immediately with plenty of water for at least 15 minutes. Immediate medical attention is required. |
| Inhalation | Move to fresh air. If not breathing, give artificial respiration. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a |

pocket mask equipped with a one-way valve or other proper respiratory medical device. Immediate medical attention is required.

Ingestion Do not induce vomiting. Call a physician or Poison Control Center immediately.

Most important symptoms/effects None reasonably foreseeable. May cause allergic skin reaction. Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting: Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling of the hands and feet, dizziness, lightheadedness, chest pain, muscle pain or flushing

Notes to Physician Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Unsuitable Extinguishing Media No information available

Flash Point No information available
Method - No information available

Autoignition Temperature 410 °C / 770 °F

Explosion Limits

Upper 10.5 vol %

Lower 8 vol %

Oxidizing Properties Not oxidising

Sensitivity to Mechanical Impact No information available

Sensitivity to Static Discharge No information available

Specific Hazards Arising from the Chemical

Thermal decomposition can lead to release of irritating gases and vapors. Containers may explode when heated. Keep product and empty container away from heat and sources of ignition.

Hazardous Combustion Products

Hydrogen chloride gas Chlorine Phosgene Carbon monoxide (CO) Carbon dioxide (CO₂)

Protective Equipment and Precautions for Firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. Thermal decomposition can lead to release of irritating gases and vapors.

NFPA

Health
2

Flammability
1

Instability
0

Physical hazards
N/A

6. Accidental release measures

Personal Precautions Ensure adequate ventilation. Use personal protective equipment. Keep people away from and upwind of spill/leak. Evacuate personnel to safe areas.

Environmental Precautions Should not be released into the environment. Do not flush into surface water or sanitary sewer system.

Methods for Containment and Clean Up Soak up with inert absorbent material. Keep in suitable, closed containers for disposal.

7. Handling and storage

Handling Wear personal protective equipment. Do not get in eyes, on skin, or on clothing. Use only under a chemical fume hood. Do not breathe vapors or spray mist. Do not ingest.

Storage Keep containers tightly closed in a dry, cool and well-ventilated place. Protect from light. Do not store in aluminum containers.

8. Exposure controls / personal protection

Exposure Guidelines

| Component | ACGIH TLV | OSHA PEL | NIOSH IDLH | Mexico OEL (TWA) |
|-------------------|-----------------------------|--|----------------|---|
| Trichloroethylene | TWA: 10 ppm STEL: 25 ppm | (Vacated) TWA: 50 ppm (Vacated) TWA: 270 mg/m ³ Ceiling: 200 ppm (Vacated) STEL: 200 ppm (Vacated) STEL: 1080 mg/m ³ TWA: 100 ppm | IDLH: 1000 ppm | TWA: 100 ppm TWA: 535 mg/m ³ STEL: 200 ppm STEL: 1080 mg/m ³ |

Legend

ACGIH - American Conference of Governmental Industrial Hygienists

OSHA - Occupational Safety and Health Administration

NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health

Engineering Measures

Use only under a chemical fume hood. Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment

Eye/face Protection

Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection

Long sleeved clothing.

Respiratory Protection

Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

| | |
|--|-----------------------------------|
| Physical State | Liquid |
| Appearance | Colorless |
| Odor | Characteristic |
| Odor Threshold | No information available |
| pH | No information available |
| Melting Point/Range | -85 °C / -121 °F |
| Boiling Point/Range | 87 °C / 188.6 °F |
| Flash Point | No information available |
| Evaporation Rate | 0.69 (Carbon Tetrachloride = 1.0) |
| Flammability (solid,gas) | Not applicable |
| Flammability or explosive limits | |
| Upper | 10.5 vol % |
| Lower | 8 vol % |
| Vapor Pressure | 77.3 mbar @ 20 °C |
| Vapor Density | 4.5 (Air = 1.0) |
| Specific Gravity | 1.460 |
| Solubility | Slightly soluble in water |
| Partition coefficient; n-octanol/water | No data available |
| Autoignition Temperature | 410 °C / 770 °F |
| Decomposition Temperature | > 120°C |
| Viscosity | 0.55 mPa.s (25°C) |

Molecular Formula C2 H Cl3
Molecular Weight 131.39

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Light sensitive.

Conditions to Avoid Incompatible products. Excess heat. Exposure to light. Exposure to moist air or water.

Incompatible Materials Strong oxidizing agents, Strong bases, Amines, Alkali metals, Metals,

Hazardous Decomposition Products Hydrogen chloride gas, Chlorine, Phosgene, Carbon monoxide (CO), Carbon dioxide (CO₂)

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information Component Information

| Component | LD50 Oral | LD50 Dermal | LC50 Inhalation |
|-------------------|--|--|----------------------------|
| Trichloroethylene | LD50 = 4290 mg/kg (Rat) LD50 = 4920 mg/kg (Rat) | LD50 > 20 g/kg (Rabbit) LD50 = 29000 mg/kg (Rabbit) | LC50 = 26 mg/L (Rat) 4 h |

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation Irritating to eyes and skin

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

| Component | CAS-No | IARC | NTP | ACGIH | OSHA | Mexico |
|-------------------|---------|---------|------------------------|-------|------|------------|
| Trichloroethylene | 79-01-6 | Group 1 | Reasonably Anticipated | A2 | X | Not listed |

IARC: (International Agency for Research on Cancer)

NTP: (National Toxicity Program)

ACGIH: (American Conference of Governmental Industrial Hygienists)

IARC: (International Agency for Research on Cancer)

Group 1 - Carcinogenic to Humans

Group 2A - Probably Carcinogenic to Humans

Group 2B - Possibly Carcinogenic to Humans

NTP: (National Toxicity Program)

Known - Known Carcinogen

Reasonably Anticipated - Reasonably Anticipated to be a Human Carcinogen

A1 - Known Human Carcinogen

A2 - Suspected Human Carcinogen

A3 - Animal Carcinogen

ACGIH: (American Conference of Governmental Industrial Hygienists)

Mutagenic Effects Mutagenic effects have occurred in humans.

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

| | |
|---|--|
| STOT - single exposure | Central nervous system (CNS) |
| STOT - repeated exposure | Kidney Liver Heart spleen Blood |
| Aspiration hazard | No information available |
| Symptoms / effects, both acute and delayed | Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting; Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling of the hands and feet, dizziness, lightheadedness, chest pain, muscle pain or flushing |
| Endocrine Disruptor Information | No information available |
| Other Adverse Effects | The toxicological properties have not been fully investigated. |

12. Ecological information

Ecotoxicity

Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment. Do not empty into drains. The product contains following substances which are hazardous for the environment. Contains a substance which is: Harmful to aquatic organisms. Toxic to aquatic organisms.

| Component | Freshwater Algae | Freshwater Fish | Microtox | Water Flea |
|-------------------|--|--|--|--|
| Trichloroethylene | EC50: = 175 mg/L, 96h (Pseudokirchneriella subcapitata) EC50: = 450 mg/L, 96h (Desmodesmus subspicatus) | LC50: 39 - 54 mg/L, 96h static (Lepomis macrochirus) LC50: 31.4 - 71.8 mg/L, 96h flow-through (Pimephales promelas) | EC50 = 0.81 mg/L 24 h EC50 = 115 mg/L 10 min EC50 = 190 mg/L 15 min EC50 = 235 mg/L 24 h EC50 = 410 mg/L 24 h EC50 = 975 mg/L 5 min | EC50: = 2.2 mg/L, 48h (Daphnia magna) |

Persistence and Degradability Persistence is unlikely based on information available.

Bioaccumulation/ Accumulation No information available.

Mobility Will likely be mobile in the environment due to its volatility.

| Component | log Pow |
|-------------------|---------|
| Trichloroethylene | 2.4 |

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

| Component | RCRA - U Series Wastes | RCRA - P Series Wastes |
|-----------------------------|------------------------|------------------------|
| Trichloroethylene - 79-01-6 | U228 | - |

14. Transport information

DOT

| | |
|-----------------------------|-------------------|
| UN-No | UN1710 |
| Proper Shipping Name | TRICHLOROETHYLENE |
| Hazard Class | 6.1 |
| Packing Group | III |

TDG

| | |
|-----------------------------|-------------------|
| UN-No | UN1710 |
| Proper Shipping Name | TRICHLOROETHYLENE |
| Hazard Class | 6.1 |
| Packing Group | III |

IATA

| | |
|-----------------------------|-------------------|
| UN-No | UN1710 |
| Proper Shipping Name | TRICHLOROETHYLENE |

| | |
|----------------------|-------------------|
| Hazard Class | 6.1 |
| Packing Group | III |
| IMDG/IMO | |
| UN-No | UN1710 |
| Proper Shipping Name | TRICHLOROETHYLENE |
| Hazard Class | 6.1 |
| Packing Group | III |

15. Regulatory information

All of the components in the product are on the following Inventory lists: X = listed

International Inventories

| Component | TSCA | DSL | NDSL | EINECS | ELINCS | NLP | PICCS | ENCS | AICS | IECSC | KECL |
|-------------------|------|-----|------|-----------|--------|-----|-------|------|------|-------|------|
| Trichloroethylene | X | X | - | 201-167-4 | - | | X | X | X | X | X |

Legend:

X - Listed

E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.

F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.

N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.

P - Indicates a commenced PMN substance

R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.

S - Indicates a substance that is identified in a proposed or final Significant New Use Rule

T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.

XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B)).

Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.

Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable

| Component | TSCA 12(b) |
|-------------------|------------|
| Trichloroethylene | Section 5 |

SARA 313

| Component | CAS-No | Weight % | SARA 313 - Threshold Values % |
|-------------------|---------|----------|-------------------------------|
| Trichloroethylene | 79-01-6 | 100 | 0.1 |

SARA 311/312 Hazard Categories

| | |
|-----------------------------------|-----|
| Acute Health Hazard | Yes |
| Chronic Health Hazard | Yes |
| Fire Hazard | No |
| Sudden Release of Pressure Hazard | No |
| Reactive Hazard | No |

CWA (Clean Water Act)

| Component | CWA - Hazardous Substances | CWA - Reportable Quantities | CWA - Toxic Pollutants | CWA - Priority Pollutants |
|-------------------|----------------------------|-----------------------------|------------------------|---------------------------|
| Trichloroethylene | X | 100 lb | X | X |

Clean Air Act

| Component | HAPS Data | Class 1 Ozone Depletors | Class 2 Ozone Depletors |
|-------------------|-----------|-------------------------|-------------------------|
| Trichloroethylene | X | | - |

OSHA Occupational Safety and Health Administration
Not applicable

CERCLA

This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

| Component | Hazardous Substances RQs | CERCLA EHS RQs |
|-------------------|--------------------------|----------------|
| Trichloroethylene | 100 lb 1 lb | - |

California Proposition 65 This product contains the following proposition 65 chemicals

| Component | CAS-No | California Prop. 65 | Prop 65 NSRL | Category |
|-------------------|---------|--|------------------------|-----------------------------|
| Trichloroethylene | 79-01-6 | Carcinogen Developmental Male Reproductive | 14 µg/day 50 µg/day | Developmental Carcinogen |

U.S. State Right-to-Know Regulations

| Component | Massachusetts | New Jersey | Pennsylvania | Illinois | Rhode Island |
|-------------------|---------------|------------|--------------|----------|--------------|
| Trichloroethylene | X | X | X | X | X |

U.S. Department of Transportation

Reportable Quantity (RQ): Y
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security

This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

16. Other information

Prepared By Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date 03-Feb-2010
Revision Date 14-Jul-2016
Print Date 14-Jul-2016
Revision Summary This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS

APPENDIX B ACTIVITY HAZARD ANALYSES

RENU Engineering Technologies, PC

| | | |
|---|---|---|
| Project Identification | Location 92-98 Nagle Avenue, New York, New York | Estimated Dates TBD |
| Phase of Work Mobilization/ Demobilization | Page 1 of 1 | Analysis Approved by Jessica Ferngren, PM/HSM |
| TASKS | HAZARDS | CONTROL MEASURES |
| 1. Mobilization and demobilization of equipment site tools, personnel | Slips/trips/falls | <ul style="list-style-type: none"> Maintain alertness to slip/trip/fall hazards; Maintain good housekeeping; Walk, do not run; Wear footwear with soles that grip; Unloading areas should be on even terrain; and Mark and repair if possible tripping hazards. |
| | Manual lifting and material handling | <ul style="list-style-type: none"> Instruct personnel on proper lifting techniques; Use proper lifting techniques; and Team lifting will be used for heavy loads or use mechanical lifting devices. |
| | Temperature extremes | <ul style="list-style-type: none"> Drink plenty of fluids; Train personnel of signs/symptoms of heat/cold stress; Monitor air temperatures when extreme weather conditions are present; and Stay in visual and verbal contact with your buddy. |
| | Vehicular traffic | <ul style="list-style-type: none"> Spotters will be used when backing up trucks and heavy equipment and when moving equipment. |
| | Overhead hazards | <ul style="list-style-type: none"> Personnel will be required to wear hard hats that meet ANSI Standard Z89.1; Ground personnel will stay clear of suspended loads; Equipment will be provided with guards, canopies or grills to protect the operator from falling or flying objects; and Overhead hazards will be identified prior to commencing work operations. |
| | Noise | <ul style="list-style-type: none"> Ear plugs or ear muffs shall be worn for operations that exceed 85 decibels. |
| | Electrocution | <ul style="list-style-type: none"> Equipment will be equipped with GFCI; A licensed electrician will conduct electrical work; Equipment will stay a minimum of 15 feet from overhead-energized electrical lines (up to 50 kV). This distance will increase 0.4 inches for each 1 kV above 50kV. |
| | Biological hazards | <ul style="list-style-type: none"> Be alert to the presence of biological hazards; Wear insect repellent; Follow procedures in Section 4.2.2 for tick bites; FTL/SHSO should be aware of on-site personnel with allergic reactions in insect bites and stings. |

RENU Engineering Technologies, PC

| Project Identification | Location | Estimated Dates |
|---|--|--|
| | 92-98 Nagle Avenue, New York, New York | TBD |
| Phase of Work | Page 1 of 2 | Analysis Approved by |
| Drilling | | Jessica Ferngren, PM/HSM |
| TASKS | HAZARDS | CONTROL MEASURES |
| 1. Drill to required depths and collect soil samples/install wells. | Chemical hazards | <ul style="list-style-type: none"> Wear appropriate PPE per Table 6-1; Perform air monitoring per Community Air Monitoring Plan; Practice contamination avoidance; Follow proper decontamination procedures; and Wash hands/face before eating, drinking or smoking. |
| | Hand and power tool usage | <ul style="list-style-type: none"> Equip electrical equipment with GFCI's; Inspect electrical equipment and tools prior to use; Daily inspections will be performed; Remove broken or damaged tools from service; Use the tool for its intended purpose; Use in accordance with manufacturer instructions; and Tag and remove defective equipment. |
| | Temperature extremes | <ul style="list-style-type: none"> Drink plenty of fluids; Train personnel of signs/symptoms of heat/cold stress; Monitor air temperatures when extreme weather conditions are present; and, Stay in visual and verbal contact with your buddy. |
| | Manual lifting and material handling | <ul style="list-style-type: none"> Instruct personnel on proper lifting techniques; Use proper lifting techniques; and Team lifting will be used for heavy loads or use mechanical lifting devices. |
| | Fire/Explosion | <ul style="list-style-type: none"> ABC type fire extinguishers shall be readily available; No smoking in workarea. |
| | Biological hazards | <ul style="list-style-type: none"> Be alert to the presence of biological hazards; Wear insect repellent; Follow procedures in Section 4.2.2 for tick bites; FTL/SHSO should be aware of on-site personnel with allergic reactions in insect bites and stings. |
| | Heavy equipment | <ul style="list-style-type: none"> Ground personnel will stay clear of suspended loads; Ground personnel will stay out of the swing radius; Eye contact with operators will be made before approaching equipment; Equipment will not be approached on blind sides; Equipment will be equipped with backup alarms or spotters shall be used. |
| | Slips/Trips/Falls | <ul style="list-style-type: none"> Maintain alertness to slip/trip/fall hazards; Maintain good housekeeping; Walk, do not run; Wear footwear with soles that grip; Unloading areas should be on even terrain; and mark and repair if possible tripping hazards are present. |

RENU Engineering Technologies, PC

| | | |
|--|---------------|--|
| | Electrocution | <ul style="list-style-type: none"> • Equipment will be equipped with GFCI; • A licensed electrician will conduct electrical work; • Equipment will stay a minimum of 15 feet from overhead-energized electrical lines (up to 50 kV). This distance will increase 0.4 inches for each 1 kV above 50kV. |
|--|---------------|--|

| | | |
|----------------------------------|---|---|
| Project Identification | Location 92-98 Nagle Avenue, New York, New York | Estimated Dates TBD |
| Phase of Work Drilling | Page 1 of 1 | Analysis Approved by Jessica Ferngren, PM/HSM |
| TASKS | HAZARDS | CONTROL MEASURES |
| | Noise | <ul style="list-style-type: none"> • Hearing protection mandatory at or above 85 dBA. • Instruct personnel how to properly wear hearing protective devices. <ul style="list-style-type: none"> • Disposable ear plugs or other hearing protection required when working near noisy equipment. |
| | Steam/Heat/Splashing | <ul style="list-style-type: none"> • Use face shield and safety glasses or goggles; • Stay out of the splash/steam radius; • Do not direct steam at anyone; • Do not hold objects with your foot and steam area near it; • Direct spray to minimize spread of constituents of concern; and • Use shielding as necessary. |
| | Excavation hazards | <ul style="list-style-type: none"> • Follow 29 CFR 1926 Subpart P. |
| | Overhead hazards | <ul style="list-style-type: none"> • Personnel will be required to wear hard hats that meet ANSI Standard Z89.1; • Ground personnel will stay clear of suspended loads; • Equipment will be provided with guards, canopies or grills to protect the operator from falling or flying objects; and • Overhead hazards will be identified prior to commencing work operations. |
| | Electrocution | <ul style="list-style-type: none"> • Equipment will be equipped with GFCI; • A licensed electrician will conduct electrical work; • Equipment will stay a minimum of 15 feet from overhead-energized electrical lines (up to 50 kV). This distance will increase 0.4 inches for each 1 kV above 50kV. |

RENU Engineering Technologies, PC

| | | |
|---|---|--|
| Project Identification | Location 92-98 Nagle Avenue, New York, New York | Estimated Dates TBD |
| Phase of Work Soil/Groundwater Sampling | Page 1 of 1 | Analysis Approved by Jessica Ferngren, PM/HSM |
| TASKS | HAZARDS | CONTROL MEASURES |
| 1. Collect soil samples. | Chemical hazards | <ul style="list-style-type: none"> Wear appropriate PPE per Table 6-1; Practice contamination avoidance; Follow proper decontamination procedures; and Wash hands/face before eating, drinking or smoking. |
| | Temperature extremes | <ul style="list-style-type: none"> Drink plenty of fluids; Train personnel of signs/symptoms of heat/cold stress; Monitor air temperatures when extreme weather conditions are present; and Stay in visual and verbal contact with your buddy. |
| | Manual lifting and material handling | <ul style="list-style-type: none"> Site personnel will be instructed on proper lifting techniques; mechanical devices should be used to reduce manual handling of materials; team lifting should be utilized if mechanical devices are not available. |
| | Slips/Trips/Falls | <ul style="list-style-type: none"> Maintain alertness to slip/trip/fall hazards; Maintain good housekeeping; Walk, do not run; Wear footwear with soles that grip; Unloading areas should be on even terrain; and Mark and repair if possible tripping hazards. |
| | Electrocution | <ul style="list-style-type: none"> Equipment will be equipped with GFCI; A licensed electrician will conduct electrical work; Equipment will stay a minimum of 15 feet from overhead-energized electrical lines (up to 50 kV). This distance will increase 0.4 inches for each 1 kV above 50kV. |

RENU Engineering Technologies, PC

| | | |
|---|---|---|
| Project Identification | Location 92-98 Nagle Avenue, New York, New York | Estimated Dates TBD |
| Phase of Work Decontamination | Page 1 of 1 | Analysis Approved by Jessica Ferngren, PM/HSM |
| TASKS | HAZARDS | CONTROL MEASURES |
| 1. Decontaminate equipment | Chemical hazards | <ul style="list-style-type: none"> Wear appropriate PPE per Table 6-1; Practice contamination avoidance; Follow proper decontamination procedures; and Wash hands/face before eating, drinking or smoking. |
| | Temperature extremes | <ul style="list-style-type: none"> Drink plenty of fluids; Train personnel of signs/symptoms of heat/cold stress; Monitor air temperatures when extreme weather conditions are present; and Stay in visual and verbal contact with your buddy. |
| | Manual lifting and material handling | <ul style="list-style-type: none"> Site personnel will be instructed on proper lifting techniques; mechanical devices should be used to reduce manual handling of materials; team lifting should be utilized if mechanical devices are not available. |
| | Slips/Trips/Falls | <ul style="list-style-type: none"> Maintain alertness to slip/trip/fall hazards; Maintain good housekeeping; Walk, do not run; Wear footwear with soles that grip; Unloading areas should be on even terrain; and Mark and repair if possible tripping hazards. |
| | Electrocution | <ul style="list-style-type: none"> Equipment will be equipped with GFCI; A licensed electrician will conduct electrical work; Equipment will stay a minimum of 15 feet from overhead-energized electrical lines (up to 50 kV). This distance will increase 0.4 inches for each 1 kV above 50 kV. |

APPENDIX C

HEAT/COLD STRESS PROTOCOLS

HEAT STRESS

Heat Stress (Hyperthermia)

Heat stress is the body's inability to regulate the core temperature. A worker's susceptibility to heat stress can vary according to his/her physical fitness, degree of acclimation to heat, humidity, age and diet.

1. Prior to site activity, the field team leader may make arrangements for heat stress monitoring (i.e., monitoring heart rate, body temperature, and body water loss) during actual site work if conditions warrant. In addition, the FTL is to ensure that each team member has been acclimatized to the prevailing environmental conditions, that personnel are aware of the signs and symptoms of heat sickness, that they have been adequately trained in first aid procedures, and that there are enough personnel on-site to rotate work assignments and schedule work during hours of reduced temperatures. Personnel should not consume alcoholic or caffeinated beverages but rather drink moderate levels of an electrolyte solution and eat well prior to commencing site work.
2. Although there is no specific test given during a baseline physical that would identify a person's intolerance to heat, some indicators are tobacco or medication use, dietary habits, body weight, and chronic conditions such as high blood pressure or diabetes.
3. *Heat cramps*, caused by profuse perspiration with inadequate fluid intake and salt replacement, most often afflict people in good physical condition who work in high temperature and humidity. Heat cramps usually come on suddenly during vigorous activity. Untreated, heat cramps may progress rapidly to heat exhaustion or heat stroke. First aid treatment: remove victim to a cool place and replace lost fluids with water.
4. Thirst is not an adequate indicator of heat exposure. Drinking fluid by itself does not indicate sufficient water replacement during heat exposure. A general rule, the amount of water administered should replace the amount of water lost, and it should be administered at regular intervals throughout the day. For every half pound of water lost, 8 ounces of water should be ingested. Water should be replaced by drinking 2 – 4 ounce servings during every rest period. A recommended alternative to water is an electrolyte drink split 50/50 with water.

5. *Heat exhaustion* results from salt and water loss along with peripheral pooling of blood. Like heat cramps, heat exhaustion tends to occur in persons in good physical health who are working in high temperatures and humidity. Heat exhaustion may come on suddenly as dizziness and collapse. Untreated, heat exhaustion may progress to heat stroke.
6. *Treatment for heat exhaustion*: Move the victim to a cool environment (e.g. air-conditioned room/car), lay victim down and fan him/her. If the air-conditioning is not available, remove the victim to a shaded area, remove shirt, and fan. If symptoms do not subside within an hour, notify 911 to transport to hospital.
7. *Heat stroke* results from the body's inability to dissipate excess heat. A true medical emergency that requires immediate care, it usually occurs when one ignores the signs of heat exhaustion and continues strenuous activities. Working when the relative humidity exceeds 60% is a particular problem. Workers in the early phase of heat stress may not be coherent or they will be confused, delirious or comatose. Changes in behavior, irritability and combativeness are useful early signs of heat stroke.
8. *Treatment of heat stroke*: Move the victim to a cool, air-conditioned environment. Place victim in a semi-reclined position with head elevated and strip to underclothing. Cool victim as rapidly as possible, applying ice packs to the arms and legs and massaging the neck and torso. Spray victim with tepid water and constantly fan to promote evaporation. Notify 911 to transport to hospital as soon as possible.

TABLE 1

SYMPTOMS OF HEAT STRESS

Heat cramps are caused by heavy sweating with inadequate fluid intake. Symptoms include;

- Muscle cramps
- Cramps in the hands, legs, feet and abdomen

Heat exhaustion occurs when body organs attempt to keep the body cool. Symptoms include;

- Pale, cool moist skin
- Core temperature elevated 1-2°
- Thirst
- Anxiety
- Rapid heart rate
- Heavy sweating
- Dizziness
- Nausea

Heat stroke is the most serious form of heat stress. Immediate action must be taken to cool the body before serious injury and death occur. Symptoms are;

- Red, hot, dry skin
- Lack of perspiration
- Seizures
- Dizziness and confusion
- Strong, rapid pulse
- Core temperature of 104° or above
- Coma

TABLE 2HEAT STRESS INDICATORS

| Heat stress indicator | When to measure | If Exceeds... | Action |
|------------------------------|---|--|---------------------------------------|
| Heart rate (pulse) | Beginning of rest period | 110 beats per minute | Shorten next work period by 33% |
| Oral temperature | Beginning of rest period | 99°F (after thermometer is under tongue for 3 minutes) | Shorten next work period by 33% |
| | | 100.6°F | Prohibit work in impermeable clothing |
| Body weight | 1. Before workday begins (a.m.) 2. After workday ends (p.m.) | | Increase fluid intake |

COLD STRESS

Cold stress (Hypothermia)

In hypothermia the core body temperature drops below 95°F. Hypothermia can be attributed to a decrease in heat production, increased heat loss or both.

Prevention

Institute the following steps to prevent overexposure of workers to cold:

1. Maintain body core temperature at 98.6°F or above by encouraging workers to drink warm liquids during breaks (preferably not coffee) and wear several layers of clothing that can keep the body warm even when the clothing is wet.
2. Avoid frostbite by adequately covering hands, feet and other extremities. Clothing such as insulated gloves or mittens, earmuffs and hat liners should be worn. To prevent contact frostbite (from touching metal and cold surfaces below 20°F), workers should wear gloves. Tool handles should be covered with insulating material.
3. Adjust work schedules to provide adequate rest periods. When feasible, rotate personnel and perform work during the warmer hours of the day.
4. Provide heated shelter. Workers should remove their outer layer(s) of clothing while in the shelter to allow sweat to evaporate.
5. In the event that wind barriers are constructed around an intrusive operation (such as drilling), the enclosure must be properly vented to prevent the buildup of toxic or explosive gases or vapors. Care must be taken to keep a heat source away from flammable substances.
6. Using a wind chill chart such as the one in Table 3, obtain the equivalent chill temperature (ECT) based on actual wind speed and temperature. Refer to the ECT when setting up work warm-up schedules, planning appropriate clothing, etc. Workers should use warming shelters at regular intervals at or below an ECT of 20°F. For exposed skin, continuous exposure should not be permitted at or below an ECT of -25°F.

Frostbite

Personnel should be aware of symptoms of frostbite/hypothermia. If the following symptoms are noticed in any worker, he/she should immediately go to a warm shelter.

| Condition | Skin Surface | Tissue Under Skin | Skin Color |
|-----------|--------------|-------------------|---------------------------------------|
| Frostnip | Soft | Soft | Initially red, then white |
| Frostbite | Hard | Soft | White and waxy |
| Freezing | Hard | Hard | Blotchy, white to yellow-gray to gray |

1. *Frostnip* is the incipient stage of frostbite, brought about by direct contact with a cold object or exposure of a body part to cool/cold air. Wind chill or cold water also can be major factors. This condition is not serious. Tissue damage is minor and the response to care is good. The tip of the nose, tips of ears, upper cheeks and fingers (all areas generally exposed) are most susceptible to frostnip.
2. *Treatment of frostnip*: Care for frostnip by warming affected areas. Usually the worker can apply warmth from his/her bare hands, blow warm air on the site, or, if the fingers are involved, hold them in the armpits. During recovery, the worker may complain of tingling or burning sensation, which is normal. If the condition does not respond to this simple care, begin treatment for frostbite.
3. *Frostbite*: The skin and subcutaneous layers become involved. If frostnip goes untreated, it becomes superficial frostbite. This condition is serious. Tissue damage may be serious. The worker must be transported to a medical facility for evaluation. The tip of the nose, tips of ears, upper cheeks and fingers (all areas generally exposed) are most susceptible to frostbite. The affected area will feel frozen, but only on the surface. The tissue below the surface must still be soft and have normal response to touch. *DO NOT* squeeze or poke the tissue. The condition of the deeper tissues can be determined by gently palpating the affected area. The skin will turn mottled or blotchy. It may also be white and then turn grayish-yellow.
4. *Treatment of frostbite*: When practical, transport victim as soon as possible. Get the worker inside and keep him/her warm. Do not allow any smoking or alcohol consumption. Thaw frozen parts by immersion, re-warming in a 100°F to 106°F water bath. Water temperature will

drop rapidly, requiring additional warm water throughout the process. Cover the thawed part with a dry sterile dressing. Do not puncture or drain any blisters.

NOTE: Never listen to myths and folk tales about the care of frostbite. *Never* rub a frostbitten or frozen area. *Never* rub snow on a frostbitten or frozen area. Rubbing the area may cause serious damage to already injured tissues. Do not attempt to thaw a frozen area if there is any chance it will be re-frozen.

5. *General cooling/Hypothermia:* General cooling of the body is known as systemic hypothermia. This condition is not a common problem unless workers are exposed to cold for prolonged periods of time without any shelter.

| Body Temperature | °C | Symptoms |
|------------------|-----------|--|
| 99-96 | 37-35.5 | Intense, uncontrollable shivering |
| 95-91 | 35.5-32.7 | Violent shivering persists. If victim is conscious, he has difficulty speaking. |
| 90-86 | 32-30 | Shivering decreases and is replaced by strong muscular rigidity. Muscle coordination is affected. Erratic or jerkey movements are produced. Thinking is less clear. General comprehension is dulled. There may be total amnesia. The worker is generally still able to maintain the appearance of psychological contact with his surroundings. |
| 85-81 | 29.4-27.2 | Victim becomes irrational, loses contact with his environment, and drifts into a stuporous state. Muscular rigidity continues. Pulse and respirations are slow and the worker may develop cardiac arrhythmias. |
| 80-78 | 26.6-18.5 | Victim becomes unconscious. He does not respond to the spoken word. Most reflexes cease to function. Heartbeat becomes erratic |
| Below 78 | 25.5 | Cardiac and respiratory centers of the brain fail. Ventricular fibrillation occurs; probably edema and hemorrhage in the lungs; death. |

6. *Treatment of hypothermia:* Keep worker dry. Remove any wet clothing and replace with dry clothes, or wrap person in dry blankets. Keep person at rest. Do not allow him/her to move around. Transport the victim to a medical facility as soon as possible.

TABLE 3⁽¹⁾
COOLING POWER OF WIND ON EXPOSED FLESH EXPRESSED AS AN
EQUIVALENT TEMPERATURE (UNDER CALM CONDITIONS)

| Estimated wind Speed (in mph) | Actual Temperature Reading (°F) | | | | | | | | | | | |
|--|--|----|----|-----|--|-----|-----|-----|---|------|------|------|
| | 50 | 40 | 30 | 20 | 10 | 0 | 10 | 20 | 30 | 40 | 50 | 60 |
| Equivalent Chill Temperature (°F) | | | | | | | | | | | | |
| Calm | 50 | 40 | 30 | 20 | 10 | 0 | -10 | -20 | -30 | -40 | -50 | -60 |
| 5 | 48 | 37 | 27 | 16 | 6 | -5 | -15 | -26 | -36 | -47 | -57 | -68 |
| 10 | 40 | 28 | 15 | 4 | -9 | -24 | -33 | -46 | -58 | -70 | -83 | -95 |
| 15 | 36 | 22 | 9 | -5 | -18 | -32 | -45 | -58 | -72 | -85 | -99 | -112 |
| 20 | 32 | 18 | 4 | -10 | -25 | -39 | -53 | -67 | -82 | -96 | -110 | -121 |
| 25 | 30 | 16 | 0 | -15 | -29 | -44 | -59 | -74 | -88 | -104 | -118 | -133 |
| 30 | 28 | 13 | -2 | -18 | -33 | -48 | -63 | -79 | -94 | -109 | -125 | -140 |
| 35 | 27 | 11 | -4 | -20 | -35 | -51 | -67 | -82 | -98 | -113 | -129 | -145 |
| 40 | 26 | 10 | -6 | -21 | -37 | -53 | -69 | -85 | -100 | -116 | -132 | -146 |
| (Wind speeds greater than 40 mph have little additional effect.) | LITTLE DANGER in < hr with dry skin. Maximum danger of false sense of security. | | | | INCREASING DANGER Danger from freezing of exposed flesh within one minute | | | | GREAT DANGER Flesh may freeze within 30 seconds. | | | |
| | Trench foot and immersion foot may occur | | | | at any point on this chart | | | | | | | |

Developed by U.S. Army Research Institute of Environmental Medicine, Natick, MA.

(1) Reproduced from American Conference of Governmental Industrial Hygienists, Threshold Limit Values and Biological Exposure Indices for 1985-1986, p.01.

APPENDIX D
MEDICAL DATA SHEET

Medical Data Sheet

Name:

Date:

Phone:

Emergency contact:

Medical Conditions:

Allergies:

Current Medications:

APPENDIX E

GENERAL HEALTH AND SAFETY WORK PRACTICES

GENERAL HEALTH AND SAFETY WORK PRACTICES

1. Site personnel must attend each day's Daily Briefing and sign the attendance sheet.
2. Any individual taking prescribed drugs shall inform the FTL/HSO of the type of medication. The FTL/HSO will review the matter with the HSM and the Corporate Medical Consultant (CMC), who will decide if the employee can safely work on-site while taking the medication.
3. The personal protective equipment specified by the FTL/HSO and/or associated procedures shall be worn by site personnel. This includes hard hats and safety glasses which must be worn in active work areas.
4. Facial hair (beards, long sideburns or mustaches) which may interfere with a satisfactory fit of a respirator mask is not allowed on any person who may be required to wear a respirator.
5. Personnel must follow proper decontamination procedures and shower as soon as possible upon completion of work shift.
6. Eating, drinking, chewing tobacco or gum, smoking and any other practice that may increase the possibility of hand-to-mouth contact is prohibited in the exclusion zone or the contamination reduction zone. (Exceptions may be permitted by the HSM to allow fluid intake during heat stress conditions).
7. Lighters, matches, cigarettes and other forms of tobacco are prohibited in the Exclusion Zone.
8. Signs and demarcations shall be followed. Such signs and demarcation shall not be removed, except as authorized by the FTL/HSO.
9. No one shall enter a permit-required confined space without a permit and appropriate training. Confined space entry permits shall be implemented as issued.
10. Personnel must follow Hot Work Permits as issued.
11. Personnel must use the Buddy System in the Exclusion Zone.
12. Personnel must follow the work-rest regimens and other practices required by the heat stress program.

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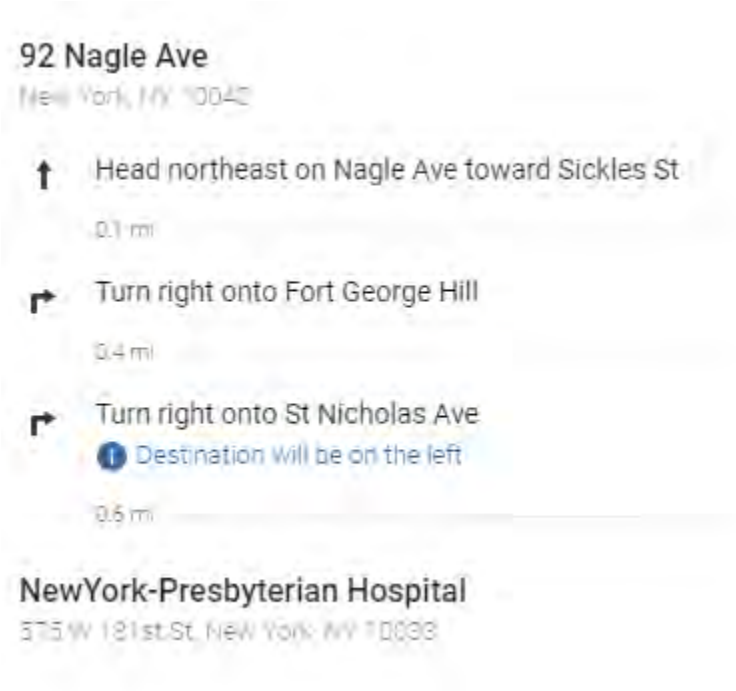
13. Personnel must follow lockout/tagout procedures when working on equipment involving moving parts or hazardous energy sources.
14. No person shall operate equipment unless trained and authorized.
15. No one may enter an excavation greater than four feet deep unless authorized by the Competent Person. Excavations must be sloped or shored properly. Safe means of access and egress from excavations must be maintained.
16. Ladders and scaffolds shall be solidly constructed, in good working condition, and inspected prior to use. No one may use defective ladders or scaffolds.
17. Fall protection or fall arrest systems must be in place when working at elevations greater than six feet for temporary working surfaces and four feet for fixed platforms.
18. Safety belts, harnesses and lanyards must be selected by the Supervisor. The user must inspect the equipment prior to use. No defective personal fall protection equipment shall be used. Personal fall protection that has been shock loaded must be discarded.
19. Hand and portable power tools must be inspected prior to use. Defective tools and equipment shall not be used.
20. Ground fault interrupters shall be used for cord and plug equipment used outdoors or in damp locations. Electrical cords shall be kept out walkways and puddles unless protected and rated for the service.
21. Improper use, mishandling, or tampering with health and safety equipment and samples is prohibited.
22. Horseplay of any kind is prohibited.
23. Possession or use of alcoholic beverages, controlled substances, or firearms on any site is forbidden.
24. Incidents, no matter how minor, must be reported immediately to the Supervisor.
25. Personnel shall be familiar with the Site Emergency Action Plan, which is contained in Section 12 of the HASP/EAP.

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The above Health and Safety Rules are not all inclusive and it is your responsibility to comply with regulations set forth by OSHA, the client, Castleton Supervisors, and the FTL/HSO.

APPENDIX F

HOSPITAL ROUTE MAP AND DIRECTIONS



APPENDIX G

INCIDENT REPORT FORM/INVESTIGATION FORM

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| INCIDENT / NEAR MISS REPORT AND INVESTIGATION - PAGE 1 OF 2 | | |
|--|---|--|
| TYPE OF INCIDENT - CHECK ALL THAT APPLY | | |
| <input type="checkbox"/> INJURY/ILLNESS | <input type="checkbox"/> VEHICLE DAMAGE | <input type="checkbox"/> PROPERTY DAMAGE |
| <input type="checkbox"/> FIRE | <input type="checkbox"/> SPILL/RELEASE | <input type="checkbox"/> PERMIT EXCEEDENCE |
| <input type="checkbox"/> NEAR MISS | <input type="checkbox"/> OTHER | |
| GENERAL INFORMATION | | |
| PROJECT NAME: | DATE OF REPORT: | REPORT NO.: |
| DATE OF INCIDENT: | TIME: | DAY OF WEEK: |
| LOCATION OF INCIDENT: | | |
| WEATHER CONDITIONS: | ADEQUATE LIGHTING AT SCENE? <input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A | |
| DESCRIBE WHAT HAPPENED (STEP BY STEP - USE ADDITIONAL PAGES IF NECESSARY) | | |
| | | |
| | | |
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| | | |
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| | | |
| | | |
| | | |
| | | |
| AFFECTED EMPLOYEE INFORMATION | | |
| NAME: | EMPLOYEE: <input type="checkbox"/> YES <input type="checkbox"/> NO | |
| HOME ADDRESS: | | |
| SOCIAL SECURITY NO.: | HOME PHONE NO.: | |
| JOB CLASSIFICATION: | YEARS IN JOB CLASSIFICATION: | |
| HOURS WORKED ON SHIFT PRIOR TO INCIDENT: AGE: | | |
| DID INCIDENT RELATE TO ROUTINE TASK FOR JOB CLASSIFICATION? <input type="checkbox"/> YES <input type="checkbox"/> NO | | |
| INJURY/ILLNESS INFORMATION | | |
| NATURE OF INJURY OR ILLNESS: | | |
| | | |
| OBJECT/EQUIPMENT/SUBSTANCE CAUSING HARM: | | |
| FIRST AID PROVIDED? <input type="checkbox"/> YES <input type="checkbox"/> NO | | |
| IF YES, WHERE WAS IT GIVEN: <input type="checkbox"/> ON-SITE <input type="checkbox"/> OFF-SITE | | |
| IF YES, WHO PROVIDED FIRST AID: | | |

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| | |
|--|-------------------------------------|
| WILL THE INJURY/ILLNESS RESULT IN: <input type="checkbox"/> RESTRICTED DUTY <input type="checkbox"/> LOST TIME <input type="checkbox"/> UNKNOWN | |
| INCIDENT / NEAR MISS REPORT AND INVESTIGATION - PAGE 2 OF 2 | REPORT NO. |
| MEDICAL TREATMENT INFORMATION | |
| WAS MEDICAL TREATMENT PROVIDED? <input type="checkbox"/> YES <input type="checkbox"/> NO | |
| IF YES, WAS MEDICAL TREATMENT PROVIDED: <input type="checkbox"/> ON-SITE <input type="checkbox"/> DR.'S OFFICE <input type="checkbox"/> HOSPITAL | |
| NAME OF PERSON(S) PROVIDING TREATMENT: | |
| ADDRESS WHERE TREATMENT WAS PROVIDED: | |
| TYPE OF TREATMENT: | |
| VEHICLE AND PROPERTY DAMAGE INFORMATION | |
| VEHICLE/PROPERTY DAMAGED: | |
| DESCRIPTION OF DAMAGE: | |
| SPILL AND AIR EMISSIONS INFORMATION: | |
| SUBSTANCE SPILLED OR RELEASED: | FROM WHERE: TO WHERE: |
| ESTIMATED QUANTITY/DURATION: | |
| CERCLA HAZARDOUS SUBSTANCE? <input type="checkbox"/> YES <input type="checkbox"/> NO | |
| REPORTABLE TO AGENCY? <input type="checkbox"/> YES <input type="checkbox"/> NO SPECIFY: | |
| WRITTEN REPORT: <input type="checkbox"/> YES <input type="checkbox"/> NO TIME FRAME: | |
| RESPONSE ACTION TAKEN: | |
| PERMIT EXCEEDENCE | |
| TYPE OF PERMIT: | PERMIT #: |
| DATE OF EXCEEDENCE: | DATE FIRST KNOWLEDGE OF EXCEEDENCE: |
| PERMITTED LEVEL OR CRITERIA: | |
| EXCEEDENCE LEVEL OR CRITERIA: | |
| REPORTABLE TO AGENCY? <input type="checkbox"/> YES <input type="checkbox"/> NO SPECIFY: | |
| WRITTEN REPORT: <input type="checkbox"/> YES <input type="checkbox"/> NO TIME FRAME: | |
| RESPONSE ACTION TAKEN: | |
| NOTIFICATIONS | |
| NAMES OF PERSONNEL NOTIFIED: | DATE/TIME: |
| CLIENT NOTIFIED: | DATE/TIME: |
| AGENCY NOTIFIED: | DATE/TIME: |
| CONTACT NAME: | |

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| | | | |
|--|--------------------|--------------------------------|-----------------|
| PERSONS PREPARING REPORT | | | |
| EMPLOYEE'S NAME:(PRINT) | | SIGN: | |
| SUPERVISOR'S NAME:(PRINT) | | SIGN: | |
| INVESTIGATIVE REPORT | | | |
| DATE OF INCIDENT: | | DATE OF REPORT: REPORT NUMBER: | |
| INCIDENT COST: ESTIMATED: \$ | | ACTUAL: \$ | |
| OSHA RECORDABLE(S): <input type="checkbox"/> YES <input type="checkbox"/> NO # RESTRICTED DAYS # DAYS AWAY FROM WORK | | | |
| CAUSE ANALYSIS | | | |
| IMMEDIATE CAUSES - WHAT ACTIONS AND CONDITIONS CONTRIBUTED TO THIS EVENT? | | | |
| | | | |
| BASIC CAUSES - WHAT SPECIFIC PERSONAL OR JOB FACTORS CONTRIBUTED TO THIS EVENT? | | | |
| | | | |
| ACTION PLAN | | | |
| REMEDIAL ACTIONS - WHAT HAS AND OR SHOULD BE DONE TO CONTROL EACH OF THE CAUSES | | | |
| ACTION | PERSON RESPONSIBLE | TARGET DATE | COMPLETION DATE |
| | | | |
| | | | |
| | | | |
| | | | |
| PERSONS PERFORMING INVESTIGATION | | | |
| INVESTIGATOR'S NAME: (PRINT) | | SIGN: | DATE: |
| INVESTIGATOR'S NAME: (PRINT) | | SIGN: | DATE: |
| INVESTIGATOR'S NAME: (PRINT) | | SIGN: | DATE: |
| MANAGEMENT REVIEW | | | |
| PROJECT MANAGER: (PRINT) | | SIGN: | DATE: |
| COMMENTS: | | | |
| H&S MANAGER: (PRINT) | | SIGN: | DATE: |
| COMMENTS: | | | |

EXAMPLES OF IMMEDIATE CAUSES

Substandard Actions

1. Operating equipment without authority
2. Failure to warn
3. Failure to secure
4. Operating at improper speed
5. Making safety devices inoperable
6. Removing safety devices
7. Using defective equipment
8. Failure to use PPE properly
9. Improper loading
10. Improper placement
11. Improper lifting
12. Improper position for task
13. Servicing equipment in operation
14. Under influence of alcohol/drugs
15. Horseplay

Substandard Conditions

1. Guards or barriers
2. Protective equipment
3. Tools, equipment, or materials
4. Congestion
5. Warning system
6. Fire and explosion hazards
7. Poor housekeeping
8. Noise exposure
9. Exposure to hazardous materials
10. Extreme temperature exposure
11. Illumination
12. Ventilation
13. Visibility

EXAMPLES OF BASIC CAUSES

Personal Factors

1. Capability
2. Knowledge
3. Skill
4. Stress
5. Motivation
6. Work Standards
7. Wear and tear
8. Abuse or misuse

Job Factors

1. Supervision
2. Engineering
3. Purchasing
4. Maintenance
5. Tools/equipment

MANAGEMENT PROGRAMS FOR CONTROL OF INCIDENTS

1. Leadership and administration
2. Management training
3. Planned inspections
4. Task analysis and procedures
5. Safety programs
6. Safety committees
7. Safety audits
8. Safety education
9. Safety research
10. Health control
11. Program audits
12. Engineering controls
13. Personal communications

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5. Task observation
6. Emergency preparedness
7. Organizational rules
8. Accident/incident analysis
9. Personal protective equipment
14. Group meetings
15. General promotion
16. Hiring and placement
17. Purchasing controls

**APPENDIX H
DAILY BRIEFING SIGN-IN SHEET**

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DAILY BRIEFING SIGN-IN SHEET

Date: _____

Project Name/Location: _____

Person Conducting Briefing: _____

1. AWARENESS (topics discussed, special safety concerns, recent incidents, etc.)

2. OTHER ISSUES (HASP/EAP changes, attendee comments, etc.)

3. ATTENDEES (Print Name):

| | |
|-----|-----|
| 1. | 21. |
| 2. | 22. |
| 3. | 23. |
| 4. | 24. |
| 5. | 25. |
| 6. | 26. |
| 7. | 27. |
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| 18. | 38. |
| 19. | 39. |