27-10 49th AVENUE

QUEENS COUNTY

LONG ISLAND CITY, NEW YORK

SITE MANAGEMENT PLAN

NYSDEC Site Number: C241219

Prepared for:

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10 West Forest Avenue

Englewood, New Jersey, 07631

Prepared by:

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Revisions to Final Approved Site Management Plan:

Revision No.	Date Submitted	Summary of Revision	NYSDEC Approval Date
1	6/30/2026	Update property boundaries as per amended EE	

NOVEMBER 2025

CERTIFICATION STATEMENT

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

_____ P.E. #097317

___JUNE 30, 2026__ DATE



27-10 49th AVENUE

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SITE MANAGEMENT PLAN

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List of Acronyms

AS	Air Sparging
ASP	Analytical Services Protocol
BCA	Brownfield Cleanup Agreement
BCP	Brownfield Cleanup Program
BMP	Best Management Practice
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CAMP	Community Air Monitoring Plan
C/D	Construction and Demolition
CFR	Code of Federal Regulation
CLP	Contract Laboratory Program
COC	Certificate of Completion
CO2	Carbon Dioxide
CP	Commissioner Policy
DER	Division of Environmental Remediation
DUSR	Data Usability Summary Report
EC	Engineering Control
ECL	Environmental Conservation Law
ELAP	Environmental Laboratory Approval Program
ERP	Environmental Restoration Program
EWP	Excavation Work Plan
GHG	Greenhouse Gas
GWE&T	Groundwater Extraction and Treatment
HASP	Health and Safety Plan
IC	Institutional Control
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYCRR	New York Codes, Rules and Regulations
O&M	Operation and Maintenance
OM&M	Operation, Maintenance and Monitoring
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
P.E. or PE	Professional Engineer
PFAS	Per- and Polyfluoroalkyl Substances
PID	Photoionization Detector
PRP	Potentially Responsible Party
PRR	Periodic Review Report
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
QEP	Qualified Environmental Professional
RAO	Remedial Action Objective
RAWP	Remedial Action Work Plan
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RP	Remedial Party

RSO	Remedial System Optimization
SAC	State Assistance Contract
SCG	Standards, Criteria and Guidelines
SCO	Soil Cleanup Objective
SMP	Site Management Plan
SOP	Standard Operating Procedures
SOW	Statement of Work
SPDES	State Pollutant Discharge Elimination System
SSD	Sub-slab Depressurization
SVE	Soil Vapor Extraction
SVI	Soil Vapor Intrusion
TAL	Target Analyte List
TCL	Target Compound List
TCLP	Toxicity Characteristic Leachate Procedure
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VCA	Voluntary Cleanup Agreement
VCP	Voluntary Cleanup Program

ES EXECUTIVE SUMMARY

The following provides a brief summary of the controls implemented for the Site, as well as the inspections, monitoring, maintenance and reporting activities required by this Site Management Plan:

Site Identification:	NYSDEC BCP Site No. C241219 27-10 49th Avenue, Long Island City, NY 11101
Institutional Controls:	1. The property may be used for commercial and industrial use.
	2. All ECs must be operated and maintained as specified in this SMP.
	3. All ECs must be inspected at a frequency and in a manner defined in the SMP.
	4. The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the New York State Department of Health (NYSDOH) or the New York City Department of Environmental Protection (NYCDEP) to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the Department.
	5. Groundwater and other environmental or public health monitoring, if any, must be performed as defined in this SMP.
	6. Data and information pertinent to Site management must be reported at the frequency and in a manner as defined in this SMP.
	7. All future activities that will disturb remaining contaminated material must be conducted in accordance with this SMP.
	8. Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in this SMP.

	9. Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical component of the remedy shall be performed as defined in this SMP.	
	10. Access to the Site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by the Environmental Easement.	
	11. The potential for vapor intrusion must be evaluated for any new buildings (excluding the existing building) developed in the area within the IC boundaries noted on Figure 2, and any potential impacts that are identified must be monitored or mitigated.	
	12. Vegetable gardens and farming on the Site are prohibited.	
	13. An evaluation shall be performed to determine the need for further investigation and remediation should large scale redevelopment occur if any of the existing structures are demolished, or if the subsurface is otherwise made accessible.	
Engineering Controls:	1. Site Cover System	
	2. Sub-Slab Depressurization System (SSDS)/ Soil Vapor Extraction System (SVES)	
	3. Expanded SVES	
Inspections:		Frequency
1. Site Cover System Inspection		Annually
2. SSDS/SVES Visual Inspection		Annually
3. Expanded SVES Visual Inspection		Annually

Monitoring:	
1. Routine SSDS/SVES Detailed Operation Inspection	Quarterly
2. Routine Expanded SVES Detailed Operation Inspection	Quarterly
3. Expanded SVES effluent discharge sampling	Annually
4. Indoor Air Sampling	Annually (during heating season)
5. Soil Vapor Intrusion Sampling	Upon request to shut down the SSDS/SVES
6. Soil Vapor Sampling	Upon request to shut down Expanded SVES
Maintenance:	
1. Site Cover System	As needed
2. Routine SSDS/SVES Detailed Operation Inspection	Quarterly
3. Routine Expanded SVES Detailed Operation Inspection	Quarterly
4. Non-Routine SSDS/SVES Detailed Operation Inspection	As needed
5. Non-Routine Expanded SVES Detailed Operation Inspection	As needed
Reporting:	
1. SSDS/SVES Operating Log	Quarterly
2. Expanded SVES Operating Log	Quarterly
3. Periodic Review Report	First report sixteen (16) months after COC is issued, then annually, or as determined by NYSDEC.

Further descriptions of the above requirements are provided in detail in the latter sections of this Site Management Plan.

1.0 INTRODUCTION

1.1 General

This Site Management Plan (SMP) is a required element of the remedial program for the 27-10 49th Avenue Site located in Long Island City, New York (hereinafter referred to as the "Site"). See Figure 1. The Site is currently in the New York State (NYS) Brownfield Cleanup Program (BCP), Site No. C241219, which is administered by New York State Department of Environmental Conservation (NYSDEC or Department).

Hunters Point SG, LLC entered into a Brownfield Cleanup Agreement (BCA) on November 30, 2018 with the NYSDEC to remediate the site. The BCA was amended on July 24, 2025 to reflect the Site's location within an EN-Zone. A figure showing the site location and boundaries of this site is provided in Figure 2. The boundaries of the site are more fully described in the metes and bounds site description that is part of the Environmental Easement provided in Appendix A, which reflects changes made in the Amendment to Environmental Easement dated June 1, 2026.

After completion of the remedial work, some contamination was left at this site, which is hereafter referred to as "remaining contamination". Institutional and Engineering Controls (ICs and ECs) have been incorporated into the site remedy to control exposure to remaining contamination to ensure protection of public health and the environment. An Environmental Easement granted to the NYSDEC and recorded with the Queens County Clerk, and amended in June 2026 (collectively, the "Environmental Easement"), requires compliance with this SMP and all ECs and ICs placed on the site.

This SMP was prepared to manage remaining contamination at the site and prevent off-site migration until the Environmental Easement is extinguished in accordance with ECL Article 71, Title 36. This plan has been approved by the NYSDEC, and compliance with this plan is required by the grantor of the Environmental Easement and the grantor's successors and assigns. This SMP may only be revised with the approval of the NYSDEC.

It is important to note that:

- This SMP details the site-specific implementation procedures that are required by the Environmental Easement. Failure to properly implement the SMP is a violation of the Environmental Easement, which is grounds for revocation of the Certificate of Completion (COC); and
- Failure to comply with this SMP is also a violation of Environmental Conservation Law, 6 NYCRR Part 375 and the BCA (Index #C241219-10-18; Site #C241219) for the site, and thereby subject to applicable penalties.

All reports associated with the site can be viewed by contacting the NYSDEC or its successor agency managing environmental issues in New York State. A list of contacts for persons involved with the site is provided in Appendix B of this SMP.

This SMP was prepared by Roux Environmental Engineering and Geology, D.P.C. (Roux), on behalf of Hunters Point SG, LLC, in accordance with the requirements of the NYSDEC's DER-10 ("Technical Guidance for Site Investigation and Remediation"), dated May 2010 (updated April, 2019), and the guidelines provided by the NYSDEC. This SMP addresses the means for implementing the ICs and/or ECs that are required by the Environmental Easement for the site.

1.2 Revisions and Alterations

Revisions and alterations to this plan will be proposed in writing to the NYSDEC's project manager. The NYSDEC can also make changes to the SMP or request revisions from the remedial party. Revisions will be necessary upon, but not limited to, the following occurring: a change in media monitoring requirements, upgrades to or shutdown of a remedial system, post-remedial removal of contaminated sediment or soil, or other significant change to the site conditions. All approved alterations must conform with Article 145 Section 7209 of the Education Law regarding the application of professional seals and alterations. For example, any changes to as-built drawings must be stamped by a New York State Professional Engineer. In accordance with the Environmental Easement for the site, the NYSDEC project manager will provide a notice of any approved changes to the SMP and append these notices to the SMP that is retained in its files.

1.3 Notifications

Notifications will be submitted by the property owner to the NYSDEC, as needed, in accordance with NYSDEC's DER – 10 for the following reasons:

1. 60-day advance notice of any proposed changes in site use that are required under the terms of the BCA, 6 NYCRR Part 375 and/or Environmental Conservation Law.
2. 7-day advance notice of any field activity associated with the remedial program.
3. 15-day advance notice of any proposed ground-intrusive activity pursuant to the Excavation Work Plan. If the ground-intrusive activity qualifies as a change of use as defined in 6 NYCRR Part 375, the above mentioned 60-day advance notice is also required.
4. Notice within 48 hours of any damage or defect to the foundation, structures or EC that reduces or has the potential to reduce the effectiveness of an EC, and likewise, any action to be taken to mitigate the damage or defect.
5. Notice within 48 hours of any non-routine maintenance activities.
6. Verbal notice by noon of the following day of any emergency, such as a fire; flood; or earthquake that reduces or has the potential to reduce the effectiveness of ECs in place at the site, with written confirmation within 7 days that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public.
7. Follow-up status reports on actions taken to respond to any emergency event requiring ongoing responsive action submitted to the NYSDEC within 45 days describing and documenting actions taken to restore the effectiveness of the ECs.

Any change in the ownership of the site or the responsibility for implementing this SMP will include the following notifications:

1. At least 60 days prior to the change, the NYSDEC will be notified in writing of the proposed change. This will include a certification that the prospective purchaser/Remedial Party has been provided with a copy of the BCA, and all approved work plans and reports, including this SMP.
2. Within 15 days after the transfer of all or part of the site, the new owner's name, contact representative, and contact information will be confirmed in writing to the NYSDEC.

Table 1 on the following page includes contact information for the above notifications. The information on this table will be updated as necessary to provide accurate

contact information. A full listing of site-related contact information is provided in Appendix B.

Table 1: Notifications*

Name	Contact Information	Required Notification**
Daniel Nierenberg NYSDEC Project Manager	(518) 402-9554 Daniel.nierenberg@dec.ny.gov	All Notifications
Sarah Quandt NYSDEC Project Manager's Supervisor	(518) 402-9116 Sarah.quandt@dec.ny.gov	All Notifications
Kelly Lewandowski NYSDEC Site Control	(518) 402-9569 Kelly.lewandowski@dec.ny.gov	Notifications 1 and 8
Megan Rivera NYSDOH Project Manager	(518) 402-7877 Megan.rivera@health.ny.gov	Notifications 4, 6, and 7

* Note: Notifications are subject to change and will be updated as necessary.

** Note: Numbers in this column reference the numbered bullets in the notification list in this section.

2.0 SUMMARY OF PREVIOUS INVESTIGATIONS AND REMEDIAL ACTIONS

2.1 Site Location and Description

The site is located in Long Island City, Queens County, New York and is identified as Block 113 and Lot 35 on the Queens County Tax Map (see Figure 2). The site is an approximately 0.84-acre area and is bounded by 49th Avenue to the north, commercial properties and Dutch Kills Creek to the south, Dutch Creek Kills to the east, and 27th Street to the west (see Figure 2 – Site Layout Map). The boundaries of the site are more fully described in Appendix A –Environmental Easement. The owner(s) of the site parcel(s) at the time of issuance of this SMP is Hunters Point SG, LLC.

The operator(s) of the site parcel(s) at the time of issuance of this SMP is Lyft, Inc.

2.2 Physical Setting

2.2.1 Land Use

The Site consists of the following: a two-story commercial building within the western side of the Site and a parking lot located on the eastern side of the Site. The Site is zoned M3-2 (a heavy manufacturing district that primarily accommodates industrial uses) and is currently occupied by a ride share company, Lyft, and is used as office space and storage. Site occupants previously included a warehouse used for mixing, repackaging, and distribution of petroleum products. A limousine company utilized the second floor of the building as an office space, with a small reception area on the first floor.

The properties adjoining the Site and in the neighborhood surrounding the Site primarily include commercial, manufacturing, and industrial properties. The properties immediately south of the Site include a warehouse operated by Leadstone, USA, a quartz manufacturing company; followed by Dutch Kills Creek; the properties immediately north of the Site include 49th Avenue (Hunters Point Avenue); followed by a warehouse operated by Mana Products, a cosmetic manufacturer; the properties immediately east of the Site include Dutch Kills Creek; and the properties to the west of the Site include 27th Street; followed by a warehouse operated by UPS.

2.2.2 Geology

According to the USGS, the area is underlain by the Harrison Gneiss, biotite-hornblende-quartz-plagioclase gneiss with accessory garnet and sphene. The formation is known to be up to 4,000 feet thick in places. The surficial geology of the area is comprised mainly of glacial till of varying texture. The till layer varies in thickness from 3-150 feet.

The shallow soils at the Site are classified by the U.S. Department of Agriculture Soil Conservation Service as urban land. The soil surface textures include silt loam, loamy sand, sandy loam, and fine sandy loam. Deeper soils consist of stratified sandy loams, and gravels underlain by metamorphic rock. Soils on the Site consisted of approximately 9 feet of fill material containing brick, concrete, fly ash, slag, fine silty sands, clay, and fine gravels. Native material consisting of fine to medium sands with some silt was observed at depths greater than 9 feet below ground surface (bgs).

Available Site specific boring logs prepared by the former remedial consultant, AESI, for the Site are provided in Appendix C.

2.2.3 Hydrogeology

According to the 2013 United State Geological Survey (USGS) Brooklyn, NY 7.5 Minute Series Topographic Quadrangle Map, the Site is at an elevation of about 14 feet above mean sea level. The property is generally flat and slopes gently to the east towards the Dutch Kills.

The nearest body of water is the Dutch Kills Creek, located adjacent to the east and south of the subject property. The Dutch Kills Creek flows into the Newtown Creek approximately 0.25 miles to the south of the subject property. Groundwater has been observed at depths of 9-13 feet at the subject property.

A historic groundwater contour map from data collected during the Remedial Investigation is shown in Figure 3. Available groundwater monitoring well construction logs prepared by the former remedial consultant, AESI, for the Site are provided in Appendix C.

2.3 Investigation and Remedial History

The following narrative provides a remedial history timeline and a brief summary of the available project records to document key investigative and remedial milestones for the Site. Full titles for each of the reports referenced below are provided in Section 8.0 – References.

The following environmental investigations/Interim Remedial Measures (IRMs) have been performed at the Site and are discussed in detail in the sections below:

- Preliminary Remedial Investigation (PRI), prepared by Atlantic Environmental Solutions, Inc. (AESI) in October 2017.
- Supplemental Remedial Investigation (SRI), prepared by AESI in September 2018.
- Remedial Investigation Work Plan (RIWP), prepared by AESI, dated October 2018.
- IRM Work Plan (IRMWP), prepared by AESI in March 2019.
- Post IRM Indoor Sampling, conducted by AESI in June 2021.
- Additional Soil Vapor, conducted by Roux in August and November 2022.
- SVES Expansion Pilot Test Workplan, prepared by Roux, dated May 8, 2023.
- Additional Groundwater Remedial Investigation, conducted by Roux in May 2024.
- Remedial Action Work Plan (RAWP) prepared by Roux in August 2024.
- Confirmatory Soil Vapor Intrusion Investigation, conducted by Roux in March 2025.

2.3.1 PRI – AESI, October 2017

In October 2017, AESI conducted a PRI at the Site. The PRI was conducted to evaluate potential impacts and to provide general characterization of the Site. A total of 56 soil samples, along with three (3) soil vapor samples and four (4) ambient air samples were collected for chemical analysis. In addition, three (3) permanent monitoring wells were installed, and a geophysical survey was completed as part of the PRI. The survey identified an area potentially consistent with a 7,500-gallon heating oil UST that had been filled and abandoned in 2005. Analytical results of the PRI identified the presence of elevated concentrations of tetrachloroethene (PCE) in soil gas and the presence of elevated concentrations of other VOCs in soil in the vicinity of the eastern floor drain. Based on

the results of the investigation, AESI recommended that additional investigation activities be performed at the Site.

2.3.2 SRI – AESI, September 2018

In September 2018, AESI conducted a SRI at the Site in order to confirm that PCE contamination identified during previous investigation activities was not migrating off-Site towards the Dutch Kills. The SRI activities were conducted to delineate soil, groundwater, and soil vapor conditions at the Site. Based on the results of the SRI, Hunters Point SG, LLC applied to enter into the BCP as a volunteer in September 2018.

2.3.3 RIWP – AESI, October 2018

Due to the proximity of the Site to Dutch Kills and Newton Creek, the NYSDEC requested additional investigation activities to supplement existing data to define the nature and extent of contamination more fully in soil, groundwater, and soil vapor identified at the Site. As required by the NYSDEC, a RIWP was prepared by AESI in July 2018 and was approved by the NYSDEC in October 2018. Subsequent to the RIWP approval, the Site was accepted into the BCP in September 2018 (as Site number C241219). In October 2018, AESI conducted additional remedial investigation activities as outlined in the NYSDEC approved RIWP at the Site.

Upon being accepted as a Volunteer into the BCP, remedial investigation activities (outlined in the approved RIWP) were implemented to investigate and characterize the extent of environmental impacts on the Site, as well as to define chemical constituent migration pathways and evaluate the potential feasibility of planned remedial actions for the Site. Remedial investigation activities were performed onsite during October through November 2018 and included the installation of 23 soil borings, seven (7) permanent monitoring wells, 60 sub-slab soil gas screening points and eight (8) confirmation soil gas sample points. Based on the remedial investigation data, it was concluded that the nature of contamination present at the Site was consistent with the fill materials used during development of the Site. It was also concluded that PCE contamination, previously identified in soil at the Site above commercial use soil cleanup objectives (SCOs), was fully delineated. In addition to the elevated PCE contamination, there was also petroleum-related contamination identified primarily in the vicinity of the oil/water separator within

the Site building. Soil gas results identified high levels of PCE along the northern property boundary, with concentrations decreasing across the property towards the south and east.

2.3.4 IRMWP – AESI, March 2018

In January 2019 AESI submitted an IRMWP to NYSDEC, which was approved in March 2019. The IRMWP was implemented between April 2019 and November 2019 by AESI. The following interim remedial measures were implemented:

- Exposure, cleaning, removal, and off-Site disposal of hydraulic lifts;
- Exposure, cleaning, removal, and off-Site disposal of oil/water separator;
- Installation of a SSDS/SVES to optimize mass removal beneath the building and parking lot of the Site to mitigate the potential migration of sub-slab soil vapor associated with VOCs and CVOCs;
- Removal and off-Site disposal of approximately 372-tons of soil/fill generated during the removal of hydraulic lifts and the installation of the SSDS/SVES, comingled with impacted petroleum soils surrounding the oil/water separator; and
- Excavation support activities, including:
    - Stockpiling of excavated material and backfill brought to the Site;
    - Waste characterization sampling;
    - Excavation endpoint documentation soil sampling;
    - Transport and disposal of excavated material at a permitted disposal facility; and
    - Backfill and compaction of excavation with acceptable backfill material.

A figure showing the SSDS plan and details is provided in Appendix D1. The implemented IRM actions are described and documented in the NYSDEC-approved December 2021 IRM Construction Completion Report prepared by Roux.

2.3.5 Post IRM Indoor Sampling, conducted by AESI in June 2021

Following the construction and start-up of the SSDS/SVES, in June 2021, AESI collected confirmatory indoor air samples for analysis for indoor air locations A1 through A4. Confirmatory indoor air samples showed an overall significant decrease in TCE and PCE concentrations compared to pre-IRM analytical results.

2.3.6 Additional Soil Vapor, conducted by Roux in August and November 2022.

Following Roux's initial submittal of the Remedial Action Work Plan to the NYSDEC in February 2022, the NYSDEC and NYSDOH requested additional soil vapor sampling activities to be completed within the Site and along the sidewalk that is present along the northern boundary of the Site. A total of 12 sub-slab soil vapor samples were collected; six samples were collected in the offsite sidewalk in August 2022, and six samples were collected in the onsite building and parking area in November 2022. All sub-slab soil vapor samples were analyzed for VOCs using United States Environmental Protection Agency (USEPA) Method TO-15. Results were compared to PCE concentrations beneath the Site prior to the installation of the SSDS/SVES. The comparison demonstrated that the general magnitude of the PCE concentrations along the northern border of the Site had significantly reduced as a result of the systems operations, with PCE concentrations reduced by two orders of magnitude. Following submission of this data, the NYSDEC and NYSDOH determined that additional measures were required to further prevent the potential for off-Site migration of soil vapor.

2.3.7 SVES Expansion Pilot Test Summary and Design Report, prepared by Roux, dated August 15, 2023.

In accordance with the SVES Expansion Pilot Test Workplan submitted by Roux on May 8, 2023, a Pilot Test was performed at the Site to provide empirical data to aid in the design of the SVES Expansion and determine the potential effective radius of influence (ROI) for SVES extraction points. As per the SVES Expansion Pilot Test Workplan, one 4-inch diameter screened polyvinyl chloride (PVC) SVE point, and six ½-inch diameter screened PVC monitoring points were installed to conduct the Pilot Test. The Pilot Test concluded that an ROI of 30 feet was achievable with a minimum pressure of -2.0 inches of water column (in. w.c.) and an air flow rate of 143 cubic feet per minute (CFM) to be applied at each point in the full scale system. However, upon further review of the Pilot Test data while finalizing the design, it was determined these design parameters did not reflect the actual minimum air flow and pressure conditions that achieved the target ROI for the system and therefore were overly conservative. The actual minimum air flow and pressure determined during the Pilot Test to achieve the target ROI of 30 feet were a pressure of -0.6 in. w.c. and an air flow rate of 41.6 CFM, as indicated in the Summary of

SVE Pilot Test Data that was included as an attachment to the August 2023 SVES Expansion Pilot Test and Summary Design Report. Therefore, Roux chose these criteria (-0.6 in. w.c. and an air flow rate of 41.6 CFM, per SVE Point) as the minimum for design. Based on post-remedial monitoring discussed in Section 5.5.1, the system has met and exceeded the minimum design criteria.

2.3.8 Additional Groundwater Remedial Investigation, conducted by Roux in May 2024.

In May 2024, Roux conducted additional remedial investigation of groundwater for Polycyclic Aromatic Hydrocarbons (PAHs) as requested by the NYSDEC to address concerns about perceived data gaps. Five (5) of the existing ten (10) groundwater wells spread across the Site were sampled for PAHs. Analytical groundwater sampling results indicated limited detections of PAHs and no exceedances of NYSDEC Ambient Water Quality Standards and Guidance Values (AWQSGVs) (referred to as 6NYCRR 703.5 Groundwater Quality Standards [GQS] by AESI in previous reports). Based on investigation data, it was concluded that no further PAHs groundwater investigation was necessary at the Site, and no additional remediation is required to treat PAHs beyond the RAWP remediation, due to the following conditions: 1) wells were properly purged which allowed for the collection of low/no turbidity samples and 2) since PAHs were not reported above AWQSGVs, the corresponding Protection of Groundwater SCO exceedances in soil were not applicable and, therefore, were not considered source material contributing to groundwater contamination. PAH concentrations present in groundwater indicated no source area concerns.

2.3.9 RAWP prepared by Roux in August 2024.

In August 2024, Roux submitted the RAWP for Site. On September 30, 2024 the NYSDEC and NYSDOH approved the RAWP and provided the Decision Document.

2.3.10 Confirmatory Soil Vapor Intrusion Investigation, conducted by Roux in March 2025.

In March 2025, Roux conducted a confirmatory soil vapor intrusion investigation in accordance with the Confirmatory Soil Vapor Intrusion (SVI) Work Plan, dated February 24, 2025, and as approved by the NYSDEC and NYSDOH on February 27, 2025.

Two (2) collocated sub-slab soil vapor and indoor air samples were collected along with one (1) ambient air sample and analyzed for VOCs using USEPA Method TO-15. SVI air samples results indicated "No Further Action" in accordance with the NYSDOH Decision Matrices (Matrices A through F), indicating that the SSDS/SVES is effective at mitigating SVI at the Site.

2.4 Remedial Action Objectives

The Remedial Action Objectives (RAOs) for the Site as listed in the Decision Document dated September 30, 2024 are as follows:

Groundwater

RAOs for Public Health Protection

- Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards.
- Prevent contact with, or inhalation of, volatiles from contaminated groundwater.

Soil

RAOs for Public Health Protection

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

RAOs for Environmental Protection

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

Soil Vapor

RAOs for Public Health Protection

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

2.5 Remaining Contamination

2.5.1 Soil

Constituents above commercial SCOs in soil are located Site-wide and are covered by the Site building and asphalt paving (Site Cover System). Soil contamination remaining at the Site is based on samples collected as part of the RI and IRM completed by AESI. No end point samples were collected as part of the RAWP implementation. Contamination remains in soil at the Site at approximately 2 to 16 ft bls where data is available, however, AESI did not provide depth ranges for all soil samples collected.

Soil samples collected by AESI from soil boring locations advanced during the RI were submitted for laboratory analysis and compared to the following NYSDEC 6 NYCRR Subpart 375-6.8(a-b) SCOs in order to evaluate Site-wide soil quality and to determine contamination in soil: NYSDEC Part 375 Unrestricted Use SCOs (UUSCOs), Commercial Use SCOs (CSCOs) and Protection of Groundwater SCOs (PGWSCOs).

A summary of VOC, SVOC, metals and pesticides exceedances in soil samples is provided below. No PCBs were detected in exceedance of the Unrestricted Use SCOs, Commercial Use SCOs or Protection of Groundwater SCOs.

VOC Exceedances of SCOs in Soil

Analyte	UUSCO (mg/kg)	Detections above UUSCOs	CSCOs (mg/kg)	Detections above CSCOs	PGWSCOs (mg/kg)	Detections above PGWSCOs	Range in Concentration Above SCOs (mg/kg)	Soil Sample with Maximum Detection (depth in ft bls, if applicable)
2-Butanone	0.12	2	500	-	0.12	2	0.218 - 0.389	SB-7 (10-10.5)
Acetone	0.05	12	500	-	0.05	12	0.051 – 0.337	SB-2 (15.5-16)
Benzene	0.06	1	44	-	0.06	1	0.065	SB-8 (10-10.5)
Tetrachloroethene	1.3	19	150	-	1.3	19	1.55 – 61.6D	SB-30 (7.5-8)
Trichloroethylene (TCE)	0.47	3	200	-	0.47	3	0.625 – 0.956	SB-14 (3.5-4)
Xylenes	0.26	1	500	-	1.6	-	0.767D	SB-37S (2-2.5)

- No exceedances detected
D – A secondary analysis after dilution due to exceedance of the calibration range in the original sample.

SVOC Exceedances of SCOs in Soil

Analyte	UUSCO (mg/kg)	Detections above UUSCOs	CSCOs (mg/kg)	Detections above CSCOs	PGWSCOs (mg/kg)	Detections above PGWSCOs	Range in Concentration Above SCOs (mg/kg)	Soil Sample with Maximum Detection (depth in ft bls, if applicable)
Benzo[a]anthracene	1	41	5.6	8	1	41	1.01 – 49.1D	SB-58B (9.5-10)
Benzo[a]pyrene	1	36	1	36	22	4	1.04D – 47.3D	SB-58B (9.5-10)
Benzo[b]fluoranthene	1	30	5.6	7	1.7	18	1.02D – 39.4D	SB-58B (9.5-10)
Benzo[k]fluoranthene	0.8	30	56	-	1.7	17	0.805 – 29.1D	SB-58B (9.5-10)
Chrysene	1	45	56	-	1	45	1.06 – 48.4D	SB-58B (9.5-10)
Dibenzo[a,h]anthracene	0.33	26	0.56	15	1000	-	0.332 – 8.71D	SB-58B (9.5-10)
Indeno [1,2,3-cd] pyrene	0.5	44	5.6	6	8.2	5	0.528 – 29.5D	SB-58B (9.5-10)
Pentachlorophenol	0.8	1	6.7	-	0.8	1	1.69	COMPOSITE
Pyrene	100	1	500	-	1000	-	110D	SB-58B (9.5-10)

- No exceedances detected
D – A secondary analysis after dilution due to exceedance of the calibration range in the original sample.

Metals Exceedances of SCOs in Soil

Analyte	UUSCO (mg/kg)	Detections above UUSCOs	CSCOs (mg/kg)	Detections above CSCOs	PGWSCOs (mg/kg)	Detections above PGWSCOs	Range in Concentration Above SCOs (mg/kg)	Soil Sample with Maximum Detection (depth in ft bls, if applicable)
Arsenic	13	7	16	6	16	6	14.3 – 78.4	SB-35S (2-2.5)
Barium	350	28	400	27	820	5	385 - 1540	SB-56A (2-2.5)
Beryllium	7.2	1	590	-	47	-	10.3	SB-77A (2-2.5)
Cadmium	2.5	6	9.3	2	7.5	2	2.79 – 22.6	SB-74B (8-8.5)
Chromium, Hexavalent	1	6	400	-	19	1	2.4 - 142	Dup 1114
Chromium, Trivalent	30	12	1500	-	-	-	37.2 - 1230	Dup 1114
Chromium	30	19	1500	-	-	-	34.6 – 1370	Dup 1114
Copper	50	42	270	9	1720	1	54.1 – 1870	SB-77A (2-2.5)
Lead	63	56	1000	20	450	38	79.7 – 3630	SB42-A
Mercury	0.18	51	2.8	1	0.73	12	0.2 – 4.78	SB-61C (8-8.5)
Nickel	30	18	310	1	130	3	33.4 – 2330	SB-57C (8-8.5)
Selenium	3.9	2	1500	-	4	2	11.2	SB-64A (2-2.5) & SB-68A (2-2.5)
Silver	2	4	1500	-	8.3	1	2.28 – 15.9	Dup 1114
Zinc	109	52	10000	1	2480	4	119 – 14,600D	SB-77A (2-2.5)

- No exceedances detected
D – A secondary analysis after dilution due to exceedance of the calibration range in the original sample.

Pesticide Exceedances of SCOs in Soil

Analyte	UUSCO (mg/kg)	Detections above UUSCOs	CSCOs (mg/kg)	Detections above CSCOs	PGWSCOs (mg/kg)	Detections above PGWSCOs	Range in Concentration Above SCOs (mg/kg)	Soil Sample with Maximum Detection (depth in ft bls, if applicable)
4,4'-DDD	0.0033	5	92	-	14	-	0.00473 – 0.03	SB-32S (2-2.5)
4,4'-DDE	0.0033	8	62	-	17	-	0.00402J – 0.1	SB-37S (2-2.5)
4,4'-DDT	0.0033	21	47	-	136	-	0.00338J – 0.201	SB-37S (2-2.5)

- No exceedances detected
J – Estimated value

As documented in the approved 2019 IRMWP, soil samples collected surrounding the area of the former oil/water separator identified petroleum related compounds above the Part 375 Commercial Use SCO. These compounds included PAHs observed at soil boring SB-77 during the Remedial Investigation, as shown in the table below.

Analyte	Concentration (ppm)	SCO Concentration (ppm)
Benzo(a)anthracene	2.55	PGWSCO: 1 CSCO: 5.6 UUSCO: 1
Chrysene	2.4	PGWSCO: 1 CSCO: 56 UUSCO: 1
Benzo(a)pyrene	2.87	PGWSCO: 22 CSCO: 1 UUSCO: 1
Benzo(b)fluoranthene	2.65	PGWSCO: 1.7 CSCO: 5.6 UUSCO: 1
Benzo(k)fluoranthene	2.3	PGWSCO: 1.7 CSCO: 56 UUSCO: 0.8
Dibenz(a,h)anthracene	0.597	PGWSCO: 1,000 CSCO: 0.56 UUSCO: 0.33

The area around the former oil/water separator was treated as a hot spot and was further excavated and delineated. The remedial excavation activities associated with the former oil/water separator were performed in May 2019.

In accordance with the NYSDEC'S DER-10, on May 29, 2019 five endpoint documentation soil samples were collected from the excavation. The excavation cavity extended approximately 10 feet long by 8 feet wide, and 9 feet bgs. One endpoint sample was collected at the base of the excavation, and four endpoint samples were collected along the side walls of the excavation. Endpoint samples were collected at a depth of approximately 8.5 to 9.0 feet bgs. Endpoint samples were analyzed for VOCs and SVOCs.

VOCs and SVOCs were not detected exceeding the Protection of Groundwater or Commercial Use SCOs in soil in any of the endpoint samples collected. Only one SVOC, indeno(1,2,3-cd)pyrene, had a detection above the Unrestricted Use SCOs in one end point sample ("OWS-PE-4") at a concentration of 0.557D mg/kg. VOCs were not detected exceeding the Unrestricted Use SCOs in soil in any of the end point samples collected.

Tables 2 through 8 and Figures 4A through 4C summarize the results of all soil samples collected that exceed the Unrestricted Use SCOs, Protection of Groundwater SCOs, and Commercial Use SCOs at the site after completion of the remedial action. The location of all excavations completed as part of the IRM and RAWP are shown on Figure 5, and the backfilled areas are shown on Figure 6.

2.5.2 Groundwater

During previous investigations, groundwater samples were compared to NYSDEC AWQSGVs (referred to as 6NYCRR 703.5 GQS by AESI in previous reports). No PCBs were detected above their AWQSGVs in the groundwater samples. One VOC, Isopropylbenzene (at 26.1 µg/L), was detected above its AWQSGVs in the SB-15-AQ PHASE sample located in the vicinity of the oil-water separator[1].

In May 2024, Roux conducted an additional remedial investigation of groundwater for PAHs as suggested by the NYSDEC to address concerns about perceived data gaps (see Section 2.3.8). Five (5) of the existing ten (10) groundwater wells spread across the Site were sampled for PAHs (MW-1, MW-2, MW-4, MW-8 and MW-9). Analytical

[1] SVOCs were also sampled during the previous investigations, however, were resampled as described in the remainder of this section. Groundwater was resampled due to incorrect purging methods conducted by AESI, resulting in over-turbid samples which did not accurately reflect Site conditions.

groundwater sampling results indicated limited detections of PAHs and no exceedances of NYSDEC AWQSGVs.

Tables 9 through 14 and Figure 7 summarize the results of all samples of groundwater.

2.5.3 Soil Vapor

Residual contamination remaining at the Site includes VOC related compounds in soil vapor. Following start-up of the SVES expansion, on March 10, 2025, Roux conducted a confirmatory soil vapor intrusion investigation while the SSDS/SVES and Expanded SVES were operating in accordance with the Confirmatory SVI Work Plan, dated February 24, 2025, and as approved by the NYSDEC and NYSDOH on February 27, 2025. Two (2) collocated sub-slab soil vapor and indoor air samples were collected along with one (1) ambient air sample and analyzed for VOCs using USEPA Method TO-15. SVI air samples results indicated "No Further Action" in accordance with the NYSDOH Decision Matrices (Matrices A through F).

Laboratory analytical detections in the soil vapors are summarized below.

Analyte	Detections	Range in Concentrations ($\mu g/m^3$)	Sample with Maximum Detection
1,1,2-Trichloro-1,2,2-Trifluoroethane	2	0.46 J – 0.5 J	SSV-2
1,2,4-Trimethylbenzene	2	0.94 J – 1.3	SSV-2
1,3,5-Trimethylbenzene (Mesitylene)	1	0.25 J	SSV-2
1,4-Dioxane	2	3.6 J – 16J	SSV-2
2,2,4-Trimethylpentane	1	0.37 J	SSV-2
4-Ethyltoluene	1	0.31 J	SSV-2
Acetone	2	24 – 120 D	SSV-2
Benzene	2	0.46 J – 0.49 J	SSV-2
Butane	2	0.8 J – 5	SSV-2
Carbon Disulfide	2	8.5 – 9.3	SSV-1
Carbon Tetrachloride	2	0.4 – 0.42	SSV-2
Chlorodifluoromethane	2	1.3 J – 1.7 J	SSV-1
Chloromethane	1	0.61 J	SSV-1
Cyclohexane	1	0.29 J	SSV-2

Analyte	Detections	Range in Concentrations (µg/m^3)	Sample with Maximum Detection
Dichlorodifluoromethane	2	2.3 J – 2.4 J	SSV-2
Ethylbenzene	2	1.4	SSV-1 & SSV-2
Isopropanol	2	10 J – 43	SSV-2
m,p-Xylene	2	5.8 – 6.2	SSV-2
Methyl Ethyl Ketone (2-Butanone)	2	2.7 – 6.1	SSV-2
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	1	0.98 J	SSV-2
N-Heptane	2	0.75 J – 1	SSV-2
N-Hexane	2	0.42 J – 0.65 J	SSV-2
N-Propylbenzene	1	0.24 J	SSV-1
O-Xylene (1,2-Dimethylbenzene)	2	1.5 – 1.8	SSV-2
Styrene	1	0.59 J	SSV-2
Tert-Butyl Alcohol	1	17	SSV-2
Tetrachloroethylene (PCE)	2	2.4 – 2.9	SSV-2
Toluene	2	2.9 – 3.1	SSV-1
Trichlorofluoromethane	2	1.2	SSV-1 & SSV-2

Analytical data for indoor air and ambient air indicate there were detections of 21 different VOCs across the Site, consisting primarily of petroleum-related VOCs and CVOCs. Laboratory analytical detections in indoor air and ambient air are summarized below.

Analyte	Detections	Range in Concentrations (µg/m3)	Sample with Maximum Detection
1,1,2-Trichloro-1,2,2-Trifluoroethane	3	0.47 J - 0.49 J	AA-1
1,3-Butadiene	3	0.089 J – 0.15 J	IA-1 DUP
2,2,4-Trimethylpentane	3	0.34 J – 0.47 J	IA-1 DUP
Acetone	3	9.9 J - 13	AA-1
Benzene	3	0.64 – 0.74	IA-1 DUP
Butane	3	6.1 – 6.4	IA-1 DUP
Carbon Tetrachloride	3	0.32 - 0.4	IA-1 DUP
Chlorodifluoromethane	3	1.2 J – 1.3 J	IA-1 DUP & IA-2
Chloromethane	3	1.4- 1.5	AA-1

Analyte	Detections	Range in Concentrations (µg/m3)	Sample with Maximum Detection
Dichlorodifluoromethane	2	2.1 J - 2.4 J	IA-2
Ethylbenzene	3	0.47 J – 0.78 J	AA-1
Isopropanol	1	6.8 J	IA-1 DUP
m,p-Xylene	3	1.8 J – 3.3	AA-1
Methylene Chloride	3	0.69 J – 0.85 J	IA-1 & AA-1
N-Heptane	3	0.34 J – 0.52 J	IA-1 DUP
N-Hexane	3	0.4 J – 0.59 J	IA-1 DUP
O-Xylene (1,2-Dimethylbenzene)	3	0.56 J – 0.99	AA-1
Tetrachloroethylene (PCE)	3	0.57 J - 0.93 J	IA-2
Toluene	3	1.1 – 1.2	AA-1
Trans-1,2-Dichloroethene	1	2.6	AA-1
Trichlorofluoromethane	3	1.1 - 1.3	IA-2

Matrix A Compounds

- TCE was not detected in sub-slab soil vapor, indoor air or ambient air.
- Carbon tetrachloride was detected in two sub-slab soil vapor samples, ranging in concentration from 0.4 µg/m^3 to 0.42 µg/m^3 with a maximum detection in SSV-2. Carbon tetrachloride was detected in two indoor air samples, ranging in concentration from 0.37 µg/m^3 to 0.4 µg/m^3, with a maximum detection in indoor air sample IA-1 DUP. Carbon tetrachloride was detected in ambient air sample AA-1 at a concentration of 0.32 µg/m^3.
- Cis-1,2-DCE was not detected in sub-slab soil vapor, indoor air or ambient air.
- 1,1-DCE was not detected in sub-slab soil vapor, indoor air or ambient air.

Matrix B Compounds

- PCE was detected in two sub-slab soil vapor samples, ranging in concentration from 2.4 µg/m^3 to 2.9 µg/m^3 with a maximum detection in SSV-2. PCE was detected in two indoor air samples, ranging in concentration from 0.57 J µg/m^3 to 0.93 J µg/m^3, with a maximum detection in indoor air sample IA-2. PCE was detected in ambient air at a concentration of 0.79 J µg/m^3
- 1,1,1-TCA was not detected in sub-slab soil vapor, indoor air or ambient air.
- Methylene chloride was not detected in sub-slab soil vapor. Methylene chloride was detected in two indoor air samples, ranging from concentration from 0.69 J µg/m^3 to 0.85 J µg/m^3, with a maximum detection in indoor air sample IA-1 DUP and ambient air sample AA-1 at a concentration of 0.85 J µg/m^3.

Matrix C Compounds

- Vinyl chloride was not detected in sub-slab soil vapor, indoor air or ambient air.

Matrix D Compounds

- Benzene was detected in sub-slab soil vapor samples, ranging in concentration from 0.46 J µg/m^3 to 0.49 J µg/m^3 with a maximum detection at SSV-2. Benzene was detected in two indoor air samples, ranging in concentration from 0.65 µg/m^3 to 0.74 µg/m^3, with a maximum detection in indoor air sample IA-1 DUP. Benzene was detected in ambient air sample AA-1 at a concentration of 0.64 µg/m^3.
- Ethylbenzene was detected in two sub-slab soil vapor samples, both at concentrations of 1.4 µg/m^3. Ethylbenzene was detected in two indoor air samples, ranging in concentration from ranging in concentration from 0.47J µg/m^3 to 0.67 J µg/m^3, with a maximum detection in indoor air sample IA-1. Ethylbenzene was detected in ambient air at a concentration of 0.78 J µg/m^3.
- Naphthalene was not detected in sub-slab soil vapor, indoor air or ambient air.
- Cyclohexane was detected in sub-slab soil vapor sample SSV-2 at a concentration of 0.29 J µg/m^3. Cyclohexane was not detected in indoor air or ambient air.
- Isooctane (2,2,4-trimethylpentane) was detected in sub-slab soil vapor sample SSV-2 at a concentration of 0.37 J µg/m^3. Isooctane was detected in two indoor air samples, ranging in concentration from 0.34 J µg/m^3 to 0.47 J µg/m^3, with a maximum detection in indoor air sample IA-1 DUP. Isooctane was detected in ambient air sample AA-1 at a concentration of 0.39 J µg/m^3.
- 1,2,4-Trimethylbenzene was detected in two sub-slab soil vapor samples ranging in concentration from 0.94 J to 1.3 µg/m^3 with a maximum detection at SSV-2. 1,2,4-Trimethylbenzene was not detected in indoor air or ambient air.
- 1,3,5-trimethylbenzene was detected in sub-slab soil vapor sample SSV-2 at a concentration of 0.25 J µg/m^3. 1,3,5-Trimethylbenzene was not detected in indoor air or ambient air.
- O-xylene was detected in two sub-slab soil vapor samples ranging in concentration from 1.5 µg/m^3 to 1.8 µg/m^3 with a maximum detection at SSV-2. O-xylene was detected in two indoor air samples, ranging in concentration from 0.56 J µg/m^3 to 0.92 µg/m^3, with a maximum detection in indoor air sample IA-2. O-xylene was detected in ambient air sample AA-1 at a concentration of 0.99 µg/m^3.

Matrix E Compounds

- M,p-Xylene was detected in two sub-slab soil vapor samples ranging in concentration from 5.8 µg/m^3 to 6.2 µg/m^3 with a maximum detection at SSV-2. M,p-Xylene was detected in two indoor air samples, ranging in concentration from 1.8 J µg/m^3 to 3.1 µg/m^3, with a maximum detection in indoor air sample IA-2. M,p-Xylene was detected in ambient air sample AA-1 at a concentration of 3.3 µg/m^3.

- Heptane was detected in two sub-slab soil vapor samples ranging in concentration from 0.75 J µg/m^3 to 1 µg/m^3 with a maximum detection at SSV-2. Heptane was detected in two indoor air samples, ranging in concentration from 0.34 J µg/m^3 to 0.52 J µg/m^3, with a maximum detection in indoor air sample IA-1 DUP. Heptane was detected in ambient air sample AA-1 at a concentration of 0.46 J µg/m^3.
- Hexane was detected in two sub-slab soil vapor samples ranging in concentration from 0.42 J µg/m^3 to 0.65 J µg/m^3 with a maximum detection at SSV-2. Hexane was detected in two indoor air samples, ranging in concentration from 0.4 J µg/m^3 to 0.59 J µg/m^3, with a maximum detection in indoor air sample IA-1 DUP. Hexane was detected in ambient air sample AA-1 at a concentration of 0.49 J µg/m^3.

Matrix F Compounds

- Toluene was detected in two sub-slab soil vapor samples ranging in concentration from 2.9 µg/m^3 to 3.1 µg/m^3 with a maximum detection at SSV-1. Toluene was detected in two indoor air samples, both at a concentration of 1.1 µg/m^3. Toluene was detected in ambient air sample AA-1 at a concentration of 1.2 µg/m^3.

Tables 15 through 17 and Figures 8A and 8B summarize the results of all samples of soil vapor.

The effluent discharge stack was also sampled for VOCs via EPA Method TO-15 and assessed in accordance with the Guidance on Air Emissions of VOCs at DER Remediation Sites prepared by the DER and the Division of Air Resources (DAR). The DAR Evaluation is included in Table 18. Sampling results indicated that treatment is not required. Sampling results and analysis are provided in the FER. Additionally, PID readings and pressure differential readings were collected on March 10, 2025, and results are included on Figure 8B. A DUSR was prepared for all data generated during the confirmatory soil vapor intrusion investigation, which is detailed in the FER.

3.0 INSTITUTIONAL AND ENGINEERING CONTROL PLAN

3.1 General

Since remaining contamination exists at the site, Institutional Controls (ICs) and Engineering Controls (ECs) are required to protect human health and the environment. This IC/EC Plan describes the procedures for the implementation and management of all IC/ECs at the site. The IC/EC Plan is one component of the SMP and is subject to revision by the NYSDEC project manager.

This plan provides:

- A description of all IC/ECs on the site;
- The basic implementation and intended role of each IC/EC;
- A description of the key components of the ICs set forth in the Environmental Easement;
- A description of the controls to be evaluated during each required inspection and periodic review;
- A description of plans and procedures to be followed for implementation of IC/ECs, such as the implementation of the Excavation Work Plan (EWP) (as provided in Appendix E) for the proper handling of remaining contamination that may be disturbed during maintenance or redevelopment work on the site; and
- Any other provisions necessary to identify or establish methods for implementing the IC/ECs required by the site remedy, as determined by the NYSDEC project manager.

3.2 Institutional Controls

A series of ICs is required by the Decision Document to: (1) implement, maintain and monitor Engineering Control systems; (2) prevent future exposure to remaining contamination; and (3) limit the use and development of the site to commercial or industrial uses only. Adherence to these ICs on the site is required by the Environmental Easement and will be implemented under this SMP. ICs identified in the Environmental Easement may not be discontinued without an amendment to or extinguishment of the Environmental Easement. The IC boundaries are shown on Figure 2. These ICs are:

- The property may be used for: commercial or industrial use;
- All ECs must be operated and maintained as specified in this SMP;

- All ECs must be inspected at a frequency and in a manner defined in the SMP;
- The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the Environmental Easement, NYSDOH or the New York City Department of Health and Mental Hygiene to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the Department;
- Groundwater and other environmental or public health monitoring, if any, must be performed as defined in this SMP;
- Data and information pertinent to site management must be reported at the frequency and in a manner as defined in this SMP;
- All future activities that will disturb remaining contaminated material must be conducted in accordance with this SMP;
- Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in this SMP;
- Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical component of the remedy shall be performed as defined in this SMP;
- Access to the site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by the Environmental Easement;
- The potential for vapor intrusion must be evaluated for any new buildings (excluding the existing building) developed in the area within the IC boundaries noted on Figure 2, and any potential impacts that are identified must be monitored or mitigated; and
- Vegetable gardens and farming on the site are prohibited.
- An evaluation shall be performed to determine the need for further investigation and remediation should large scale redevelopment occur, if any of the existing structures are demolished, or if the subsurface is otherwise made accessible.

3.3 Engineering Controls

3.3.1 Site Cover System

Exposure to remaining contamination at the site is prevented by a cover system placed over the site. This cover system is comprised of a minimum of 6 inches of concrete building slab and sidewalks, and 2 inches of asphalt pavement. Figure 9 presents the location of the cover system and applicable demarcation layers. The Excavation Work Plan (EWP) provided in Appendix E outlines the procedures required to be implemented in the

event the cover system is breached, penetrated or temporarily removed. Procedures for the inspection of this cover are provided in the Monitoring and Sampling Plan included in Section 4.0 of this SMP. Any work conducted pursuant to the EWP must also be conducted in accordance with the procedures defined in a Health and Safety Plan (HASP) and associated Community Air Monitoring Plan (CAMP) prepared for the site and provided in Appendix F. Any breach of the site's cover system must be overseen by a Professional Engineer (PE) who is licensed and registered in New York State or a qualified person who directly reports to a PE who is licensed and registered in New York State.

3.3.2 SSDS/SVES and Expanded SVES

As a protective measure to mitigate potential soil vapor intrusion into the building, an active SSDS/SVES was installed under the building slab and parking lot during the implementation of the IRMWP. The SSDS/SVES was designed by the former remedial consultant, AESI, for the Site following the basic requirements established with respect to soil vapor migration established in the NYSDOH SVI Guidance, as updated in May 2017. The SSDS/SVES designs for the IRM were submitted to the NYSDEC and NYSDOH in the January 2019 IRMWP and were approved in March 2019.

In order to prevent the off-site migration of vapor-phase contaminants, SVES components were installed beneath the building foundation slab, north of the building interior and north of the parking lot during the implementation of the RAWP (referred to herein as the Expanded SVES).

3.3.2.1 SSDS/SVES

The SSDS was installed by Highground Industrial. The following describes components, materials, and general layout of the installed SSDS:

- Three separate sets of horizontal perforated pipes in a "H" pattern were installed within a 16-inch layer of crushed stone immediately beneath the building slab.
- Three legs of horizontal perforated pipe were installed within a 16-inch layer of crushed stone immediately beneath the parking lot area.
- Loops of perforated PVC gas collection pipes (4-inch diameter schedule 80 PVC pipes) were embedded in a gas permeable aggregate layer with a minimum of 6 inches of crushed stone (¾ inch non-angular stone with less than 5% fines smaller than ¾ inches) placed above and below the perforated pipe trench. The perforated pipes were installed in 2 foot by 1 foot trenches.

- Once the perforated pipes were installed, the Site building floor was restored with six-inches of concrete on top of the crushed stone to prevent preferential pathways for vapor migration.
- As per the IRMWP, five sub-slab soil vacuum monitoring points (SVMPs) were installed within the floor slab of the Site building to monitor/evaluate the effectiveness of the system.
- The horizontal depressurization piping was connected to four separate vertical header pipes that discharge above the building roof line. Vent locations were installed at minimum of 10 feet from any window or HVAC intake point.
- A Radon Away fan model #RP265 was connected to each of the four vertical header piping on the roof.

During the startup of the SSDS, the system was tested and found to be operating as designed and providing adequate negative pressure (i.e., vacuum) beneath the building. Differential pressure readings were collected from the network of sub-slab monitoring points located throughout the building. Readings collected ranged from -0.004 - -0.1 in w.c.. It should be noted that in order to maintain the minimum required vacuum response throughout the footprint of the building, a minimum operational differential pressure of -0.004 should be maintained at each of the monitoring points. Additionally, Roux personnel inspected the SSDS and collected differential pressure readings at the monitoring points on October 27, 2021. It was confirmed that the SSDS was operational with adequate vacuum measured in all monitoring points, with a minimum pressure reading of -0.004 inches of water column at each point.

In order to remove potential source material from the area with PCE in soil, a single SVE point was installed by AESI in the location of the former hydraulic lifts; however, the SVE point was connected to an undersized Radon fan. The SVE point was incorporated into the Expanded SVES during implementation of the RAWP and is further described in Section 3.3.2.2, below.

3.3.2.2 Expanded SVES

The Expanded SVES includes eight newly installed SVE points and one existing SVE point, connected to 4-inch riser piping, 6-inch header piping and a new SVES blower located on the roof. There are a total of nine Expanded SVES treatment areas; four SVE points along the northern boundary of the onsite building, four SVE points along the

northern boundary of the Site parking lot, and one existing SVE point along the east side of the onsite building. The Expanded SVES installation began on October 21, 2024 and included installation of the following SVE components:

- Four 4-inch diameter PVC SVE points along the north side of the building connected via 4-inch steel riser pipes to a 6-inch steel header pipe along the ceiling to the blower on the roof. Four 4-inch diameter PVC SVE points along the north side of the parking lot connected via 6-inch PVC header below grade to a 6-inch steel riser pipe to the 6-inch steel header pipe on the roof. Each SVE points was screened from 1.5 feet to 10 feet below grade except SVE-2 and SVE-7 which were installed to 8 feet below grade and 7 feet below grade, respectively, due to obstructions at depth;
- Interconnection of the existing building SVE point via a 4-inch diameter solid PVC riser pipe transitioned to a 4-inch diameter steel riser pipe and connected to the 6-inch diameter steel header pipe on the roof;
    - The existing building SVE point (4 feet of solid PVC riser and 4 feet of SCH 40 slotted screen) was installed in the vadose zone, and the screened zone was installed below the depth of the SSDS trench to prevent cross communication between the systems.
    - Once the existing building SVE point extraction well was installed, the well riser was connected to horizontal solid piping (4-inch diameter SCH 80 PVC), which runs through the SSDS trench directly into a vertical riser installed on the perimeter wall.
    - The header pipe from the existing building SVE point runs up the perimeter wall of the Site building, venting through the building roof and is connected to the Expanded SVES blower.
- SVES connected to a 10 HP, Atlantic Blowers Model No. AB-850.

Construction related to the SVE expansion included excavation and removal of 4 cubic yards (cy) of soil in the areas shown on Drawing 1. Soil was excavated during installation of the horizontal piping and SVE points to a maximum depth of approximately two feet below grade for piping and 10 feet below grade for SVE points. Soil was disposed of at Clean Earth of North Jersey, Inc., on March 21, 2025. The Expanded SVES was commissioned and operational starting on January 10, 2025. System start-up and testing is further described in Section 5.3.1.

Procedures for operating and maintaining the SSDS/SVES and Expanded SVES are documented in the Operation and Maintenance Plan (Section 5.0 of this SMP). As-built drawings, signed and sealed by a PE who is licensed and registered in New York State, are included in Appendix D – SSDS/SVES (D1) and Expanded SVES (D2) As-Built and Component Manual. Well construction logs for the Expanded SVES are provided in Appendix D as well. Drawing 1 shows the location of the ECs for the site.

3.3.3 Criteria for Completion of Remediation/Termination of Remedial Systems

Generally, remedial processes are considered completed when monitoring indicates that the remedy has achieved the remedial action objectives identified by the decision document. The framework for determining when remedial processes are complete is provided in Section 6.4 of NYSDEC DER-10. Unless waived by the NYSDEC, confirmation samples of applicable environmental media are required before terminating any remedial actions at the site. Confirmation samples require Category B deliverables and a Data Usability Summary Report (DUSR).

The remedial party will also conduct any needed site restoration activities, such as asphalt patching and decommissioning treatment system equipment. In addition, the remedial party will conduct any necessary restoration of vegetation coverage, trees and wetlands, and will comply with NYSDEC and United States Army Corps of Engineers regulations and guidance. Also, the remedial party will ensure that no ongoing erosion is occurring on the site.

3.3.3.1 Site Cover System

The composite cover system is a permanent control, and the quality and integrity of this system will be inspected at defined, regular intervals in accordance with this SMP in perpetuity.

3.3.3.2 SSDS/SVES

The SSDS/SVES will not be discontinued unless prior written approval is granted by the NYSDEC and the NYSDOH project managers. If monitoring data indicates that the SSDS/SVES may no longer be required, a work plan to discontinue the SSDS/SVES will be submitted by the remedial party to the NYSDEC and NYSDOH project managers. The work plan must include soil vapor sampling to verify that the SSDS/SVES is no longer

needed and must comply with the NYSDOH Soil Vapor Intrusion Guidance. The SSDS/SVES should be shut off for a minimum of 30 days prior to conducting soil vapor intrusion sampling.

If the NYSDEC project manager approves termination of operation and maintenance of the SSDS/SVES, the remedial party will notify the property owner and ask whether the property owner wants to keep the SSDS/SVES. If the property owner elects to keep the system, the property owner will be responsible for the operation and maintenance of the system going forward. If the property owner wants the system removed, the remedial party will remove and dispose of the system and repair any parts of the structure that were altered or modified by the SSDS/SVES, such as holes in the basement floor or walls.

3.3.3.3 Expanded SVES

The Expanded SVES will not be discontinued unless prior written approval is granted by the NYSDEC and the NYSDOH project managers. If monitoring data indicates that the Expanded SVES may no longer be required, a work plan to discontinue the Expanded SVES will be submitted by the remedial party to the NYSDEC and NYSDOH project managers. The work plan must include soil vapor sampling to verify that the Expanded SVES is no longer needed and must comply with the NYSDOH Soil Vapor Intrusion Guidance. The Expanded SVES should be shut off for a minimum of 30 days prior to conducting soil vapor sampling.

4.0 MONITORING AND SAMPLING PLAN

4.1 General

This Monitoring and Sampling Plan describes the measures for evaluating the overall performance and effectiveness of the remedy. This Monitoring and Sampling Plan may only be revised with the approval of the NYSDEC project manager. Details regarding the sampling procedures, data quality usability objectives, analytical methods, etc. for all samples collected as part of site management for the site are included in the Quality Assurance Project Plan provided in Appendix G.

This Monitoring and Sampling Plan describes the methods to be used for:

- Sampling and analysis of all appropriate media (e.g., indoor air, soil vapor);
- Assessing compliance with applicable NYSDEC SCGs, particularly groundwater standards and Part 375 SCOs for soil; and
- Evaluating site information periodically to confirm that the remedy continues to be effective in protecting public health and the environment;

To adequately address these issues, this Monitoring and Sampling Plan provides information on:

- Sampling locations, protocol and frequency;
- Information on all designed monitoring systems;
- Analytical sampling program requirements;
- Inspection and maintenance requirements for monitoring wells; and
- Annual inspection and periodic certification.

Reporting requirements are provided in Section 7.0 of this SMP.

4.2 Site – wide Inspection/ Site Cover Inspection

Site-wide inspections and Site cover inspections will be performed on an annual basis. These periodic inspections must be conducted when the ground surface is visible (i.e. no snow cover). Site-wide inspections will be performed by a Professional Engineer (PE) who is licensed and registered in New York State, or a qualified person who directly reports to a PE who is licensed and registered in New York State. Modification to the frequency or duration of the inspections will require approval from the NYSDEC project

manager. Site-wide inspections will also be performed after all severe weather conditions that may affect ECs or monitoring devices. During these inspections, an inspection form will be completed as provided in Appendix H – Site Management Forms. The form will compile sufficient information to assess the following:

- Compliance with all ICs, including site usage;
- An evaluation of the condition and continued effectiveness of ECs;
- General site conditions at the time of the inspection;
- Whether stormwater management systems, such as basins and outfalls, are working as designed;
- The site management activities being conducted including, where appropriate, confirmation sampling and a health and safety inspection; and
- Confirm that site records are up to date.

Inspections of all remedial components installed at the site will be conducted. A comprehensive site-wide inspection will be conducted and documented according to the SMP schedule, regardless of the frequency of the Periodic Review Report. The inspections will determine and document the following:

- Whether ECs continue to perform as designed;
- If these controls continue to be protective of human health and the environment;
- Compliance with requirements of this SMP and the Environmental Easement;
- Achievement of remedial performance criteria; and
- If site records are complete and up to date.

Reporting requirements are outlined in Section 7.0 of this plan.

Inspections will also be performed in the event of an emergency. If an emergency, such as a natural disaster or an unforeseen failure of any of the ECs occurs that reduces or has the potential to reduce the effectiveness of ECs in place at the site, verbal notice to the NYSDEC project manager must be given by noon of the following day. In addition, an inspection of the site will be conducted within 5 days of the event to verify the effectiveness of the IC/ECs implemented at the site by a qualified environmental professional, as defined in 6 NYCCR Part 375. Written confirmation must be provided to the NYSDEC project manager within 7 days of the event that includes a summary of actions taken, or to be taken,

and the potential impact to the environment and the public. The remedial party will submit follow-up status reports to the NYSDEC within 45 days of the event on actions taken to respond to any emergency event requiring ongoing responsive action, describing and documenting actions taken to restore the effectiveness of the ECs.

4.3 Treatment System Monitoring and Sampling

4.3.1 SSDS/SVES

Monitoring of the SSDS/SVES will be performed on a routine basis, as identified in Table 19 Remedial System Monitoring Requirements and Schedule (see below). The monitoring of remedial systems must be conducted by a Professional Engineer (PE) who is licensed and registered in New York State, or a qualified person who directly reports to a PE who is licensed and registered in New York State. Modification to the frequency or sampling requirements will require approval from the NYSDEC project manager. A visual inspection of the complete system will be conducted during each monitoring event. Unscheduled inspections and/or sampling may take place when a suspected failure of the SSDS/SVES has been reported, or an emergency occurs that is deemed likely to affect the operation of the system. SSDS/SVES components to be monitored include, but are not limited to, the components included in Table 20 below. All remedial system components listed below are shown on Figure 2.

Table 19 – Remedial System Monitoring Requirements and Schedule

Remedial System Component	Monitoring Parameter	Design Range	Monitoring Schedule
Sub-slab Monitoring Points (Roux: SV-1, SV-2; AESI: ASV-1, ASV-2, ASV-3, ASV-4, ASV-5)	Vacuum and PID reading (in ppb)	≥-0.004 in. w.c.	Quarterly
SSDS Riser Sample Ports	Vacuum and PID reading (in ppb)	≥-0.5 in. w.c.	Quarterly
SVES Riser Sample Ports	Vacuum and PID reading (in ppb)	≥-1 in. w.c.	Quarterly
Vacuum Blower	Flow Rate/ Vacuum	~432 cfm ~ -1 to -2 in. w.c.	Quarterly
Exposed Piping, Fans, Appurtenances	Visual Inspection	N/A	Quarterly

Remedial System Component	Monitoring Parameter	Design Range	Monitoring Schedule
Groundwater Monitoring Wells (To be evaluated) (AESI: MW-1 through MW-10)	Pressure and PID Reading (in ppb)	To be evaluated	Quarterly

Comprehensive inspections of all SSDS/SVES components will occur quarterly. Inspections will include: confirming that fans are running correctly, determining whether there is damage to the stacks or other exterior system components, determining whether there have been structural changes (such as an addition to the structure), confirming pressure differential on manometers, inspecting the interior components for damage, recording vacuum readings from vacuum monitoring points, and inspecting the site cover system for cracks that may have developed since the SSDS/SVES was installed. The property owner will notify the NYSDEC and the NYSDOH project managers about any problems within 48-hours of the inspection, in accordance with Section 1.3. Inspection reports will be emailed to the NYSDEC and the NYSDOH Project Managers and included in the next PRR.

A complete list of components to be inspected is provided in the Inspection Checklist, provided in Appendix H – Site Management Forms. If any equipment readings are not within their specified design range, any equipment is observed to be malfunctioning or the system is not performing within specifications; maintenance and repair, as per the Operation and Maintenance Plan, is required immediately. Any needed repairs will be made immediately according to the procedures in the Operation and Maintenance Plan (Section 5.0).

4.3.2 Expanded SVES Monitoring

Monitoring of the Expanded SVES will be performed on a routine basis, as identified in Table 19 Remedial System Monitoring Requirements and Schedule (see above). Note that the pilot test monitoring points were temporary and have been removed. Therefore, they have not been included in Table 19. All remedial system components listed in Table 19 are shown on Figure 2. The monitoring of remedial systems must be conducted by a Professional Engineer (PE) who is licensed and registered in New York State, or a qualified person who directly reports to a PE who is licensed and registered in New York

State. Modification to the frequency or sampling requirements will require approval from the NYSDEC project manager. A visual inspection of the complete system will be conducted during each monitoring event. Unscheduled inspections and/or sampling may take place when a suspected failure of the Expanded SVES has been reported, or an emergency occurs that is deemed likely to affect the operation of the system. Expanded SVES components to be monitored include, but are not limited to, the components included in Table 19 above.

Comprehensive inspections of all Expanded SVES components will occur quarterly. Inspections will include: confirming that fans are running correctly, determining whether there is damage to the stacks or other exterior system components, determining whether there have been structural changes (such as an addition to the structure), confirming pressure differential on manometers, inspecting the interior components for damage, recording vacuum readings from vacuum monitoring points, and inspecting the site cover system for cracks that may have developed since the Expanded SVES was installed. Existing groundwater monitoring wells (MW-1 through MW-10) will be evaluated during first year after SMP approval as potential vacuum monitoring points or determined to be abandoned during site management. The property owner will notify the NYSDEC and the NYSDOH project managers about any problems within 48-hours of the inspection, in accordance with Section 1.3. If monitoring well abandonment is required, the procedures listed in the CP-43:Groundwater Monitoring Well Decommissioning Policy will be followed. Inspection reports will be emailed to the NYSDEC and the NYSDOH Project Managers and included in the next PRR. Any needed repairs will be made promptly according to the procedures in the Operation and Maintenance Plan (Section 5.0).

A complete list of components to be inspected is provided in the Inspection Checklist, provided in Appendix H – Site Management Forms. If any equipment readings are not within their specified design range, any equipment is observed to be malfunctioning or the system is not performing within specifications; maintenance and repair, as per the Operation and Maintenance Plan, is required immediately. Any needed repairs will be made immediately according to the procedures in the Operation and Maintenance Plan (Section 5.0).

4.3.3 Remedial System Sampling

Effluent discharge samples shall be collected from the Expanded SVES on an annual basis. Sampling locations, required analytical parameters and schedule are provided in Table 20 – Remedial System Sampling Requirements and Schedule below. Modification to the frequency or sampling requirements will require approval from the NYSDEC project manager.

Table 20 – Remedial System Sampling Requirements and Schedule

Sampling Location	Analytical Parameters	Schedule
Effluent Discharge Stack	VOC (EPA Method TO-15)	Annually

Detailed sample collection and analytical procedures and protocols are provided in Appendix G – Quality Assurance Project Plan and Field Sampling Plan.

4.3.4 Post-Remediation Media Monitoring and Sampling

Indoor air samples shall be collected from the on-site building interior on an annual basis. Sampling locations, required analytical parameters and schedule are provided in Table 21 – Post Remediation Sampling Requirements and Schedule below and proposed indoor and ambient air sampling locations are provided in Figure 10. Modification to the frequency or sampling requirements will require approval from the NYSDEC project manager.

Table 21 – Post Remediation Sampling Requirements and Schedule

Sampling Location	Analytical Parameter	Schedule
VOCs (EPA Method TO-15 / TO-15 SIM)		
Indoor Air (3 locations)	X	Annually (during heating season)
Expanded SVES Effluent Samples (1 location)	X	Annually

Detailed sample collection and analytical procedures and protocols are provided in Appendix G –Quality Assurance Project Plan and Field Sampling Plan.

The sampling frequency may only be modified with the approval of the NYSDEC project manager. This SMP will be modified to reflect changes in sampling plans approved by the NYSDEC project manager.

Deliverables for the Post-Remediation Media Monitoring and Sampling are specified in Section 7.0 – Reporting Requirements.

4.3.5 Monitoring and Sampling Protocol

All sampling activities will be recorded in a field book and associated sampling log as provided in Appendix H – Site Management Forms. Other observations (e.g., soil vapor monitoring point integrity) will be noted on the sampling log. The sampling log will serve as the inspection form for the monitoring network. Additional detail regarding monitoring and sampling protocols are provided in the site-specific Field Sampling Plan provided as Appendix G of this document.

5.0 OPERATION AND MAINTENANCE PLAN

5.1 General

This Operation and Maintenance Plan provides a brief description of the measures necessary to operate, monitor and maintain the mechanical components of the remedy selected for the site. This Operation and Maintenance Plan:

- Includes the procedures necessary to allow individuals unfamiliar with the site to operate and maintain the SSDS/SVES and the Expanded SVES; and
- Will be updated periodically to reflect changes in site conditions or the manner in which the SSDS/SVES and the Expanded SVES are operated and maintained.

Further detail regarding the Operation and Maintenance of the SSDS/SVES and the Expanded SVES is provided in Appendix D – SSDS/SVES and Expanded SVES As-Builts and Component Manuals and Appendix H – Site Management Forms. A copy of the relevant SSDS/SVES and the Expanded SVES specifications and troubleshooting information, along with the complete SMP, is to be maintained at the site. These specifications are not to be used as a stand-alone document, but as a component document of this SMP.

5.2 SSDS/SVES Remedial System Performance Criteria

The SSDS in-line fan assemblies each include a RadonAway Model #RP265. If adequate depressurization (e.g., vacuum influence) is not occurring, the cause for the lack of depressurization will be investigated and repaired, and measurements will be collected again. Each soil vapor monitoring point will be measured with a pressure differential gauge and shall have a minimum pressure differential of -0.004 in. w.c. across the slab.

5.3 Operation and Maintenance of SSDS/SVES

The following sections provide a description of the operations and maintenance of SSDS/SVES. Cut-sheets and as-built drawings for the SSDS/SVES are provided in Appendix D – SSDS/SVES As-Built and Component Manuals.

5.3.1 System Start-Up and Testing

During start-up testing, readings were collected from the SSDS monitoring points throughout the building. Readings collected ranged from -0.030 to -0.108 in. w.c. (properly maintaining a pressure of -0.004 in. w.c. or less); therefore, data indicates the SSDS/SVES was operational with adequate negative differential pressure measured in all monitoring points and the blower was operating as designed based on the remedial design performance criteria. It was confirmed that that the SSDS/SVES was operational with adequate negative differential pressure measured in all monitoring points. A summary of the PID readings and differential pressure readings are provided on Figure 8C. Two (2) permanent soil vapor monitoring points were installed using Vapor Pins to collect soil vapor samples in addition to two (2) indoor air samples, one ambient air sample to confirm the SSDS/SVES is preventing soil vapor intrusion.

The system testing described below will be conducted if, in the course of the SSDS/ SVES lifetime, the system goes down or significant changes are made to the system, and the system must be restarted.

As appropriate, the start-up and testing procedures for the SSDS/SVES will include the following:

- Manufacturer's recommendations;
    - Pre start-up inspection;
    - Baseline measurements;
- Testing methods:
    - Vacuum Readings from SV-1, SV-2, ASV-1, ASV-2, ASV-3, ASV-4, ASV-5
    - Checks for leaks;
    - Checks of seals;
    - Check of backdrafts;
    - Pressure tests;
    - System balancing;

- Warning devices; and
- Sampling.

5.3.2 Routine System Operation and Maintenance

The routine maintenance activities for the SSDS/SVES include quarterly visual inspections, operating data collection (quarterly monitoring point vacuum measurements), general maintenance, collecting manometer readings for SSDS/SVES lines and radon fans, collecting PID readings from effluent discharge stacks at monitoring points and within the building. In the field, special attention will be paid to the condition of the blower, in-line fans and appurtenances, and the above slab discharge piping and supports. The connections around the blower and fans should be verified to be tight and leak-free and all accessible connections should be verified, including butterfly valve and pipe connections. Special attention should be given to any unusual or excessive noise or vibrations from the piping, blower and in-line fans. The piping and valves will be inspected for leaks. The Owner/building occupants will report any alarm conditions that may occur between routine visits to the Engineer of Record via telephone call or email. There are five GBR25-R Differential Pressure Gauges and Alarms on the SSDS/SVES. The GBR25-R is an audible and visual alarm with an adjustable set point. The GBR25-R monitors for low vacuum conditions.

All equipment maintenance will be performed in accordance with the manufacturer's instructions located in Appendix D.

Table 22 provided below summarizes routine Site monitoring, inspection, and sampling activities including routine maintenance.

Table 22 - Monitoring, Inspection, and Sampling Schedule

Monitoring Program	Frequency*
Site-Wide Inspection	Annually. After emergencies (e.g. fire or flood) and after a severe weather event.
SSDS/SVES and Expanded SVES Visual and Detailed Operation Inspection	Quarterly

Monitoring Program	Frequency*
Expanded SVES Effluent Sampling	Annually
Non-Routine SSDS/SVES and Expanded SVES Detailed Operation Inspection	As needed, after emergencies and after a severe weather event, or after an alarm condition is reported by the Owner/building occupant
Soil Vapor Intrusion Sampling	Upon request to shut down the SSDS/SVES
Soil Vapor Sampling	Upon request to shut down Expanded SVES
Indoor Air Sampling	Annually during the heating season

* The frequency of events will be conducted as specified above until otherwise approved by NYSDEC and NYSDOH.

5.3.3 Non-Routine Operation and Maintenance

Non-routine equipment maintenance consists of maintenance activities that will be performed with less frequency than the routine maintenance on several system components. Non-routine equipment maintenance will be performed in accordance with the manufacturer's instructions and will be recorded on a Non-routine Maintenance Form provided in Appendix H. Specific non-routine maintenance tasks are outlined below:

- Replacement of vacuum/pressure gauges;
- Replacement of air filter;
- Warning devices are initiated;
- System damage;
- Reduced system effectiveness; and
- System or component replacement.

5.3.4 System Monitoring Devices and Alarms

The SSDS/SVES has warning devices to indicate that the system is not operating properly. There are five GBR25-R Differential Pressure Gauges and Alarms on the SSDS/SVES. The GBR25-R is an audible and visual alarm with an adjustable set point. The GBR25-R monitors for low vacuum conditions and is programmed to alarm if pressure

drops to below -1 in. w.c. (default setting). In the event that one or more of the differential pressure gauges indicates a reading outside of the set point limits, indicating the SSDS/SVES is not operating properly, the audible and visual alarm will be engaged. In the event that a warning device is activated, the Owner/building occupant will notify the Engineer of Record and notification requirements will be followed as per Section 1.3, applicable maintenance and repairs will be conducted, as specified in the manufacturer's recommendations, and the SSDS/SVES will be restarted. Operational problems will be noted in the Periodic Review Report to be prepared for that reporting period.

5.4 Expanded SVES Remedial System Performance Criteria

The SVES blower assembly includes a 10 HP Atlantic Blower Model AB-850 with an ultra-low vacuum gauge, an explosion-proof differential pressure switch, alarm indicator, and a moisture separator tank. The blower assembly is able to provide suction and flowrate to meet the design needs of the system with 432 CFM at -1 to -2 inches of water pressure.

5.5 Operation and Maintenance of Expanded SVES

The following sections provide a description of the operations and maintenance of SSDS/SVES and the Expanded SVES. Cut-sheets and as-built drawings for the SSDS/SVES and Expanded SVES are provided in Appendix D – SSDS/SVES As-Built and Component Manual.

5.5.1 System Start-Up and Testing

The Expanded SVES was commissioned and operational starting on January 10, 2025. On March 10, 2025, full start-up testing and reading collection was conducted and the SVES expansion was confirmed to be operating as designed within blower operating ranges of 150 to 470 CFM and 0 to -130 inches of water pressure, and achieving the target flow rate of approximately 432 CFM at a pressure of approximately -1 to -2 in. w.c., respectively. This equates to a flow rate of approximately 48 CFM at a pressure of -1 to -2 in. w.c. at each SVE point, exceeding the minimum parameters required to achieve the target an ROI of 30 feet, which was determined during the Pilot Test to be achievable with a minimum pressure of -0.6 in. w.c. and an air flow rate of 41.6 CFM per SVE Point. This start-up data confirms that the system has achieved the design objectives. A summary of the PID readings and differential pressure readings are provided on Figure 8C. An effluent

air sample was collected from the SVES blower discharge and analyzed by Eurofins Test America in Burlington, Vermont to TO-15 analyses and results indicated that vapor treatment is not required.

The system testing described below will be conducted if, in the course of the Expanded SVES lifetime, the system goes down or significant changes are made to the system, and the system must be restarted.

As appropriate, the start-up and testing procedures for the Expanded SVES will include the following:

- Manufacturer's recommendations;
    - Pre start-up inspection;
    - Baseline measurements;
- Testing methods:
    - Checks for leaks;
    - Checks of seals;
    - Check of backdrafts;
    - Pressure tests;
    - System balancing;
    - Warning devices; and
    - Sampling.

5.5.2 Routine System Operation and Maintenance

The routine maintenance activities for the Expanded SVES include quarterly visual inspections, operating data collection (quarterly monitoring point vacuum measurements), general maintenance, checking the moisture separator for proper operation, checking CFM/vacuum at blower, moisture knock-out check, collecting PID readings from effluent discharge stacks, and checking the vacuum of the Expanded SVES. In the field, special attention will be paid to the condition of the blower, in-line fans and appurtenances, and the above slab discharge piping and supports. The connections around the blower and fans

should be verified to be tight and leak-free and all accessible connections should be verified, including butterfly valve and pipe connections. Special attention should be given to any unusual or excessive noise or vibrations from the piping, blower and in-line fans. The piping and valves will be inspected for leaks. The Owner/building occupants will report any alarm conditions that may occur between routine visits to the Engineer of Record via telephone call or email. There is one GBR25-R Differential Pressure Gauge and Alarm on the SVE-3 riser of the Expanded SVES. The GBR25-R is an audible and visual alarm with an adjustable set point. The GBR25-R monitors for low vacuum conditions.

All equipment maintenance will be performed in accordance with the manufacturer's instructions located in Appendix D.

Table 22 provided above summarizes routine Site monitoring, inspection, and sampling activities including routine maintenance.

5.5.3 Non-Routine Operation and Maintenance

Non-routine equipment maintenance consists of maintenance activities that will be performed on occasion, as needed, or with less frequency than the routine maintenance on several system components. Non-routine equipment maintenance will be performed in accordance with the manufacturer's instructions and will be recorded on a Non-routine Maintenance Form provided in Appendix H. Specific non-routine maintenance tasks are outlined below:

- Replacement of vacuum/pressure gauges;
- Replacement of air filter;
- Warning devices are initiated;
- System damage;
- Reduced system effectiveness; and
- System or component replacement.

If water accumulates in a moisture separator tank, the high-level float switch will shut down the blower. A manual drain has been provided on the bottom of the knockout tank. The first batch of water in the knockout tank will be sampled for VOCs for disposal purposes. Following receipt of the water sample results, a hose will be attached to the manual drain and the manual drain valve will be opened and the knockout water will be gravity drained to a

55-gallon drum and properly disposed of off-site or discharged to the roof stormwater drains if sampling results indicate there are no exceedances of the AWQSGVs. Drums will be secured and appropriately labeled prior to being sent for offsite disposal.

5.5.4 System Monitoring Devices and Alarms

The Expanded SVES has warning devices to indicate that the system is not operating properly. There is one GBR25-R Differential Pressure Gauge and Alarm on the SVE-3 riser of the Expanded SVES. The GBR25-R is an audible and visual alarm with an adjustable set point. The GBR25-R monitors for low vacuum conditions and is programmed to alarm if pressure drops to below -1 in. w.c. (default setting). In the event that one or more of the differential pressure gauges indicates a reading outside of the set point limits, indicating the Expanded SVES is not operating properly, the audible and visual alarm will be engaged. In the event that a warning device is activated, the Owner/building occupant will notify the Engineer of Record and notification requirements will be followed as per Section 1.3, applicable maintenance and repairs will be conducted, as specified in the manufacturer's recommendations, and the Expanded SVES will be restarted. Operational problems will be noted in the Periodic Review Report to be prepared for that reporting period.

6.0 PERIODIC ASSESSMENTS/EVALUATIONS

6.1 Climate Change Vulnerability Assessment

Increases in both the severity and frequency of storms/weather events, an increase in sea level elevations along with accompanying flooding impacts, shifting precipitation patterns and wide temperature fluctuation, resulting from global climactic change and instability, have the potential to significantly impact the performance, effectiveness and protectiveness of a given site and associated remedial systems. Vulnerability assessments provide information so that the site and associated remedial systems are prepared for the impacts of the increasing frequency and intensity of severe storms/weather events and associated flooding.

This section provides a current vulnerability assessment that evaluates the vulnerability of the site and/or engineering controls to severe storms/weather events and associated flooding. This section also identifies vulnerability assessment updates that will be conducted for the site in Periodic Review Reports.

- *Flood Plain*: Site is partly located within FEMA Zone AE (high risk flood zone).
- *Sea Level Rise*: Site is near the shoreline and susceptible to sea level rise or storm surge events.
- *Site Drainage and Storm Water Management*: Site is covered by the building or asphalt on the parking lot east of the Site, except for a catch basin located adjacent southeast of the onsite building.
- *Erosion*: Site is entirely covered by the building and asphalt paved parking lot and will have very few areas susceptible to erosion, and therefore the Site has little to no risk.
- *High Wind*: Site is covered by the building and asphalt paved parking lot and will have no areas of abnormally susceptible damage from wind or falling objects, and therefore the Site has little to no risk.
- *Electricity*: Site is covered by the building in accordance with NYC Building Code and will have typical susceptibility to infrequent power loss, dips or surges, and therefore the Site has little to no risk.
- *Spill/Contaminant*: Site is covered by the building and paved asphalt and will have no areas abnormally susceptible to spills or contaminants released due to high winds or loss of power, and therefore the Site has little to no risk.

- *Wildfires*: The immediate area surrounding the Site is not wooded and therefore the Site has little to no risk.

6.2 Green Remediation Evaluation

NYSDEC's DER-31 Green Remediation requires that green remediation concepts and techniques be considered during all stages of the remedial program including site management, with the goal of improving the sustainability of the cleanup and summarizing the net environmental benefit of any implemented green technology. This section provides an environmental footprint analysis of the remedy, as implemented at the time of this SMP. This section of the SMP also provides a summary of green remediation evaluations to be completed for the site during site management and reported in Periodic Review Reports (PRRs).

Green remediation principles and techniques were implemented to the extent feasible in the design, implementation, and Site management of the remedy per DER-31. The primary green remediation principles that were incorporated into the Site's remediation, to the degree possible, are as follows:

- Consideration of the environmental impacts of treatment technologies and remedy stewardship over the long term;
- Reduction of direct and indirect greenhouse gas and other emissions;
- Increase in energy efficiency and minimizing use of non-renewable energy;
- Reduction of waste and increase in recycling and reuse of materials, which would otherwise be considered waste;
- Integration of the remedy with the end use where possible and encouragement of green and sustainable re-development.

<u>Discussion and Measurement of Environmental Impacts</u>

The remedial actions incorporate green sustainable remediation measures, such as:

- Appropriately sized exhaust fans and blower were designed and installed for the SSDS/SVES and Expanded SVES that will require minimal electrical current to operate.
- The construction crew carpooled to the Site to save on greenhouse gas emissions.
- Post start-up sampling confirmed that the emissions were within the acceptable range.

6.2.1 Timing of Green Remediation Evaluations

For major remedial system components, green remediation evaluations and corresponding modifications will be undertaken as part of a formal Remedial System Optimization (RSO), or at any time that the NYSDEC project manager feels appropriate, (e.g. during significant maintenance events or in conjunction with storm recovery activities).

Modifications resulting from green remediation evaluations will be routinely implemented and scheduled to occur during planned/routine operation and maintenance activities after approval from the DER project manager. Reporting of these modifications will be presented in the PRR.

6.2.2 Remedial Systems

Remedial systems will be operated properly considering the current site conditions to conserve materials and resources to the greatest extent possible. Appropriately sized exhaust fans and blower were designed and installed for the SSDS/SVES and Expanded SVES that will require minimal electrical current to operate continuously. The existing vertical vapor extraction point installed during the IRM was connected to the Expanded SVES blower, slightly reducing electrical consumption. Spent materials will be sent for recycling, as appropriate.

6.2.3 Building Operations

Structures including buildings will be operated and maintained to provide for the most efficient operation of the remedy, while minimizing energy, waste generation and water consumption.

6.2.4 Frequency of System Checks, Sampling and Other Periodic Activities

Transportation to and from the Site, use of consumables in relation to visiting the Site in order to conduct system checks and/or collect samples, and shipping samples to a laboratory for analyses have direct and/or inherent energy costs. The schedule and/or means of these periodic activities have been prepared so that these tasks can be accomplished in a manner that does not impact remedy protectiveness but reduces expenditure of energy or resources.

6.2.5 Metrics and Reporting

As discussed in Section 7.0 and as shown in Appendix H – Site Management Forms, information on energy usage, solid waste generation, transportation and shipping, water usage and land use and ecosystems will be recorded to facilitate and document consistent implementation of green remediation during site management and to identify corresponding benefits. A set of metrics has been developed and will be evaluated over time to ensure that green remediation actions are achieving the desired results.

6.3 Remedial System Optimization

A Remedial System Optimization (RSO) study will be conducted any time that the NYSDEC project manager or the remedial party requests in writing that an in-depth evaluation of the remedy is needed. An RSO may be appropriate if any of the following occur:

- The remedial actions have not met or are not expected to meet RAOs in the time frame estimated in the Decision Document;
- The management and operation of the remedial system is exceeding the estimated costs;
- The remedial system is not performing as expected or as designed;
- Previously unidentified source material may be suspected;
- Plume shift has potentially occurred;
- Site conditions change due to development, change of use, change in groundwater use, etc.;
- There is an anticipated transfer of the site management to another remedial party or agency; and
- A new and applicable remedial technology becomes available.

An RSO will provide a critique of a site's conceptual model, give a summary of past performance, document current cleanup practices, summarize progress made toward the site's cleanup goals, gather additional performance or media specific data and information and provide recommendations for improvements to enhance the ability of the present system to reach RAOs or to provide a basis for changing the remedial strategy.

The RSO study will focus on overall site cleanup strategy, process optimization and management with the intent of identifying impediments to cleanup and improvements to site operations to increase efficiency, cost effectiveness and remedial time frames. Green remediation technology and principals are to be considered when performing the RSO.

7.0. REPORTING REQUIREMENTS

7.1 Site Management Reports

All site management inspection, maintenance and monitoring events will be recorded on the appropriate site management forms provided in Appendix H. These forms are subject to NYSDEC revision. All site management inspection, maintenance, and monitoring events will be conducted by a Professional Engineer (PE) who is licensed and registered in New York State, or a qualified person who directly reports to a PE who is licensed and registered in New York State.

All applicable inspection forms and other records, including media sampling data and system maintenance reports, generated for the site during the reporting period will be provided in electronic format to the NYSDEC in accordance with the requirements of Table 20 and summarized in the Periodic Review Report.

Table 23: Schedule of Interim Monitoring/Inspection Reports

Task/Report	Reporting Frequency*
Site-Wide Inspection	Annually**
SSDS/SVES and Expanded SVES Inspection	Quarterly**
Periodic Review Report	Annually, or as otherwise determined by the NYSDEC

* The frequency of events will be conducted as specified until otherwise approved by the NYSDEC project manager.
**Inspection Results will be reported to NYSDEC and NYSDOH within 30 days after the completion of the routine inspection event and in the Periodic Review Report.

All interim monitoring/inspections reports will include, at a minimum:

- Date of event or reporting period;
- Name, company, and position of person(s) conducting monitoring/inspection activities;
- Description of the activities performed;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet);
- Type of samples collected (e.g., sub-slab vapor, indoor air, outdoor air);

- Copies of all field forms completed (e.g., well sampling logs, chain-of-custody documentation);
- Sampling results in comparison to appropriate standards/criteria;
- A figure illustrating sample type and sampling locations;
- Copies of all laboratory data sheets and the required laboratory data deliverables required for all points sampled (to be submitted electronically in the NYSDEC-identified format);
- Any observations, conclusions, or recommendations; and
- A determination as to whether contaminant conditions have changed since the last reporting event.

Routine maintenance event reporting forms will include, at a minimum:

- Date of event;
- Name, company, and position of person(s) conducting maintenance activities;
- Description of maintenance activities performed;
- Any modifications to the system;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet); and
- Other documentation such as copies of invoices for maintenance work, receipts for replacement equipment, etc., (attached to the checklist/form).

Non-routine maintenance event reporting forms will include, at a minimum:

- Date of event;
- Name, company, and position of person(s) conducting non-routine maintenance/repair activities;
- Description of non-routine activities performed;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents (included either on the form or on an attached sheet); and
- Other documentation such as copies of invoices for repair work, receipts for replacement equipment, etc. (attached to the checklist/form).

Data will be reported in digital format as determined by the NYSDEC. Currently, data is to be supplied electronically and submitted to the NYSDEC EQuIS™ database in accordance with the requirements found at this link http://www.dec.ny.gov/chemical/62440.html.

7.2 Periodic Review Report

A Periodic Review Report (PRR) will be submitted to the NYSDEC project manager beginning sixteen (16) months after the Certificate of Completion is issued. After submittal of the initial Periodic Review Report, the next PRR shall be submitted annually to the NYSDEC project manager or at another frequency as may be required by the NYSDEC project manager. In the event that the site is subdivided into separate parcels with different ownership, a single Periodic Review Report will be prepared that addresses the site described in Appendix A -Environmental Easement. The report will be prepared in accordance with NYSDEC's DER-10 and submitted within 30 days of the end of each certification period. Media sampling results will also be incorporated into the Periodic Review Report. The report will include:

- Identification, assessment and certification of all ECs/ICs required by the remedy for the site.
- Results of the required annual site inspections, fire inspections and severe condition inspections, if applicable.
- Description of any change of use, import of materials, or excavation that occurred during the certifying period.
- All applicable site management forms and other records generated for the site during the reporting period in the NYSDEC-approved electronic format, if not previously submitted.
- Identification of any wastes generated during the reporting period, along with waste characterization data, manifests, and disposal documentation.
- A summary of any discharge monitoring data and/or information generated during the reporting period, with comments and conclusions.
- Data summary tables and graphical representations of contaminants of concern by media (soil vapor, indoor air, etc.), which include a listing of all compounds analyzed, along with the applicable standards, with all exceedances highlighted. These tables and figures will include a presentation of past data as part of an evaluation of contaminant concentration trends, including but not limited to:
  - O&M data summary tables;
- Results of all analyses, copies of all laboratory data sheets, and the required laboratory data deliverables for all samples collected during the reporting period will be submitted in digital format as determined by the NYSDEC. Currently, data is supplied electronically and submitted to the NYSDEC EQuIS™ database in accordance with the requirements found at this link: http://www.dec.ny.gov/chemical/62440.html.

- A site evaluation, which includes the following:
  - The compliance of the remedy with the requirements of the site-specific Remedial Action Work Plan (RAWP) or Decision Document;
  - The operation and the effectiveness of all treatment units, etc., including identification of any needed repairs or modifications;
  - Any new conclusions or observations regarding site contamination based on inspections or data generated by the Monitoring and Sampling Plan for the media being monitored;
  - Recommendations regarding any necessary changes to the remedy and/or Monitoring and Sampling Plan;
  - An update to the climate change vulnerability assessment if site or external conditions have changed since the previous assessment, and recommendations to address vulnerabilities.
  - A summary of the Green Remediation evaluation, including a quantitative and qualitative overview of a site's environmental impacts and recommendations to improve the remedy's environmental footprint will be provided if requested by the NYSDEC. The PRR will include the completed Summary of Green Remediation Metrics.
  - The overall performance and effectiveness of the remedy.
- A performance summary for all treatment systems at the site during the calendar year, including information such as:
  - The number of days the system operated for the reporting period;
  - The average, high, and low flows per day;
  - The contaminant mass removed and the cost per pound of mass removed during the certification period and during the life of the treatment system;
  - A description of breakdowns and/or repairs along with an explanation for any significant downtime;
  - A description of the resolution of performance problems;
  - Alarm conditions;
  - Trends in equipment failure;
  - A summary of the performance, effluent and/or effectiveness monitoring; and
  - Comments, conclusions, and recommendations based on data evaluation. Recommendations must address how receptors would be impacted. Recommendations can include:
    - Proposals to address efficiency and costs such as: instituting remote operation, system changes to decrease maintenance costs and downtime, and system changes to decrease energy use; and

- Proposals to modify or shut down a treatment system due to remediation completion, system performance or changed conditions. System shutdowns are addressed in Section 6.4 of DER-10.

7.2.1 Certification of Institutional and Engineering Controls

Following the last inspection of the reporting period, a Professional Engineer licensed to practice and registered in New York State will prepare, and include in the Periodic Review Report, the following certification as per the requirements of NYSDEC DER-10:

"*For each institutional or engineering control identified for the site, I certify that all of the following statements are true:*

- *The inspection of the site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under my direction;*
- *The institutional control and/or engineering control employed at this site is unchanged from the date the control was put in place, or last approved by the Department;*
- *Nothing has occurred that would impair the ability of the control to protect the public health and environment;*
- *Nothing has occurred that would constitute a violation or failure to comply with any site management plan for this control;*
- *Access to the site will continue to be provided to the Department to evaluate the remedy, including access to evaluate the continued maintenance of this control;*
- *If a financial assurance mechanism is required under the oversight document for the site, the mechanism remains valid and sufficient for the intended purpose under the document;*
- *Use of the site is compliant with the environmental easement;*
- *The engineering control systems are performing as designed and are effective;*
- *To the best of my knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program and generally accepted engineering practices; and*
- *The information presented in this report is accurate and complete.*

I certify that all information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law. I, [name], of [business address], am

certifying as [Owner/Remedial Party or Owner's/Remedial Party's Designated Site Representative] for the site."

"I certify that the New York State Education Department has granted a Certificate of Authorization to provide Professional Engineering services to the firm that prepared this Periodic Review Report."

For BCP projects, every five years the following certification will be added:

- *The assumptions made in the qualitative exposure assessment remain valid.*

The signed certification will be included in the Periodic Review Report.

The Periodic Review Report will be submitted, in electronic format, to the NYSDEC project manager and the NYSDOH project manager. The Periodic Review Report may also need to be submitted in hard-copy format if requested by the NYSDEC project manager.

7.3 Corrective Measures Work Plan

If any component of the remedy is found to have failed, or if the periodic certification cannot be provided due to the failure of an institutional or engineering control or failure to conduct site management activities, a Corrective Measures Work Plan will be submitted to the NYSDEC project manager for approval. This plan will explain the failure and provide the details and schedule for performing work necessary to correct the failure. Unless an emergency condition exists, no work will be performed pursuant to the Corrective Measures Work Plan until it has been approved by the NYSDEC project manager.

7.4 Remedial System Optimization Report

If an RSO is to be performed (see Section 6.3), upon completion of an RSO, an RSO report must be submitted to the NYSDEC project manager for approval. A general outline for the RSO report is provided in Appendix I. The RSO report will document the research/ investigation and data gathering that was conducted, evaluate the results and facts obtained, present a revised conceptual site model and present recommendations. RSO recommendations are to be implemented upon approval from the NYSDEC. Additional work plans, design documents, HASPs etc., may still be required to implement the

recommendations, based upon the actions that need to be taken. A final engineering report and update to the SMP may also be required.

The RSO report will be submitted, in electronic format, to the NYSDEC project manager and the NYSDOH project manager.

8.0 REFERENCES

6 NYCRR Part 375, Environmental Remediation Programs. December 14, 2006.

NYSDEC DER-10 – "Technical Guidance for Site Investigation and Remediation". May 3, 2010, updated April 9, 2019.

NYSDEC, 1998. Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1. June 1998 (April 2000 addendum).

Preliminary Remedial Investigation (PRI) by AESI, dated October 2017.

Supplemental Remedial Investigation (SRI) by AESI, dated September 2018.

Remedial Investigation Work Plan (RIWP) by AESI, dated October 2018.

IRM Work Plan (IRMWP) by AESI, dated March 2019.

Remedial Action Work Plan (RAWP) by Roux, dated August 2024.

TABLES

1. Notifications (*Embedded in text in Section 1.3*)
2. Summary of Volatile Organic Compounds in Soil
3. Summary of Semivolatile Organic Compounds in Soil
4. Summary of Metals in Soil
5. Summary of Polychlorinated Biphenyls in Soil
6. Summary of Pesticides and Herbicides in Soil
7. Summary of Petroleum Hydrocarbons in Soil
8. Summary of TCLP Metals in Soil
9. Summary of Volatile Organic Compounds in Groundwater
10. Summary of Semivolatile Organic Compounds in Groundwater

10B. Summary of Polycyclic Aromatic Hydrocarbons in Groundwater

11. Summary of Metals in Groundwater
12. Summary of Polychlorinated Biphenyls in Groundwater
13. Summary of Pesticides and Herbicides in Groundwater
14. Summary of Emerging Contaminants (Per- and Polyfluoroalkyl Substances and 1,4-Dioxane) in Groundwater
15. Summary of Volatile Organic Compounds in Soil Vapor (ppbv)
16. Summary of Volatile Organic Compounds in Soil Vapor ($\mu g/m^3$)
17. Summary of Volatile Organic Compounds in Soil Vapor and Indoor Air
18. Division of Air Resources Evaluation
19. Remedial System Monitoring Requirements and Schedule *(Embedded in text in Section 4.3.1)*
20. Remedial System Sampling Requirements and Schedule *(Embedded in text in Section 4.3.3)*
21. Post Remediation Sampling Requirements and Schedule *(Embedded in text in Section 4.3.4)*
22. Monitoring, Inspection, and Sampling Schedule *(Embedded in text in Section 5.3.2)*
23. Schedule of Interim Monitoring/Inspection Reports *(Embedded in text in Section 7.1)*

Notes Utilized Throughout Tables	
Soil Tables	
J -	Estimated value
U -	Indicates that the compound was analyzed for but not detected
D -	A secondary analysis after dilution due to exceedance of the calibration range in the original sample.
C -	Result confirmed by reanalysis
ft bls -	Feet below land surface
DUP -	Duplicate sample
NA -	Compound was not analyzed for by laboratory
mg/kg -	Milligrams per kilogram
NYSDEC -	New York State Department of Environmental Conservation
SCO -	Soil Cleanup Objectives
--	No SCO available
Bold data indicates that parameter was detected above the NYSDEC Part 375 Commercial SCO	
Shaded data indicates that parameter was detected above the NYSDEC Part 375 Commercial SCO	
Boxed data indicates that parameter was detected above the NYSDEC Part 375 Protection of Groundwater SCO	
TCLP Tables	
mg/L -	Milligrams per liter
USEPA -	United States Environmental Protection Agency
TCLP -	Toxicity Characteristic Leaching Procedure
USEPA Regulatory	Levels - United States Environmental Protection Agency Limits for RCRA Characteristic Waste for Toxicity
RCRA -	Resource Conservation and Recovery Act
Bold -	Parameter was detected above USEPA Regulatory Levels
Groundwater Tables	
J -	Estimated Value
U -	Compound was analyzed for but not detected
DUP -	Duplicate
NA -	Compound was not analyzed for by laboratory
µg/L -	Micrograms per liter
ng/L -	Nanogram per liter
NYSDEC -	New York State Department of Environmental Conservation
AWQSGVs -	Ambient Water-Quality Standards and Guidance Values
--	No NYSDEC AWQSGV available
Bold data indicates that parameter was detected above the NYSDEC AWQSGVs	
Emerging Contaminants (Per- and Polyfluoroalkyl Substances and 1,4-Dioxane)	
Soil Vapor/Ambient Air	
J -	Estimated value
U -	Indicates that the compound was analyzed for but not detected
D -	Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte
DUP -	Duplicate sample
ppbv -	Parts per billion/volume
ug/m3 -	Micrograms per cubic meter
Bold data indicates that parameter was detected	

Table 2. Summary of Volatile Organic Compounds in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	**Sample Designation:**	COMPOSITE	Dup 1114	OWS-PE-1	OWS-PE-2	OWS-PE-3	OWS-PE-4	OWS-PE-5	SB-1	SB-2	SB-3	SB-4	SB-5	SB-6
					Sample Date:	12/20/2017	11/15/2018	5/29/2019	5/29/2019	5/29/2019	5/29/2019	5/29/2019	10/23/2017	10/23/2017	10/23/2017	10/23/2017	10/23/2017	10/23/2017
					Sample Depth (ft bls):	-	-	-	-	-	-	-	7.5 - 8	15.5 - 16	15 - 15.5	15.5 - 16	15 - 15.5	11 - 11.5
1,1,1,2-Tetrachloroethane	--	--	--	mg/kg		NA	NA	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	NA	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	0.68	500	0.68	mg/kg		0.00566 U	0.0027 U	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	0.068 U	0.00218 U	0.00123 U	0.00165 U	0.0012 U	0.00133 U
1,1,2,2-Tetrachloroethane	--	--	--	mg/kg		0.00566 U	NA	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	0.068 U	0.00218 U	0.00123 U	0.00165 U	0.0012 U	0.00133 U
1,1,2-Trichloroethane	--	--	--	mg/kg		0.00566 U	NA	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	0.068 U	0.00218 U	0.00123 U	0.00165 U	0.0012 U	0.00133 U
1,1-Dichloroethane	0.27	240	0.27	mg/kg		0.00566 U	0.0027 U	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	0.068 U	0.00218 U	0.00123 U	0.00165 U	0.0012 U	0.00133 U
1,1-Dichloroethene	0.33	500	0.33	mg/kg		0.00566 U	0.0027 U	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	0.068 U	0.00218 U	0.00123 U	0.00165 U	0.0012 U	0.00133 U
1,2,3-Trichlorobenzene	--	--	--	mg/kg		0.00566 U	NA	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	0.137 U	0.00218 U	0.00123 U	0.00165 U	0.0012 U	0.00133 U
1,2,3-Trichloropropane	--	--	--	mg/kg		NA	NA	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	--	--	--	mg/kg		0.00566 U	NA	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	0.137 U	0.00218 U	0.00123 U	0.00165 U	0.0012 U	0.00133 U
1,2,4-Trimethylbenzene	3.6	190	3.6	mg/kg		NA	0.0027 U	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane	--	--	--	mg/kg		0.00566 U	NA	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	0.068 U	0.00218 U	0.00123 U	0.00165 U	0.0012 U	0.00133 U
1,2-Dichlorobenzene	1.1	500	1.1	mg/kg		0.00566 U	0.0027 U	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	0.068 U	0.00218 U	0.00123 U	0.00165 U	0.0012 U	0.00133 U
1,2-Dichloroethane	0.02	30	0.02	mg/kg		0.00566 U	0.0027 U	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	0.068 U	0.00218 U	0.00123 U	0.00165 U	0.0012 U	0.00133 U
1,2-Dichloropropane	--	--	--	mg/kg		0.00566 U	NA	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	0.068 U	0.00218 U	0.00123 U	0.00165 U	0.0012 U	0.00133 U
1,3,5-Trimethylbenzene	8.4	190	8.4	mg/kg		NA	0.0027 U	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	2.4	280	2.4	mg/kg		0.00566 U	0.0027 U	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	0.068 U	0.00218 U	0.00123 U	0.00165 U	0.0012 U	0.00133 U
1,3-Dichloropropene	--	--	--	mg/kg		0.00566 U	NA	NA	NA	NA	NA	NA	0.068 U	0.00218 U	0.00123 U	0.00165 U	0.0012 U	0.00133 U
1,4-Dichlorobenzene	1.8	130	1.8	mg/kg		0.00566 U	0.0027 U	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	0.068 U	0.00218 U	0.00123 U	0.00165 U	0.0012 U	0.00133 U
1,4-Dioxane	0.1	130	0.1	mg/kg		1.13 U	0.054 U	0.062 U	0.074 U	0.058 U	0.052 U	0.058 U	13.7 U	0.436 U	0.246 U	0.33 U	0.24 U	0.266 U
2-Butanone (MEK)	0.12	500	0.12	mg/kg		0.011 U	0.0027 U	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	0.273 U	0.072	0.00805	0.019	0.0024 U	0.00266 U
2-Hexanone	--	--	--	mg/kg		0.011 U	NA	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	0.273 U	0.00436 U	0.00246 U	0.0033 U	0.0024 U	0.00266 U
4-Methyl-2-pentanone (MIBK)	--	--	--	mg/kg		0.011 U	NA	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	0.273 U	0.00436 U	0.00246 U	0.0033 U	0.0024 U	0.00266 U
Acetone	**0.05**	500	0.05	mg/kg		0.057 U	0.014	0.0062 U	0.0074 U	0.0068 J	0.015	0.0084 J	0.273 U	**0.337**	**0.06**	**0.115**	0.00894 J	0.013 J
Acrolein	--	--	--	mg/kg		NA	NA	0.0062 U	0.0074 U	0.0058 U	0.0052 U	0.0058 U	NA	NA	NA	NA	NA	NA
Acrylonitrile	--	--	--	mg/kg		NA	NA	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	NA	NA	NA	NA	NA	NA
Benzene	0.06	44	0.06	mg/kg		0.00566 U	0.0027 U	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	0.068 U	0.00218 U	0.00123 U	0.00165 U	0.0012 U	0.00133 U
Bromochloromethane	--	--	--	mg/kg		0.00566 U	NA	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	0.137 U	0.00218 U	0.00123 U	0.00165 U	0.0012 U	0.00133 U
Bromodichloromethane	--	--	--	mg/kg		0.00566 U	NA	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	0.068 U	0.00218 U	0.00123 U	0.00165 U	0.0012 U	0.00133 U
Bromoform	--	--	--	mg/kg		0.00566 U	NA	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	0.068 U	0.00218 U	0.00123 U	0.00165 U	0.0012 U	0.00133 U
Bromomethane	--	--	--	mg/kg		0.00566 U	NA	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	0.137 U	0.00218 U	0.00123 U	0.00165 U	0.0012 U	0.00133 U
Carbon disulfide	--	--	--	mg/kg		0.00566 U	NA	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	0.068 U	0.0041	0.0019	0.099	0.00132	0.00222
Carbon tetrachloride	0.76	22	0.76	mg/kg		0.00566 U	0.0027 U	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	0.137 U	0.00218 U	0.00123 U	0.00165 U	0.0012 U	0.00133 U
Chlorobenzene	1.1	500	1.1	mg/kg		0.00566 U	0.0027 U	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	0.068 U	0.00218 U	0.00123 U	0.00165 U	0.0012 U	0.00133 U
Chloroethane	--	--	--	mg/kg		0.00566 U	NA	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	0.068 U	0.00218 U	0.00123 U	0.00165 U	0.0012 U	0.00133 U
Chloroform	0.37	350	0.37	mg/kg		0.00566 U	0.0027 U	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	0.068 U	0.00218 U	0.00123 U	0.00165 U	0.0012 U	0.00133 U
Chloromethane	--	--	--	mg/kg		0.00566 U	NA	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	0.068 U	0.00218 U	0.00123 U	0.00165 U	0.0012 U	0.00133 U
cis-1,2-Dichloroethene	0.25	500	0.25	mg/kg		0.00566 U	0.0027 U	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	0.068 U	0.00218 U	0.00123 U	0.00304	0.0012 U	0.00133 U
cis-1,3-Dichloropropene	--	--	--	mg/kg		0.00566 U	NA	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	0.068 U	0.00218 U	0.00123 U	0.00165 U	0.0012 U	0.00133 U
Cyclohexane	--	--	--	mg/kg		0.00566 U	NA	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	0.137 U	0.00218 U	0.00123 U	0.00165 U	0.0012 U	0.00133 U
Dibromochloromethane	--	--	--	mg/kg		0.00566 U	NA	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	0.068 U	0.00218 U	0.00123 U	0.00165 U	0.0012 U	0.00133 U
Dibromochloropropane	--	--	--	mg/kg		0.00566 U	NA	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	0.137 U	0.00218 U	0.00123 U	0.00165 U	0.0012 U	0.00133 U
Dibromomethane	--	--	--	mg/kg		NA	NA	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane	--	--	--	mg/kg		0.00566 U	NA	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	0.137 U	0.00218 U	0.00123 U	0.00165 U	0.0012 U	0.00133 U
Ethylbenzene	1	390	1	mg/kg		0.00566 U	0.0027 U	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	0.068 U	0.00218 U	0.00123 U	0.00165 U	0.0012 U	0.00133 U
Freon 113	--	--	--	mg/kg		0.00566 U	NA	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	0.137 U	0.00436 U	0.00246 U	0.0033 U	0.0024 U	0.00266 U
Hexachlorobutadiene	--	--	--	mg/kg		NA	NA	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	NA	NA	NA	NA	NA	NA
Isopropylbenzene	--	--	--	mg/kg		0.00566 U	NA	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	0.068 U	0.00218 U	0.00123 U	0.00165 U	0.0012 U	0.00133 U
m+p-Xylene	--	--	--	mg/kg		NA	0.0054 U	0.0062 U	0.0074 U	0.0058 U	0.0052 U	0.0058 U	NA	NA	NA	NA	NA	NA
Methyl acetate	--	--	--	mg/kg		0.00566 U	NA	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	0.068 U	0.00218 U	0.00123 U	0.00165 U	0.0012 U	0.00133 U
Methylcyclohexane	--	--	--	mg/kg		0.00566 U	NA	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	0.068 U	0.00218 U	0.00123 U	0.00165 U	0.0012 U	0.00133 U
Methylene chloride	0.05	500	0.05	mg/kg		0.011 U	0.0054 U	0.0062 U	0.0074 U	0.0058 U	0.0058 J	0.0058 U	0.137 U	0.00436 U	0.00246 U	0.0033 U	0.0024 U	0.00266 U
MTBE	0.93	500	0.93	mg/kg		0.00566 U	0.0027 U	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	0.068 U	0.00218 U	0.00123 U	0.00165 U	0.0012 U	0.00133 U

Table 2. Summary of Volatile Organic Compounds in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	**Sample Designation:**	COMPOSITE	Dup 1114	OWS-PE-1	OWS-PE-2	OWS-PE-3	OWS-PE-4	OWS-PE-5	SB-1	SB-2	SB-3	SB-4	SB-5	SB-6
					Sample Date:	12/20/2017	11/15/2018	5/29/2019	5/29/2019	5/29/2019	5/29/2019	5/29/2019	10/23/2017	10/23/2017	10/23/2017	10/23/2017	10/23/2017	10/23/2017
					Sample Depth (ft bls):	-	-	-	-	-	-	-	7.5 - 8	15.5 - 16	15 - 15.5	15.5 - 16	15 - 15.5	11 - 11.5
Naphthalene	12	500	12	mg/kg		NA	0.0048 JB	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Butylbenzene	12	500	12	mg/kg		NA	0.0027 U	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	NA	NA	NA	NA	NA	NA
n-Propylbenzene	3.9	500	3.9	mg/kg		NA	0.0027 U	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	NA	NA	NA	NA	NA	NA
o-Xylene	--	--	--	mg/kg		NA	0.0027 U	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	NA	NA	NA	NA	NA	NA
P-CYMENE (P-ISOPROPYLTOLUENE)	--	--	--	mg/kg		NA	NA	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	NA	NA	NA	NA	NA	NA
sec-Butylbenzene	11	500	11	mg/kg		NA	0.0027 U	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	NA	NA	NA	NA	NA	NA
Styrene	--	--	--	mg/kg		0.00566 U	NA	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	0.068 U	0.00218 U	0.00123 U	0.00165 U	0.0012 U	0.00133 U
t-Butyl Alcohol	--	--	--	mg/kg		NA	NA	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	NA	NA	NA	NA	NA	NA
tert-Butylbenzene	5.9	500	5.9	mg/kg		NA	0.0027 U	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	NA	NA	NA	NA	NA	NA
Tetrachloroethene	1.3	150	1.3	mg/kg		0.00375 DJ	0.0072	0.0031 U	0.0059 J	0.0036 J	0.0033 J	0.014	**10.5**	0.00218 U	0.00123 U	0.00165 U	0.0012 U	0.00133 U
Toluene	0.7	500	0.7	mg/kg		0.00566 U	0.0027 U	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	0.068 U	0.000719 J	0.00123 U	0.00165 U	0.0012 U	0.00133 U
trans-1,2-Dichloroethene	0.19	500	0.19	mg/kg		0.00566 U	0.0027 U	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	0.068 U	0.00218 U	0.00123 U	0.00165 U	0.0012 U	0.00133 U
trans-1,3-Dichloropropene	--	--	--	mg/kg		0.00566 U	NA	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	0.068 U	0.00218 U	0.00123 U	0.00165 U	0.0012 U	0.00133 U
trans-1,4-Dichloro-2-butene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	0.47	200	0.47	mg/kg		0.00566 U	0.0027 U	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	0.088	0.00218 U	0.00123 U	0.00165 U	0.0012 U	0.00133 U
Trichlorofluoromethane	--	--	--	mg/kg		0.00566 U	NA	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	0.068 U	0.00218 U	0.00123 U	0.00165 U	0.0012 U	0.00133 U
Vinyl chloride	0.02	13	0.02	mg/kg		0.00566 U	0.0027 U	0.0031 U	0.0037 U	0.0029 U	0.0026 U	0.0029 U	0.137 U	0.00218 U	0.00123 U	0.00165 U	0.0012 U	0.00133 U
Xylenes (total)	0.26	500	1.6	mg/kg		0.011 U	0.0081 U	0.0092 U	0.011 U	0.0087 U	0.0077 U	0.0088 U	0.137 U	0.00436 U	0.00246 U	0.0033 U	0.0024 U	0.00266 U

Table 2. Summary of Volatile Organic Compounds in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	Sample Designation:	SB-7	SB-8	SB-9	SB-10	SB-11	SB-12	SB-13	SB-14	SB-15	SB-16	SB-17	SB-18	SB-19
					Sample Date:	10/23/2017	10/23/2017	10/23/2017	10/23/2017	10/24/2017	10/24/2017	10/24/2017	10/24/2017	10/24/2017	10/24/2017	10/24/2017	10/24/2017	10/24/2017
					Sample Depth (ft bls):	-	-	-	-	-	-	-	-	-	-	-	-	-
1,1,1,2-Tetrachloroethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	0.68	500	0.68	mg/kg		0.075 U	0.025 U	0.00118 U	0.00156 U	0.00125 U	0.00157 U	0.00169 U	0.104 U	3.39 U	0.00116 U	0.082 U	0.00187 U	0.036 U
1,1,2,2-Tetrachloroethane	--	--	--	mg/kg		0.075 U	0.025 U	0.00118 U	0.00156 U	0.00125 U	0.00157 U	0.00169 U	0.104 U	3.39 U	0.00116 U	0.082 U	0.00187 U	0.036 U
1,1,2-Trichloroethane	--	--	--	mg/kg		0.075 U	0.025 U	0.00118 U	0.00156 U	0.00125 U	0.00157 U	0.00169 U	0.104 U	3.39 U	0.00116 U	0.082 U	0.00187 U	0.036 U
1,1-Dichloroethane	0.27	240	0.27	mg/kg		0.075 U	0.025 U	0.00118 U	0.00156 U	0.00125 U	0.00157 U	0.00169 U	0.104 U	3.39 U	0.00116 U	0.082 U	0.00187 U	0.036 U
1,1-Dichloroethene	0.33	500	0.33	mg/kg		0.075 U	0.025 U	0.00118 U	0.00156 U	0.00125 U	0.00157 U	0.00169 U	0.104 U	3.39 U	0.00116 U	0.082 U	0.00187 U	0.036 U
1,2,3-Trichlorobenzene	--	--	--	mg/kg		0.151 U	0.05 U	0.00118 U	0.00156 U	0.00125 U	0.00157 U	0.00169 U	0.208 U	6.79 U	0.00116 U	0.163 U	0.00187 U	0.073 U
1,2,3-Trichloropropane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	--	--	--	mg/kg		0.151 U	0.05 U	0.00118 U	0.00156 U	0.00125 U	0.00157 U	0.00169 U	0.208 U	6.79 U	0.00116 U	0.163 U	0.00187 U	0.073 U
1,2,4-Trimethylbenzene	3.6	190	3.6	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane	--	--	--	mg/kg		0.075 U	0.025 U	0.00118 U	0.00156 U	0.00125 U	0.00157 U	0.00169 U	0.104 U	3.39 U	0.00116 U	0.082 U	0.00187 U	0.036 U
1,2-Dichlorobenzene	1.1	500	1.1	mg/kg		0.075 U	0.025 U	0.00118 U	0.00156 U	0.00125 U	0.00157 U	0.00169 U	0.104 U	3.39 U	0.00116 U	0.082 U	0.00187 U	0.036 U
1,2-Dichloroethane	0.02	30	0.02	mg/kg		0.075 U	0.025 U	0.00118 U	0.00156 U	0.00125 U	0.00157 U	0.00169 U	0.104 U	3.39 U	0.00116 U	0.082 U	0.00187 U	0.036 U
1,2-Dichloropropane	--	--	--	mg/kg		0.075 U	0.025 U	0.00118 U	0.00156 U	0.00125 U	0.00157 U	0.00169 U	0.104 U	3.39 U	0.00116 U	0.082 U	0.00187 U	0.036 U
1,3,5-Trimethylbenzene	8.4	190	8.4	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	2.4	280	2.4	mg/kg		0.075 U	0.025 U	0.00118 U	0.00156 U	0.00125 U	0.00157 U	0.00169 U	0.104 U	3.39 U	0.00116 U	0.082 U	0.00187 U	0.036 U
1,3-Dichloropropene	--	--	--	mg/kg		0.075 U	0.025 U	0.00118 U	0.00156 U	0.00125 U	0.00157 U	0.00169 U	0.104 U	3.39 U	0.00116 U	0.082 U	0.00187 U	0.036 U
1,4-Dichlorobenzene	1.8	130	1.8	mg/kg		0.075 U	0.025 U	0.00118 U	0.00156 U	0.00125 U	0.00157 U	0.00169 U	0.104 U	3.39 U	0.00116 U	0.082 U	0.00187 U	0.036 U
1,4-Dioxane	0.1	130	0.1	mg/kg		15.1 U	5.02 U	0.236 U	0.312 U	0.25 U	0.314 U	0.338 U	20.8 U	679 U	0.232 U	16.3 U	0.374 U	7.25 U
2-Butanone (MEK)	0.12	500	0.12	mg/kg		**0.389**	0.1 U	0.00541	0.00312 U	0.0025 U	0.00314 U	0.00338 U	0.417 U	13.6 U	0.014	0.326 U	0.025	**0.218**
2-Hexanone	--	--	--	mg/kg		0.301 U	0.1 U	0.00236 U	0.00312 U	0.0025 U	0.00314 U	0.00338 U	0.417 U	13.6 U	0.00232 U	0.326 U	0.00374 U	0.145 U
4-Methyl-2-pentanone (MIBK)	--	--	--	mg/kg		0.301 U	0.1 U	0.00236 U	0.00312 U	0.0025 U	0.00314 U	0.00338 U	0.417 U	13.6 U	0.00232 U	0.326 U	0.00374 U	0.145 U
Acetone	**0.05**	500	0.05	mg/kg		0.301 U	0.1 U	0.033	0.016 U	0.032	**0.06**	0.017 U	0.417 U	13.6 U	**0.202**	0.326 U	**0.154**	0.145 U
Acrolein	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acrylonitrile	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	0.06	44	0.06	mg/kg		0.075 U	**0.065**	0.000811 J	0.00156 U	0.00125 U	0.00157 U	0.00169 U	0.104 U	3.39 U	0.00141	0.082 U	0.00187 U	0.036 U
Bromochloromethane	--	--	--	mg/kg		0.151 U	0.05 U	0.00118 U	0.00156 U	0.00125 U	0.00157 U	0.00169 U	0.208 U	6.79 U	0.00116 U	0.163 U	0.00187 U	0.073 U
Bromodichloromethane	--	--	--	mg/kg		0.075 U	0.025 U	0.00118 U	0.00156 U	0.00125 U	0.00157 U	0.00169 U	0.104 U	3.39 U	0.00116 U	0.082 U	0.00187 U	0.036 U
Bromoform	--	--	--	mg/kg		0.075 U	0.025 U	0.00118 U	0.00156 U	0.00125 U	0.00157 U	0.00169 U	0.104 U	3.39 U	0.00116 U	0.082 U	0.00187 U	0.036 U
Bromomethane	--	--	--	mg/kg		0.151 U	0.05 U	0.00118 U	0.00156 U	0.00125 U	0.00157 U	0.00169 U	0.208 U	6.79 U	0.00116 U	0.163 U	0.00187 U	0.073 U
Carbon disulfide	--	--	--	mg/kg		0.075 U	0.025 U	0.00118 U	0.00156 U	0.00891	0.028	0.00299	0.104 U	3.39 U	0.00401	0.082 U	0.00324	0.036 U
Carbon tetrachloride	0.76	22	0.76	mg/kg		0.151 U	0.05 U	0.00118 U	0.00156 U	0.00125 U	0.00157 U	0.00169 U	0.208 U	6.79 U	0.00116 U	0.163 U	0.00187 U	0.073 U
Chlorobenzene	1.1	500	1.1	mg/kg		0.075 U	0.025 U	0.00118 U	0.00156 U	0.00125 U	0.00157 U	0.00169 U	0.104 U	3.39 U	0.00116 U	0.082 U	0.00187 U	0.036 U
Chloroethane	--	--	--	mg/kg		0.075 U	0.025 U	0.00118 U	0.00156 U	0.00125 U	0.00157 U	0.00169 U	0.104 U	3.39 U	0.00116 U	0.082 U	0.00187 U	0.036 U
Chloroform	0.37	350	0.37	mg/kg		0.075 U	0.025 U	0.00118 U	0.00156 U	0.00125 U	0.00157 U	0.00169 U	0.104 U	3.39 U	0.00116 U	0.082 U	0.00187 U	0.036 U
Chloromethane	--	--	--	mg/kg		0.075 U	0.025 U	0.00118 U	0.00156 U	0.00125 U	0.00157 U	0.00169 U	0.104 U	3.39 U	0.00116 U	0.082 U	0.00187 U	0.036 U
cis-1,2-Dichloroethene	0.25	500	0.25	mg/kg		0.075 U	0.025 U	0.00118 U	0.00156 U	0.00125 U	0.00157 U	0.00169 U	0.104 U	3.39 U	0.00116 U	0.118	0.00187 U	0.036 U
cis-1,3-Dichloropropene	--	--	--	mg/kg		0.075 U	0.025 U	0.00118 U	0.00156 U	0.00125 U	0.00157 U	0.00169 U	0.104 U	3.39 U	0.00116 U	0.082 U	0.00187 U	0.036 U
Cyclohexane	--	--	--	mg/kg		0.151 U	0.05 U	0.00118 U	0.00156 U	0.00125 U	0.00157 U	0.00169 U	0.208 U	6.79 U	0.00116 U	0.163 U	0.00187 U	0.073 U
Dibromochloromethane	--	--	--	mg/kg		0.075 U	0.025 U	0.00118 U	0.00156 U	0.00125 U	0.00157 U	0.00169 U	0.104 U	3.39 U	0.00116 U	0.082 U	0.00187 U	0.036 U
Dibromochloropropane	--	--	--	mg/kg		0.151 U	0.05 U	0.00118 U	0.00156 U	0.00125 U	0.00157 U	0.00169 U	0.208 U	6.79 U	0.00116 U	0.163 U	0.00187 U	0.073 U
Dibromomethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane	--	--	--	mg/kg		0.151 U	0.05 U	0.00118 U	0.00156 U	0.00125 U	0.00157 U	0.00169 U	0.208 U	6.79 U	0.00116 U	0.163 U	0.00187 U	0.073 U
Ethylbenzene	1	390	1	mg/kg		0.075 U	0.025 U	0.00118 U	0.00156 U	0.00125 U	0.00157 U	0.00169 U	0.104 U	3.39 U	0.000396 J	0.082 U	0.00187 U	0.036 U
Freon 113	--	--	--	mg/kg		0.151 U	0.05 U	0.00236 U	0.00312 U	0.0025 U	0.00314 U	0.00338 U	0.208 U	6.79 U	0.00232 U	0.163 U	0.00374 U	0.073 U
Hexachlorobutadiene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	--	--	--	mg/kg		0.075 U	0.025 U	0.00118 U	0.00156 U	0.00125 U	0.00157 U	0.00169 U	0.104 U	3.39 U	0.00116 U	0.082 U	0.00187 U	0.036 U
m+p-Xylene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl acetate	--	--	--	mg/kg		0.075 U	0.025 U	0.00118 U	0.00156 U	0.00125 U	0.00157 U	0.00169 U	0.104 U	3.39 U	0.011	0.082 U	0.00187 U	0.036 U
Methylcyclohexane	--	--	--	mg/kg		0.075 U	0.025 U	0.00118 U	0.00156 U	0.00125 U	0.00157 U	0.00169 U	0.104 U	3.39 U	0.011	0.082 U	0.00187 U	0.036 U
Methylene chloride	0.05	500	0.05	mg/kg		0.151 U	0.05 U	0.00236 U	0.00312 U	0.0025 U	0.00314 U	0.00338 U	0.208 U	6.79 U	0.00232 U	0.163 U	0.00374 U	0.073 U
MTBE	0.93	500	0.93	mg/kg		0.075 U	0.025 U	0.00118 U	0.00156 U	0.00125 U	0.00157 U	0.00169 U	0.104 U	3.39 U	0.00116 U	0.082 U	0.00187 U	0.036 U

Table 2. Summary of Volatile Organic Compounds in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	Sample Designation:	SB-7	SB-8	SB-9	SB-10	SB-11	SB-12	SB-13	SB-14	SB-15	SB-16	SB-17	SB-18	SB-19
					Sample Date:	10/23/2017	10/23/2017	10/23/2017	10/23/2017	10/24/2017	10/24/2017	10/24/2017	10/24/2017	10/24/2017	10/24/2017	10/24/2017	10/24/2017	10/24/2017
					Sample Depth (ft bls):	-	-	-	-	-	-	-	-	-	-	-	-	-
Naphthalene	12	500	12	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Butylbenzene	12	500	12	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Propylbenzene	3.9	500	3.9	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
P-CYMENE (P-ISOPROPYLTOLUENE)	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
sec-Butylbenzene	11	500	11	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	--	--	--	mg/kg		0.075 U	0.025 U	0.00118 U	0.00156 U	0.00125 U	0.00157 U	0.00169 U	0.104 U	3.39 U	0.00116 U	0.082 U	0.00187 U	0.036 U
t-Butyl Alcohol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
tert-Butylbenzene	5.9	500	5.9	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	1.3	150	1.3	mg/kg		**7.78**	0.268	0.00118 U	0.0032	0.015	0.012	0.019	**10.9**	3.39 U	0.00116 U	**2.66**	0.00187 U	**1.84**
Toluene	0.7	500	0.7	mg/kg		0.174	0.032	0.00118 U	0.00156 U	0.00125 U	0.000507 J	0.00169 U	0.104 U	3.39 U	0.00116 U	0.082 U	0.00187 U	0.036 U
trans-1,2-Dichloroethene	0.19	500	0.19	mg/kg		0.075 U	0.025 U	0.00118 U	0.00156 U	0.00125 U	0.00157 U	0.00169 U	0.104 U	3.39 U	0.00116 U	0.082 U	0.00187 U	0.036 U
trans-1,3-Dichloropropene	--	--	--	mg/kg		0.075 U	0.025 U	0.00118 U	0.00156 U	0.00125 U	0.00157 U	0.00169 U	0.104 U	3.39 U	0.00116 U	0.082 U	0.00187 U	0.036 U
trans-1,4-Dichloro-2-butene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	0.47	200	0.47	mg/kg		0.272	0.028	0.00118 U	0.000696 J	0.000523 J	0.00157 U	0.000735 J	**0.956**	3.39 U	0.00116 U	0.198	0.00187 U	0.036 U
Trichlorofluoromethane	--	--	--	mg/kg		0.075 U	0.025 U	0.00118 U	0.00156 U	0.00125 U	0.00157 U	0.00169 U	0.104 U	3.39 U	0.00116 U	0.082 U	0.00187 U	0.036 U
Vinyl chloride	0.02	13	0.02	mg/kg		0.151 U	0.05 U	0.00118 U	0.00156 U	0.00125 U	0.00157 U	0.00169 U	0.208 U	6.79 U	0.00116 U	0.163 U	0.00187 U	0.073 U
Xylenes (total)	0.26	500	1.6	mg/kg		0.166	0.049 J	0.00236 U	0.00312 U	0.0025 U	0.00314 U	0.00338 U	0.208 U	6.79 U	0.00232 U	0.163 U	0.00374 U	0.073 U

Table 2. Summary of Volatile Organic Compounds in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	Sample Designation:	SB-20	SB-21	SB-22	SB-23	SB-24	SB-25	SB-26	SB-27	SB-28	SB-29	SB-30	SB-31A	SB-31D
					Sample Date:	10/24/2017	11/10/2017	11/10/2017	11/10/2017	11/10/2017	11/10/2017	12/13/2017	12/13/2017	12/13/2017	12/13/2017	12/13/2017	12/13/2017	12/18/2017
					Sample Depth (ft bls):	-	11 - 11.5	11.5 - 12	11.5 - 12	11.5 - 12	10 - 10.5	-	-	-	-	-	-	8 - 8.5
1,1,1,2-Tetrachloroethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	0.68	500	0.68	mg/kg		0.00141 U	0.584 U	0.00152 U	0.00104 U	0.00117 U	0.00083 U	0.138 U	0.076 U	0.092 U	0.081 U	0.076 U	0.00191 U	0.00154 U
1,1,2,2-Tetrachloroethane	--	--	--	mg/kg		0.00141 U	0.584 U	0.00152 U	0.00104 U	0.00117 U	0.00083 U	0.138 U	0.076 U	0.092 U	0.081 U	0.076 U	0.00191 U	0.00154 U
1,1,2-Trichloroethane	--	--	--	mg/kg		0.00141 U	0.584 U	0.00152 U	0.00104 U	0.00117 U	0.00083 U	0.138 U	0.076 U	0.092 U	0.081 U	0.076 U	0.00191 U	0.00154 U
1,1-Dichloroethane	0.27	240	0.27	mg/kg		0.00141 U	0.584 U	0.00152 U	0.00104 U	0.00117 U	0.00083 U	0.138 U	0.076 U	0.092 U	0.081 U	0.076 U	0.00191 U	0.00154 U
1,1-Dichloroethene	0.33	500	0.33	mg/kg		0.00141 U	0.584 U	0.00152 U	0.00104 U	0.00117 U	0.00083 U	0.138 U	0.076 U	0.092 U	0.081 U	0.076 U	0.00191 U	0.00154 U
1,2,3-Trichlorobenzene	--	--	--	mg/kg		0.00141 U	1.17 U	0.00152 U	0.00104 U	0.00117 U	0.00083 U	0.276 U	0.152 U	0.184 U	0.163 U	0.152 U	0.00191 U	0.00154 U
1,2,3-Trichloropropane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	--	--	--	mg/kg		0.00141 U	1.17 U	0.00152 U	0.00104 U	0.00117 U	0.00083 U	0.276 U	0.152 U	0.184 U	0.163 U	0.152 U	0.00191 U	0.00154 U
1,2,4-Trimethylbenzene	3.6	190	3.6	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane	--	--	--	mg/kg		0.00141 U	0.584 U	0.00152 U	0.00104 U	0.00117 U	0.00083 U	0.138 U	0.076 U	0.092 U	0.081 U	0.076 U	0.00191 U	0.00154 U
1,2-Dichlorobenzene	1.1	500	1.1	mg/kg		0.00141 U	0.584 U	0.00152 U	0.00104 U	0.00117 U	0.00083 U	0.138 U	0.076 U	0.092 U	0.081 U	0.076 U	0.00191 U	0.00154 U
1,2-Dichloroethane	0.02	30	0.02	mg/kg		0.00141 U	0.584 U	0.00152 U	0.00104 U	0.00117 U	0.00083 U	0.138 U	0.076 U	0.092 U	0.081 U	0.076 U	0.00191 U	0.00154 U
1,2-Dichloropropane	--	--	--	mg/kg		0.00141 U	0.584 U	0.00152 U	0.00104 U	0.00117 U	0.00083 U	0.138 U	0.076 U	0.092 U	0.081 U	0.076 U	0.00191 U	0.00154 U
1,3,5-Trimethylbenzene	8.4	190	8.4	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	2.4	280	2.4	mg/kg		0.00141 U	0.584 U	0.00152 U	0.00104 U	0.00117 U	0.00083 U	0.138 U	0.076 U	0.092 U	0.081 U	0.076 U	0.00191 U	0.00154 U
1,3-Dichloropropene	--	--	--	mg/kg		0.00141 U	0.584 U	0.00152 U	0.00104 U	0.00117 U	0.00083 U	0.138 U	0.076 U	0.092 U	0.081 U	0.076 U	0.00191 U	0.00154 U
1,4-Dichlorobenzene	1.8	130	1.8	mg/kg		0.00141 U	0.584 U	0.00152 U	0.00104 U	0.00117 U	0.00083 U	0.138 U	0.076 U	0.092 U	0.081 U	0.076 U	0.00191 U	0.00154 U
1,4-Dioxane	0.1	130	0.1	mg/kg		0.282 U	117 U	0.304 U	0.208 U	0.234 U	0.166 U	27.6 U	15.2 U	18.4 U	16.3 U	15.2 U	0.382 U	0.308 U
2-Butanone (MEK)	0.12	500	0.12	mg/kg		0.00282 U	2.34 U	0.00304 U	0.00815	0.00234 U	0.00166 U	0.552 U	0.304 U	0.367 U	0.326 U	0.305 U	0.00382 U	0.00308 U
2-Hexanone	--	--	--	mg/kg		0.00282 U	2.34 U	0.00304 U	0.00208 U	0.00234 U	0.00166 U	0.552 U	0.304 U	0.367 U	0.326 U	0.305 U	0.00382 U	0.00308 U
4-Methyl-2-pentanone (MIBK)	--	--	--	mg/kg		0.00282 U	2.34 U	0.00304 U	0.00208 U	0.00234 U	0.00166 U	0.552 U	0.304 U	0.367 U	0.326 U	0.305 U	0.00382 U	0.00308 U
Acetone	**0.05**	500	0.05	mg/kg		0.00782 J	2.34 U	**0.053**	**0.065**	0.018	0.012	0.552 U	0.304 U	0.367 U	0.326 U	0.305 U	0.023	0.02
Acrolein	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acrylonitrile	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	0.06	44	0.06	mg/kg		0.00141 U	0.584 U	0.00152 U	0.000341 J	0.00117 U	0.000257 J	0.138 U	0.076 U	0.092 U	0.081 U	0.076 U	0.00191 U	0.00154 U
Bromochloromethane	--	--	--	mg/kg		0.00141 U	1.17 U	0.00152 U	0.00104 U	0.00117 U	0.00083 U	0.276 U	0.152 U	0.184 U	0.163 U	0.152 U	0.00191 U	0.00154 U
Bromodichloromethane	--	--	--	mg/kg		0.00141 U	0.584 U	0.00152 U	0.00104 U	0.00117 U	0.00083 U	0.138 U	0.076 U	0.092 U	0.081 U	0.076 U	0.00191 U	0.00154 U
Bromoform	--	--	--	mg/kg		0.00141 U	0.584 U	0.00152 U	0.00104 U	0.00117 U	0.00083 U	0.138 U	0.076 U	0.092 U	0.081 U	0.076 U	0.00191 U	0.00154 U
Bromomethane	--	--	--	mg/kg		0.00141 U	1.17 U	0.00152 U	0.00104 U	0.00117 U	0.00083 U	0.276 U	0.152 U	0.184 U	0.163 U	0.152 U	0.00191 U	0.00154 U
Carbon disulfide	--	--	--	mg/kg		0.00141 U	0.584 U	0.00409	0.00104	0.00117 U	0.00083 U	0.138 U	0.076 U	0.092 U	0.081 U	0.076 U	0.00191 U	0.00154 U
Carbon tetrachloride	0.76	22	0.76	mg/kg		0.00141 U	1.17 U	0.00152 U	0.00104 U	0.00117 U	0.00083 U	0.138 U	0.076 U	0.092 U	0.081 U	0.076 U	0.00191 U	0.00154 U
Chlorobenzene	1.1	500	1.1	mg/kg		0.00141 U	0.584 U	0.00152 U	0.00104 U	0.00117 U	0.00083 U	0.138 U	0.076 U	0.092 U	0.081 U	0.076 U	0.00191 U	0.00154 U
Chloroethane	--	--	--	mg/kg		0.00141 U	0.584 U	0.00152 U	0.00104 U	0.00117 U	0.00083 U	0.276 U	0.152 U	0.184 U	0.163 U	0.152 U	0.00191 U	0.00154 U
Chloroform	0.37	350	0.37	mg/kg		0.00141 U	0.584 U	0.00152 U	0.00104 U	0.00152	0.00083 U	0.138 U	0.076 U	0.092 U	0.081 U	0.076 U	0.00191 U	0.00154 U
Chloromethane	--	--	--	mg/kg		0.00141 U	0.584 U	0.00152 U	0.00104 U	0.00117 U	0.00083 U	0.138 U	0.076 U	0.092 U	0.081 U	0.076 U	0.00382 U	0.00308 U
cis-1,2-Dichloroethene	0.25	500	0.25	mg/kg		0.00141 U	0.584 U	0.00152 U	0.00104 U	0.00117 U	0.00083 U	0.138 U	0.076 U	0.092 U	0.081 U	0.076 U	0.00191 U	0.00154 U
cis-1,3-Dichloropropene	--	--	--	mg/kg		0.00141 U	0.584 U	0.00152 U	0.00104 U	0.00117 U	0.00083 U	0.138 U	0.076 U	0.092 U	0.081 U	0.076 U	0.00191 U	0.00154 U
Cyclohexane	--	--	--	mg/kg		0.00141 U	1.17 U	0.00152 U	0.00104 U	0.00117 U	0.00083 U	0.276 U	0.152 U	0.184 U	0.163 U	0.152 U	0.00955 U	0.0077 U
Dibromochloromethane	--	--	--	mg/kg		0.00141 U	0.584 U	0.00152 U	0.00104 U	0.00117 U	0.00083 U	0.138 U	0.076 U	0.092 U	0.081 U	0.076 U	0.00191 U	0.00154 U
Dibromochloropropane	--	--	--	mg/kg		0.00141 U	1.17 U	0.00152 U	0.00104 U	0.00117 U	0.00083 U	0.276 U	0.152 U	0.184 U	0.163 U	0.152 U	0.00191 U	0.00154 U
Dibromomethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane	--	--	--	mg/kg		0.00141 U	1.17 U	0.00152 U	0.00104 U	0.00117 U	0.00083 U	0.276 U	0.152 U	0.184 U	0.163 U	0.152 U	0.00191 U	0.00154 U
Ethylbenzene	1	390	1	mg/kg		0.00141 U	0.584 U	0.00152 U	0.00104 U	0.00117 U	0.00083 U	0.138 U	0.076 U	0.092 U	0.081 U	0.076 U	0.00191 U	0.00154 U
Freon 113	--	--	--	mg/kg		0.00282 U	1.17 U	0.00304 U	0.00208 U	0.00234 U	0.00166 U	0.276 U	0.152 U	0.184 U	0.163 U	0.152 U	0.00191 U	0.00154 U
Hexachlorobutadiene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	--	--	--	mg/kg		0.00141 U	5.02 D	0.00152 U	0.00104 U	0.00117 U	0.00083 U	0.138 U	0.076 U	0.092 U	0.081 U	0.076 U	0.00191 U	0.00154 U
m+p-Xylene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl acetate	--	--	--	mg/kg		0.00141 U	0.584 U	0.00152 U	0.00104 U	0.00117 U	0.00083 U	0.138 U	0.076 U	0.092 U	0.081 U	0.076 U	0.00457	0.00154 U
Methylcyclohexane	--	--	--	mg/kg		0.00141 U	17.9 D	0.00152 U	0.00301	0.00117 U	0.00083 U	0.138 U	0.076 U	0.092 U	0.081 U	0.316	0.00191 U	0.00154 U
Methylene chloride	0.05	500	0.05	mg/kg		0.00282 U	1.17 U	0.00474 B	0.0024 B	0.00414 B	0.00202 B	0.276 U	0.152 U	0.184 U	0.163 U	0.152 U	0.0089 C	0.00512 C
MTBE	0.93	500	0.93	mg/kg		0.00141 U	0.584 U	0.00152 U	0.00104 U	0.00117 U	0.00083 U	0.138 U	0.076 U	0.092 U	0.081 U	0.076 U	0.00191 U	0.00154 U

Table 2. Summary of Volatile Organic Compounds in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	Sample Designation:	SB-20	SB-21	SB-22	SB-23	SB-24	SB-25	SB-26	SB-27	SB-28	SB-29	SB-30	SB-31A	SB-31D
					Sample Date:	10/24/2017	11/10/2017	11/10/2017	11/10/2017	11/10/2017	11/10/2017	12/13/2017	12/13/2017	12/13/2017	12/13/2017	12/13/2017	12/13/2017	12/18/2017
					Sample Depth (ft bls):	-	11 - 11.5	11.5 - 12	11.5 - 12	11.5 - 12	10 - 10.5	-	-	-	-	-	-	8 - 8.5
Naphthalene	12	500	12	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Butylbenzene	12	500	12	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Propylbenzene	3.9	500	3.9	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
P-CYMENE (P-ISOPROPYLTOLUENE)	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
sec-Butylbenzene	11	500	11	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	--	--	--	mg/kg		0.00141 U	0.584 U	0.00152 U	0.00104 U	0.00117 U	0.00083 U	0.138 U	0.076 U	0.092 U	0.081 U	0.076 U	0.00191 U	0.00154 U
t-Butyl Alcohol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
tert-Butylbenzene	5.9	500	5.9	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	1.3	150	1.3	mg/kg		0.00181	0.584 U	0.00152 U	0.00104 U	0.038	0.00083 U	**29 D**	**14.8**	**15**	**45.5 D**	**61.6 D**	0.091	0.012
Toluene	0.7	500	0.7	mg/kg		0.00141 U	0.584 U	0.00152 U	0.00104 U	0.00117 U	0.00083 U	0.138 U	0.076 U	0.092 U	0.081 U	0.076 U	0.00191 U	0.00154 U
trans-1,2-Dichloroethene	0.19	500	0.19	mg/kg		0.00141 U	0.584 U	0.00152 U	0.00104 U	0.00117 U	0.00083 U	0.138 U	0.076 U	0.092 U	0.081 U	0.076 U	0.00191 U	0.00154 U
trans-1,3-Dichloropropene	--	--	--	mg/kg		0.00141 U	0.584 U	0.00152 U	0.00104 U	0.00117 U	0.00083 U	0.138 U	0.076 U	0.092 U	0.081 U	0.076 U	0.00191 U	0.00154 U
trans-1,4-Dichloro-2-butene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	0.47	200	0.47	mg/kg		0.00141 U	0.584 U	0.00152 U	0.00104 U	0.000892 J	0.00083 U	0.449 D	0.26	0.348	**0.625**	**0.946**	0.00102 J	0.000507 J
Trichlorofluoromethane	--	--	--	mg/kg		0.00141 U	0.584 U	0.00152 U	0.00104 U	0.00117 U	0.00083 U	0.138 U	0.076 U	0.092 U	0.081 U	0.076 U	0.00191 U	0.00154 U
Vinyl chloride	0.02	13	0.02	mg/kg		0.00141 U	1.17 U	0.00152 U	0.00104 U	0.00117 U	0.00083 U	0.276 U	0.152 U	0.184 U	0.163 U	0.152 U	0.00191 U	0.00154 U
Xylenes (total)	0.26	500	1.6	mg/kg		0.00282 U	1.17 U	0.00304 U	0.00208 U	0.00234 U	0.00166 U	0.276 U	0.152 U	0.184 U	0.163 U	0.152 U	0.00382 U	0.00308 U

Table 2. Summary of Volatile Organic Compounds in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	Sample Designation:	SB-31S	SB-32A	SB-32D	SB-32D1	SB-32S	SB-33A	SB-33D	SB-33S	SB-34A	SB-34D	SB-34S	SB-35A	SB-35D
					Sample Date:	12/18/2017	12/13/2017	12/18/2017	12/18/2017	12/18/2017	12/13/2017	12/18/2017	12/18/2017	12/13/2017	12/18/2017	12/18/2017	12/13/2017	12/18/2017
					Sample Depth (ft bls):	2 - 2.5	-	8 - 8.5	12 - 12.5	2 - 2.5	-	8 - 8.5	2 - 2.5	-	8 - 8.5	2 - 2.5	-	8 - 8.5
1,1,1,2-Tetrachloroethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	0.68	500	0.68	mg/kg		0.00106 U	0.001 U	0.00126 U	0.00107 U	0.0014 U	0.00193 U	0.00164 U	0.00173 U	0.00129 U	0.00113 U	0.00122 U	0.00105 U	0.00122 U
1,1,2,2-Tetrachloroethane	--	--	--	mg/kg		0.00106 U	0.001 U	0.00126 U	0.00107 U	0.0014 U	0.00193 U	0.00164 U	0.00173 U	0.00129 U	0.00113 U	0.00122 U	0.00105 U	0.00122 U
1,1,2-Trichloroethane	--	--	--	mg/kg		0.00106 U	0.001 U	0.00126 U	0.00107 U	0.0014 U	0.00193 U	0.00164 U	0.00173 U	0.00129 U	0.00113 U	0.00122 U	0.00105 U	0.00122 U
1,1-Dichloroethane	0.27	240	0.27	mg/kg		0.00106 U	0.001 U	0.00126 U	0.00107 U	0.0014 U	0.00193 U	0.00164 U	0.00173 U	0.00129 U	0.00113 U	0.00122 U	0.00105 U	0.00122 U
1,1-Dichloroethene	0.33	500	0.33	mg/kg		0.00106 U	0.001 U	0.00126 U	0.00107 U	0.0014 U	0.00193 U	0.00164 U	0.00173 U	0.00129 U	0.00113 U	0.00122 U	0.00105 U	0.00122 U
1,2,3-Trichlorobenzene	--	--	--	mg/kg		0.00106 U	0.001 U	0.00126 U	0.00107 U	0.0014 U	0.00193 U	0.00164 U	0.00173 U	0.00129 U	0.00113 U	0.00122 U	0.00105 U	0.00122 U
1,2,3-Trichloropropane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	--	--	--	mg/kg		0.00106 U	0.001 U	0.00126 U	0.00107 U	0.0014 U	0.00193 U	0.00164 U	0.00173 U	0.00129 U	0.00113 U	0.00122 U	0.00105 U	0.00122 U
1,2,4-Trimethylbenzene	3.6	190	3.6	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dibromoethane	--	--	--	mg/kg		0.00106 U	0.001 U	0.00126 U	0.00107 U	0.0014 U	0.00193 U	0.00164 U	0.00173 U	0.00129 U	0.00113 U	0.00122 U	0.00105 U	0.00122 U
1,2-Dichlorobenzene	1.1	500	1.1	mg/kg		0.00106 U	0.001 U	0.00126 U	0.00107 U	0.0014 U	0.00193 U	0.00164 U	0.00173 U	0.00129 U	0.00113 U	0.00122 U	0.00105 U	0.00122 U
1,2-Dichloroethane	0.02	30	0.02	mg/kg		0.00106 U	0.001 U	0.00126 U	0.00107 U	0.0014 U	0.00193 U	0.00164 U	0.00173 U	0.00129 U	0.00113 U	0.00122 U	0.00105 U	0.00122 U
1,2-Dichloropropane	--	--	--	mg/kg		0.00106 U	0.001 U	0.00126 U	0.00107 U	0.0014 U	0.00193 U	0.00164 U	0.00173 U	0.00129 U	0.00113 U	0.00122 U	0.00105 U	0.00122 U
1,3,5-Trimethylbenzene	8.4	190	8.4	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	2.4	280	2.4	mg/kg		0.00106 U	0.001 U	0.00126 U	0.00107 U	0.0014 U	0.00193 U	0.00164 U	0.00173 U	0.00129 U	0.00113 U	0.00122 U	0.00105 U	0.00122 U
1,3-Dichloropropene	--	--	--	mg/kg		0.00106 U	0.001 U	0.00126 U	0.00107 U	0.0014 U	0.00193 U	0.00164 U	0.00173 U	0.00129 U	0.00113 U	0.00122 U	0.00105 U	0.00122 U
1,4-Dichlorobenzene	1.8	130	1.8	mg/kg		0.00106 U	0.001 U	0.00126 U	0.00107 U	0.0014 U	0.00193 U	0.00164 U	0.00173 U	0.00129 U	0.00113 U	0.00122 U	0.00105 U	0.00122 U
1,4-Dioxane	0.1	130	0.1	mg/kg		0.212 U	0.2 U	0.252 U	0.214 U	0.28 U	0.386 U	0.328 U	0.346 U	0.258 U	0.226 U	0.244 U	0.21 U	0.244 U
2-Butanone (MEK)	0.12	500	0.12	mg/kg		0.00212 U	0.002 U	0.00252 U	0.00431	0.0028 U	0.00386 U	0.00328 U	0.00346 U	0.00258 U	0.00246	0.00244 U	0.0021 U	0.00244 U
2-Hexanone	--	--	--	mg/kg		0.00212 U	0.002 U	0.00252 U	0.00214 U	0.0028 U	0.00386 U	0.00328 U	0.00346 U	0.00258 U	0.00226 U	0.00244 U	0.0021 U	0.00244 U
4-Methyl-2-pentanone (MIBK)	--	--	--	mg/kg		0.00212 U	0.002 U	0.00252 U	0.00214 U	0.0028 U	0.00386 U	0.00328 U	0.00346 U	0.00258 U	0.00226 U	0.00244 U	0.0021 U	0.00244 U
Acetone	**0.05**	500	0.05	mg/kg		0.011 J	0.00764 J	0.025	0.029	0.018	0.044	0.022	0.041	0.015	0.019	0.012 J	0.014	**0.086**
Acrolein	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acrylonitrile	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	0.06	44	0.06	mg/kg		0.00106 U	0.001 U	0.00126 U	0.00107 U	0.0014 U	0.00193 U	0.00164 U	0.00173 U	0.00129 U	0.000355 J	0.00122 U	0.00105 U	0.00122 U
Bromochloromethane	--	--	--	mg/kg		0.00106 U	0.001 U	0.00126 U	0.00107 U	0.0014 U	0.00193 U	0.00164 U	0.00173 U	0.00129 U	0.00113 U	0.00122 U	0.00105 U	0.00122 U
Bromodichloromethane	--	--	--	mg/kg		0.00106 U	0.001 U	0.00126 U	0.00107 U	0.0014 U	0.00193 U	0.00164 U	0.00173 U	0.00129 U	0.00113 U	0.00122 U	0.00105 U	0.00122 U
Bromoform	--	--	--	mg/kg		0.00106 U	0.001 U	0.00126 U	0.00107 U	0.0014 U	0.00193 U	0.00164 U	0.00173 U	0.00129 U	0.00113 U	0.00122 U	0.00105 U	0.00122 U
Bromomethane	--	--	--	mg/kg		0.00106 U	0.001 U	0.00126 U	0.00107 U	0.0014 U	0.00193 U	0.00164 U	0.00173 U	0.00129 U	0.00113 U	0.00122 U	0.00105 U	0.00122 U
Carbon disulfide	--	--	--	mg/kg		0.00106 U	0.001 U	0.00126 U	0.00107 U	0.0014 U	0.00193 U	0.00164 U	0.00173 U	0.00129 U	0.00113 U	0.00122 U	0.00105 U	0.00122 U
Carbon tetrachloride	0.76	22	0.76	mg/kg		0.00106 U	0.001 U	0.00126 U	0.00107 U	0.0014 U	0.00193 U	0.00164 U	0.00173 U	0.00129 U	0.00113 U	0.00122 U	0.00105 U	0.00122 U
Chlorobenzene	1.1	500	1.1	mg/kg		0.00106 U	0.001 U	0.00126 U	0.00107 U	0.0014 U	0.00193 U	0.00164 U	0.00173 U	0.00129 U	0.00113 U	0.00122 U	0.00105 U	0.00122 U
Chloroethane	--	--	--	mg/kg		0.00106 U	0.001 U	0.00126 U	0.00107 U	0.0014 U	0.00193 U	0.00164 U	0.00173 U	0.00129 U	0.00113 U	0.00122 U	0.00105 U	0.00122 U
Chloroform	0.37	350	0.37	mg/kg		0.00106 U	0.001 U	0.00126 U	0.00107 U	0.0014 U	0.00193 U	0.00164 U	0.00173 U	0.00129 U	0.00113 U	0.00122 U	0.00105 U	0.00122 U
Chloromethane	--	--	--	mg/kg		0.00212 U	0.002 U	0.00252 U	0.00214 U	0.0028 U	0.00386 U	0.00328 U	0.00346 U	0.00258 U	0.00226 U	0.00244 U	0.0021 U	0.00244 U
cis-1,2-Dichloroethene	0.25	500	0.25	mg/kg		0.00106 U	0.001 U	0.00126 U	0.00107 U	0.0014 U	0.00193 U	0.00164 U	0.00173 U	0.00129 U	0.00113 U	0.00122 U	0.00105 U	0.00122 U
cis-1,3-Dichloropropene	--	--	--	mg/kg		0.00106 U	0.001 U	0.00126 U	0.00107 U	0.0014 U	0.00193 U	0.00164 U	0.00173 U	0.00129 U	0.00113 U	0.00122 U	0.00105 U	0.00122 U
Cyclohexane	--	--	--	mg/kg		0.0053 U	0.005 U	0.0063 U	0.00535 U	0.007 U	0.00965 U	0.0082 U	0.00865 U	0.00645 U	0.00565 U	0.0061 U	0.00525 U	0.0061 U
Dibromochloromethane	--	--	--	mg/kg		0.00106 U	0.001 U	0.00126 U	0.00107 U	0.0014 U	0.00193 U	0.00164 U	0.00173 U	0.00129 U	0.00113 U	0.00122 U	0.00105 U	0.00122 U
Dibromochloropropane	--	--	--	mg/kg		0.00106 U	0.001 U	0.00126 U	0.00107 U	0.0014 U	0.00193 U	0.00164 U	0.00173 U	0.00129 U	0.00113 U	0.00122 U	0.00105 U	0.00122 U
Dibromomethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane	--	--	--	mg/kg		0.00106 U	0.001 U	0.00126 U	0.00107 U	0.0014 U	0.00193 U	0.00164 U	0.00173 U	0.00129 U	0.00113 U	0.00122 U	0.00105 U	0.00122 U
Ethylbenzene	1	390	1	mg/kg		0.00106 U	0.001 U	0.00126 U	0.00107 U	0.0014 U	0.00193 U	0.00164 U	0.00173 U	0.00129 U	0.00113 U	0.00122 U	0.00105 U	0.00122 U
Freon 113	--	--	--	mg/kg		0.00106 U	0.001 U	0.00126 U	0.00107 U	0.0014 U	0.00193 U	0.00164 U	0.00173 U	0.00129 U	0.00113 U	0.00122 U	0.00105 U	0.00122 U
Hexachlorobutadiene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	--	--	--	mg/kg		0.00106 U	0.001 U	0.00126 U	0.00107 U	0.0014 U	0.00193 U	0.00164 U	0.00173 U	0.00129 U	0.00113 U	0.00122 U	0.00105 U	0.00122 U
m+p-Xylene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methyl acetate	--	--	--	mg/kg		0.00106 U	0.001 U	0.00126 U	0.00107 U	0.0014 U	0.00533	0.00164 U	0.00173 U	0.0017	0.00113 U	0.00122 U	0.00189	0.00122 U
Methylcyclohexane	--	--	--	mg/kg		0.00106 U	0.001 U	0.00126 U	0.00107 U	0.0014 U	0.00193 U	0.00164 U	0.00173 U	0.00129 U	0.00113 U	0.00122 U	0.00105 U	0.00122 U
Methylene chloride	0.05	500	0.05	mg/kg		0.00212 U	0.00324 C	0.00252 U	0.00328 C	0.00689 C	0.00904 C	0.00542 C	0.011 C	0.00544 C	0.00226 U	0.00368 C	0.00529 C	0.00382 C
MTBE	0.93	500	0.93	mg/kg		0.00106 U	0.001 U	0.00126 U	0.00107 U	0.0014 U	0.00193 U	0.00164 U	0.00173 U	0.00129 U	0.00113 U	0.00122 U	0.00105 U	0.00122 U

Table 2. Summary of Volatile Organic Compounds in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	**Sample Designation:**	SB-31S	SB-32A	SB-32D	SB-32D1	SB-32S	SB-33A	SB-33D	SB-33S	SB-34A	SB-34D	SB-34S	SB-35A	SB-35D
					Sample Date:	12/18/2017	12/13/2017	12/18/2017	12/18/2017	12/18/2017	12/13/2017	12/18/2017	12/18/2017	12/13/2017	12/18/2017	12/18/2017	12/13/2017	12/18/2017
					Sample Depth (ft bls):	2 - 2.5	-	8 - 8.5	12 - 12.5	2 - 2.5	-	8 - 8.5	2 - 2.5	-	8 - 8.5	2 - 2.5	-	8 - 8.5
Naphthalene	12	500	12	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Butylbenzene	12	500	12	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Propylbenzene	3.9	500	3.9	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
o-Xylene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
P-CYMENE (P-ISOPROPYLTOLUENE)	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
sec-Butylbenzene	11	500	11	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	--	--	--	mg/kg		0.00106 U	0.001 U	0.00126 U	0.00107 U	0.0014 U	0.00193 U	0.00164 U	0.00173 U	0.00129 U	0.00113 U	0.00122 U	0.00105 U	0.00122 U
t-Butyl Alcohol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
tert-Butylbenzene	5.9	500	5.9	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	1.3	150	1.3	mg/kg		0.0032	0.027	0.015	0.00107 U	0.019	0.052	0.00817	0.00424	0.029	0.022	0.019	0.019	0.023
Toluene	0.7	500	0.7	mg/kg		0.00106 U	0.001 U	0.00126 U	0.00107 U	0.0014 U	0.00193 U	0.00164 U	0.00173 U	0.00129 U	0.00113 U	0.00122 U	0.00105 U	0.00122 U
trans-1,2-Dichloroethene	0.19	500	0.19	mg/kg		0.00106 U	0.001 U	0.00126 U	0.00107 U	0.0014 U	0.00193 U	0.00164 U	0.00173 U	0.00129 U	0.00113 U	0.00122 U	0.00105 U	0.00122 U
trans-1,3-Dichloropropene	--	--	--	mg/kg		0.00106 U	0.001 U	0.00126 U	0.00107 U	0.0014 U	0.00193 U	0.00164 U	0.00173 U	0.00129 U	0.00113 U	0.00122 U	0.00105 U	0.00122 U
trans-1,4-Dichloro-2-butene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	0.47	200	0.47	mg/kg		0.00106 U	0.001 U	0.000483 J	0.00107 U	0.000652 J	0.00106 J	0.00164 U	0.000507 J	0.000435 J	0.00234	0.00269	0.000447 J	0.00055 J
Trichlorofluoromethane	--	--	--	mg/kg		0.00106 U	0.001 U	0.00126 U	0.00107 U	0.0014 U	0.00193 U	0.00164 U	0.00173 U	0.00129 U	0.00113 U	0.00122 U	0.00105 U	0.00122 U
Vinyl chloride	0.02	13	0.02	mg/kg		0.00106 U	0.001 U	0.00126 U	0.00107 U	0.0014 U	0.00193 U	0.00164 U	0.00173 U	0.00129 U	0.00113 U	0.00122 U	0.00105 U	0.00122 U
Xylenes (total)	0.26	500	1.6	mg/kg		0.00212 U	0.002 U	0.00252 U	0.00214 U	0.0028 U	0.00386 U	0.00328 U	0.00346 U	0.00258 U	0.00226 U	0.00244 U	0.0021 U	0.00244 U

Table 2. Summary of Volatile Organic Compounds in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	Sample Designation:	SB-35S	SB-36D	SB-36S	SB-37D	SB-37S	SB-38(D)	SB-38(S)	SB-39(D)	SB-39(S)	SB-40(D)	SB-40(S)	SB42-A	SB42-B
					Sample Date:	12/18/2017	12/18/2017	12/18/2017	12/18/2017	12/18/2017	12/20/2017	12/20/2017	12/20/2017	12/20/2017	12/20/2017	12/20/2017	5/15/2018	5/15/2018
					Sample Depth (ft bls):	2 - 2.5	8 - 8.5	2 - 2.5	8 - 8.5	2 - 2.5	-	-	-	-	-	-	-	-
1,1,1,2-Tetrachloroethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0028 U	0.0026 U
1,1,1-Trichloroethane	0.68	500	0.68	mg/kg		0.00158 U	0.00112 U	0.0013 U	0.035 U	0.11 U	0.00088 U	0.105 U	0.00119 U	0.074 U	0.00161 U	0.058 U	0.0028 U	0.0026 U
1,1,2,2-Tetrachloroethane	--	--	--	mg/kg		0.00158 U	0.00112 U	0.0013 U	0.035 U	0.11 U	0.00088 U	0.105 U	0.00119 U	0.074 U	0.00161 U	0.058 U	0.0028 U	0.0026 U
1,1,2-Trichloroethane	--	--	--	mg/kg		0.00158 U	0.00112 U	0.0013 U	0.035 U	0.11 U	0.00088 U	0.105 U	0.00119 U	0.074 U	0.00161 U	0.058 U	0.0028 U	0.0026 U
1,1-Dichloroethane	0.27	240	0.27	mg/kg		0.00158 U	0.00112 U	0.0013 U	0.035 U	0.11 U	0.00088 U	0.105 U	0.00119 U	0.074 U	0.00161 U	0.058 U	0.0028 U	0.0026 U
1,1-Dichloroethene	0.33	500	0.33	mg/kg		0.00158 U	0.00112 U	0.0013 U	0.035 U	0.11 U	0.00088 U	0.105 U	0.00119 U	0.074 U	0.00161 U	0.058 U	0.0028 U	0.0026 U
1,2,3-Trichlorobenzene	--	--	--	mg/kg		0.00158 U	0.00112 U	0.0013 U	0.07 U	0.219 U	0.00088 U	0.211 U	0.00119 U	0.148 U	0.00161 U	0.116 U	0.0028 U	0.0026 U
1,2,3-Trichloropropane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0028 U	0.0026 U
1,2,4-Trichlorobenzene	--	--	--	mg/kg		0.00158 U	0.00112 U	0.0013 U	0.07 U	0.219 U	0.00088 U	0.211 U	0.00119 U	0.148 U	0.00161 U	0.116 U	0.0028 U	0.0026 U
1,2,4-Trimethylbenzene	3.6	190	3.6	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0039	0.0026 U
1,2-Dibromoethane	--	--	--	mg/kg		0.00158 U	0.00112 U	0.0013 U	0.035 U	0.11 U	0.00088 U	0.105 U	0.00119 U	0.074 U	0.00161 U	0.058 U	0.0028 U	0.0026 U
1,2-Dichlorobenzene	1.1	500	1.1	mg/kg		0.00158 U	0.00112 U	0.0013 U	0.035 U	0.11 U	0.00088 U	0.105 U	0.00119 U	0.074 U	0.00161 U	0.058 U	0.0028 U	0.0026 U
1,2-Dichloroethane	0.02	30	0.02	mg/kg		0.00158 U	0.00112 U	0.0013 U	0.035 U	0.11 U	0.00088 U	0.105 U	0.00119 U	0.074 U	0.00161 U	0.058 U	0.0028 U	0.0026 U
1,2-Dichloropropane	--	--	--	mg/kg		0.00158 U	0.00112 U	0.0013 U	0.035 U	0.11 U	0.00088 U	0.105 U	0.00119 U	0.074 U	0.00161 U	0.058 U	0.0028 U	0.0026 U
1,3,5-Trimethylbenzene	8.4	190	8.4	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0028 U	0.0026 U
1,3-Dichlorobenzene	2.4	280	2.4	mg/kg		0.00158 U	0.00112 U	0.0013 U	0.035 U	0.11 U	0.00088 U	0.105 U	0.00119 U	0.074 U	0.00161 U	0.058 U	0.0028 U	0.0026 U
1,3-Dichloropropene	--	--	--	mg/kg		0.00158 U	0.00112 U	0.0013 U	0.035 U	0.11 U	0.00088 U	0.105 U	0.00119 U	0.074 U	0.00161 U	0.058 U	NA	NA
1,4-Dichlorobenzene	1.8	130	1.8	mg/kg		0.00158 U	0.00112 U	0.0013 U	0.035 U	0.11 U	0.00088 U	0.105 U	0.00119 U	0.074 U	0.00161 U	0.058 U	0.0028 U	0.0026 U
1,4-Dioxane	0.1	130	0.1	mg/kg		0.316 U	0.224 U	0.26 U	6.98 U	21.9 U	0.176 U	21.1 U	0.238 U	14.8 U	0.322 U	11.6 U	0.057 U	0.052 U
2-Butanone (MEK)	0.12	500	0.12	mg/kg		0.00316 U	0.00224 U	0.0026 U	0.14 U	0.438 U	0.00176 U	0.422 U	0.00238 U	0.296 U	0.00322 U	0.232 U	0.0053	0.0026 U
2-Hexanone	--	--	--	mg/kg		0.00316 U	0.00224 U	0.0026 U	0.14 U	0.438 U	0.00176 U	0.422 U	0.00238 U	0.296 U	0.00322 U	0.232 U	0.0028 U	0.0026 U
4-Methyl-2-pentanone (MIBK)	--	--	--	mg/kg		0.00316 U	0.00224 U	0.0026 U	0.14 U	0.438 U	0.00176 U	0.422 U	0.00238 U	0.296 U	0.00322 U	0.232 U	0.0028 U	0.0026 U
Acetone	**0.05**	500	0.05	mg/kg		0.012 J	0.014	0.033	0.14 U	0.438 U	0.015	0.422 U	0.012 U	0.296 U	0.016 U	0.232 U	0.034	0.0052 U
Acrolein	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0057 U	0.0052 U
Acrylonitrile	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0028 U	0.0026 U
Benzene	0.06	44	0.06	mg/kg		0.00158 U	0.00112 U	0.0013 U	0.035 U	0.11 U	0.00088 U	0.105 U	0.00119 U	0.074 U	0.00161 U	0.058 U	0.0028 U	0.0026 U
Bromochloromethane	--	--	--	mg/kg		0.00158 U	0.00112 U	0.0013 U	0.07 U	0.219 U	0.00088 U	0.211 U	0.00119 U	0.148 U	0.00161 U	0.116 U	0.0028 U	0.0026 U
Bromodichloromethane	--	--	--	mg/kg		0.00158 U	0.00112 U	0.0013 U	0.035 U	0.11 U	0.00088 U	0.105 U	0.00119 U	0.074 U	0.00161 U	0.058 U	0.0028 U	0.0026 U
Bromoform	--	--	--	mg/kg		0.00158 U	0.00112 U	0.0013 U	0.035 U	0.11 U	0.00088 U	0.105 U	0.00119 U	0.074 U	0.00161 U	0.058 U	0.0028 U	0.0026 U
Bromomethane	--	--	--	mg/kg		0.00158 U	0.00112 U	0.0013 U	0.07 U	0.219 U	0.00088 U	0.211 U	0.00119 U	0.148 U	0.00161 U	0.116 U	0.0028 U	0.0026 U
Carbon disulfide	--	--	--	mg/kg		0.00158 U	0.00112 U	0.0013 U	0.035 U	0.11 U	0.00134	0.105 U	0.00119 U	0.074 U	0.00161 U	0.058 U	0.0028 U	0.0026 U
Carbon tetrachloride	0.76	22	0.76	mg/kg		0.00158 U	0.00112 U	0.0013 U	0.07 U	0.219 U	0.00088 U	0.211 U	0.00119 U	0.148 U	0.00161 U	0.116 U	0.0028 U	0.0026 U
Chlorobenzene	1.1	500	1.1	mg/kg		0.00158 U	0.00112 U	0.0013 U	0.035 U	0.11 U	0.00088 U	0.105 U	0.00119 U	0.074 U	0.00161 U	0.058 U	0.0028 U	0.0026 U
Chloroethane	--	--	--	mg/kg		0.00158 U	0.00112 U	0.0013 U	0.035 U	0.11 U	0.00088 U	0.105 U	0.00119 U	0.074 U	0.00161 U	0.058 U	0.0028 U	0.0026 U
Chloroform	0.37	350	0.37	mg/kg		0.00158 U	0.00112 U	0.0013 U	0.035 U	0.11 U	0.00088 U	0.105 U	0.00119 U	0.074 U	0.00161 U	0.058 U	0.0028 U	0.0026 U
Chloromethane	--	--	--	mg/kg		0.00316 U	0.00224 U	0.0026 U	0.035 U	0.11 U	0.00088 U	0.105 U	0.00119 U	0.074 U	0.00161 U	0.058 U	0.0028 U	0.0026 U
cis-1,2-Dichloroethene	0.25	500	0.25	mg/kg		0.00158 U	0.00112 U	0.0013 U	0.035 U	0.11 U	0.00088 U	0.105 U	0.00119 U	0.074 U	0.00161 U	0.058 U	0.0028 U	0.0026 U
cis-1,3-Dichloropropene	--	--	--	mg/kg		0.00158 U	0.00112 U	0.0013 U	0.035 U	0.11 U	0.00088 U	0.105 U	0.00119 U	0.074 U	0.00161 U	0.058 U	0.0028 U	0.0026 U
Cyclohexane	--	--	--	mg/kg		0.0079 U	0.0056 U	0.0065 U	0.07 U	0.219 U	0.00088 U	0.29	0.00119 U	0.148 U	0.00161 U	0.116 U	0.0028 U	0.0026 U
Dibromochloromethane	--	--	--	mg/kg		0.00158 U	0.00112 U	0.0013 U	0.035 U	0.11 U	0.00088 U	0.105 U	0.00119 U	0.074 U	0.00161 U	0.058 U	0.0028 U	0.0026 U
Dibromochloropropane	--	--	--	mg/kg		0.00158 U	0.00112 U	0.0013 U	0.07 U	0.219 U	0.00088 U	0.211 U	0.00119 U	0.148 U	0.00161 U	0.116 U	0.0028 U	0.0026 U
Dibromomethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0028 U	0.0026 U
Dichlorodifluoromethane	--	--	--	mg/kg		0.00158 U	0.00112 U	0.0013 U	0.07 U	0.219 U	0.00088 U	0.211 U	0.00119 U	0.148 U	0.00161 U	0.116 U	0.0028 U	0.0026 U
Ethylbenzene	1	390	1	mg/kg		0.00158 U	0.00112 U	0.0013 U	0.035 U	0.105 DJ	0.00088 U	0.105 U	0.00119 U	0.074 U	0.00161 U	0.058 U	0.0028 U	0.0026 U
Freon 113	--	--	--	mg/kg		0.00158 U	0.00112 U	0.0013 U	0.07 U	0.219 U	0.00088 U	0.211 U	0.00119 U	0.148 U	0.00161 U	0.116 U	0.0028 U	0.0026 U
Hexachlorobutadiene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0028 U	0.0026 U
Isopropylbenzene	--	--	--	mg/kg		0.00158 U	0.00112 U	0.0013 U	0.035 U	0.081 DJ	0.00088 U	0.105 U	0.00119 U	0.074 U	0.00161 U	0.058 U	0.0028 U	0.0026 U
m+p-Xylene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0057 U	0.0052 U
Methyl acetate	--	--	--	mg/kg		0.00158 U	0.00112 U	0.0013 U	0.035 U	0.11 U	0.00161	0.478	0.00119 U	0.074 U	0.00161 U	0.058 U	0.0028 U	0.0026 U
Methylcyclohexane	--	--	--	mg/kg		0.00158 U	0.00112 U	0.0013 U	0.071	0.573 D	0.00088 U	0.105 U	0.00119 U	0.074 U	0.00161 U	0.058 U	0.0028 U	0.0026 U
Methylene chloride	0.05	500	0.05	mg/kg		0.00316 U	0.00224 U	0.00671 C	0.07 U	0.219 U	0.00471 C	0.211 U	0.00238 U	0.148 U	0.00878 C	0.116 U	0.0057 U	0.0052 U
MTBE	0.93	500	0.93	mg/kg		0.00158 U	0.00112 U	0.0013 U	0.035 U	0.11 U	0.00088 U	0.105 U	0.00119 U	0.074 U	0.00161 U	0.058 U	0.0028 U	0.0026 U

Table 2. Summary of Volatile Organic Compounds in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	Sample Designation:	SB-35S	SB-36D	SB-36S	SB-37D	SB-37S	SB-38(D)	SB-38(S)	SB-39(D)	SB-39(S)	SB-40(D)	SB-40(S)	SB42-A	SB42-B
					Sample Date:	12/18/2017	12/18/2017	12/18/2017	12/18/2017	12/18/2017	12/20/2017	12/20/2017	12/20/2017	12/20/2017	12/20/2017	12/20/2017	5/15/2018	5/15/2018
					Sample Depth (ft bls):	2 - 2.5	8 - 8.5	2 - 2.5	8 - 8.5	2 - 2.5	-	-	-	-	-	-	-	-
Naphthalene	12	500	12	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Butylbenzene	12	500	12	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0028 U	0.0026 U
n-Propylbenzene	3.9	500	3.9	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0028 U	0.0026 U
o-Xylene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0028 U	0.0026 U
P-CYMENE (P-ISOPROPYLTOLUENE)	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0028 U	0.0026 U
sec-Butylbenzene	11	500	11	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0028 U	0.0026 U
Styrene	--	--	--	mg/kg		0.00158 U	0.00112 U	0.0013 U	0.035 U	0.11 U	0.00088 U	0.105 U	0.00119 U	0.074 U	0.00161 U	0.058 U	0.0028 U	0.0026 U
t-Butyl Alcohol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0028 U	0.0026 U
tert-Butylbenzene	5.9	500	5.9	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0028 U	0.0026 U
Tetrachloroethene	1.3	150	1.3	mg/kg		0.026	0.017	0.012	0.429	**2.41 D**	0.00088 U	**1.82**	0.00337	**2.95**	0.011	**1.55**	0.087	0.004
Toluene	0.7	500	0.7	mg/kg		0.00158 U	0.00112 U	0.0013 U	0.035 U	0.105 DJ	0.00088 U	0.105 U	0.00119 U	0.074 U	0.000794 J	0.058 U	0.0028 U	0.0026 U
trans-1,2-Dichloroethene	0.19	500	0.19	mg/kg		0.00158 U	0.00112 U	0.0013 U	0.035 U	0.11 U	0.00088 U	0.105 U	0.00119 U	0.074 U	0.00161 U	0.058 U	0.0028 U	0.0026 U
trans-1,3-Dichloropropene	--	--	--	mg/kg		0.00158 U	0.00112 U	0.0013 U	0.035 U	0.11 U	0.00088 U	0.105 U	0.00119 U	0.074 U	0.00161 U	0.058 U	0.0028 U	0.0026 U
trans-1,4-Dichloro-2-butene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0028 U	0.0026 U
Trichloroethene	0.47	200	0.47	mg/kg		0.000803 J	0.00109 J	0.000415 J	0.035 U	0.11 U	0.00088 U	0.105 U	0.00272	0.216	0.000586 J	0.058 U	0.0076	0.0026 U
Trichlorofluoromethane	--	--	--	mg/kg		0.00158 U	0.00112 U	0.0013 U	0.035 U	0.11 U	0.00088 U	0.105 U	0.00119 U	0.074 U	0.00161 U	0.058 U	0.0028 U	0.0026 U
Vinyl chloride	0.02	13	0.02	mg/kg		0.00158 U	0.00112 U	0.0013 U	0.07 U	0.219 U	0.00088 U	0.211 U	0.00119 U	0.148 U	0.00161 U	0.116 U	0.0028 U	0.0026 U
Xylenes (total)	0.26	500	1.6	mg/kg		0.00316 U	0.00224 U	0.0026 U	0.072	**0.767 D**	0.00176 U	0.211 U	0.00238 U	0.148 U	0.00322 U	0.116 U	0.0085 U	0.0078 U

Table 2. Summary of Volatile Organic Compounds in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	Sample Designation:	SB43-A	SB43-B	SB-44a	SB-44b	SB-45a	SB-45b	SB-46a	SB-46b	SB-47a	SB-47b	SB-48a	SB-48b	SB-49a	SB-49b	SB-49c
					Sample Date:	5/15/2018	5/15/2018	5/24/2018	5/24/2018	5/24/2018	5/24/2018	5/24/2018	5/24/2018	5/24/2018	5/24/2018	5/24/2018	5/24/2018	5/24/2018	5/24/2018	5/24/2018
					Sample Depth (ft bls):	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,1,1,2-Tetrachloroethane	--	--	--	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
1,1,1-Trichloroethane	0.68	500	0.68	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
1,1,2,2-Tetrachloroethane	--	--	--	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
1,1,2-Trichloroethane	--	--	--	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
1,1-Dichloroethane	0.27	240	0.27	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
1,1-Dichloroethene	0.33	500	0.33	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
1,2,3-Trichlorobenzene	--	--	--	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
1,2,3-Trichloropropane	--	--	--	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
1,2,4-Trichlorobenzene	--	--	--	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
1,2,4-Trimethylbenzene	3.6	190	3.6	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
1,2-Dibromoethane	--	--	--	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
1,2-Dichlorobenzene	1.1	500	1.1	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
1,2-Dichloroethane	0.02	30	0.02	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
1,2-Dichloropropane	--	--	--	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
1,3,5-Trimethylbenzene	8.4	190	8.4	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
1,3-Dichlorobenzene	2.4	280	2.4	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
1,3-Dichloropropene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	1.8	130	1.8	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
1,4-Dioxane	0.1	130	0.1	mg/kg		0.053 U	0.045 U	0.051 U	0.047 U	0.068 U	0.056 U	0.043 U	0.047 U	0.043 U	0.058 U	0.064 U	0.042 U	0.065 U	0.048 U	0.056 U
2-Butanone (MEK)	0.12	500	0.12	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
2-Hexanone	--	--	--	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
4-Methyl-2-pentanone (MIBK)	--	--	--	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
Acetone	**0.05**	500	0.05	mg/kg		0.0053 U	0.0087	0.0076	0.0047 U	0.0068 U	0.0056 U	0.0043	0.0088	0.0071	0.0082	0.014	0.0092	0.0065 U	0.0056	0.014
Acrolein	--	--	--	mg/kg		0.0053 U	0.0045 U	0.0051 U	0.0047 U	0.0068 U	0.0056 U	0.0043 U	0.0047 U	0.0043 U	0.0058 U	0.0064 U	0.0042 U	0.0065 U	0.0048 U	0.0056 U
Acrylonitrile	--	--	--	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
Benzene	0.06	44	0.06	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
Bromochloromethane	--	--	--	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
Bromodichloromethane	--	--	--	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
Bromoform	--	--	--	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
Bromomethane	--	--	--	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
Carbon disulfide	--	--	--	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
Carbon tetrachloride	0.76	22	0.76	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
Chlorobenzene	1.1	500	1.1	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
Chloroethane	--	--	--	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
Chloroform	0.37	350	0.37	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
Chloromethane	--	--	--	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
cis-1,2-Dichloroethene	0.25	500	0.25	mg/kg		0.0029	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
cis-1,3-Dichloropropene	--	--	--	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
Cyclohexane	--	--	--	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
Dibromochloromethane	--	--	--	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
Dibromochloropropane	--	--	--	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
Dibromomethane	--	--	--	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
Dichlorodifluoromethane	--	--	--	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
Ethylbenzene	1	390	1	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
Freon 113	--	--	--	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
Hexachlorobutadiene	--	--	--	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
Isopropylbenzene	--	--	--	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
m+p-Xylene	--	--	--	mg/kg		0.0053 U	0.0045 U	0.0051 U	0.0047 U	0.0068 U	0.0056 U	0.0043 U	0.0047 U	0.0043 U	0.0058 U	0.0064 U	0.0042 U	0.0065 U	0.0048 U	0.0056 U
Methyl acetate	--	--	--	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
Methylcyclohexane	--	--	--	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
Methylene chloride	0.05	500	0.05	mg/kg		0.0053 U	0.0045 U	0.006	0.0077	0.014	0.014	0.01	0.012	0.0048	0.011	0.0095	0.011	0.0099	0.012	0.008
MTBE	0.93	500	0.93	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U

Table 2. Summary of Volatile Organic Compounds in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	Sample Designation:	SB43-A	SB43-B	SB-44a	SB-44b	SB-45a	SB-45b	SB-46a	SB-46b	SB-47a	SB-47b	SB-48a	SB-48b	SB-49a	SB-49b	SB-49c
					Sample Date:	5/15/2018	5/15/2018	5/24/2018	5/24/2018	5/24/2018	5/24/2018	5/24/2018	5/24/2018	5/24/2018	5/24/2018	5/24/2018	5/24/2018	5/24/2018	5/24/2018	5/24/2018
					Sample Depth (ft bls):	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Naphthalene	12	500	12	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Butylbenzene	12	500	12	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
n-Propylbenzene	3.9	500	3.9	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
o-Xylene	--	--	--	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
P-CYMENE (P-ISOPROPYLTOLUENE)	--	--	--	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
sec-Butylbenzene	11	500	11	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
Styrene	--	--	--	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
t-Butyl Alcohol	--	--	--	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0056
tert-Butylbenzene	5.9	500	5.9	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
Tetrachloroethene	1.3	150	1.3	mg/kg		0.22	0.0072	0.07	0.0026	0.019	0.0066	0.021	0.0024 U	0.039	0.017	**39**	0.0021 U	0.016	0.0026	0.046
Toluene	0.7	500	0.7	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
trans-1,2-Dichloroethene	0.19	500	0.19	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
trans-1,3-Dichloropropene	--	--	--	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
trans-1,4-Dichloro-2-butene	--	--	--	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
Trichloroethene	0.47	200	0.47	mg/kg		0.0054	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.021	0.0021 U	0.0033 U	0.0024 U	0.0028 U
Trichlorofluoromethane	--	--	--	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
Vinyl chloride	0.02	13	0.02	mg/kg		0.0026 U	0.0022 U	0.0026 U	0.0024 U	0.0034 U	0.0028 U	0.0021 U	0.0024 U	0.0021 U	0.0029 U	0.0032 U	0.0021 U	0.0033 U	0.0024 U	0.0028 U
Xylenes (total)	0.26	500	1.6	mg/kg		0.0079 U	0.0067 U	0.0077 U	0.0071 U	0.01 U	0.0084 U	0.0064 U	0.0071 U	0.0064 U	0.0087 U	0.0096 U	0.0064 U	0.0098 U	0.0072 U	0.0084 U

Table 2. Summary of Volatile Organic Compounds in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	Sample Designation:	SB-50a	SB-50b	SB-50c	SB-51a	SB-51b	SB-51c	SB-52	SB-53	SB-54	SB-55	SB-56A	SB-56B	SB-56C	SB-57A
					Sample Date:	5/24/2018	5/24/2018	5/24/2018	5/24/2018	5/24/2018	5/24/2018	5/24/2018	5/24/2018	5/24/2018	5/24/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018
					Sample Depth (ft bls):	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,1,1,2-Tetrachloroethane	--	--	--	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	NA	NA	NA	NA
1,1,1-Trichloroethane	0.68	500	0.68	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	0.0028 U	0.0028 U	0.0029 U	0.0028 U
1,1,2,2-Tetrachloroethane	--	--	--	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	NA	NA	NA	NA
1,1,2-Trichloroethane	--	--	--	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	NA	NA	NA	NA
1,1-Dichloroethane	0.27	240	0.27	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	0.0028 U	0.0028 U	0.0029 U	0.0028 U
1,1-Dichloroethene	0.33	500	0.33	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	0.0028 U	0.0028 U	0.0029 U	0.0028 U
1,2,3-Trichlorobenzene	--	--	--	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	NA	NA	NA	NA
1,2,3-Trichloropropane	--	--	--	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	NA	NA	NA	NA
1,2,4-Trichlorobenzene	--	--	--	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	NA	NA	NA	NA
1,2,4-Trimethylbenzene	3.6	190	3.6	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	0.0028 U	0.0028 U	0.0029 U	0.0028 U
1,2-Dibromoethane	--	--	--	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	NA	NA	NA	NA
1,2-Dichlorobenzene	1.1	500	1.1	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	0.0028 U	0.0028 U	0.0029 U	0.0028 U
1,2-Dichloroethane	0.02	30	0.02	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	0.0028 U	0.0028 U	0.0029 U	0.0028 U
1,2-Dichloropropane	--	--	--	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	NA	NA	NA	NA
1,3,5-Trimethylbenzene	8.4	190	8.4	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	0.0028 U	0.0028 U	0.0029 U	0.0028 U
1,3-Dichlorobenzene	2.4	280	2.4	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	0.0028 U	0.0028 U	0.0029 U	0.0028 U
1,3-Dichloropropene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	1.8	130	1.8	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	0.0028 U	0.0028 U	0.0029 U	0.0028 U
1,4-Dioxane	0.1	130	0.1	mg/kg		0.1 U	0.05 U	0.11 U	0.05 U	0.053 U	0.06 U	0.066 U	0.056 U	0.056 U	0.065 U	0.057 U	0.057 U	0.057 U	0.056 U
2-Butanone (MEK)	0.12	500	0.12	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	0.0028 U	0.0028 U	0.0029 U	0.0028 U
2-Hexanone	--	--	--	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	NA	NA	NA	NA
4-Methyl-2-pentanone (MIBK)	--	--	--	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	NA	NA	NA	NA
Acetone	**0.05**	500	0.05	mg/kg		0.028	0.006	**0.064**	0.0068	0.015	0.006 U	0.024	0.011	0.011	0.022	0.011	0.027	0.0082 J	0.01 J
Acrolein	--	--	--	mg/kg		0.01 U	0.005 U	0.011 U	0.005 U	0.0053 U	0.006 U	0.0066 U	0.0056 U	0.0056 U	0.0065 U	NA	NA	NA	NA
Acrylonitrile	--	--	--	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	NA	NA	NA	NA
Benzene	0.06	44	0.06	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	0.0028 U	0.0028 U	0.0029 U	0.0028 U
Bromochloromethane	--	--	--	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	NA	NA	NA	NA
Bromodichloromethane	--	--	--	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	NA	NA	NA	NA
Bromoform	--	--	--	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	NA	NA	NA	NA
Bromomethane	--	--	--	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	NA	NA	NA	NA
Carbon disulfide	--	--	--	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	NA	NA	NA	NA
Carbon tetrachloride	0.76	22	0.76	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	0.0028 U	0.0028 U	0.0029 U	0.0028 U
Chlorobenzene	1.1	500	1.1	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	0.0028 U	0.0028 U	0.0029 U	0.0028 U
Chloroethane	--	--	--	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	NA	NA	NA	NA
Chloroform	0.37	350	0.37	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	0.0028 U	0.0028 U	0.0029 U	0.0028 U
Chloromethane	--	--	--	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	NA	NA	NA	NA
cis-1,2-Dichloroethene	0.25	500	0.25	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	0.0028 U	0.0028 U	0.0029 U	0.0028 U
cis-1,3-Dichloropropene	--	--	--	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	NA	NA	NA	NA
Cyclohexane	--	--	--	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	NA	NA	NA	NA
Dibromochloromethane	--	--	--	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	NA	NA	NA	NA
Dibromochloropropane	--	--	--	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	NA	NA	NA	NA
Dibromomethane	--	--	--	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	NA	NA	NA	NA
Dichlorodifluoromethane	--	--	--	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	NA	NA	NA	NA
Ethylbenzene	1	390	1	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	0.0028 U	0.0028 U	0.0029 U	0.0028 U
Freon 113	--	--	--	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	NA	NA	NA	NA
Hexachlorobutadiene	--	--	--	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	NA	NA	NA	NA
Isopropylbenzene	--	--	--	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	NA	NA	NA	NA
m+p-Xylene	--	--	--	mg/kg		0.01 U	0.005 U	0.011 U	0.005 U	0.0053 U	0.006 U	0.0066 U	0.0056 U	0.0056 U	0.0065 U	0.0057 U	0.0057 U	0.0057 U	0.0056 U
Methyl acetate	--	--	--	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	NA	NA	NA	NA
Methylcyclohexane	--	--	--	mg/kg		0.0067	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	NA	NA	NA	NA
Methylene chloride	0.05	500	0.05	mg/kg		0.013	0.013	0.022	0.0096	0.012	0.0065	0.015	0.011	0.0068	0.0081	0.02	0.015	0.0057 U	0.016
MTBE	0.93	500	0.93	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	0.0028 U	0.0028 U	0.0029 U	0.0028 U

Table 2. Summary of Volatile Organic Compounds in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	Sample Designation:	SB-50a	SB-50b	SB-50c	SB-51a	SB-51b	SB-51c	SB-52	SB-53	SB-54	SB-55	SB-56A	SB-56B	SB-56C	SB-57A
					Sample Date:	5/24/2018	5/24/2018	5/24/2018	5/24/2018	5/24/2018	5/24/2018	5/24/2018	5/24/2018	5/24/2018	5/24/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018
					Sample Depth (ft bls):	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Naphthalene	12	500	12	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0028 U	0.016 B	0.0059 JB	0.0028 U
n-Butylbenzene	12	500	12	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	0.0028 U	0.0028 U	0.0029 U	0.0028 U
n-Propylbenzene	3.9	500	3.9	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	0.0028 U	0.0028 U	0.0029 U	0.0028 U
o-Xylene	--	--	--	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	0.0028 U	0.0028 U	0.0029 U	0.0028 U
P-CYMENE (P-ISOPROPYLTOLUENE)	--	--	--	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	NA	NA	NA	NA
sec-Butylbenzene	11	500	11	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	0.0028 U	0.0028 U	0.0029 U	0.0028 U
Styrene	--	--	--	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	NA	NA	NA	NA
t-Butyl Alcohol	--	--	--	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0082	0.0028 U	0.0028 U	0.014	NA	NA	NA	NA
tert-Butylbenzene	5.9	500	5.9	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	0.0028 U	0.0028 U	0.0029 U	0.0028 U
Tetrachloroethene	1.3	150	1.3	mg/kg		**21**	0.007	0.029	0.056	0.013	0.084	0.011	0.13	0.063	0.057	0.017	**14 D**	0.095	0.013
Toluene	0.7	500	0.7	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	0.0028 U	0.0028 U	0.0029 U	0.0028 U
trans-1,2-Dichloroethene	0.19	500	0.19	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	0.0028 U	0.0028 U	0.0029 U	0.0028 U
trans-1,3-Dichloropropene	--	--	--	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	NA	NA	NA	NA
trans-1,4-Dichloro-2-butene	--	--	--	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	NA	NA	NA	NA
Trichloroethene	0.47	200	0.47	mg/kg		NA	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.006	0.0047	0.0047	0.0028 U	0.032	0.0029 U	0.0028 U
Trichlorofluoromethane	--	--	--	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	NA	NA	NA	NA
Vinyl chloride	0.02	13	0.02	mg/kg		0.0051 U	0.0025 U	0.0053 U	0.0025 U	0.0027 U	0.003 U	0.0033 U	0.0028 U	0.0028 U	0.0033 U	0.0028 U	0.0028 U	0.0029 U	0.0028 U
Xylenes (total)	0.26	500	1.6	mg/kg		0.015 U	0.0074 U	0.016 U	0.0075 U	0.008 U	0.009 U	0.0099 U	0.0084 U	0.0083 U	0.0098 U	0.0085 U	0.0085 U	0.0086 U	0.0084 U

Table 2. Summary of Volatile Organic Compounds in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	Sample Designation:	SB-57B	SB-57C	SB-58A	SB-58B	SB-58C	SB-59A	SB-59B	SB-59C	SB-60A	SB-60B	SB-60C	SB-61A	SB-61B
					Sample Date:	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018
					Sample Depth (ft bls):	-	-	-	-	-	-	-	-	-	-	-	-	-
1,1,1,2-Tetrachloroethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	0.68	500	0.68	mg/kg		0.0029 U	0.0029 U	0.0026 U	0.0032 U	0.003 U	0.0027 U	0.0027 U	0.0026 U	0.0026 U	0.0028 U	0.0029 U	0.0027 U	0.0029 U
1,1,2,2-Tetrachloroethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	0.27	240	0.27	mg/kg		0.0029 U	0.0029 U	0.0026 U	0.0032 U	0.003 U	0.0027 U	0.0027 U	0.0026 U	0.0026 U	0.0028 U	0.0029 U	0.0027 U	0.0029 U
1,1-Dichloroethene	0.33	500	0.33	mg/kg		0.0029 U	0.0029 U	0.0026 U	0.0032 U	0.003 U	0.0027 U	0.0027 U	0.0026 U	0.0026 U	0.0028 U	0.0029 U	0.0027 U	0.0029 U
1,2,3-Trichlorobenzene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3-Trichloropropane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trimethylbenzene	3.6	190	3.6	mg/kg		0.0029 U	0.0029 U	0.0026 U	0.0032 U	0.003 U	0.0027 U	0.0027 U	0.0026 U	0.0026 U	0.0028 U	0.0029 U	0.0027 U	0.0029 U
1,2-Dibromoethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	1.1	500	1.1	mg/kg		0.0029 U	0.0029 U	0.0026 U	0.0032 U	0.003 U	0.0027 U	0.0027 U	0.0026 U	0.0026 U	0.0028 U	0.0029 U	0.0027 U	0.0029 U
1,2-Dichloroethane	0.02	30	0.02	mg/kg		0.0029 U	0.0029 U	0.0026 U	0.0032 U	0.003 U	0.0027 U	0.0027 U	0.0026 U	0.0026 U	0.0028 U	0.0029 U	0.0027 U	0.0029 U
1,2-Dichloropropane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3,5-Trimethylbenzene	8.4	190	8.4	mg/kg		0.0029 U	0.0029 U	0.0026 U	0.0032 U	0.003 U	0.0027 U	0.0027 U	0.0026 U	0.0026 U	0.0028 U	0.0029 U	0.0027 U	0.0029 U
1,3-Dichlorobenzene	2.4	280	2.4	mg/kg		0.0029 U	0.0029 U	0.0026 U	0.0032 U	0.003 U	0.0027 U	0.0027 U	0.0026 U	0.0026 U	0.0028 U	0.0029 U	0.0027 U	0.0029 U
1,3-Dichloropropene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	1.8	130	1.8	mg/kg		0.0029 U	0.0029 U	0.0026 U	0.0032 U	0.003 U	0.0027 U	0.0027 U	0.0026 U	0.0026 U	0.0028 U	0.0029 U	0.0027 U	0.0029 U
1,4-Dioxane	0.1	130	0.1	mg/kg		0.059 U	0.058 U	0.051 U	0.064 U	0.059 U	0.054 U	0.055 U	0.052 U	0.053 U	0.056 U	0.058 U	0.054 U	0.059 U
2-Butanone (MEK)	0.12	500	0.12	mg/kg		0.0029 U	0.0029 U	0.0026 U	0.0032 U	0.003 U	0.0027 U	0.0027 U	0.0026 U	0.0026 U	0.0028 U	0.0029 U	0.0027 U	0.0029 U
2-Hexanone	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone (MIBK)	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	**0.05**	500	0.05	mg/kg		0.0074 J	0.012	**0.12**	0.011 J	0.012	0.023	0.01 J	0.0064 J	0.029	0.0056 U	0.0084 J	0.0054 U	0.0059 U
Acrolein	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acrylonitrile	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	0.06	44	0.06	mg/kg		0.0029 U	0.0029 U	0.0026 U	0.0032 U	0.003 U	0.0027 U	0.0027 U	0.0026 U	0.0026 U	0.0028 U	0.0029 U	0.0027 U	0.0029 U
Bromochloromethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromoform	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromomethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	0.76	22	0.76	mg/kg		0.0029 U	0.0029 U	0.0026 U	0.0032 U	0.003 U	0.0027 U	0.0027 U	0.0026 U	0.0026 U	0.0028 U	0.0029 U	0.0027 U	0.0029 U
Chlorobenzene	1.1	500	1.1	mg/kg		0.0029 U	0.0029 U	0.0026 U	0.0032 U	0.003 U	0.0027 U	0.0027 U	0.0026 U	0.0026 U	0.0028 U	0.0029 U	0.0027 U	0.0029 U
Chloroethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	0.37	350	0.37	mg/kg		0.0029 U	0.0029 U	0.0026 U	0.0032 U	0.003 U	0.0027 U	0.0027 U	0.0026 U	0.0026 U	0.0028 U	0.0029 U	0.0027 U	0.0029 U
Chloromethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	0.25	500	0.25	mg/kg		0.0029 U	0.0029 U	0.0026 U	0.0032 U	0.003 U	0.0027 U	0.0027 U	0.0026 U	0.0026 U	0.0028 U	0.0029 U	0.0027 U	0.0029 U
cis-1,3-Dichloropropene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyclohexane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloropropane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromomethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	1	390	1	mg/kg		0.0029 U	0.0029 U	0.0026 U	0.0032 U	0.003 U	0.0027 U	0.0027 U	0.0026 U	0.0026 U	0.0028 U	0.0029 U	0.0027 U	0.0029 U
Freon 113	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m+p-Xylene	--	--	--	mg/kg		0.0059 U	0.0058 U	0.0051 U	0.0064 U	0.0059 U	0.0054 U	0.0055 U	0.0052 U	0.0053 U	0.0056 U	0.0058 U	0.0054 U	0.0059 U
Methyl acetate	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylcyclohexane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	0.05	500	0.05	mg/kg		0.013	0.0093 J	0.014	0.013	0.018	0.018	0.019	0.021	0.015	0.013	0.013	0.0054 U	0.0072 J
MTBE	0.93	500	0.93	mg/kg		0.0029 U	0.0029 U	0.0026 U	0.0032 U	0.003 U	0.0027 U	0.0027 U	0.0026 U	0.0026 U	0.0028 U	0.0029 U	0.0027 U	0.0029 U

Table 2. Summary of Volatile Organic Compounds in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	Sample Designation:	SB-57B	SB-57C	SB-58A	SB-58B	SB-58C	SB-59A	SB-59B	SB-59C	SB-60A	SB-60B	SB-60C	SB-61A	SB-61B
					Sample Date:	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018
					Sample Depth (ft bls):	-	-	-	-	-	-	-	-	-	-	-	-	-
Naphthalene	12	500	12	mg/kg		0.0038 JB	0.0073 JB	0.0026 U	0.0076 JB	0.0031 JB	0.0027 U	0.004 JB	0.0026 U	0.0027 JB	0.0041 JB	0.0029 U	0.0027 U	0.0073 JB
n-Butylbenzene	12	500	12	mg/kg		0.0029 U	0.0029 U	0.0026 U	0.0032 U	0.003 U	0.0027 U	0.0027 U	0.0026 U	0.0026 U	0.0028 U	0.0029 U	0.0027 U	0.0029 U
n-Propylbenzene	3.9	500	3.9	mg/kg		0.0029 U	0.0029 U	0.0026 U	0.0032 U	0.003 U	0.0027 U	0.0027 U	0.0026 U	0.0026 U	0.0028 U	0.0029 U	0.0027 U	0.0029 U
o-Xylene	--	--	--	mg/kg		0.0029 U	0.0029 U	0.0026 U	0.0032 U	0.003 U	0.0027 U	0.0027 U	0.0026 U	0.0026 U	0.0028 U	0.0029 U	0.0027 U	0.0029 U
P-CYMENE (P-ISOPROPYLTOLUENE)	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
sec-Butylbenzene	11	500	11	mg/kg		0.0029 U	0.0029 U	0.0026 U	0.0032 U	0.003 U	0.0027 U	0.0027 U	0.0026 U	0.0026 U	0.0028 U	0.0029 U	0.0027 U	0.0029 U
Styrene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
t-Butyl Alcohol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
tert-Butylbenzene	5.9	500	5.9	mg/kg		0.0029 U	0.0029 U	0.0026 U	0.0032 U	0.003 U	0.0027 U	0.0027 U	0.0026 U	0.0026 U	0.0028 U	0.0029 U	0.0027 U	0.0029 U
Tetrachloroethene	1.3	150	1.3	mg/kg		0.1	**12 D**	0.0029 J	**9.6 D**	0.0058 J	0.0039 J	0.088	0.0026 U	0.078	0.12	0.01	0.026	0.21
Toluene	0.7	500	0.7	mg/kg		0.0029 U	0.0029 U	0.0026 U	0.0032 U	0.003 U	0.0027 U	0.0027 U	0.0026 U	0.0026 U	0.0028 U	0.0029 U	0.0027 U	0.0029 U
trans-1,2-Dichloroethene	0.19	500	0.19	mg/kg		0.0029 U	0.0029 U	0.0026 U	0.0032 U	0.003 U	0.0027 U	0.0027 U	0.0026 U	0.0026 U	0.0028 U	0.0029 U	0.0027 U	0.0029 U
trans-1,3-Dichloropropene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,4-Dichloro-2-butene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	0.47	200	0.47	mg/kg		0.003 J	0.011	0.0026 U	0.0074	0.003 U	0.0027 U	0.0041 J	0.0026 U	0.0026 U	0.0028 U	0.0029 U	0.0027 U	0.0083
Trichlorofluoromethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	0.02	13	0.02	mg/kg		0.0029 U	0.0029 U	0.0026 U	0.0032 U	0.003 U	0.0027 U	0.0027 U	0.0026 U	0.0026 U	0.0028 U	0.0029 U	0.0027 U	0.0029 U
Xylenes (total)	0.26	500	1.6	mg/kg		0.0088 U	0.0087 U	0.0077 U	0.0096 U	0.0089 U	0.0081 U	0.0082 U	0.0077 U	0.0079 U	0.0085 U	0.0087 U	0.0081 U	0.0088 U

Table 2. Summary of Volatile Organic Compounds in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	Sample Designation:	SB-61C	SB-62	SB-63	SB-64A	SB-64B	SB-65A	SB-65B	SB-66A	SB-66B	SB-67A	SB-67B	SB-68A	SB-68B
					Sample Date:	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018
					Sample Depth (ft bls):	-	-	-	-	-	-	-	-	-	-	-	-	-
1,1,1,2-Tetrachloroethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	0.68	500	0.68	mg/kg		0.0031 U	0.0028 U	0.0028 U	0.0026 U	0.0028 U	0.0028 U	0.0026 U	0.0027 U	0.0029 U	0.0026 U	0.0028 U	0.0026 U	0.0028 U
1,1,2,2-Tetrachloroethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	0.27	240	0.27	mg/kg		0.0031 U	0.0028 U	0.0028 U	0.0026 U	0.0028 U	0.0028 U	0.0026 U	0.0027 U	0.0029 U	0.0026 U	0.0028 U	0.0026 U	0.0028 U
1,1-Dichloroethene	0.33	500	0.33	mg/kg		0.0031 U	0.0028 U	0.0028 U	0.0026 U	0.0028 U	0.0028 U	0.0026 U	0.0027 U	0.0029 U	0.0026 U	0.0028 U	0.0026 U	0.0028 U
1,2,3-Trichlorobenzene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3-Trichloropropane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trimethylbenzene	3.6	190	3.6	mg/kg		0.0031 U	0.0028 U	1.1 D	0.0026 U	0.0028 U	0.0028 U	0.0026 U	0.0027 U	0.0029 U	0.0026 U	0.0028 U	0.0026 U	0.0028 U
1,2-Dibromoethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	1.1	500	1.1	mg/kg		0.0031 U	0.0028 U	0.0028 U	0.0026 U	0.0028 U	0.0028 U	0.0026 U	0.0027 U	0.0029 U	0.0026 U	0.0028 U	0.0026 U	0.0028 U
1,2-Dichloroethane	0.02	30	0.02	mg/kg		0.0031 U	0.0028 U	0.0028 U	0.0026 U	0.0028 U	0.0028 U	0.0026 U	0.0027 U	0.0029 U	0.0026 U	0.0028 U	0.0026 U	0.0028 U
1,2-Dichloropropane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3,5-Trimethylbenzene	8.4	190	8.4	mg/kg		0.0031 U	0.0028 U	0.37 JD	0.0026 U	0.0028 U	0.0028 U	0.0026 U	0.0027 U	0.0029 U	0.0026 U	0.0028 U	0.0026 U	0.0028 U
1,3-Dichlorobenzene	2.4	280	2.4	mg/kg		0.0031 U	0.0028 U	0.0028 U	0.0026 U	0.0028 U	0.0028 U	0.0026 U	0.0027 U	0.0029 U	0.0026 U	0.0028 U	0.0026 U	0.0028 U
1,3-Dichloropropene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	1.8	130	1.8	mg/kg		0.0031 U	0.0028 U	0.0028 U	0.0026 U	0.0028 U	0.0028 U	0.0026 U	0.0027 U	0.0029 U	0.0026 U	0.0028 U	0.0026 U	0.0028 U
1,4-Dioxane	0.1	130	0.1	mg/kg		0.061 U	0.055 U	0.055 U	0.052 U	0.056 U	0.055 U	0.052 U	0.054 U	0.058 U	0.052 U	0.056 U	0.051 U	0.055 U
2-Butanone (MEK)	0.12	500	0.12	mg/kg		0.0031 U	0.0028 U	0.0028 U	0.0026 U	0.0028 U	0.0028 U	0.0026 U	0.0027 U	0.0029 U	0.0026 U	0.0028 U	0.0026 U	0.0028 U
2-Hexanone	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone (MIBK)	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	**0.05**	500	0.05	mg/kg		0.0061 U	0.0055 U	**0.051**	0.007 J	0.0092 J	0.0055 U	0.0052 U	0.0054 U	0.0058 U	0.0052 U	0.0056 U	0.0051 U	0.0055 U
Acrolein	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acrylonitrile	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	0.06	44	0.06	mg/kg		0.0031 U	0.0028 U	0.0028 U	0.0026 U	0.0028 U	0.0063	0.0026 U	0.0027 U	0.0029 U	0.0026 U	0.0055 J	0.0026 U	0.0028 U
Bromochloromethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromoform	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromomethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	0.76	22	0.76	mg/kg		0.0031 U	0.0028 U	0.0028 U	0.0026 U	0.0028 U	0.0028 U	0.0026 U	0.0027 U	0.0029 U	0.0026 U	0.0028 U	0.0026 U	0.0028 U
Chlorobenzene	1.1	500	1.1	mg/kg		0.0031 U	0.0028 U	0.0028 U	0.0026 U	0.0028 U	0.0028 U	0.0026 U	0.0027 U	0.0029 U	0.0026 U	0.0028 U	0.0026 U	0.0028 U
Chloroethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	0.37	350	0.37	mg/kg		0.0031 U	0.0029 J	0.0028 U	0.0026 U	0.0028 U	0.0028 U	0.0026 U	0.0027 U	0.0029 U	0.0026 U	0.0028 U	0.0026 U	0.0028 U
Chloromethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	0.25	500	0.25	mg/kg		0.0031 U	0.0028 U	0.0028 U	0.0026 U	0.0028 U	0.0028 U	0.0026 U	0.0027 U	0.0029 U	0.0026 U	0.0028 U	0.093	0.0028 U
cis-1,3-Dichloropropene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyclohexane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloropropane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromomethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	1	390	1	mg/kg		0.0031 U	0.0028 U	0.61 D	0.0026 U	0.0028 U	0.0028 U	0.0026 U	0.0027 U	0.0029 U	0.0026 U	0.0028 U	0.0026 U	0.0028 U
Freon 113	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m+p-Xylene	--	--	--	mg/kg		0.0061 U	0.0055 U	0.043	0.0052 U	0.0056 U	0.0055 U	0.0052 U	0.0054 U	0.0058 U	0.0052 U	0.0056 U	0.0051 U	0.0055 U
Methyl acetate	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylcyclohexane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	0.05	500	0.05	mg/kg		0.014	0.0073 J	0.0055 U	0.011	0.01 J	0.0092 J	0.0052 J	0.0054 U	0.0098 J	0.0053 J	0.0056 U	0.0071 J	0.0055 U
MTBE	0.93	500	0.93	mg/kg		0.0031 U	0.0028 U	0.0028 U	0.0026 U	0.0028 U	0.0028 U	0.0026 U	0.0027 U	0.0029 U	0.0026 U	0.0028 U	0.0026 U	0.0028 U

Table 2. Summary of Volatile Organic Compounds in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	Sample Designation:	SB-61C	SB-62	SB-63	SB-64A	SB-64B	SB-65A	SB-65B	SB-66A	SB-66B	SB-67A	SB-67B	SB-68A	SB-68B
					Sample Date:	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018
					Sample Depth (ft bls):	-	-	-	-	-	-	-	-	-	-	-	-	-
Naphthalene	12	500	12	mg/kg		0.0065 JB	0.0031 JB	0.03 B	0.0026 U	0.0028 U	0.18 B	0.0026 JB	0.0027 U	0.0029 U	0.0026 U	0.0028 U	0.0026 U	0.0028 U
n-Butylbenzene	12	500	12	mg/kg		0.0031 U	0.0028 U	0.0028 U	0.0026 U	0.0028 U	0.0028 U	0.0026 U	0.0027 U	0.0029 U	0.0026 U	0.0028 U	0.0026 U	0.0028 U
n-Propylbenzene	3.9	500	3.9	mg/kg		0.0031 U	0.0028 U	1.1 D	0.0026 U	0.0028 U	0.0028 U	0.0026 U	0.0027 U	0.0029 U	0.0026 U	0.0028 U	0.0026 U	0.0028 U
o-Xylene	--	--	--	mg/kg		0.0031 U	0.0028 U	0.037	0.0026 U	0.0028 U	0.0028 U	0.0026 U	0.0027 U	0.0029 U	0.0026 U	0.0028 U	0.0026 U	0.0028 U
P-CYMENE (P-ISOPROPYLTOLUENE)	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
sec-Butylbenzene	11	500	11	mg/kg		0.0031 U	0.0028 U	0.92 D	0.0026 U	0.0028 U	0.0028 U	0.0026 U	0.0027 U	0.0029 U	0.0026 U	0.0028 U	0.0026 U	0.0028 U
Styrene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
t-Butyl Alcohol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
tert-Butylbenzene	5.9	500	5.9	mg/kg		0.0031 U	0.0028 U	0.0028 U	0.0026 U	0.0028 U	0.0028 U	0.0026 U	0.0027 U	0.0029 U	0.0026 U	0.0028 U	0.0026 U	0.0028 U
Tetrachloroethene	1.3	150	1.3	mg/kg		0.056	0.037	0.0069	0.0035 J	0.009	0.031	0.0076	0.025	0.068	0.1	0.0028 U	1.2 D	0.16
Toluene	0.7	500	0.7	mg/kg		0.0031 U	0.0028 U	0.0036 J	0.0027 J	0.0028 U	0.0028 U	0.0026 U	0.0027 U	0.0029 U	0.0026 U	0.0028 U	0.0026 U	0.0028 U
trans-1,2-Dichloroethene	0.19	500	0.19	mg/kg		0.0031 U	0.0028 U	0.0028 U	0.0026 U	0.0028 U	0.0028 U	0.0026 U	0.0027 U	0.0029 U	0.0026 U	0.0028 U	0.0026 U	0.0028 U
trans-1,3-Dichloropropene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,4-Dichloro-2-butene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	0.47	200	0.47	mg/kg		0.0031 U	0.0028 U	0.0028 U	0.0026 U	0.0028 U	0.0028 U	0.0026 U	0.0027 U	0.0029 U	0.0026 U	0.0028 U	0.023	0.0041 J
Trichlorofluoromethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	0.02	13	0.02	mg/kg		0.0031 U	0.0028 U	0.0028 U	0.0026 U	0.0028 U	0.0028 U	0.0026 U	0.0027 U	0.0029 U	0.0026 U	0.0028 U	0.0026 U	0.0028 U
Xylenes (total)	0.26	500	1.6	mg/kg		0.0092 U	0.0083 U	0.079	0.0078 U	0.0084 U	0.0083 U	0.0077 U	0.0081 U	0.0086 U	0.0078 U	0.0084 U	0.0077 U	0.0083 U

Table 2. Summary of Volatile Organic Compounds in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	Sample Designation:	SB-69A	SB-69B	SB-70A	SB-70B	SB-71A	SB-71B	SB-72A	SB-72B	SB-72C	SB-73A	SB-73B	SB-73C	SB-74A
					Sample Date:	11/13/2018	11/13/2018	11/14/2018	11/14/2018	11/14/2018	11/14/2018	11/14/2018	11/14/2018	11/14/2018	11/14/2018	11/14/2018	11/14/2018	11/15/2018
					Sample Depth (ft bls):	-	-	-	-	-	-	-	-	-	-	-	-	-
1,1,1,2-Tetrachloroethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	0.68	500	0.68	mg/kg		0.0025 U	0.0027 U	0.0027 U	0.0028 U	0.0027 U	0.003 U	0.0027 U	0.003 U	0.0031 U	0.0029 U	0.0051 U	0.0021 U	0.0041 U
1,1,2,2-Tetrachloroethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	0.27	240	0.27	mg/kg		0.0025 U	0.0027 U	0.0027 U	0.0028 U	0.0027 U	0.003 U	0.0027 U	0.003 U	0.0031 U	0.0029 U	0.0051 U	0.0021 U	0.0041 U
1,1-Dichloroethene	0.33	500	0.33	mg/kg		0.0025 U	0.0027 U	0.0027 U	0.0028 U	0.0027 U	0.003 U	0.0027 U	0.003 U	0.0031 U	0.0029 U	0.0051 U	0.0021 U	0.0041 U
1,2,3-Trichlorobenzene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,3-Trichloropropane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trimethylbenzene	3.6	190	3.6	mg/kg		0.0025 U	0.0027 U	0.0027 U	0.0028 U	0.0027 U	0.003 U	0.0027 U	0.003 U	0.0031 U	0.0029 U	0.0051 U	0.0021 U	0.0041 U
1,2-Dibromoethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	1.1	500	1.1	mg/kg		0.0025 U	0.0027 U	0.0027 U	0.0028 U	0.0027 U	0.003 U	0.0027 U	0.003 U	0.0031 U	0.0029 U	0.0051 U	0.0021 U	0.0041 U
1,2-Dichloroethane	0.02	30	0.02	mg/kg		0.0025 U	0.0027 U	0.0027 U	0.0028 U	0.0027 U	0.003 U	0.0027 U	0.003 U	0.0031 U	0.0029 U	0.0051 U	0.0021 U	0.0041 U
1,2-Dichloropropane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3,5-Trimethylbenzene	8.4	190	8.4	mg/kg		0.0025 U	0.0027 U	0.0027 U	0.0028 U	0.0027 U	0.003 U	0.0027 U	0.003 U	0.0031 U	0.0029 U	0.0051 U	0.0021 U	0.0041 U
1,3-Dichlorobenzene	2.4	280	2.4	mg/kg		0.0025 U	0.0027 U	0.0027 U	0.0028 U	0.0027 U	0.003 U	0.0027 U	0.003 U	0.0031 U	0.0029 U	0.0051 U	0.0021 U	0.0041 U
1,3-Dichloropropene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	1.8	130	1.8	mg/kg		0.0025 U	0.0027 U	0.0027 U	0.0028 U	0.0027 U	0.003 U	0.0027 U	0.003 U	0.0031 U	0.0029 U	0.0051 U	0.0021 U	0.0041 U
1,4-Dioxane	0.1	130	0.1	mg/kg		0.05 U	0.054 U	0.054 U	0.055 U	0.054 U	0.06 U	0.055 U	0.06 U	0.061 U	0.058 U	0.1 U	0.042 U	0.082 U
2-Butanone (MEK)	0.12	500	0.12	mg/kg		0.0025 U	0.0027 U	0.0027 U	0.0028 U	0.0027 U	0.003 U	0.0027 U	0.003 U	0.0031 U	0.0072	0.0051 U	0.0021 U	0.0041 U
2-Hexanone	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone (MIBK)	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acetone	**0.05**	500	0.05	mg/kg		0.005 U	0.0054 U	0.0054 U	0.0055 U	0.0054 U	0.006 U	0.0055 U	0.006 U	0.0061 U	0.021	0.014 J	0.0042 U	0.0082 U
Acrolein	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acrylonitrile	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	0.06	44	0.06	mg/kg		0.0025 U	0.0027 U	0.0027 U	0.0028 U	0.0027 U	0.003 U	0.0027 U	0.003 U	0.0031 U	0.0029 U	0.0051 U	0.0021 U	0.0041 U
Bromochloromethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromoform	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bromomethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	0.76	22	0.76	mg/kg		0.0025 U	0.0027 U	0.0027 U	0.0028 U	0.0027 U	0.003 U	0.0027 U	0.003 U	0.0031 U	0.0029 U	0.0051 U	0.0021 U	0.0041 U
Chlorobenzene	1.1	500	1.1	mg/kg		0.0025 U	0.0027 U	0.0027 U	0.0028 U	0.0027 U	0.003 U	0.0027 U	0.003 U	0.0031 U	0.0029 U	0.0051 U	0.0021 U	0.0041 U
Chloroethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	0.37	350	0.37	mg/kg		0.0025 U	0.0027 U	0.0027 U	0.0028 U	0.0027 U	0.003 U	0.0027 U	0.003 U	0.0031 U	0.0029 U	0.0061 J	0.0021 U	0.0041 U
Chloromethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	0.25	500	0.25	mg/kg		0.0025 U	0.0027 U	0.0027 U	0.0028 U	0.0027 U	0.003 U	0.0027 U	0.003 U	0.0031 U	0.0029 U	0.0051 U	0.0021 U	0.0041 U
cis-1,3-Dichloropropene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Cyclohexane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloropropane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibromomethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	1	390	1	mg/kg		0.0025 U	0.0027 U	0.0027 U	0.0028 U	0.0027 U	0.003 U	0.0027 U	0.003 U	0.0031 U	0.0029 U	0.0051 U	0.0021 U	0.0041 U
Freon 113	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
m+p-Xylene	--	--	--	mg/kg		0.005 U	0.0054 U	0.0054 U	0.0055 U	0.0054 U	0.006 U	0.0055 U	0.006 U	0.0061 U	0.0058 U	0.01 U	0.0042 U	0.0082 U
Methyl acetate	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylcyclohexane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	0.05	500	0.05	mg/kg		0.0069 J	0.0096 J	0.0054 U	0.0055 U	0.0056 J	0.006 U	0.0055 U	0.0079 J	0.0061 U	0.0072 J	0.013 J	0.0079 J	0.0082 U
MTBE	0.93	500	0.93	mg/kg		0.0025 U	0.0027 U	0.0027 U	0.0028 U	0.0027 U	0.003 U	0.0027 U	0.003 U	0.0031 U	0.0029 U	0.0051 U	0.0021 U	0.0041 U

Table 2. Summary of Volatile Organic Compounds in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	Sample Designation:	SB-69A	SB-69B	SB-70A	SB-70B	SB-71A	SB-71B	SB-72A	SB-72B	SB-72C	SB-73A	SB-73B	SB-73C	SB-74A
					Sample Date:	11/13/2018	11/13/2018	11/14/2018	11/14/2018	11/14/2018	11/14/2018	11/14/2018	11/14/2018	11/14/2018	11/14/2018	11/14/2018	11/14/2018	11/15/2018
					Sample Depth (ft bls):	-	-	-	-	-	-	-	-	-	-	-	-	-
Naphthalene	12	500	12	mg/kg		0.0025 U	0.0027 U	0.0027 U	0.0028 U	0.0027 U	0.003 U	0.0027 U	0.003 U	0.0038 JB	0.0029 U	0.03 B	0.0021 JB	0.0041 U
n-Butylbenzene	12	500	12	mg/kg		0.0025 U	0.0027 U	0.0027 U	0.0028 U	0.0027 U	0.003 U	0.0027 U	0.003 U	0.0031 U	0.0029 U	0.0051 U	0.0021 U	0.0041 U
n-Propylbenzene	3.9	500	3.9	mg/kg		0.0025 U	0.0027 U	0.0027 U	0.0028 U	0.0027 U	0.003 U	0.0027 U	0.003 U	0.0031 U	0.0029 U	0.0051 U	0.0021 U	0.0041 U
o-Xylene	--	--	--	mg/kg		0.0025 U	0.0027 U	0.0027 U	0.0028 U	0.0027 U	0.003 U	0.0027 U	0.003 U	0.0031 U	0.0029 U	0.0051 U	0.0021 U	0.0041 U
P-CYMENE (P-ISOPROPYLTOLUENE)	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
sec-Butylbenzene	11	500	11	mg/kg		0.0025 U	0.0027 U	0.0027 U	0.0028 U	0.0027 U	0.003 U	0.0027 U	0.003 U	0.0031 U	0.0029 U	0.0051 U	0.0021 U	0.0041 U
Styrene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
t-Butyl Alcohol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
tert-Butylbenzene	5.9	500	5.9	mg/kg		0.0025 U	0.0027 U	0.0027 U	0.0028 U	0.0027 U	0.003 U	0.0027 U	0.003 U	0.0031 U	0.0029 U	0.0051 U	0.0021 U	0.0041 U
Tetrachloroethene	1.3	150	1.3	mg/kg		0.0081	0.011	0.0027 U	0.0028 U	0.0027 U	0.003 U	0.0027 U	0.003 U	0.0031 U	0.0029 U	0.02	0.0021 U	0.0041 U
Toluene	0.7	500	0.7	mg/kg		0.0025 U	0.0027 U	0.0027 U	0.0028 U	0.0027 U	0.003 U	0.0027 U	0.003 U	0.0031 U	0.0029 U	0.0051 U	0.0021 U	0.0041 U
trans-1,2-Dichloroethene	0.19	500	0.19	mg/kg		0.0025 U	0.0027 U	0.0027 U	0.0028 U	0.0027 U	0.003 U	0.0027 U	0.003 U	0.0031 U	0.0029 U	0.0051 U	0.0021 U	0.0041 U
trans-1,3-Dichloropropene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
trans-1,4-Dichloro-2-butene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	0.47	200	0.47	mg/kg		0.0025 U	0.0027 U	0.0027 U	0.0028 U	0.0027 J	0.003 U	0.0027 U	0.003 U	0.0031 U	0.0029 U	0.0051 U	0.0021 U	0.0041 U
Trichlorofluoromethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	0.02	13	0.02	mg/kg		0.0025 U	0.0027 U	0.0027 U	0.0028 U	0.0027 U	0.003 U	0.0027 U	0.003 U	0.0031 U	0.0029 U	0.0051 U	0.0021 U	0.0041 U
Xylenes (total)	0.26	500	1.6	mg/kg		0.0075 U	0.0081 U	0.0081 U	0.0083 U	0.0081 U	0.0091 U	0.0082 U	0.0089 U	0.0092 U	0.0087 U	0.015 U	0.0063 U	0.012 U

Table 2. Summary of Volatile Organic Compounds in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	**Sample Designation:**	SB-74B	SB-75A	SB-75B	SB-76A	SB-76B	SB-77A	SB-77B	SB-77C
					Sample Date:	11/15/2018	11/15/2018	11/15/2018	11/15/2018	11/15/2018	11/15/2018	11/15/2018	11/15/2018
					Sample Depth (ft bls):	-	-	-	-	-	-	-	-
1,1,1,2-Tetrachloroethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	0.68	500	0.68	mg/kg		0.0032 U	0.0026 U	0.0027 U	0.003 U	0.0028 U	0.0027 U	0.003 U	0.0024 U
1,1,2,2-Tetrachloroethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA
1,1,2-Trichloroethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA
1,1-Dichloroethane	0.27	240	0.27	mg/kg		0.0032 U	0.0026 U	0.0027 U	0.003 U	0.0028 U	0.0027 U	0.003 U	0.0024 U
1,1-Dichloroethene	0.33	500	0.33	mg/kg		0.0032 U	0.0026 U	0.0027 U	0.003 U	0.0028 U	0.0027 U	0.003 U	0.0024 U
1,2,3-Trichlorobenzene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA
1,2,3-Trichloropropane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trimethylbenzene	3.6	190	3.6	mg/kg		0.0032 U	0.0026 U	0.0027 U	0.003 U	0.0028 U	0.0027 U	0.003 U	0.0024 U
1,2-Dibromoethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	1.1	500	1.1	mg/kg		0.0032 U	0.0026 U	0.0027 U	0.003 U	0.0028 U	0.0027 U	0.003 U	0.0024 U
1,2-Dichloroethane	0.02	30	0.02	mg/kg		0.0032 U	0.0026 U	0.0027 U	0.003 U	0.0028 U	0.0027 U	0.003 U	0.0024 U
1,2-Dichloropropane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA
1,3,5-Trimethylbenzene	8.4	190	8.4	mg/kg		0.0032 U	0.0026 U	0.0027 U	0.003 U	0.0028 U	0.0027 U	0.003 U	0.0024 U
1,3-Dichlorobenzene	2.4	280	2.4	mg/kg		0.0032 U	0.0026 U	0.0027 U	0.003 U	0.0028 U	0.0027 U	0.003 U	0.0024 U
1,3-Dichloropropene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	1.8	130	1.8	mg/kg		0.0032 U	0.0026 U	0.0027 U	0.003 U	0.0028 U	0.0027 U	0.003 U	0.0024 U
1,4-Dioxane	0.1	130	0.1	mg/kg		0.064 U	0.053 U	0.054 U	0.059 U	0.057 U	0.054 U	0.061 U	0.048 U
2-Butanone (MEK)	0.12	500	0.12	mg/kg		0.0032 U	0.0026 U	0.0027 U	0.008	0.0028 U	0.0027 U	0.003 U	0.0024 U
2-Hexanone	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA
4-Methyl-2-pentanone (MIBK)	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA
Acetone	**0.05**	500	0.05	mg/kg		0.038	0.011	0.012	0.023	0.0099 J	0.0079 J	0.0061 U	0.0096
Acrolein	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA
Acrylonitrile	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA
Benzene	0.06	44	0.06	mg/kg		0.0032 U	0.0026 U	0.0027 U	0.003 U	0.0028 U	0.0027 U	0.003 U	0.0024 U
Bromochloromethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA
Bromodichloromethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA
Bromoform	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA
Bromomethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA
Carbon disulfide	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA
Carbon tetrachloride	0.76	22	0.76	mg/kg		0.0032 U	0.0026 U	0.0027 U	0.003 U	0.0028 U	0.0027 U	0.003 U	0.0024 U
Chlorobenzene	1.1	500	1.1	mg/kg		0.0032 U	0.0026 U	0.0027 U	0.003 U	0.0028 U	0.0027 U	0.003 U	0.0024 U
Chloroethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA
Chloroform	0.37	350	0.37	mg/kg		0.011	0.0026 U	0.0027 U	0.003 U	0.0028 U	0.0027 U	0.003 U	0.0024 U
Chloromethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA
cis-1,2-Dichloroethene	0.25	500	0.25	mg/kg		0.0032 U	0.0026 U	0.0027 U	0.003 U	0.0028 U	0.0027 U	0.003 U	0.0024 U
cis-1,3-Dichloropropene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA
Cyclohexane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloromethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA
Dibromochloropropane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA
Dibromomethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA
Ethylbenzene	1	390	1	mg/kg		0.0032 U	0.0026 U	0.0027 U	0.003 U	0.0028 U	0.0027 U	0.003 U	0.0024 U
Freon 113	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA
m+p-Xylene	--	--	--	mg/kg		0.0064 U	0.0053 U	0.0054 U	0.0059 U	0.0057 U	0.0054 U	0.0061 U	0.0048 U
Methyl acetate	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA
Methylcyclohexane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA
Methylene chloride	0.05	500	0.05	mg/kg		0.019	0.0091 J	0.027	0.0059 U	0.019	0.0065 J	0.014	0.026
MTBE	0.93	500	0.93	mg/kg		0.0032 U	0.0026 U	0.0027 U	0.003 U	0.0028 U	0.0027 U	0.003 U	0.0024 U

Table 2. Summary of Volatile Organic Compounds in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	**Sample Designation:**	SB-74B	SB-75A	SB-75B	SB-76A	SB-76B	SB-77A	SB-77B	SB-77C
					Sample Date:	11/15/2018	11/15/2018	11/15/2018	11/15/2018	11/15/2018	11/15/2018	11/15/2018	11/15/2018
					Sample Depth (ft bls):	-	-	-	-	-	-	-	-
Naphthalene	12	500	12	mg/kg		0.0032 U	0.0026 U	0.003 JB	0.0033 JB	0.0042 JB	0.0049 JB	0.003 U	0.0024 U
n-Butylbenzene	12	500	12	mg/kg		0.0032 U	0.0026 U	0.0027 U	0.003 U	0.0028 U	0.0027 U	0.003 U	0.0024 U
n-Propylbenzene	3.9	500	3.9	mg/kg		0.0032 U	0.0026 U	0.0027 U	0.003 U	0.0028 U	0.0027 U	0.003 U	0.0024 U
o-Xylene	--	--	--	mg/kg		0.0032 U	0.0026 U	0.0027 U	0.003 U	0.0028 U	0.0027 U	0.003 U	0.0024 U
P-CYMENE (P-ISOPROPYLTOLUENE)	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA
sec-Butylbenzene	11	500	11	mg/kg		0.0032 U	0.0026 U	0.0027 U	0.003 U	0.0028 U	0.0027 U	0.003 U	0.0024 U
Styrene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA
t-Butyl Alcohol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA
tert-Butylbenzene	5.9	500	5.9	mg/kg		0.0032 U	0.0026 U	0.0027 U	0.003 U	0.0028 U	0.0027 U	0.003 U	0.0024 U
Tetrachloroethene	1.3	150	1.3	mg/kg		0.0032 U	0.0026 U	0.0027 U	0.0051 J	0.022	0.16	0.02	0.0024 U
Toluene	0.7	500	0.7	mg/kg		0.0032 U	0.0026 U	0.0027 U	0.003 U	0.0028 U	0.0027 U	0.003 U	0.0024 U
trans-1,2-Dichloroethene	0.19	500	0.19	mg/kg		0.0032 U	0.0026 U	0.0027 U	0.003 U	0.0028 U	0.0027 U	0.003 U	0.0024 U
trans-1,3-Dichloropropene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA
trans-1,4-Dichloro-2-butene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	0.47	200	0.47	mg/kg		0.0032 U	0.0026 U	0.0027 U	0.003 U	0.0028 U	0.0049 J	0.003 U	0.0024 U
Trichlorofluoromethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA
Vinyl chloride	0.02	13	0.02	mg/kg		0.0032 U	0.0026 U	0.0027 U	0.003 U	0.0028 U	0.0027 U	0.003 U	0.0024 U
Xylenes (total)	0.26	500	1.6	mg/kg		0.0096 U	0.0079 U	0.0081 U	0.0089 U	0.0085 U	0.0081 U	0.0091 U	0.0072 U

Table 3. Summary of Semivolatile Organic Compounds in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	**Sample Designation:**	COMPOSITE	Dup 1114	OWS-PE-1	OWS-PE-2	OWS-PE-3	OWS-PE-4	OWS-PE-5	SB-1	SB-2	SB-3	SB-4	SB-5	SB-6	SB-7
					Sample Date:	12/20/2017	11/15/2018	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	10/23/2017	10/23/2017	10/23/2017	10/23/2017	10/23/2017	10/23/2017	10/23/2017
					Sample Depth (ft bls):	-	-	-	-	-	-	-	7.5 - 8	15.5 - 16	15 - 15.5	15.5 - 16	15 - 15.5	11 - 11.5	-
1,1'-Biphenyl	--	--	--	mg/kg		NA	NA	0.0431 U	0.0457 U	0.0468 U	0.0452 U	0.0458 U	0.037 U	0.048 U	0.049 U	0.053 U	0.039 U	0.038 U	0.076 U
1,2,4,5-Tetrachlorobenzene	--	--	--	mg/kg		NA	NA	0.086 U	0.0912 U	0.0934 U	0.0902 U	0.0915 U	0.037 U	0.048 U	0.049 U	0.053 U	0.039 U	0.038 U	0.076 U
1,2,4-Trichlorobenzene	--	--	--	mg/kg		NA	NA	0.0431 U	0.0457 U	0.0468 U	0.0452 U	0.0458 U	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	1.1	500	1.1	mg/kg		NA	NA	0.0431 U	0.0457 U	0.0468 U	0.0452 U	0.0458 U	NA	NA	NA	NA	NA	NA	NA
1,2-Diphenylhydrazine	--	--	--	mg/kg		NA	NA	0.0431 U	0.0457 U	0.0468 U	0.0452 U	0.0458 U	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	2.4	280	2.4	mg/kg		NA	NA	0.0431 U	0.0457 U	0.0468 U	0.0452 U	0.0458 U	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	1.8	130	1.8	mg/kg		NA	NA	0.0431 U	0.0457 U	0.0468 U	0.0452 U	0.0458 U	NA	NA	NA	NA	NA	NA	NA
2,3,4,6-Tetrachlorophenol	--	--	--	mg/kg		NA	NA	0.086 U	0.0912 U	0.0934 U	0.0902 U	0.0915 U	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	--	--	--	mg/kg		NA	NA	0.0431 U	0.0457 U	0.0468 U	0.0452 U	0.0458 U	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	--	--	--	mg/kg		NA	NA	0.0431 U	0.0457 U	0.0468 U	0.0452 U	0.0458 U	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	--	--	--	mg/kg		NA	NA	0.0431 U	0.0457 U	0.0468 U	0.0452 U	0.0458 U	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	--	--	--	mg/kg		NA	NA	0.0431 U	0.0457 U	0.0468 U	0.0452 U	0.0458 U	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	--	--	--	mg/kg		NA	NA	0.086 U	0.0912 U	0.0934 U	0.0902 U	0.0915 U	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	--	--	--	mg/kg		NA	NA	0.0431 U	0.0457 U	0.0468 U	0.0452 U	0.0458 U	0.037 U	0.048 U	0.049 U	0.053 U	0.039 U	0.038 U	0.076 U
2,6-Dinitrotoluene	--	--	--	mg/kg		NA	NA	0.0431 U	0.0457 U	0.0468 U	0.0452 U	0.0458 U	0.037 U	0.048 U	0.049 U	0.053 U	0.039 U	0.038 U	0.076 U
2-Chloronaphthalene	--	--	--	mg/kg		NA	NA	0.0431 U	0.0457 U	0.0468 U	0.0452 U	0.0458 U	0.037 U	0.048 U	0.049 U	0.053 U	0.039 U	0.038 U	0.076 U
2-Chlorophenol	--	--	--	mg/kg		NA	NA	0.0431 U	0.0457 U	0.0468 U	0.0452 U	0.0458 U	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	--	--	--	mg/kg		0.065	NA	0.0431 U	0.0457 U	0.0468 U	0.0452 U	0.0458 U	0.047	0.048 U	0.049 U	0.053 U	0.039 U	0.038 U	0.158 D
2-Methylphenol	0.33	500	0.33	mg/kg		NA	0.045 U	0.0431 U	0.0457 U	0.0468 U	0.0452 U	0.0458 U	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	--	--	--	mg/kg		NA	NA	0.086 U	0.0912 U	0.0934 U	0.0902 U	0.0915 U	0.037 U	0.048 U	0.049 U	0.053 U	0.039 U	0.038 U	0.076 U
2-Nitrophenol	--	--	--	mg/kg		NA	NA	0.0431 U	0.0457 U	0.0468 U	0.0452 U	0.0458 U	NA	NA	NA	NA	NA	NA	NA
3&4-Methylphenol	0.33	500	0.33	mg/kg		NA	0.045 U	0.0431 U	0.0457 U	0.0468 U	0.0452 U	0.0458 U	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	--	--	--	mg/kg		NA	NA	0.0431 U	0.0457 U	0.0468 U	0.0452 U	0.0458 U	0.037 U	0.048 U	0.049 U	0.053 U	0.039 U	0.038 U	0.076 U
3-Nitroaniline	--	--	--	mg/kg		NA	NA	0.086 U	0.0912 U	0.0934 U	0.0902 U	0.0915 U	0.037 U	0.048 U	0.049 U	0.053 U	0.039 U	0.038 U	0.076 U
4,6-Dinitro-2-methylphenol	--	--	--	mg/kg		NA	NA	0.086 U	0.0912 U	0.0934 U	0.0902 U	0.0915 U	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl phenyl ether	--	--	--	mg/kg		NA	NA	0.0431 U	0.0457 U	0.0468 U	0.0452 U	0.0458 U	0.037 U	0.048 U	0.049 U	0.053 U	0.039 U	0.038 U	0.076 U
4-Chloro-3-methylphenol	--	--	--	mg/kg		NA	NA	0.0431 U	0.0457 U	0.0468 U	0.0452 U	0.0458 U	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	--	--	--	mg/kg		NA	NA	0.0431 U	0.0457 U	0.0468 U	0.0452 U	0.0458 U	0.037 U	0.048 U	0.049 U	0.053 U	0.039 U	0.038 U	0.076 U
4-Chlorophenyl phenyl ether	--	--	--	mg/kg		NA	NA	0.0431 U	0.0457 U	0.0468 U	0.0452 U	0.0458 U	0.037 U	0.048 U	0.049 U	0.053 U	0.039 U	0.038 U	0.076 U
4-Nitroaniline	--	--	--	mg/kg		NA	NA	0.086 U	0.0912 U	0.0934 U	0.0902 U	0.0915 U	0.037 U	0.048 U	0.049 U	0.053 U	0.039 U	0.038 U	0.076 U
4-Nitrophenol	--	--	--	mg/kg		NA	NA	0.086 U	0.0912 U	0.0934 U	0.0902 U	0.0915 U	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	20	500	98	mg/kg		0.14	0.113 D	0.0431 U	0.0457 U	0.0468 U	0.0454 JD	0.0458 U	0.219	0.19	0.049 U	0.053 U	0.039 U	0.038 U	0.162 D
Acenaphthylene	100	500	107	mg/kg		0.25	0.159 D	0.0431 U	0.0875 JD	0.122 D	0.242 D	0.0458 U	0.233	0.09	0.049 U	0.053 U	0.039 U	0.038 U	1.61 D
Acetophenone	--	--	--	mg/kg		NA	NA	0.0431 U	0.0457 U	0.0468 U	0.0452 U	0.0458 U	0.037 U	0.048 U	0.049 U	0.053 U	0.039 U	0.038 U	0.076 U
Aniline	--	--	--	mg/kg		NA	NA	0.172 U	0.183 U	0.187 U	0.181 U	0.183 U	NA	NA	NA	NA	NA	NA	NA
Anthracene	100	500	1000	mg/kg		0.4	0.305 D	0.0431 U	0.0649 JD	0.231 D	0.254 D	0.0458 U	0.818	0.369	0.049 U	0.053 U	0.039 U	0.041	1.16 D
Atrazine	--	--	--	mg/kg		NA	NA	0.0431 U	0.0457 U	0.0468 U	0.0452 U	0.0458 U	0.037 U	0.048 U	0.049 U	0.053 U	0.039 U	0.038 U	0.076 U
Benzaldehyde	--	--	--	mg/kg		NA	NA	0.0431 U	0.0457 U	0.0468 U	0.0452 U	0.0458 U	0.037 U	0.048 U	0.049 U	0.053 U	0.039 U	0.038 U	0.076 U
Benzidine	--	--	--	mg/kg		NA	NA	0.172 U	0.183 U	0.187 U	0.181 U	0.183 U	NA	NA	NA	NA	NA	NA	NA
Benzo[a]anthracene	**1**	5.6	1	mg/kg		**1.01**	**1.11 D**	0.0431 U	0.222 D	0.502 D	0.764 D	0.123 D	**2.29**	**1.72**	0.072	0.053 U	0.039 U	0.088	**5.03 D**
Benzo[a]pyrene	**1**	1	22	mg/kg		**1.06**	**1.1 D**	0.0431 U	0.245 D	0.467 D	0.794 D	0.124 D	**1.2**	0.6	0.049 U	0.053 U	0.039 U	0.049	**3.42 D**
Benzo[b]fluoranthene	**1**	5.6	1.7	mg/kg		0.881	0.984 D	0.0431 U	0.242 D	0.56 D	0.717 D	0.109 D	1	0.707	0.049 U	0.053 U	0.039 U	0.034 J	**3.11 D**
Benzo[g,h,i]perylene	100	500	1000	mg/kg		0.686	0.639 D	0.0431 U	0.184 D	0.376 D	0.484 D	0.0943 D	0.831	0.792	0.049 U	0.053 U	0.039 U	0.038 U	3.35 D
Benzo[k]fluoranthene	**0.8**	56	1.7	mg/kg		**0.897**	**0.91 D**	0.0431 U	0.203 D	0.405 D	0.646 D	0.0987 D	**1.09**	0.524	0.049 U	0.053 U	0.039 U	0.045	**3.27 D**
Benzoic Acid	--	--	--	mg/kg		NA	NA	0.0431 U	0.0457 U	0.0468 U	0.0452 U	0.0458 U	NA	NA	NA	NA	NA	NA	NA
Benzyl Alcohol	--	--	--	mg/kg		NA	NA	0.0431 U	0.0457 U	0.0468 U	0.0452 U	0.0458 U	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloro-1-methylethyl)ether	--	--	--	mg/kg		NA	NA	0.0431 U	0.0457 U	0.0468 U	0.0452 U	0.0458 U	0.037 U	0.048 U	0.049 U	0.053 U	0.039 U	0.038 U	0.076 U
Bis(2-chloroethoxy)methane	--	--	--	mg/kg		NA	NA	0.0431 U	0.0457 U	0.0468 U	0.0452 U	0.0458 U	0.037 U	0.048 U	0.049 U	0.053 U	0.039 U	0.038 U	0.076 U
Bis(2-chloroethyl) ether	--	--	--	mg/kg		NA	NA	0.0431 U	0.0457 U	0.0468 U	0.0452 U	0.0458 U	0.037 U	0.048 U	0.049 U	0.053 U	0.039 U	0.038 U	0.076 U
Bis(2-ethylhexyl) phthalate	--	--	--	mg/kg		NA	NA	0.0983 D	0.13 D	0.0468 U	0.115 D	0.16 D	0.037 U	0.048 U	0.049 U	0.053 U	0.039 U	0.038 U	0.076 U
Butylbenzyl phthalate	--	--	--	mg/kg		NA	NA	0.0431 U	0.0838 JD	0.0468 U	0.14 D	0.0819 JD	0.037 U	0.048 U	0.049 U	0.053 U	0.039 U	0.038 U	0.076 U
Caprolactam	--	--	--	mg/kg		NA	NA	0.086 U	0.0912 U	0.0934 U	0.0902 U	0.0915 U	0.037 U	0.048 U	0.049 U	0.053 U	0.039 U	0.038 U	0.076 U

Table 3. Summary of Semivolatile Organic Compounds in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	Sample Designation:	COMPOSITE	Dup 1114	OWS-PE-1	OWS-PE-2	OWS-PE-3	OWS-PE-4	OWS-PE-5	SB-1	SB-2	SB-3	SB-4	SB-5	SB-6	SB-7
					Sample Date:	12/20/2017	11/15/2018	6/3/2019	6/3/2019	6/3/2019	6/3/2019	6/3/2019	10/23/2017	10/23/2017	10/23/2017	10/23/2017	10/23/2017	10/23/2017	10/23/2017
					Sample Depth (ft bls):	-	-	-	-	-	-	-	7.5 - 8	15.5 - 16	15 - 15.5	15.5 - 16	15 - 15.5	11 - 11.5	-
Carbazole	--	--	--	mg/kg		NA	NA	0.0431 U	0.0457 U	0.0903 JD	0.116 D	0.0458 U	0.264	0.048 U	0.049 U	0.053 U	0.039 U	0.038 U	0.713 D
Chrysene	**1**	56	1	mg/kg		**1.06**	**1.11 D**	0.0431 U	0.216 D	0.476 D	0.688 D	0.102 D	**2.04**	**2.89**	0.074	0.053 U	0.039 U	0.091	**5.16 D**
Dibenzo[a,h]anthracene	**0.33**	0.56	1000	mg/kg		0.208	0.176 D	0.0431 U	0.0634 JD	0.128 D	0.131 D	0.0458 U	**0.332**	**0.477**	0.049 U	0.053 U	0.039 U	0.038 U	**0.74 D**
Dibenzofuran	7	350	210	mg/kg		NA	0.0617 JD	0.0431 U	0.0457 U	0.0468 U	0.0452 U	0.0458 U	0.129	0.048 U	0.049 U	0.053 U	0.039 U	0.038 U	0.182 D
Diethyl phthalate	--	--	--	mg/kg		NA	NA	0.0431 U	0.0457 U	0.0468 U	0.0452 U	0.0458 U	0.037 U	0.048 U	0.049 U	0.053 U	0.039 U	0.038 U	0.076 U
Dimethyl phthalate	--	--	--	mg/kg		NA	NA	0.0431 U	0.0457 U	0.0468 U	0.0452 U	0.0458 U	0.037 U	0.048 U	0.049 U	0.053 U	0.039 U	0.038 U	0.076 U
Di-n-butyl phthalate	--	--	--	mg/kg		NA	NA	0.0431 U	0.0457 U	0.0468 U	0.0452 U	0.0458 U	0.037 U	0.048 U	0.049 U	0.053 U	0.039 U	0.038 U	0.076 U
Di-n-octyl phthalate	--	--	--	mg/kg		NA	NA	0.0431 U	0.0457 U	0.0468 U	0.0452 U	0.0458 U	0.037 U	0.048 U	0.049 U	0.053 U	0.039 U	0.038 U	0.076 U
Fluoranthene	100	500	1000	mg/kg		2.85	2.17 D	0.0431 U	0.449 D	1.18 D	1.73 D	0.27 D	4.01	1.49	0.072	0.053 U	0.039 U	0.145	8.13 D
Fluorene	30	500	386	mg/kg		0.131	0.111 D	0.0431 U	0.0457 U	0.059 JD	0.0577 JD	0.0458 U	0.209	0.052	0.049 U	0.053 U	0.039 U	0.038 U	0.233 D
Hexachlorobenzene	0.33	6	3.2	mg/kg		NA	0.045 U	0.0431 U	0.0457 U	0.0468 U	0.0452 U	0.0458 U	0.037 U	0.048 U	0.049 U	0.053 U	0.039 U	0.038 U	0.076 U
Hexachlorobutadiene	--	--	--	mg/kg		NA	NA	0.0431 U	0.0457 U	0.0468 U	0.0452 U	0.0458 U	0.037 U	0.048 U	0.049 U	0.053 U	0.039 U	0.038 U	0.076 U
Hexachlorocyclopentadiene	--	--	--	mg/kg		NA	NA	0.0431 U	0.0457 U	0.0468 U	0.0452 U	0.0458 U	0.037 U	0.048 U	0.049 U	0.053 U	0.039 U	0.038 U	0.076 U
Hexachloroethane	--	--	--	mg/kg		NA	NA	0.0431 U	0.0457 U	0.0468 U	0.0452 U	0.0458 U	0.037 U	0.048 U	0.049 U	0.053 U	0.039 U	0.038 U	0.076 U
Indeno[1,2,3-cd]pyrene	**0.5**	5.6	8.2	mg/kg		**0.637**	**0.591 D**	0.0431 U	0.205 D	0.418 D	**0.557 D**	0.0972 D	**0.707**	0.418	0.049 U	0.053 U	0.039 U	0.038 U	**2.85 D**
Isophorone	--	--	--	mg/kg		NA	NA	0.0431 U	0.0457 U	0.0468 U	0.0452 U	0.0458 U	0.037 U	0.048 U	0.049 U	0.053 U	0.039 U	0.038 U	0.076 U
Naphthalene	12	500	12	mg/kg		0.105	0.0495 JD	0.0431 U	0.0457 U	0.0468 U	0.0452 U	0.0458 U	0.08	0.044 J	0.049 U	0.053 U	0.039 U	0.038 U	0.171 D
Nitrobenzene	--	--	--	mg/kg		NA	NA	0.0431 U	0.0457 U	0.0468 U	0.0452 U	0.0458 U	0.037 U	0.048 U	0.049 U	0.053 U	0.039 U	0.038 U	0.076 U
n-Nitrosodimethylamine	--	--	--	mg/kg		NA	NA	0.0431 U	0.0457 U	0.0468 U	0.0452 U	0.0458 U	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodi-n-propylamine	--	--	--	mg/kg		NA	NA	0.0431 U	0.0457 U	0.0468 U	0.0452 U	0.0458 U	0.037 U	0.048 U	0.049 U	0.053 U	0.039 U	0.038 U	0.076 U
n-Nitrosodiphenylamine	--	--	--	mg/kg		NA	NA	0.0431 U	0.0457 U	0.0468 U	0.0452 U	0.0458 U	0.037 U	0.048 U	0.049 U	0.053 U	0.039 U	0.038 U	0.076 U
Pentachlorophenol	**0.8**	6.7	0.8	mg/kg		**1.69**	0.045 U	0.0431 U	0.0457 U	0.0468 U	0.0452 U	0.0458 U	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	100	500	1000	mg/kg		NA	1.26 D	0.0431 U	0.203 D	0.776 D	0.926 D	0.151 D	2.92	0.233	0.053	0.053 U	0.039 U	0.121	4.82 D
Phenols (Total)	--	--	--	mg/kg		NA	0.045 U	0.0431 U	0.0457 U	0.0468 U	0.0452 U	0.0458 U	NA	NA	NA	NA	NA	NA	NA
Pyrene	**100**	500	1000	mg/kg		1.58	2.32 D	0.0431 U	0.315 D	0.762 D	1.21 D	0.199 D	3.9	2.32	0.095	0.053 U	0.039 U	0.143	6.89 D

Table 3. Summary of Semivolatile Organic Compounds in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	Sample Designation:	SB-8	SB-9	SB-10	SB-11	SB-12	SB-13	SB-14	SB-15	SB-16	SB-17	SB-18	SB-19	SB-20	SB-21
					Sample Date:	10/23/2017	10/23/2017	10/23/2017	10/24/2017	10/24/2017	10/24/2017	10/24/2017	10/24/2017	10/24/2017	10/24/2017	10/24/2017	10/24/2017	10/24/2017	11/10/2017
					Sample Depth (ft bls):	-	-	-	-	-	-	-	-	-	-	-	-	-	11 - 11.5
1,1'-Biphenyl	--	--	--	mg/kg		0.038 U	0.078 U	0.036 U	0.041 U	0.037 U	0.036 U	0.073 U	0.072 U	0.041 U	0.04 U	0.053 U	0.036 U	0.073 U	0.039 U
1,2,4,5-Tetrachlorobenzene	--	--	--	mg/kg		0.038 U	0.078 U	0.036 U	0.041 U	0.037 U	0.036 U	0.073 U	0.072 U	0.041 U	0.04 U	0.053 U	0.036 U	0.073 U	0.039 U
1,2,4-Trichlorobenzene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	1.1	500	1.1	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Diphenylhydrazine	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	2.4	280	2.4	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	1.8	130	1.8	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,6-Tetrachlorophenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	--	--	--	mg/kg		0.038 U	0.078 U	0.036 U	0.041 U	0.037 U	0.036 U	0.073 U	0.072 U	0.041 U	0.04 U	0.053 U	0.036 U	0.073 U	0.039 U
2,6-Dinitrotoluene	--	--	--	mg/kg		0.038 U	0.078 U	0.036 U	0.041 U	0.037 U	0.036 U	0.073 U	0.072 U	0.041 U	0.04 U	0.053 U	0.036 U	0.073 U	0.039 U
2-Chloronaphthalene	--	--	--	mg/kg		0.038 U	0.078 U	0.036 U	0.041 U	0.037 U	0.036 U	0.073 U	0.072 U	0.041 U	0.04 U	0.053 U	0.036 U	0.073 U	0.039 U
2-Chlorophenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	--	--	--	mg/kg		0.038 U	0.078 U	0.053	0.041 U	0.037 U	0.033 J	0.125 D	0.133	0.041 U	0.04 U	0.053 U	0.104	0.06 DJ	15.7 D
2-Methylphenol	0.33	500	0.33	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	--	--	--	mg/kg		0.038 U	0.078 U	0.036 U	0.041 U	0.037 U	0.036 U	0.073 U	0.072 U	0.041 U	0.04 U	0.053 U	0.036 U	0.073 U	0.039 U
2-Nitrophenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3&4-Methylphenol	0.33	500	0.33	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	--	--	--	mg/kg		0.038 U	0.078 U	0.036 U	0.041 U	0.037 U	0.036 U	0.073 U	0.072 U	0.041 U	0.04 U	0.053 U	0.036 U	0.073 U	0.039 U
3-Nitroaniline	--	--	--	mg/kg		0.038 U	0.078 U	0.036 U	0.041 U	0.037 U	0.036 U	0.073 U	0.072 U	0.041 U	0.04 U	0.053 U	0.036 U	0.073 U	0.039 U
4,6-Dinitro-2-methylphenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl phenyl ether	--	--	--	mg/kg		0.038 U	0.078 U	0.036 U	0.041 U	0.037 U	0.036 U	0.073 U	0.072 U	0.041 U	0.04 U	0.053 U	0.036 U	0.073 U	0.039 U
4-Chloro-3-methylphenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	--	--	--	mg/kg		0.038 U	0.078 U	0.036 U	0.041 U	0.037 U	0.036 U	0.073 U	0.072 U	0.041 U	0.04 U	0.053 U	0.036 U	0.073 U	0.039 U
4-Chlorophenyl phenyl ether	--	--	--	mg/kg		0.038 U	0.078 U	0.036 U	0.041 U	0.037 U	0.036 U	0.073 U	0.072 U	0.041 U	0.04 U	0.053 U	0.036 U	0.073 U	0.039 U
4-Nitroaniline	--	--	--	mg/kg		0.038 U	0.078 U	0.036 U	0.041 U	0.037 U	0.036 U	0.073 U	0.072 U	0.041 U	0.04 U	0.053 U	0.036 U	0.073 U	0.039 U
4-Nitrophenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	20	500	98	mg/kg		0.038 U	0.078 U	0.122	0.041 U	0.037 U	0.042	0.536 D	0.069 J	0.073	0.04 U	0.053 U	0.174	0.158 D	0.401
Acenaphthylene	100	500	107	mg/kg		0.038 U	0.441 D	0.14	0.131	0.065	0.215	0.223 D	0.123	0.041 U	0.04 U	0.053 U	0.186	0.323 D	0.149
Acetophenone	--	--	--	mg/kg		0.038 U	0.078 U	0.036 U	0.041 U	0.037 U	0.036 U	0.073 U	0.072 U	0.041 U	0.04 U	0.053 U	0.036 U	0.073 U	0.039 U
Aniline	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	100	500	1000	mg/kg		0.038 U	0.485 D	0.332	0.112	0.049	0.268	1.15 D	0.287	0.063	0.04 U	0.053 U	0.508	0.655 D	0.279
Atrazine	--	--	--	mg/kg		0.038 U	0.078 U	0.036 U	0.041 U	0.037 U	0.036 U	0.073 U	0.072 U	0.041 U	0.04 U	0.053 U	0.036 U	0.073 U	0.039 U
Benzaldehyde	--	--	--	mg/kg		0.038 U	0.078 U	0.036 U	0.041 U	0.037 U	0.036 U	0.073 U	0.072 U	0.041 U	0.04 U	0.053 U	0.036 U	0.073 U	0.039 U
Benzidine	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo[a]anthracene	**1**	5.6	1	mg/kg		0.102	**5.92 D**	**1.12**	0.584	0.218	**1.07**	**2.87 D**	0.793	0.135	0.046	0.053 U	**1.66**	**1.82 D**	0.164
Benzo[a]pyrene	**1**	1	22	mg/kg		0.067	**4.31 D**	0.752	0.428	0.14	0.722	**1.97 D**	0.563	0.088	0.04 U	0.053 U	**1.09**	**1.39 D**	0.113
Benzo[b]fluoranthene	**1**	5.6	1.7	mg/kg		0.053	**3.59 D**	0.687	0.366	0.16	0.584	**1.55 D**	0.453	0.069	0.04 U	0.053 U	0.98	**1.29 D**	0.091
Benzo[g,h,i]perylene	100	500	1000	mg/kg		0.044	2.98 D	0.619	0.326	0.168	0.647	1.52 D	0.335	0.073	0.04 U	0.053 U	0.862	1.35 D	0.05
Benzo[k]fluoranthene	**0.8**	56	1.7	mg/kg		0.064	**3.56 D**	0.708	0.435	0.157	**0.806**	**1.67 D**	0.538	0.066	0.04 U	0.053 U	**0.943**	**1.31 D**	0.089
Benzoic Acid	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzyl Alcohol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloro-1-methylethyl)ether	--	--	--	mg/kg		0.038 U	0.078 U	0.036 U	0.041 U	0.037 U	0.036 U	0.073 U	0.072 U	0.041 U	0.04 U	0.053 U	0.036 U	0.073 U	0.039 U
Bis(2-chloroethoxy)methane	--	--	--	mg/kg		0.038 U	0.078 U	0.036 U	0.041 U	0.037 U	0.036 U	0.073 U	0.072 U	0.041 U	0.04 U	0.053 U	0.036 U	0.073 U	0.039 U
Bis(2-chloroethyl) ether	--	--	--	mg/kg		0.038 U	0.078 U	0.036 U	0.041 U	0.037 U	0.036 U	0.073 U	0.072 U	0.041 U	0.04 U	0.053 U	0.036 U	0.073 U	0.039 U
Bis(2-ethylhexyl) phthalate	--	--	--	mg/kg		0.038 U	0.078 U	0.044	0.041 U	0.037 U	0.036 U	0.073 U	1.36	0.041 U	0.04 U	0.053 U	0.678	0.073 U	0.276
Butylbenzyl phthalate	--	--	--	mg/kg		0.038 U	0.078 U	0.036 U	0.041 U	0.037 U	0.036 U	0.073 U	0.072 U	0.041 U	0.04 U	0.053 U	0.09	0.073 U	0.039 U
Caprolactam	--	--	--	mg/kg		0.038 U	0.078 U	0.036 U	0.041 U	0.037 U	0.036 U	0.073 U	0.072 U	0.041 U	0.04 U	0.053 U	0.036 U	0.073 U	0.039 U

Table 3. Summary of Semivolatile Organic Compounds in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	Sample Designation:	SB-8	SB-9	SB-10	SB-11	SB-12	SB-13	SB-14	SB-15	SB-16	SB-17	SB-18	SB-19	SB-20	SB-21
					Sample Date:	10/23/2017	10/23/2017	10/23/2017	10/24/2017	10/24/2017	10/24/2017	10/24/2017	10/24/2017	10/24/2017	10/24/2017	10/24/2017	10/24/2017	10/24/2017	11/10/2017
					Sample Depth (ft bls):	-	-	-	-	-	-	-	-	-	-	-	-	-	11 - 11.5
Carbazole	--	--	--	mg/kg		0.038 U	0.072 DJ	0.118	0.064	0.037 U	0.162	0.498 D	0.12	0.041 U	0.04 U	0.053 U	0.191	0.291 D	0.039 U
Chrysene	**1**	56	1	mg/kg		0.103	**5.13 D**	**1.13**	0.711	0.235	**1.13**	**2.77 D**	0.84	0.129	0.05	0.053 U	**1.71**	**1.91 D**	0.192
Dibenzo[a,h]anthracene	**0.33**	0.56	1000	mg/kg		0.038 U	**1.03 D**	0.169	0.106	0.049	0.143	**0.37 D**	0.098	0.041 U	0.04 U	0.053 U	0.212	**0.363 D**	0.039 U
Dibenzofuran	7	350	210	mg/kg		0.038 U	0.078 U	0.07	0.047	0.037 U	0.076	0.339 D	0.077	0.041 U	0.04 U	0.053 U	0.136	0.125 D	0.613
Diethyl phthalate	--	--	--	mg/kg		0.038 U	0.078 U	0.036 U	0.041 U	0.037 U	0.036 U	0.073 U	0.072 U	0.041 U	0.04 U	0.053 U	0.036 U	0.073 U	0.039 U
Dimethyl phthalate	--	--	--	mg/kg		0.038 U	0.078 U	0.036 U	0.041 U	0.037 U	0.036 U	0.073 U	0.072 U	0.041 U	0.04 U	0.053 U	0.036 U	0.073 U	0.039 U
Di-n-butyl phthalate	--	--	--	mg/kg		0.038 U	0.078 U	0.036 U	0.041 U	0.037 U	0.036 U	0.073 U	0.066 J	0.041 U	0.04 U	0.053 U	0.099	0.073 U	0.039 U
Di-n-octyl phthalate	--	--	--	mg/kg		0.038 U	0.078 U	0.036 U	0.041 U	0.037 U	0.036 U	0.073 U	0.072 U	0.041 U	0.04 U	0.053 U	0.048	0.073 U	0.039 U
Fluoranthene	100	500	1000	mg/kg		0.196	6.37 D	2.02	1.24	0.39	2.55	5.81 D	1.66	0.227	0.076	0.053 U	3.56	2.76 D	0.382
Fluorene	30	500	386	mg/kg		0.038 U	0.075 DJ	0.095	0.043	0.037 U	0.095	0.311 D	0.089	0.041 U	0.04 U	0.053 U	0.159	0.155 D	0.733
Hexachlorobenzene	0.33	6	3.2	mg/kg		0.038 U	0.078 U	0.036 U	0.041 U	0.037 U	0.036 U	0.073 U	0.072 U	0.041 U	0.04 U	0.053 U	0.036 U	0.073 U	0.039 U
Hexachlorobutadiene	--	--	--	mg/kg		0.038 U	0.078 U	0.036 U	0.041 U	0.037 U	0.036 U	0.073 U	0.072 U	0.041 U	0.04 U	0.053 U	0.036 U	0.073 U	0.039 U
Hexachlorocyclopentadiene	--	--	--	mg/kg		0.038 U	0.078 U	0.036 U	0.041 U	0.037 U	0.036 U	0.073 U	0.072 U	0.041 U	0.04 U	0.053 U	0.036 U	0.073 U	0.039 U
Hexachloroethane	--	--	--	mg/kg		0.038 U	0.078 U	0.036 U	0.041 U	0.037 U	0.036 U	0.073 U	0.072 U	0.041 U	0.04 U	0.053 U	0.036 U	0.073 U	0.039 U
Indeno[1,2,3-cd]pyrene	**0.5**	5.6	8.2	mg/kg		0.035 J	**2.65 D**	0.498	0.317	0.128	0.484	**1.22 D**	0.287	0.059	0.04 U	0.053 U	**0.674**	**1.04 D**	0.064
Isophorone	--	--	--	mg/kg		0.038 U	0.078 U	0.036 U	0.041 U	0.037 U	0.036 U	0.073 U	0.072 U	0.041 U	0.04 U	0.053 U	0.036 U	0.073 U	0.039 U
Naphthalene	12	500	12	mg/kg		0.038 U	0.133 D	0.066	0.055	0.037 U	0.056	0.229 D	0.089	0.041 U	0.04 U	0.053 U	0.104	0.091 D	0.797
Nitrobenzene	--	--	--	mg/kg		0.038 U	0.078 U	0.036 U	0.041 U	0.037 U	0.036 U	0.073 U	0.072 U	0.041 U	0.04 U	0.053 U	0.036 U	0.073 U	0.039 U
n-Nitrosodimethylamine	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodi-n-propylamine	--	--	--	mg/kg		0.038 U	0.078 U	0.036 U	0.041 U	0.037 U	0.036 U	0.073 U	0.072 U	0.041 U	0.04 U	0.053 U	0.036 U	0.073 U	0.039 U
n-Nitrosodiphenylamine	--	--	--	mg/kg		0.038 U	0.078 U	0.036 U	0.041 U	0.037 U	0.036 U	0.073 U	0.072 U	0.041 U	0.04 U	0.053 U	0.036 U	0.073 U	0.039 U
Pentachlorophenol	**0.8**	6.7	0.8	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	100	500	1000	mg/kg		0.111	0.59 D	1.43	0.877	0.219	1.76	5.45 D	0.932	0.229	0.068	0.053 U	2.71	1.96 D	1.55
Phenols (Total)	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	**100**	500	1000	mg/kg		0.206	8.2 D	1.89	1.19	0.366	2.06	5.44 D	1.59	0.224	0.072	0.053 U	3.04	3.3 D	0.397

Table 3. Summary of Semivolatile Organic Compounds in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	Sample Designation:	SB-22	SB-23	SB-24	SB-25	SB-26	SB-27	SB-28	SB-29	SB-30	SB-31A	SB-31D	SB-31S	SB-32A	SB-32D
					Sample Date:	11/10/2017	11/10/2017	11/10/2017	11/10/2017	12/13/2017	12/13/2017	12/13/2017	12/13/2017	12/13/2017	12/13/2017	12/18/2017	12/18/2017	12/13/2017	12/18/2017
					Sample Depth (ft bls):	11.5 - 12	11.5 - 12	11.5 - 12	10 - 10.5	-	-	-	-	-	-	8 - 8.5	2 - 2.5	-	8 - 8.5
1,1'-Biphenyl	--	--	--	mg/kg		0.041 U	0.04 U	0.036 U	0.035 U	0.039 U	0.035 U	0.038 U	0.038 U	0.038 U	0.423 U	0.039 U	0.038 U	0.039 U	0.036 U
1,2,4,5-Tetrachlorobenzene	--	--	--	mg/kg		0.041 U	0.04 U	0.036 U	0.035 U	0.039 U	0.035 U	0.038 U	0.038 U	0.038 U	0.423 U	0.039 U	0.038 U	0.039 U	0.036 U
1,2,4-Trichlorobenzene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	1.1	500	1.1	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Diphenylhydrazine	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	2.4	280	2.4	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	1.8	130	1.8	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,6-Tetrachlorophenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	--	--	--	mg/kg		0.041 U	0.04 U	0.036 U	0.035 U	0.039 U	0.035 U	0.038 U	0.038 U	0.038 U	0.423 U	0.039 U	0.038 U	0.039 U	0.036 U
2,6-Dinitrotoluene	--	--	--	mg/kg		0.041 U	0.04 U	0.036 U	0.035 U	0.039 U	0.035 U	0.038 U	0.038 U	0.038 U	0.423 U	0.039 U	0.038 U	0.039 U	0.036 U
2-Chloronaphthalene	--	--	--	mg/kg		0.041 U	0.04 U	0.036 U	0.035 U	0.039 U	0.035 U	0.038 U	0.038 U	0.038 U	0.423 U	0.039 U	0.038 U	0.039 U	0.036 U
2-Chlorophenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	--	--	--	mg/kg		0.041 U	0.04 U	0.036 U	0.035 U	0.039 U	0.035 U	0.058	0.029 J	0.049	0.423 U	0.078	0.052	0.086	0.036 U
2-Methylphenol	0.33	500	0.33	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	--	--	--	mg/kg		0.041 U	0.04 U	0.036 U	0.035 U	0.039 U	0.035 U	0.038 U	0.038 U	0.038 U	0.423 U	0.039 U	0.038 U	0.039 U	0.036 U
2-Nitrophenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3&4-Methylphenol	0.33	500	0.33	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	--	--	--	mg/kg		0.041 U	0.04 U	0.036 U	0.035 U	0.039 U	0.035 U	0.038 U	0.038 U	0.038 U	0.423 U	0.039 U	0.038 U	0.039 U	0.036 U
3-Nitroaniline	--	--	--	mg/kg		0.041 U	0.04 U	0.036 U	0.035 U	0.039 U	0.035 U	0.038 U	0.038 U	0.038 U	0.423 U	0.039 U	0.038 U	0.039 U	0.036 U
4,6-Dinitro-2-methylphenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl phenyl ether	--	--	--	mg/kg		0.041 U	0.04 U	0.036 U	0.035 U	0.039 U	0.035 U	0.038 U	0.038 U	0.038 U	0.423 U	0.039 U	0.038 U	0.039 U	0.036 U
4-Chloro-3-methylphenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	--	--	--	mg/kg		0.041 U	0.04 U	0.036 U	0.035 U	0.039 U	0.035 U	0.038 U	0.038 U	0.038 U	0.423 U	0.039 U	0.038 U	0.039 U	0.036 U
4-Chlorophenyl phenyl ether	--	--	--	mg/kg		0.041 U	0.04 U	0.036 U	0.035 U	0.039 U	0.035 U	0.038 U	0.038 U	0.038 U	0.423 U	0.039 U	0.038 U	0.039 U	0.036 U
4-Nitroaniline	--	--	--	mg/kg		0.041 U	0.04 U	0.036 U	0.035 U	0.039 U	0.035 U	0.038 U	0.038 U	0.038 U	0.423 U	0.039 U	0.038 U	0.039 U	0.036 U
4-Nitrophenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	20	500	98	mg/kg		0.041 U	0.04 U	0.065	0.035 U	0.097	0.035 U	0.064	0.058	0.13	0.792 D	0.131	0.077	0.228	0.077
Acenaphthylene	100	500	107	mg/kg		0.041 U	0.04 U	0.036 U	0.035 U	0.044	0.035 U	0.038 U	0.053	0.038 U	4.78 D	0.291	0.614	0.106	0.113
Acetophenone	--	--	--	mg/kg		0.041 U	0.04 U	0.036 U	0.035 U	0.039 U	0.035 U	0.038 U	0.038 U	0.038 U	0.423 U	0.039 U	0.038 U	0.039 U	0.036 U
Aniline	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	100	500	1000	mg/kg		0.041 U	0.04 U	0.12	0.035 U	0.274	0.035 U	0.117	0.173	0.274	6.82 D	0.631	0.523	0.564	0.237
Atrazine	--	--	--	mg/kg		0.041 U	0.04 U	0.036 U	0.035 U	0.039 U	0.035 U	0.038 U	0.038 U	0.038 U	0.423 U	0.039 U	0.038 U	0.039 U	0.036 U
Benzaldehyde	--	--	--	mg/kg		0.041 U	0.04 U	0.036 U	0.035 U	0.039 U	0.035 U	0.038 U	0.038 U	0.038 U	0.423 U	0.039 U	0.038 U	0.039 U	0.036 U
Benzidine	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo[a]anthracene	**1**	5.6	1	mg/kg		0.041 U	0.04 U	0.418	0.067	**1.01**	0.035 U	0.526	**1.33**	**1.22**	**41.2 D**	**2.54**	**2.63**	**2.2**	0.973
Benzo[a]pyrene	**1**	1	22	mg/kg		0.041 U	0.04 U	0.303	0.043	0.668	0.035 U	0.351	0.93	0.926	**26.1 D**	**1.54**	**1.73**	**1.62**	0.587
Benzo[b]fluoranthene	**1**	5.6	1.7	mg/kg		0.041 U	0.04 U	0.264	0.045	0.691	0.035 U	0.42	0.895	0.852	**25.7 D**	**1.62**	**1.94**	**1.45**	0.534
Benzo[g,h,i]perylene	100	500	1000	mg/kg		0.041 U	0.04 U	0.238	0.035 U	0.295	0.035 U	0.357	0.663	0.884	15 D	0.883	0.993	1.23	0.264
Benzo[k]fluoranthene	**0.8**	56	1.7	mg/kg		0.041 U	0.04 U	0.245	0.035 U	0.487	0.035 U	0.328	0.79	0.682	**20.8 D**	**1.43**	**1.98**	**1.27**	0.556
Benzoic Acid	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzyl Alcohol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloro-1-methylethyl)ether	--	--	--	mg/kg		0.041 U	0.04 U	0.036 U	0.035 U	0.039 U	0.035 U	0.038 U	0.038 U	0.038 U	0.423 U	0.039 U	0.038 U	0.039 U	0.036 U
Bis(2-chloroethoxy)methane	--	--	--	mg/kg		0.041 U	0.04 U	0.036 U	0.035 U	0.039 U	0.035 U	0.038 U	0.038 U	0.038 U	0.423 U	0.039 U	0.038 U	0.039 U	0.036 U
Bis(2-chloroethyl) ether	--	--	--	mg/kg		0.041 U	0.04 U	0.036 U	0.035 U	0.039 U	0.035 U	0.038 U	0.038 U	0.038 U	0.423 U	0.039 U	0.038 U	0.039 U	0.036 U
Bis(2-ethylhexyl) phthalate	--	--	--	mg/kg		0.041 U	0.04 U	0.036 U	0.035 U	0.039 U	0.035 U	0.038 U	0.038 U	0.038 U	0.423 U	0.039 U	0.038 U	0.079	0.036 U
Butylbenzyl phthalate	--	--	--	mg/kg		0.041 U	0.04 U	0.036 U	0.035 U	0.039 U	0.035 U	0.038 U	0.038 U	0.038 U	0.423 U	0.039 U	0.038 U	0.039 U	0.036 U
Caprolactam	--	--	--	mg/kg		0.041 U	0.04 U	0.036 U	0.035 U	0.039 U	0.035 U	0.038 U	0.038 U	0.038 U	0.423 U	0.039 U	0.038 U	0.039 U	0.036 U

Table 3. Summary of Semivolatile Organic Compounds in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	Sample Designation:	SB-22	SB-23	SB-24	SB-25	SB-26	SB-27	SB-28	SB-29	SB-30	SB-31A	SB-31D	SB-31S	SB-32A	SB-32D
					Sample Date:	11/10/2017	11/10/2017	11/10/2017	11/10/2017	12/13/2017	12/13/2017	12/13/2017	12/13/2017	12/13/2017	12/13/2017	12/18/2017	12/18/2017	12/13/2017	12/18/2017
					Sample Depth (ft bls):	11.5 - 12	11.5 - 12	11.5 - 12	10 - 10.5	-	-	-	-	-	-	8 - 8.5	2 - 2.5	-	8 - 8.5
Carbazole	--	--	--	mg/kg		0.041 U	0.04 U	0.042	0.035 U	0.086	0.035 U	0.043	0.051	0.115	2.01 D	0.342	0.475	0.236	0.092
Chrysene	**1**	56	1	mg/kg		0.041 U	0.04 U	0.466	0.069	**1.09**	0.06	0.779	**1.41**	**1.32**	**36.8 D**	**2.53**	**3.13**	**2.18**	0.963
Dibenzo[a,h]anthracene	**0.33**	0.56	1000	mg/kg		0.041 U	0.04 U	0.073	0.035 U	0.108	0.035 U	0.128	0.203	0.246	**5.63 D**	0.23	**0.403**	**0.378**	0.065
Dibenzofuran	7	350	210	mg/kg		0.041 U	0.04 U	0.034 J	0.035 U	0.057	0.035 U	0.039	0.038 U	0.08	0.481 D	0.173	0.202	0.174	0.042
Diethyl phthalate	--	--	--	mg/kg		0.041 U	0.04 U	0.036 U	0.035 U	0.039 U	0.035 U	0.038 U	0.038 U	0.038 U	0.423 U	0.039 U	0.038 U	0.039 U	0.036 U
Dimethyl phthalate	--	--	--	mg/kg		0.041 U	0.04 U	0.036 U	0.035 U	0.039 U	0.035 U	0.038 U	0.038 U	0.038 U	0.423 U	0.039 U	0.038 U	0.039 U	0.036 U
Di-n-butyl phthalate	--	--	--	mg/kg		0.041 U	0.04 U	0.036 U	0.035 U	0.039 U	0.035 U	0.038 U	0.049	0.038 U	0.423 U	0.039 U	0.038 U	0.039 U	0.036 U
Di-n-octyl phthalate	--	--	--	mg/kg		0.041 U	0.04 U	0.036 U	0.035 U	0.039 U	0.035 U	0.038 U	0.038 U	0.038 U	0.423 U	0.039 U	0.038 U	0.039 U	0.036 U
Fluoranthene	100	500	1000	mg/kg		0.041 U	0.04 U	0.653	0.088	1.74	0.037	0.77	1.72	1.8	60.9 D	4.9	6.09	3.5	1.83
Fluorene	30	500	386	mg/kg		0.041 U	0.04 U	0.052	0.035 U	0.066	0.035 U	0.044	0.049	0.101	1.06 D	0.143	0.147	0.194	0.063
Hexachlorobenzene	0.33	6	3.2	mg/kg		0.041 U	0.04 U	0.036 U	0.035 U	0.039 U	0.035 U	0.038 U	0.038 U	0.038 U	0.423 U	0.039 U	0.038 U	0.039 U	0.036 U
Hexachlorobutadiene	--	--	--	mg/kg		0.041 U	0.04 U	0.036 U	0.035 U	0.039 U	0.035 U	0.038 U	0.038 U	0.038 U	0.423 U	0.039 U	0.038 U	0.039 U	0.036 U
Hexachlorocyclopentadiene	--	--	--	mg/kg		0.041 U	0.04 U	0.036 U	0.035 U	0.039 U	0.035 U	0.038 U	0.038 U	0.038 U	0.423 U	0.039 U	0.038 U	0.039 U	0.036 U
Hexachloroethane	--	--	--	mg/kg		0.041 U	0.04 U	0.036 U	0.035 U	0.039 U	0.035 U	0.038 U	0.038 U	0.038 U	0.423 U	0.039 U	0.038 U	0.039 U	0.036 U
Indeno[1,2,3-cd]pyrene	**0.5**	5.6	8.2	mg/kg		0.041 U	0.04 U	0.19	0.035 U	0.292	0.035 U	0.279	**0.528**	**0.613**	**14.1 D**	**0.788**	**1.04**	**0.982**	0.248
Isophorone	--	--	--	mg/kg		0.041 U	0.04 U	0.036 U	0.035 U	0.039 U	0.035 U	0.038 U	0.038 U	0.038 U	0.423 U	0.039 U	0.038 U	0.039 U	0.036 U
Naphthalene	12	500	12	mg/kg		0.041 U	0.04 U	0.036 U	0.035 U	0.038 J	0.035 U	0.041	0.04	0.066	0.423 U	0.162	0.048	0.189	0.032 J
Nitrobenzene	--	--	--	mg/kg		0.041 U	0.04 U	0.036 U	0.035 U	0.039 U	0.035 U	0.038 U	0.038 U	0.038 U	0.423 U	0.039 U	0.038 U	0.039 U	0.036 U
n-Nitrosodimethylamine	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodi-n-propylamine	--	--	--	mg/kg		0.041 U	0.04 U	0.036 U	0.035 U	0.039 U	0.035 U	0.038 U	0.038 U	0.038 U	0.423 U	0.039 U	0.038 U	0.039 U	0.036 U
n-Nitrosodiphenylamine	--	--	--	mg/kg		0.041 U	0.04 U	0.036 U	0.035 U	0.039 U	0.035 U	0.038 U	0.038 U	0.038 U	0.423 U	0.039 U	0.038 U	0.039 U	0.036 U
Pentachlorophenol	**0.8**	6.7	0.8	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	100	500	1000	mg/kg		0.041 U	0.04 U	0.616	0.06	1.3	0.035 U	0.656	0.908	1.38	20.8 D	3	4.08	2.61	1.02
Phenols (Total)	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	**100**	500	1000	mg/kg		0.041 U	0.04 U	0.686	0.095	1.8	0.046	0.763	2.15	1.96	60.8 D	3.72	4.43	3.52	1.54

Table 3. Summary of Semivolatile Organic Compounds in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	Sample Designation:	SB-32D1	SB-32S	SB-33A	SB-33D	SB-33S	SB-34A	SB-34D	SB-34S	SB-35A	SB-35D	SB-35S	SB-36D	SB-36S	SB-37D
					Sample Date:	12/18/2017	12/18/2017	12/13/2017	12/18/2017	12/18/2017	12/13/2017	12/18/2017	12/18/2017	12/13/2017	12/18/2017	12/18/2017	12/18/2017	12/18/2017	12/18/2017
					Sample Depth (ft bls):	12 - 12.5	2 - 2.5	-	8 - 8.5	2 - 2.5	-	8 - 8.5	2 - 2.5	-	8 - 8.5	2 - 2.5	8 - 8.5	2 - 2.5	8 - 8.5
1,1'-Biphenyl	--	--	--	mg/kg		0.042 U	0.037 U	0.039 U	0.039 U	0.038 U	0.042 U	0.037 U	0.037 U	0.041 U	0.038 U	0.037 U	0.037 U	0.036 U	0.037 U
1,2,4,5-Tetrachlorobenzene	--	--	--	mg/kg		0.042 U	0.037 U	0.039 U	0.039 U	0.038 U	0.042 U	0.037 U	0.037 U	0.041 U	0.038 U	0.037 U	0.037 U	0.036 U	0.037 U
1,2,4-Trichlorobenzene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	1.1	500	1.1	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Diphenylhydrazine	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	2.4	280	2.4	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	1.8	130	1.8	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,6-Tetrachlorophenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	--	--	--	mg/kg		0.042 U	0.037 U	0.039 U	0.039 U	0.038 U	0.042 U	0.037 U	0.037 U	0.041 U	0.038 U	0.037 U	0.037 U	0.036 U	0.037 U
2,6-Dinitrotoluene	--	--	--	mg/kg		0.042 U	0.037 U	0.039 U	0.039 U	0.038 U	0.042 U	0.037 U	0.037 U	0.041 U	0.038 U	0.037 U	0.037 U	0.036 U	0.037 U
2-Chloronaphthalene	--	--	--	mg/kg		0.042 U	0.037 U	0.039 U	0.039 U	0.038 U	0.042 U	0.037 U	0.037 U	0.041 U	0.038 U	0.037 U	0.037 U	0.036 U	0.037 U
2-Chlorophenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	--	--	--	mg/kg		0.042 U	0.03 J	0.063	0.039 U	0.064	0.042 U	0.037 U	0.038	0.041 U	0.038 U	0.036 J	0.037 U	0.036 U	0.037 U
2-Methylphenol	0.33	500	0.33	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitroaniline	--	--	--	mg/kg		0.042 U	0.037 U	0.039 U	0.039 U	0.038 U	0.042 U	0.037 U	0.037 U	0.041 U	0.038 U	0.037 U	0.037 U	0.036 U	0.037 U
2-Nitrophenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3&4-Methylphenol	0.33	500	0.33	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3,3'-Dichlorobenzidine	--	--	--	mg/kg		0.042 U	0.037 U	0.039 U	0.039 U	0.038 U	0.042 U	0.037 U	0.037 U	0.041 U	0.038 U	0.037 U	0.037 U	0.036 U	0.037 U
3-Nitroaniline	--	--	--	mg/kg		0.042 U	0.037 U	0.039 U	0.039 U	0.038 U	0.042 U	0.037 U	0.037 U	0.041 U	0.038 U	0.037 U	0.037 U	0.036 U	0.037 U
4,6-Dinitro-2-methylphenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl phenyl ether	--	--	--	mg/kg		0.042 U	0.037 U	0.039 U	0.039 U	0.038 U	0.042 U	0.037 U	0.037 U	0.041 U	0.038 U	0.037 U	0.037 U	0.036 U	0.037 U
4-Chloro-3-methylphenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	--	--	--	mg/kg		0.042 U	0.037 U	0.039 U	0.039 U	0.038 U	0.042 U	0.037 U	0.037 U	0.041 U	0.038 U	0.037 U	0.037 U	0.036 U	0.037 U
4-Chlorophenyl phenyl ether	--	--	--	mg/kg		0.042 U	0.037 U	0.039 U	0.039 U	0.038 U	0.042 U	0.037 U	0.037 U	0.041 U	0.038 U	0.037 U	0.037 U	0.036 U	0.037 U
4-Nitroaniline	--	--	--	mg/kg		0.042 U	0.037 U	0.039 U	0.039 U	0.038 U	0.042 U	0.037 U	0.037 U	0.041 U	0.038 U	0.037 U	0.037 U	0.036 U	0.037 U
4-Nitrophenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	20	500	98	mg/kg		0.042 U	0.123	0.266	0.039 U	0.049	0.102	0.037 U	0.086	0.041 U	0.038 U	0.213	0.037 U	0.036 U	0.037 U
Acenaphthylene	100	500	107	mg/kg		0.042 U	0.245	0.177	0.113	0.262	0.057	0.037 U	0.232	0.233	0.046	0.112	0.037 U	0.048	0.037 U
Acetophenone	--	--	--	mg/kg		0.042 U	0.037 U	0.039 U	0.039 U	0.038 U	0.042 U	0.037 U	0.037 U	0.041 U	0.038 U	0.037 U	0.037 U	0.036 U	0.037 U
Aniline	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	100	500	1000	mg/kg		0.039 J	0.384	0.601	0.119	0.163	0.222	0.037 U	0.315	0.41	0.038 U	0.377	0.037 U	0.052	0.038
Atrazine	--	--	--	mg/kg		0.042 U	0.037 U	0.039 U	0.039 U	0.038 U	0.042 U	0.037 U	0.037 U	0.041 U	0.038 U	0.037 U	0.037 U	0.036 U	0.037 U
Benzaldehyde	--	--	--	mg/kg		0.042 U	0.037 U	0.039 U	0.039 U	0.038 U	0.042 U	0.037 U	0.037 U	0.041 U	0.038 U	0.037 U	0.037 U	0.036 U	0.037 U
Benzidine	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo[a]anthracene	**1**	5.6	1	mg/kg		0.133	**1.86**	**3.64**	0.418	0.572	0.949	0.055	**1.81**	0.775	0.095	**1.14**	0.142	0.227	0.134
Benzo[a]pyrene	**1**	1	22	mg/kg		0.074	**1.18**	**3.17**	0.304	0.423	0.738	0.037 U	**1.12**	**1.44**	0.057	0.665	0.091	0.121	0.082
Benzo[b]fluoranthene	**1**	5.6	1.7	mg/kg		0.081	**1.24**	**2.68**	0.302	0.439	0.611	0.037 U	**1.21**	**1.83**	0.048	0.552	0.08	0.114	0.074
Benzo[g,h,i]perylene	100	500	1000	mg/kg		0.08	0.622	2.39	0.181	0.214	0.576	0.121	0.416	3.45	0.099	0.23	0.04	0.069	0.197
Benzo[k]fluoranthene	**0.8**	56	1.7	mg/kg		0.058	**0.995**	**2.28**	0.291	0.446	0.672	0.037 U	**1.22**	**1.14**	0.068	0.721	0.083	0.157	0.082
Benzoic Acid	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzyl Alcohol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloro-1-methylethyl)ether	--	--	--	mg/kg		0.042 U	0.037 U	0.039 U	0.039 U	0.038 U	0.042 U	0.037 U	0.037 U	0.041 U	0.038 U	0.037 U	0.037 U	0.036 U	0.037 U
Bis(2-chloroethoxy)methane	--	--	--	mg/kg		0.042 U	0.037 U	0.039 U	0.039 U	0.038 U	0.042 U	0.037 U	0.037 U	0.041 U	0.038 U	0.037 U	0.037 U	0.036 U	0.037 U
Bis(2-chloroethyl) ether	--	--	--	mg/kg		0.042 U	0.037 U	0.039 U	0.039 U	0.038 U	0.042 U	0.037 U	0.037 U	0.041 U	0.038 U	0.037 U	0.037 U	0.036 U	0.037 U
Bis(2-ethylhexyl) phthalate	--	--	--	mg/kg		0.042 U	0.037 U	0.089	0.061	0.038 U	0.042 U	0.037 U	0.037 U	0.041 U	0.038 U	0.037 U	0.037 U	0.036 U	0.202
Butylbenzyl phthalate	--	--	--	mg/kg		0.042 U	0.037 U	0.039 U	0.039 U	0.038 U	0.042 U	0.037 U	0.037 U	0.041 U	0.038 U	0.037 U	0.037 U	0.036 U	0.037 U
Caprolactam	--	--	--	mg/kg		0.042 U	0.037 U	0.039 U	0.039 U	0.038 U	0.042 U	0.037 U	0.037 U	0.041 U	0.038 U	0.037 U	0.037 U	0.036 U	0.037 U

Table 3. Summary of Semivolatile Organic Compounds in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	Sample Designation:	SB-32D1	SB-32S	SB-33A	SB-33D	SB-33S	SB-34A	SB-34D	SB-34S	SB-35A	SB-35D	SB-35S	SB-36D	SB-36S	SB-37D
					Sample Date:	12/18/2017	12/18/2017	12/13/2017	12/18/2017	12/18/2017	12/13/2017	12/18/2017	12/18/2017	12/13/2017	12/18/2017	12/18/2017	12/18/2017	12/18/2017	12/18/2017
					Sample Depth (ft bls):	12 - 12.5	2 - 2.5	-	8 - 8.5	2 - 2.5	-	8 - 8.5	2 - 2.5	-	8 - 8.5	2 - 2.5	8 - 8.5	2 - 2.5	8 - 8.5
Carbazole	--	--	--	mg/kg		0.042 U	0.166	0.173	0.066	0.208	0.072	0.037 U	0.147	0.114	0.038 U	0.176	0.037 U	0.03 J	0.037 U
Chrysene	**1**	56	1	mg/kg		0.124	**1.82**	**3.46**	0.469	0.736	0.971	0.048	**2.08**	**1.12**	0.101	**1.14**	0.142	0.252	0.131
Dibenzo[a,h]anthracene	**0.33**	0.56	1000	mg/kg		0.042 U	0.204	**0.693**	0.039 U	0.063	0.16	0.037 U	0.206	**0.911**	0.038 U	0.105	0.037 U	0.036 U	0.037 U
Dibenzofuran	7	350	210	mg/kg		0.042 U	0.06	0.12	0.039	0.119	0.042	0.037 U	0.057	0.041 U	0.038 U	0.105	0.037 U	0.036 U	0.037 U
Diethyl phthalate	--	--	--	mg/kg		0.042 U	0.037 U	0.039 U	0.039 U	0.038 U	0.042 U	0.037 U	0.037 U	0.041 U	0.038 U	0.037 U	0.037 U	0.036 U	0.037 U
Dimethyl phthalate	--	--	--	mg/kg		0.042 U	0.037 U	0.039 U	0.039 U	0.038 U	0.042 U	0.037 U	0.037 U	0.041 U	0.038 U	0.037 U	0.037 U	0.036 U	0.037 U
Di-n-butyl phthalate	--	--	--	mg/kg		0.042 U	0.037 U	0.039 U	0.039 U	0.038 U	0.042 U	0.037 U	0.037 U	0.048	0.038 U	0.037 U	0.037 U	0.036 U	0.037 U
Di-n-octyl phthalate	--	--	--	mg/kg		0.042 U	0.037 U	0.039 U	0.039 U	0.038 U	0.042 U	0.037 U	0.037 U	0.041 U	0.038 U	0.037 U	0.037 U	0.036 U	0.037 U
Fluoranthene	100	500	1000	mg/kg		0.224	3.22	4.52	0.908	1.52	1.36	0.086	3.65	0.789	0.136	2.31	0.24	0.561	0.231
Fluorene	30	500	386	mg/kg		0.042 U	0.101	0.186	0.039 J	0.124	0.085	0.037 U	0.096	0.041 U	0.038 U	0.147	0.037 U	0.036 U	0.037 U
Hexachlorobenzene	0.33	6	3.2	mg/kg		0.042 U	0.037 U	0.039 U	0.039 U	0.038 U	0.042 U	0.037 U	0.037 U	0.041 U	0.038 U	0.037 U	0.037 U	0.036 U	0.037 U
Hexachlorobutadiene	--	--	--	mg/kg		0.042 U	0.037 U	0.039 U	0.039 U	0.038 U	0.042 U	0.037 U	0.037 U	0.041 U	0.038 U	0.037 U	0.037 U	0.036 U	0.037 U
Hexachlorocyclopentadiene	--	--	--	mg/kg		0.042 U	0.037 U	0.039 U	0.039 U	0.038 U	0.042 U	0.037 U	0.037 U	0.041 U	0.038 U	0.037 U	0.037 U	0.036 U	0.037 U
Hexachloroethane	--	--	--	mg/kg		0.042 U	0.037 U	0.039 U	0.039 U	0.038 U	0.042 U	0.037 U	0.037 U	0.041 U	0.038 U	0.037 U	0.037 U	0.036 U	0.037 U
Indeno[1,2,3-cd]pyrene	**0.5**	5.6	8.2	mg/kg		0.044	**0.573**	**1.84**	0.158	0.212	0.474	0.06	0.407	**2.3**	0.05	0.242	0.041	0.067	0.102
Isophorone	--	--	--	mg/kg		0.042 U	0.037 U	0.039 U	0.039 U	0.038 U	0.042 U	0.037 U	0.037 U	0.041 U	0.038 U	0.037 U	0.037 U	0.036 U	0.037 U
Naphthalene	12	500	12	mg/kg		0.042 U	0.057	0.116	0.06	0.211	0.042 U	0.037 U	0.058	0.041 U	0.038 U	0.069	0.037 U	0.036 U	0.037 U
Nitrobenzene	--	--	--	mg/kg		0.042 U	0.037 U	0.039 U	0.039 U	0.038 U	0.042 U	0.037 U	0.037 U	0.041 U	0.038 U	0.037 U	0.037 U	0.036 U	0.037 U
n-Nitrosodimethylamine	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodi-n-propylamine	--	--	--	mg/kg		0.042 U	0.037 U	0.039 U	0.039 U	0.038 U	0.042 U	0.037 U	0.037 U	0.041 U	0.038 U	0.037 U	0.037 U	0.036 U	0.037 U
n-Nitrosodiphenylamine	--	--	--	mg/kg		0.042 U	0.037 U	0.039 U	0.039 U	0.038 U	0.042 U	0.037 U	0.037 U	0.041 U	0.038 U	0.037 U	0.037 U	0.036 U	0.037 U
Pentachlorophenol	**0.8**	6.7	0.8	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	100	500	1000	mg/kg		0.15	1.48	2.4	0.531	1.24	0.897	0.06	1.62	0.319	0.071	1.72	0.11	0.315	0.138
Phenols (Total)	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	**100**	500	1000	mg/kg		0.186	2.74	4.82	0.759	1.09	1.44	0.076	2.93	0.899	0.121	2.03	0.239	0.416	0.21

Table 3. Summary of Semivolatile Organic Compounds in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	**Sample Designation:**	SB-37S	SB42-A	SB42-B	SB43-A	SB43-B	SB-56A	SB-56B	SB-56C	SB-57A	SB-57B	SB-57C	SB-58A	SB-58B	SB-58C
					Sample Date:	12/18/2017	5/15/2018	5/15/2018	5/15/2018	5/15/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018
					Sample Depth (ft bls):	2 - 2.5	-	-	-	-	-	-	-	-	-	-	-	-	-
1,1'-Biphenyl	--	--	--	mg/kg		0.174	0.0695 U	0.07 U	0.0709 U	0.0719 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4,5-Tetrachlorobenzene	--	--	--	mg/kg		0.039 U	0.139 U	0.14 U	0.141 U	0.143 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	--	--	--	mg/kg		NA	0.0695 U	0.07 U	0.0709 U	0.0719 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	1.1	500	1.1	mg/kg		NA	0.0695 U	0.07 U	0.0709 U	0.0719 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Diphenylhydrazine	--	--	--	mg/kg		NA	0.0695 U	0.07 U	0.0709 U	0.0719 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	2.4	280	2.4	mg/kg		NA	0.0695 U	0.07 U	0.0709 U	0.0719 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	1.8	130	1.8	mg/kg		NA	0.0695 U	0.07 U	0.0709 U	0.0719 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,6-Tetrachlorophenol	--	--	--	mg/kg		NA	0.139 U	0.14 U	0.141 U	0.143 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	--	--	--	mg/kg		NA	0.0695 U	0.07 U	0.0709 U	0.0719 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	--	--	--	mg/kg		NA	0.0695 U	0.07 U	0.0709 U	0.0719 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	--	--	--	mg/kg		NA	0.0695 U	0.07 U	0.0709 U	0.0719 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	--	--	--	mg/kg		NA	0.0695 U	0.07 U	0.0709 U	0.0719 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	--	--	--	mg/kg		NA	0.139 U	0.14 U	0.141 U	0.143 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	--	--	--	mg/kg		0.039 U	0.0695 U	0.07 U	0.0709 U	0.0719 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	--	--	--	mg/kg		0.039 U	0.0695 U	0.07 U	0.0709 U	0.0719 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	--	--	--	mg/kg		0.039 U	0.0695 U	0.07 U	0.0709 U	0.0719 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	--	--	--	mg/kg		NA	0.0695 U	0.07 U	0.0709 U	0.0719 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	--	--	--	mg/kg		1.07	0.0695 U	0.07 U	0.0709 U	0.0719 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	0.33	500	0.33	mg/kg		NA	0.0695 U	0.07 U	0.0709 U	0.0719 U	0.0472 U	0.0473 U	0.048 U	0.0464 U	0.0489 U	0.0488 U	0.0429 U	0.0531 U	0.0495 U
2-Nitroaniline	--	--	--	mg/kg		0.039 U	0.139 U	0.14 U	0.141 U	0.143 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrophenol	--	--	--	mg/kg		NA	0.0695 U	0.07 U	0.0709 U	0.0719 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
3&4-Methylphenol	0.33	500	0.33	mg/kg		NA	0.0695 U	0.07 U	0.0709 U	0.0719 U	0.0472 U	0.0473 U	0.048 U	0.0464 U	0.0489 U	0.0488 U	0.0429 U	0.13 D	0.0495 U
3,3'-Dichlorobenzidine	--	--	--	mg/kg		0.039 U	0.0695 U	0.07 U	0.0709 U	0.0719 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	--	--	--	mg/kg		0.039 U	0.139 U	0.14 U	0.141 U	0.143 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	--	--	--	mg/kg		NA	0.139 U	0.14 U	0.141 U	0.143 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl phenyl ether	--	--	--	mg/kg		0.039 U	0.0695 U	0.07 U	0.0709 U	0.0719 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	--	--	--	mg/kg		NA	0.0695 U	0.07 U	0.0709 U	0.0719 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	--	--	--	mg/kg		0.039 U	0.0695 U	0.07 U	0.0709 U	0.0719 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl phenyl ether	--	--	--	mg/kg		0.039 U	0.0695 U	0.07 U	0.0709 U	0.0719 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	--	--	--	mg/kg		0.039 U	0.139 U	0.14 U	0.141 U	0.143 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	--	--	--	mg/kg		NA	0.139 U	0.14 U	0.141 U	0.143 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	20	500	98	mg/kg		0.211	0.0695 U	0.07 U	0.153	0.0719 U	0.0685 JD	0.0566 JD	0.048 U	0.0464 U	0.0489 U	0.0488 U	0.0429 U	6.35 D	0.098 JD
Acenaphthylene	100	500	107	mg/kg		0.209	0.346	0.07 U	0.66	0.0719 U	0.37 D	0.0473 U	0.048 U	0.147 D	0.0489 U	0.0488 U	0.0429 U	1.98 D	0.231 D
Acetophenone	--	--	--	mg/kg		0.039 U	0.0695 U	0.07 U	0.0709 U	0.0719 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aniline	--	--	--	mg/kg		NA	0.278 U	0.28 U	0.283 U	0.287 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	100	500	1000	mg/kg		0.487	0.305	0.07 U	0.68	0.0803	0.304 D	0.151 D	0.048 U	0.108 D	0.0569 JD	0.115 D	0.0429 U	18.5 D	0.325 D
Atrazine	--	--	--	mg/kg		0.039 U	0.0695 U	0.07 U	0.0709 U	0.0719 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzaldehyde	--	--	--	mg/kg		0.039 U	0.0695 U	0.07 U	0.0709 U	0.0719 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzidine	--	--	--	mg/kg		NA	0.278 U	0.28 U	0.283 U	0.287 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo[a]anthracene	**1**	5.6	1	mg/kg		**1.55**	**1.17**	0.124	**2.89**	0.226	**1.59 D**	0.415 D	0.0957 D	0.486 D	0.222 D	0.285 D	0.0429 U	**49.1 D**	**1.16 D**
Benzo[a]pyrene	**1**	1	22	mg/kg		0.38	**1.06**	0.0827	**2.47**	0.178	**1.53 D**	0.37 D	0.0865 JD	0.478 D	0.214 D	0.268 D	0.0429 U	**47.3 D**	**1.18 D**
Benzo[b]fluoranthene	**1**	5.6	1.7	mg/kg		0.944	0.985	0.0782	**2.17**	0.162	**1.38 D**	0.34 D	0.075 JD	0.462 D	0.207 D	0.217 D	0.0429 U	**39.4 D**	**1.15 D**
Benzo[g,h,i]perylene	100	500	1000	mg/kg		0.126	0.802	0.0715	1.62	0.107	1.09 D	0.278 D	0.0605 JD	0.376 D	0.166 D	0.17 D	0.0429 U	26.5 D	0.804 D
Benzo[k]fluoranthene	**0.8**	56	1.7	mg/kg		**1.07**	**0.944**	0.0827	**2.15**	0.162	**1.23 D**	0.289 D	0.0673 JD	0.419 D	0.185 D	0.206 D	0.0429 U	**29.1 D**	**1.17 D**
Benzoic Acid	--	--	--	mg/kg		NA	0.0695 U	0.07 U	0.0709 U	0.0719 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzyl Alcohol	--	--	--	mg/kg		NA	0.0695 U	0.07 U	0.0709 U	0.0719 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloro-1-methylethyl)ether	--	--	--	mg/kg		0.039 U	0.0695 U	0.07 U	0.0709 U	0.0719 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethoxy)methane	--	--	--	mg/kg		0.039 U	0.0695 U	0.07 U	0.0709 U	0.0719 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethyl) ether	--	--	--	mg/kg		0.039 U	0.0695 U	0.07 U	0.0709 U	0.0719 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-ethylhexyl) phthalate	--	--	--	mg/kg		5.61	0.104	0.07 U	0.0709 U	0.0719 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butylbenzyl phthalate	--	--	--	mg/kg		0.039 U	0.0695 U	0.07 U	0.0709 U	0.0719 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Caprolactam	--	--	--	mg/kg		0.039 U	0.139 U	0.14 U	0.141 U	0.143 U	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 3. Summary of Semivolatile Organic Compounds in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	Sample Designation:	SB-37S	SB42-A	SB42-B	SB43-A	SB43-B	SB-56A	SB-56B	SB-56C	SB-57A	SB-57B	SB-57C	SB-58A	SB-58B	SB-58C
					Sample Date:	12/18/2017	5/15/2018	5/15/2018	5/15/2018	5/15/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018
					Sample Depth (ft bls):	2 - 2.5	-	-	-	-	-	-	-	-	-	-	-	-	-
Carbazole	--	--	--	mg/kg		0.184	0.133	0.07 U	0.224	0.0719 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	**1**	56	1	mg/kg		**1.36**	**1.14**	0.122	**2.61**	0.22	**1.56 D**	0.434 D	0.0987 D	0.513 D	0.243 D	0.306 D	0.0429 U	**48.4 D**	**1.43 D**
Dibenzo[a,h]anthracene	**0.33**	0.56	1000	mg/kg		0.079	0.27	0.07 U	**0.545**	0.0719 U	**0.356 D**	0.0701 JD	0.048 U	0.129 D	0.0489 U	0.0488 U	0.0429 U	**8.71 D**	0.282 D
Dibenzofuran	7	350	210	mg/kg		0.151	0.0695 U	0.07 U	0.0712	0.0719 U	0.0474 JD	0.0473 U	0.048 U	0.0464 U	0.0489 U	0.0488 U	0.0429 U	2.27 D	0.107 D
Diethyl phthalate	--	--	--	mg/kg		0.039 U	0.0695 U	0.07 U	0.0709 U	0.0719 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl phthalate	--	--	--	mg/kg		0.039 U	0.0695 U	0.07 U	0.0709 U	0.0719 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butyl phthalate	--	--	--	mg/kg		0.1	0.0921	0.07 U	0.0709 U	0.0719 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octyl phthalate	--	--	--	mg/kg		0.403	0.0695 U	0.07 U	0.0709 U	0.0719 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	100	500	1000	mg/kg		3.04	2.16	0.23	4.83	0.452	2.99 D	0.926 D	0.191 D	0.984 D	0.423 D	0.594 D	0.0429 U	80.3 D	2.55 D
Fluorene	30	500	386	mg/kg		0.328	0.081	0.07 U	0.192	0.0719 U	0.0851 JD	0.0588 JD	0.048 U	0.0464 U	0.0489 U	0.0488 U	0.0429 U	6.24 D	0.133 D
Hexachlorobenzene	0.33	6	3.2	mg/kg		0.039 U	0.0695 U	0.07 U	0.0709 U	0.0719 U	0.0472 U	0.0473 U	0.048 U	0.0464 U	0.0489 U	0.0488 U	0.0429 U	0.0531 U	0.0495 U
Hexachlorobutadiene	--	--	--	mg/kg		0.039 U	0.0695 U	0.07 U	0.0709 U	0.0719 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	--	--	--	mg/kg		0.039 U	0.0695 U	0.07 U	0.0709 U	0.0719 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	--	--	--	mg/kg		0.039 U	0.0695 U	0.07 U	0.0709 U	0.0719 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno[1,2,3-cd]pyrene	**0.5**	5.6	8.2	mg/kg		0.174	**0.694**	0.07 U	**1.44**	0.0837	**1.01 D**	0.21 D	0.0513 JD	0.345 D	0.162 D	0.188 D	0.0429 U	**29.5 D**	**0.878 D**
Isophorone	--	--	--	mg/kg		0.039 U	0.0695 U	0.07 U	0.0709 U	0.0719 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	12	500	12	mg/kg		0.377	0.0695 U	0.07 U	0.0709 U	0.0719 U	0.0472 U	0.0473 U	0.048 U	0.0464 U	0.0489 U	0.0654 JD	0.0429 U	1.9 D	0.134 D
Nitrobenzene	--	--	--	mg/kg		0.039 U	0.0695 U	0.07 U	0.0709 U	0.0719 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodimethylamine	--	--	--	mg/kg		NA	0.0695 U	0.07 U	0.0709 U	0.0719 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodi-n-propylamine	--	--	--	mg/kg		0.039 U	0.0695 U	0.07 U	0.0709 U	0.0719 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	--	--	--	mg/kg		0.039 U	0.0695 U	0.07 U	0.0709 U	0.0719 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	**0.8**	6.7	0.8	mg/kg		NA	0.0695 U	0.07 U	0.0709 U	0.0719 U	0.0472 U	0.0473 U	0.048 U	0.0464 U	0.0489 U	0.0488 U	0.0429 U	0.0531 U	0.0495 U
Phenanthrene	100	500	1000	mg/kg		2.08	0.983	0.163	2.37	0.281	1.47 D	0.826 D	0.144 D	0.489 D	0.319 D	0.537 D	0.0429 U	78.3 D	2.09 D
Phenols (Total)	--	--	--	mg/kg		NA	0.0695 U	0.07 U	0.0709 U	0.0719 U	0.0472 U	0.0473 U	0.048 U	0.0464 U	0.0489 U	0.0488 U	0.0429 U	0.0531 U	0.0495 U
Pyrene	**100**	500	1000	mg/kg		1.99	2.11	0.261	5.89	0.399	2.72 D	0.952 D	0.195 D	0.935 D	0.452 D	0.593 D	0.0429 U	**110 D**	2.24 D

Table 3. Summary of Semivolatile Organic Compounds in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	Sample Designation:	SB-59A	SB-59B	SB-59C	SB-60A	SB-60B	SB-60C	SB-61A	SB-61B	SB-61C	SB-64A	SB-64B	SB-65A	SB-65B	SB-66A
					Sample Date:	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018
					Sample Depth (ft bls):	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,1'-Biphenyl	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4,5-Tetrachlorobenzene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	1.1	500	1.1	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Diphenylhydrazine	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	2.4	280	2.4	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	1.8	130	1.8	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,6-Tetrachlorophenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	0.33	500	0.33	mg/kg		0.0449 U	0.0459 U	0.0433 U	0.044 U	0.0469 U	0.0487 U	0.0445 U	0.0488 U	0.0509 U	0.327 U	0.047 U	0.231 U	0.0431 U	0.0451 U
2-Nitroaniline	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrophenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3&4-Methylphenol	0.33	500	0.33	mg/kg		0.0449 U	0.0459 U	0.0433 U	0.044 U	0.0469 U	0.0487 U	0.0445 U	0.0488 U	0.0509 U	0.327 U	0.047 U	0.231 U	0.0431 U	0.0451 U
3,3'-Dichlorobenzidine	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl phenyl ether	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl phenyl ether	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	20	500	98	mg/kg		1.21 D	0.132 D	0.0433 U	0.14 D	0.141 D	0.0487 U	0.27 D	2.15 D	0.348 D	0.327 U	0.278 D	2.7 D	0.0431 U	0.0451 U
Acenaphthylene	100	500	107	mg/kg		0.529 D	0.369 D	0.0433 U	0.133 D	0.114 D	0.0512 JD	0.339 D	0.459 D	0.572 D	0.327 U	0.409 D	3.53 D	0.0431 U	0.0504 JD
Acetophenone	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aniline	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	100	500	1000	mg/kg		2.52 D	0.588 D	0.0433 U	0.323 D	0.364 D	0.0598 JD	0.711 D	3.88 D	1.11 D	0.327 U	0.748 D	7.22 D	0.064 JD	0.0497 JD
Atrazine	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzaldehyde	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzidine	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo[a]anthracene	**1**	5.6	1	mg/kg		**19.1 D**	0.526 D	0.0433 U	0.874 D	0.88 D	0.345 D	**1.84 D**	**7.94 D**	**3.93 D**	0.327 U	**1.95 D**	**20.3 D**	0.292 D	0.178 D
Benzo[a]pyrene	**1**	1	22	mg/kg		**21 D**	0.528 D	0.0433 U	0.793 D	0.925 D	0.404 D	**1.78 D**	**7.46 D**	**4.21 D**	0.327 U	**1.98 D**	**18.7 D**	0.371 D	0.237 D
Benzo[b]fluoranthene	**1**	5.6	1.7	mg/kg		**17.3 D**	0.572 D	0.0433 U	0.742 D	0.771 D	0.325 D	**1.65 D**	**5.89 D**	**3.67 D**	0.327 U	**1.7 D**	**14.4 D**	0.303 D	0.204 D
Benzo[g,h,i]perylene	100	500	1000	mg/kg		10.1 D	0.717 D	0.0433 U	0.487 D	0.579 D	0.274 D	0.962 D	5.29 D	2.66 D	0.327 U	1.4 D	10.5 D	0.239 D	0.176 D
Benzo[k]fluoranthene	**0.8**	56	1.7	mg/kg		**13.3 D**	0.497 D	0.0433 U	0.662 D	0.78 D	0.321 D	**1.46 D**	**6.18 D**	**3.61 D**	0.327 U	**1.73 D**	**17.2 D**	0.329 D	0.197 D
Benzoic Acid	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzyl Alcohol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloro-1-methylethyl)ether	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethoxy)methane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethyl) ether	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-ethylhexyl) phthalate	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butylbenzyl phthalate	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Caprolactam	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 3. Summary of Semivolatile Organic Compounds in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	Sample Designation:	SB-59A	SB-59B	SB-59C	SB-60A	SB-60B	SB-60C	SB-61A	SB-61B	SB-61C	SB-64A	SB-64B	SB-65A	SB-65B	SB-66A
					Sample Date:	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018
					Sample Depth (ft bls):	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Carbazole	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	**1**	56	1	mg/kg		**18.1 D**	0.505 D	0.0433 U	0.918 D	0.888 D	0.338 D	**1.82 D**	**8.43 D**	**4.51 D**	0.327 U	**2.18 D**	**20.8 D**	0.336 D	0.211 D
Dibenzo[a,h]anthracene	**0.33**	0.56	1000	mg/kg		**2.53 D**	0.146 D	0.0433 U	0.171 D	0.132 D	0.0512 JD	0.238 D	**1.58 D**	**1.01 D**	0.327 U	**0.493 D**	**4.28 D**	0.0791 JD	0.0451 U
Dibenzofuran	7	350	210	mg/kg		1.23 D	0.223 D	0.0433 U	0.0751 JD	0.111 D	0.0487 U	0.227 D	0.0488 U	0.212 D	0.327 U	0.221 D	2.21 D	0.0431 U	0.0451 U
Diethyl phthalate	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl phthalate	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butyl phthalate	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octyl phthalate	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	100	500	1000	mg/kg		32.4 D	1.38 D	0.0433 U	1.75 D	1.77 D	0.482 D	NA	20.2 D	9.2 D	0.448 JD	5.87 D	48.3 D	0.713 D	0.386 D
Fluorene	30	500	386	mg/kg		1.12 D	0.124 D	0.0433 U	0.117 D	0.126 D	0.0487 U	0.29 D	1.89 D	0.31 D	0.327 U	0.35 D	3.68 D	0.0431 U	0.0451 U
Hexachlorobenzene	0.33	6	3.2	mg/kg		0.0449 U	0.0459 U	0.0433 U	0.044 U	0.0469 U	0.0487 U	0.0445 U	0.0488 U	0.0509 U	0.327 U	0.047 U	0.231 U	0.0431 U	0.0451 U
Hexachlorobutadiene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno[1,2,3-cd]pyrene	**0.5**	5.6	8.2	mg/kg		**12.8 D**	**0.629 D**	0.0433 U	**0.572 D**	**0.624 D**	0.252 D	**1.19 D**	**4.62 D**	**2.47 D**	0.327 U	**1.3 D**	**10.7 D**	0.219 D	0.156 D
Isophorone	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	12	500	12	mg/kg		0.941 D	0.3 D	0.0433 U	0.0597 JD	0.0957 D	0.0487 U	0.205 D	1.26 D	0.195 D	0.327 U	0.364 D	2.41 D	0.0431 U	0.0451 U
Nitrobenzene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodimethylamine	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodi-n-propylamine	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	**0.8**	6.7	0.8	mg/kg		0.0449 U	0.0459 U	0.0433 U	0.044 U	0.0469 U	0.0487 U	0.0445 U	0.0488 U	0.0509 U	0.327 U	0.047 U	0.231 U	0.0431 U	0.0451 U
Phenanthrene	100	500	1000	mg/kg		24.7 D	1.35 D	0.0433 U	1.6 D	1.55 D	0.204 D	2.16 D	23.1 D	5.55 D	0.327 U	5.03 D	39.9 D	0.385 D	0.177 D
Phenols (Total)	--	--	--	mg/kg		0.0449 U	0.0459 U	0.0433 U	0.044 U	0.0469 U	0.0487 U	0.0445 U	0.0488 U	0.0509 U	0.327 U	0.047 U	0.231 U	0.0431 U	0.0451 U
Pyrene	**100**	500	1000	mg/kg		35.5 D	1.11 D	0.0433 U	1.74 D	1.78 D	0.529 D	2.81 D	17 D	7.22 D	0.443 JD	4.6 D	35.5 D	0.518 D	0.302 D

Table 3. Summary of Semivolatile Organic Compounds in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	Sample Designation:	SB-66B	SB-67A	SB-67B	SB-68A	SB-68B	SB-69A	SB-69B	SB-70A	SB-70B	SB-71A	SB-71B	SB-72A	SB-72B	SB-72C
					Sample Date:	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/14/2018	11/14/2018	11/14/2018	11/14/2018	11/14/2018	11/14/2018	11/14/2018
					Sample Depth (ft bls):	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1,1'-Biphenyl	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4,5-Tetrachlorobenzene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	1.1	500	1.1	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Diphenylhydrazine	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	2.4	280	2.4	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	1.8	130	1.8	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,6-Tetrachlorophenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	0.33	500	0.33	mg/kg		0.048 U	0.217 U	0.0468 U	0.326 U	0.0461 U	0.21 U	0.0453 U	0.225 U	0.0461 U	0.045 U	0.0505 U	0.0458 U	0.0462 U	0.0445 U
2-Nitroaniline	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrophenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3&4-Methylphenol	0.33	500	0.33	mg/kg		0.0934 JD	0.217 U	0.0468 U	0.326 U	0.0461 U	0.21 U	0.0453 U	0.225 U	0.0461 U	0.045 U	0.0505 U	0.0458 U	0.0462 U	0.0445 U
3,3'-Dichlorobenzidine	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl phenyl ether	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl phenyl ether	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	20	500	98	mg/kg		5.27 D	0.217 U	0.0807 JD	0.326 U	0.0461 U	0.21 U	0.073 JD	0.225 U	0.0654 JD	0.132 D	0.452 D	0.0458 U	0.0462 U	0.0445 U
Acenaphthylene	100	500	107	mg/kg		1.21 D	0.217 U	0.068 JD	0.326 U	0.0461 U	0.21 U	0.561 D	0.225 U	0.0461 U	0.281 D	0.241 D	0.196 D	0.108 D	0.0445 U
Acetophenone	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aniline	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	100	500	1000	mg/kg		16.8 D	0.505 D	0.279 D	0.326 U	0.112 D	0.21 U	0.478 D	0.225 U	0.156 D	0.357 D	1.17 D	0.191 D	0.132 D	0.0445 U
Atrazine	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzaldehyde	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzidine	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo[a]anthracene	**1**	5.6	1	mg/kg		**31.6 D**	**3.52 D**	0.982 D	0.665 D	0.973 D	0.969 D	**1.47 D**	0.616 D	0.357 D	**1.11 D**	**12.5 D**	0.721 D	0.551 D	0.0445 U
Benzo[a]pyrene	**1**	1	22	mg/kg		**32 D**	**3.9 D**	**1.04 D**	0.784 D	**1.08 D**	**1.4 D**	**2.16 D**	0.609 D	0.341 D	**1.15 D**	**12.2 D**	0.737 D	0.528 D	0.0445 U
Benzo[b]fluoranthene	**1**	5.6	1.7	mg/kg		**26.5 D**	**4.21 D**	0.83 D	0.987 D	**1.37 D**	**1.73 D**	**2.35 D**	0.551 D	0.259 D	**1.02 D**	**11.2 D**	0.662 D	0.442 D	0.0445 U
Benzo[g,h,i]perylene	100	500	1000	mg/kg		20.4 D	3.08 D	0.653 D	0.665 D	0.891 D	1.22 D	1.86 D	0.405 JD	0.184 D	0.749 D	6.24 D	0.492 D	0.346 D	0.0445 U
Benzo[k]fluoranthene	**0.8**	56	1.7	mg/kg		**26.8 D**	**3.88 D**	**0.902 D**	**0.805 D**	**1.08 D**	**1.37 D**	**2.08 D**	0.555 D	0.289 D	**1 D**	**10.5 D**	0.624 D	0.468 D	0.0445 U
Benzoic Acid	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzyl Alcohol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloro-1-methylethyl)ether	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethoxy)methane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethyl) ether	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-ethylhexyl) phthalate	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butylbenzyl phthalate	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Caprolactam	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 3. Summary of Semivolatile Organic Compounds in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	Sample Designation:	SB-66B	SB-67A	SB-67B	SB-68A	SB-68B	SB-69A	SB-69B	SB-70A	SB-70B	SB-71A	SB-71B	SB-72A	SB-72B	SB-72C
					Sample Date:	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/14/2018	11/14/2018	11/14/2018	11/14/2018	11/14/2018	11/14/2018	11/14/2018
					Sample Depth (ft bls):	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Carbazole	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	**1**	56	1	mg/kg		**32.6 D**	**4.81 D**	**1.12 D**	0.899 D	**1.29 D**	**1.44 D**	**1.91 D**	0.634 D	0.365 D	**1.2 D**	**13.5 D**	0.755 D	0.55 D	0.0445 U
Dibenzo[a,h]anthracene	**0.33**	0.56	1000	mg/kg		**6.96 D**	**0.886 D**	0.232 D	0.326 U	**0.348 D**	**0.466 D**	**0.691 D**	0.225 U	0.047 JD	0.197 D	**2.78 D**	0.128 D	0.0892 JD	0.0445 U
Dibenzofuran	7	350	210	mg/kg		3.31 D	0.217 U	0.0468 U	0.326 U	0.0461 U	0.21 U	0.0453 U	0.225 U	0.05 JD	0.1 D	0.062 JD	0.0458 U	0.0462 U	0.0445 U
Diethyl phthalate	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl phthalate	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butyl phthalate	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octyl phthalate	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	100	500	1000	mg/kg		91.2 D	10.1 D	2.21 D	1.6 D	2.43 D	2.16 D	2.96 D	1.11 D	0.74 D	2.06 D	18.1 D	1.28 D	0.928 D	0.0445 U
Fluorene	30	500	386	mg/kg		5.31 D	0.294 JD	0.0926 JD	0.326 U	0.0461 U	0.21 U	0.0997 D	0.225 U	0.075 JD	0.143 D	0.273 D	0.0607 JD	0.0462 U	0.0445 U
Hexachlorobenzene	0.33	6	3.2	mg/kg		0.048 U	0.217 U	0.0468 U	0.326 U	0.0461 U	0.21 U	0.0453 U	0.225 U	0.0461 U	0.045 U	0.0505 U	0.0458 U	0.0462 U	0.0445 U
Hexachlorobutadiene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno[1,2,3-cd]pyrene	**0.5**	5.6	8.2	mg/kg		**20.3 D**	**2.84 D**	**0.601 D**	**0.691 D**	**0.885 D**	**1.18 D**	**1.72 D**	0.476 D	0.222 D	**0.832 D**	**7.71 D**	**0.547 D**	0.376 D	0.0445 U
Isophorone	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	12	500	12	mg/kg		0.476 D	0.217 U	0.103 D	0.326 U	0.0461 U	0.21 U	0.0453 U	0.225 U	0.0461 U	0.0732 JD	0.0505 U	0.0458 U	0.0462 U	0.0445 U
Nitrobenzene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodimethylamine	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodi-n-propylamine	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	**0.8**	6.7	0.8	mg/kg		0.048 U	0.217 U	0.0468 U	0.326 U	0.0461 U	0.21 U	0.0453 U	0.225 U	0.0461 U	0.045 U	0.0505 U	0.0458 U	0.0462 U	0.0445 U
Phenanthrene	100	500	1000	mg/kg		78 D	4.54 D	1.43 D	0.369 JD	0.642 D	0.429 D	1.16 D	0.759 D	0.707 D	1.6 D	5.17 D	0.807 D	0.541 D	0.0445 U
Phenols (Total)	--	--	--	mg/kg		0.048 U	0.217 U	0.0468 U	0.326 U	0.0461 U	0.21 U	0.0453 U	0.225 U	0.0461 U	0.045 U	0.0505 U	0.0458 U	0.0462 U	0.0445 U
Pyrene	**100**	500	1000	mg/kg		70.3 D	6.56 D	1.77 D	1.17 D	1.67 D	1.72 D	2.44 D	1.22 D	0.763 D	2.17 D	22.5 D	1.33 D	0.94 D	0.0445 U

Table 3. Summary of Semivolatile Organic Compounds in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	Sample Designation:	SB-73A	SB-73B	SB-73C	SB-74A	SB-74B	SB-75A	SB-75B	SB-76A	SB-76B	SB-77A	SB-77B	SB-77C
					Sample Date:	11/14/2018	11/14/2018	11/14/2018	11/15/2018	11/15/2018	11/15/2018	11/15/2018	11/15/2018	11/15/2018	11/15/2018	11/15/2018	11/15/2018
					Sample Depth (ft bls):	-	-	-	-	-	-	-	-	-	-	-	-
1,1'-Biphenyl	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4,5-Tetrachlorobenzene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Dichlorobenzene	1.1	500	1.1	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Diphenylhydrazine	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,3-Dichlorobenzene	2.4	280	2.4	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	1.8	130	1.8	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,3,4,6-Tetrachlorophenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,5-Trichlorophenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4,6-Trichlorophenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dichlorophenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dimethylphenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrophenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,4-Dinitrotoluene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2,6-Dinitrotoluene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chloronaphthalene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Chlorophenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylphenol	0.33	500	0.33	mg/kg		0.228 U	0.0473 U	0.0472 U	0.046 U	0.049 U	0.0443 U	0.0499 U	0.044 U	0.0494 U	0.0453 U	0.0477 U	0.0443 U
2-Nitroaniline	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Nitrophenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3&4-Methylphenol	0.33	500	0.33	mg/kg		0.228 U	0.0473 U	0.0472 U	0.046 U	0.049 U	0.0443 U	0.0499 U	0.044 U	0.0494 U	0.0453 U	0.0477 U	0.0443 U
3,3'-Dichlorobenzidine	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
3-Nitroaniline	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4,6-Dinitro-2-methylphenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Bromophenyl phenyl ether	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloro-3-methylphenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloroaniline	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chlorophenyl phenyl ether	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitroaniline	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Nitrophenol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	20	500	98	mg/kg		0.228 U	0.0611 JD	0.0472 U	0.046 U	0.049 U	0.0443 U	0.0499 U	0.0463 JD	0.0494 U	0.0918 D	0.0477 U	0.0443 U
Acenaphthylene	100	500	107	mg/kg		0.228 U	0.144 D	0.0472 U	0.0909 JD	0.049 U	0.0443 U	0.0499 U	0.0625 JD	0.0494 U	0.437 D	0.0477 U	0.0443 U
Acetophenone	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aniline	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	100	500	1000	mg/kg		0.228 U	0.263 D	0.0472 U	0.146 D	0.135 D	0.0443 U	0.0685 JD	0.168 D	0.0494 U	0.405 D	0.102 D	0.0443 U
Atrazine	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzaldehyde	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzidine	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo[a]anthracene	**1**	5.6	1	mg/kg		0.228 U	**1.04 D**	0.0472 U	0.581 D	0.316 D	0.155 D	0.222 D	0.573 D	0.126 D	**2.55 D**	0.408 D	0.0443 U
Benzo[a]pyrene	**1**	1	22	mg/kg		0.228 U	0.983 D	0.0472 U	0.578 D	0.225 D	0.138 D	0.216 D	0.546 D	0.198 D	**2.87 D**	0.346 D	0.0529 JD
Benzo[b]fluoranthene	**1**	5.6	1.7	mg/kg		0.228 U	0.9 D	0.0472 U	0.569 D	0.272 D	0.139 D	0.18 D	0.503 D	0.138 D	**2.65 D**	0.312 D	0.0459 JD
Benzo[g,h,i]perylene	100	500	1000	mg/kg		0.228 U	0.585 D	0.0472 U	0.435 D	0.166 D	0.0997 D	0.138 D	0.318 D	0.173 D	1.59 D	0.225 D	0.0443 U
Benzo[k]fluoranthene	**0.8**	56	1.7	mg/kg		0.228 U	0.796 D	0.0472 U	0.492 D	0.195 D	0.119 D	0.16 D	0.445 D	0.114 D	**2.3 D**	0.279 D	0.0443 U
Benzoic Acid	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzyl Alcohol	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloro-1-methylethyl)ether	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethoxy)methane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-chloroethyl) ether	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bis(2-ethylhexyl) phthalate	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Butylbenzyl phthalate	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Caprolactam	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 3. Summary of Semivolatile Organic Compounds in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	Sample Designation:	SB-73A	SB-73B	SB-73C	SB-74A	SB-74B	SB-75A	SB-75B	SB-76A	SB-76B	SB-77A	SB-77B	SB-77C
					Sample Date:	11/14/2018	11/14/2018	11/14/2018	11/15/2018	11/15/2018	11/15/2018	11/15/2018	11/15/2018	11/15/2018	11/15/2018	11/15/2018	11/15/2018
					Sample Depth (ft bls):	-	-	-	-	-	-	-	-	-	-	-	-
Carbazole	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	**1**	56	1	mg/kg		0.229 JD	**1.11 D**	0.0472 U	0.629 D	0.416 D	0.158 D	0.214 D	0.563 D	0.15 D	**2.4 D**	0.429 D	0.0443 U
Dibenzo[a,h]anthracene	**0.33**	0.56	1000	mg/kg		0.228 U	0.157 D	0.0472 U	0.121 D	0.049 U	0.0443 U	0.0499 U	0.13 D	0.0497 JD	**0.597 D**	0.0609 JD	0.0443 U
Dibenzofuran	7	350	210	mg/kg		0.228 U	0.0473 U	0.0472 U	0.046 U	0.049 U	0.0443 U	0.0499 U	0.044 U	0.0494 U	0.0453 U	0.0477 U	0.0443 U
Diethyl phthalate	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dimethyl phthalate	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-butyl phthalate	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Di-n-octyl phthalate	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	100	500	1000	mg/kg		0.251 JD	1.67 D	0.0472 U	1.25 D	0.682 D	0.332 D	0.434 D	1.23 D	0.188 D	3.62 D	0.827 D	0.0572 JD
Fluorene	30	500	386	mg/kg		0.228 U	0.0792 JD	0.0472 U	0.0513 JD	0.0547 JD	0.0443 U	0.0499 U	0.0533 JD	0.0494 U	0.0889 JD	0.0477 U	0.0443 U
Hexachlorobenzene	0.33	6	3.2	mg/kg		0.228 U	0.0473 U	0.0472 U	0.046 U	0.049 U	0.0443 U	0.0499 U	0.044 U	0.0494 U	0.0453 U	0.0477 U	0.0443 U
Hexachlorobutadiene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorocyclopentadiene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachloroethane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno[1,2,3-cd]pyrene	**0.5**	5.6	8.2	mg/kg		0.228 U	**0.673 D**	0.0472 U	0.383 D	0.143 D	0.0912 D	0.115 D	0.284 D	0.122 D	**1.57 D**	0.194 D	0.0443 U
Isophorone	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	12	500	12	mg/kg		0.228 U	0.0473 U	0.0472 U	0.046 U	0.0578 JD	0.0443 U	0.0499 U	0.044 U	0.0494 U	0.0453 U	0.0477 U	0.0443 U
Nitrobenzene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodimethylamine	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodi-n-propylamine	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
n-Nitrosodiphenylamine	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	**0.8**	6.7	0.8	mg/kg		0.228 U	0.0473 U	0.0472 U	0.046 U	0.049 U	0.0443 U	0.0499 U	0.044 U	0.0494 U	0.0453 U	0.0477 U	0.0443 U
Phenanthrene	100	500	1000	mg/kg		0.228 U	1.04 D	0.0472 U	0.743 D	0.628 D	0.183 D	0.276 D	0.766 D	0.119 D	1.47 D	0.551 D	0.0443 U
Phenols (Total)	--	--	--	mg/kg		0.228 U	0.0473 U	0.0472 U	0.046 U	0.049 U	0.0443 U	0.0499 U	0.044 U	0.0494 U	0.0453 U	0.0477 U	0.0443 U
Pyrene	**100**	500	1000	mg/kg		0.345 JD	1.82 D	0.0472 U	1.04 D	0.643 D	0.298 D	0.416 D	1.05 D	0.21 D	3.62 D	0.82 D	0.0565 JD

Table 4. Summary of Metals in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	Sample Designation:	COMPOSITE	Dup 1114	SB-31D	SB-31S	SB-32D	SB-32D1	SB-32S	SB-33D	SB-33S	SB-34D	SB-34S	SB-35D	SB-35S	SB-36D
					Sample Date:	12/20/2017	11/15/2018	12/18/2017	12/18/2017	12/18/2017	12/18/2017	12/18/2017	12/18/2017	12/18/2017	12/18/2017	12/18/2017	12/18/2017	12/18/2017	12/18/2017
					Sample Depth (ft bls):	-	-	8 - 8.5	2 - 2.5	8 - 8.5	12 - 12.5	2 - 2.5	8 - 8.5	2 - 2.5	8 - 8.5	2 - 2.5	8 - 8.5	2 - 2.5	8 - 8.5
Aluminum	--	--	--	mg/kg		9330	6000	9390	6320	7010	10000	10800	8210	5210	10000	7810	10100	9100	9550
Antimony	--	--	--	mg/kg		4.31	25.7	0.864	0.831	1.94	0.332 J	1.97	1.86	2.16	0.616	2.36	0.612 U	0.765	0.656
Arsenic	**13**	16	16	mg/kg		9.55	9.21	5.53	3.84	6.04	3.44	**14.3**	**19.2**	**21.7**	5.72	8.42	4.28	**78.4**	1.96
Barium	**350**	400	820	mg/kg		**718**	**420**	218	**385**	91	45.6	**935**	**508**	**707**	52.9	283	67.7	**696**	52.6
Beryllium	7.2	590	47	mg/kg		0.759	0.054 U	0.483 J	0.359 J	0.48 J	0.42 J	1.64	0.349 J	0.607 U	0.495 J	1.76	0.538 J	0.463 J	0.52 J
Cadmium	**2.5**	9.3	7.5	mg/kg		1.11	**11.3**	0.62 U	0.451 J	0.583 U	0.63 U	1.43	1.25	1.3	0.589 U	1.31	0.612 U	0.538 J	0.614 U
Calcium	--	--	--	mg/kg		26100	17300	19900	54400	5850	1500	40900	72000	59600	2230	11700	4170	54500	3680
Chromium, Hexavalent	**1**	400	19	mg/kg		NA	**142**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium, Trivalent	**30**	1500	--	mg/kg		NA	**1230**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chromium	**30**	1500	--	mg/kg		**66.5**	**1370**	18.6	**41.5**	12.3	16.3	**34.6**	19.5	11.6	21.7	**39**	17.9	19	18.1
Cobalt	--	--	--	mg/kg		10	18	6.99	5.01	8.01	7.04	14	5.4	3.99	7.71	17.4	7.09	5.73	6.18
Copper	**50**	270	1720	mg/kg		**83.9**	**191**	28.3	14.8	25.4	16.8	**172**	35.5	22.7	15.1	**322**	14.7	33.5	22.5
Cyanide	27	27	40	mg/kg		NA	0.719	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Iron	--	--	--	mg/kg		21300	35800	19700	13200	16200	17300	29400	20000	12100	19700	26400	18400	15200	17400
Lead	**63**	1000	450	mg/kg		**745**	**2900**	**167**	**566**	**98.7**	38	**970**	**2360**	**2730**	34.3	**592**	**79.7**	**620**	16.9
Magnesium	--	--	--	mg/kg		5330	2690	5080	3920	2940	3390	4640	7270	3150	3410	2550	3740	8220	4210
Manganese	1600	10000	2000	mg/kg		351	306	322	237	443	142	366	277	205	171	301	354	295	254
Mercury	**0.18**	2.8	0.73	mg/kg		**0.327**	**0.474**	**0.241**	**0.346**	0.156	0.066	**0.65**	**1.41**	**1.59**	0.063	**0.422**	0.091	**0.421**	0.025 U
Nickel	**30**	310	130	mg/kg		26.3	**134**	18.7	14.1	**95.2**	18.1	28.6	11.2	8.32	17.9	**44**	16.5	13.1	17.7
Potassium	--	--	--	mg/kg		2090	1730	1880	1610	1170	1200	2250	2370	1250	1500	1100	1650	2330	1620
Selenium	**3.9**	1500	4	mg/kg		2.04	2.68 U	2.36	1.04	1.12	1.65	1.8	3.12	2.42	2.37	1.54	2.4	0.676	1.55
Silver	**2**	1500	8.3	mg/kg		0.31 J	**15.9**	0.62 U	0.617 U	0.583 U	0.63 U	0.311 J	0.254 J	0.338 J	0.589 U	0.255 J	0.612 U	0.571 U	0.614 U
Sodium	--	--	--	mg/kg		436	617	468	380	416	174	1050	1150	348	246	483	211	1030	729
Thallium	--	--	--	mg/kg		0.31 J	2.68 U	0.62 U	0.315 J	0.583 U	0.63 U	0.273 J	0.617 U	0.607 U	0.589 U	0.58 U	0.612 U	0.571 U	0.614 U
Vanadium	--	--	--	mg/kg		31	36.9	26.1	19	19.1	19.4	33.4	27.9	15.8	28.5	28.2	21.9	21.7	23.4
Zinc	**109**	10000	2480	mg/kg		**667**	**3070**	**246**	**1070**	**119**	53.1	**1760**	**963**	**1260**	53.5	**2290**	58.6	**470**	53.8

Table 4. Summary of Metals in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	Sample Designation:	SB-36S	SB-37D	SB-37S	SB42-A	SB42-B	SB43-A	SB43-B	SB-56A	SB-56B	SB-56C	SB-57A	SB-57B	SB-57C	SB-58A	SB-58B
					Sample Date:	12/18/2017	12/18/2017	12/18/2017	5/15/2018	5/15/2018	5/15/2018	5/15/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018
					Sample Depth (ft bls):	2 - 2.5	8 - 8.5	2 - 2.5	-	-	-	-	-	-	-	-	-	-	-	-
Aluminum	--	--	--	mg/kg		7940	8180	8900	7210	6480	7890	19600	6720	2680	6610	4020	4760	9920	3530	4520
Antimony	--	--	--	mg/kg		0.695	0.287 J	2.77	2.88	0.558 U	2.81	0.573 U	2.83 U	3.33	2.87 U	2.79 U	2.93 U	2.91 U	2.56 U	18.1
Arsenic	**13**	16	16	mg/kg		5.38	2.45	11	9.87	1.12 U	6.26	1.15 U	10	11.8	2.28	13	1.76 U	2.16	1.54 U	12.7
Barium	**350**	400	820	mg/kg		**524**	84	**680**	**465**	46.8	**1410**	141	**1540**	89.9	85.2	**945**	178	73.5	20	**546**
Beryllium	7.2	590	47	mg/kg		0.448 J	0.404 J	0.761	1.8	0.141	0.239	0.115 U	0.683	0.167	0.057 U	0.056 U	0.301	0.058 U	0.051 U	0.064 U
Cadmium	**2.5**	9.3	7.5	mg/kg		0.593	0.588 U	2.01	1.68	0.335 U	0.857	0.344 U	1.34	0.783	2.42	0.749	**7.19**	0.735	0.308 U	**3.61**
Calcium	--	--	--	mg/kg		41400	6930	45400	27700	978	38300	3260	55100	21100	16100	61100	21400	43000	549	6640
Chromium, Hexavalent	**1**	400	19	mg/kg		NA	NA	NA	NA	NA	NA	NA	**2.72**	0.567 U	0.574 U	0.557 U	0.586 U	0.582 U	0.513 U	0.637 U
Chromium, Trivalent	**30**	1500	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	22.3	7.81	12.1	9.71	13.1	12.5	6.53	17.6
Chromium	**30**	1500	--	mg/kg		21	15.9	**44.9**	**121**	13.8	20.9	**34.7**	25	7.81	12.1	9.71	13.1	12.5	6.53	17.6
Cobalt	--	--	--	mg/kg		6.1	6.21	10.8	19.5	6.77	7.67	15	8.94	4.01	8.14	6.51	12.4	42.1	4.52	8.27
Copper	**50**	270	1720	mg/kg		27.1	19.3	**147**	**229**	18	**54.1**	**57.2**	**76.4**	**481**	45	16	**116**	**855**	7.22	**331**
Cyanide	27	27	40	mg/kg		NA	NA	NA	NA	NA	NA	NA	0.776	1.13	0.574 U	0.607	0.586 U	0.582 U	0.513 U	1.45
Iron	--	--	--	mg/kg		14900	16000	30900	43800	12200	14000	29100	13500	15400	20800	8650	84700	21500	9280	23500
Lead	**63**	1000	450	mg/kg		**1020**	**94.3**	**751**	**3630**	54.6	**1070**	**161**	**896**	**430**	**200**	**627**	**381**	52	2.63	**1220**
Magnesium	--	--	--	mg/kg		3920	3070	6150	4090	2680	4490	10600	4540	4660	6450	4380	610	13600	1710	1850
Manganese	1600	10000	2000	mg/kg		306	353	348	370	325	253	383	303	111	360	232	446	657	165	404
Mercury	**0.18**	2.8	0.73	mg/kg		0.027 U	**0.274**	**0.467**	**0.782**	0.104	**1.14**	**1.31**	**0.719**	**0.375**	**0.298**	**0.38**	**0.39**	**0.253**	0.0308 U	**1.68**
Nickel	**30**	310	130	mg/kg		16	14.1	27.4	**48.4**	12.5	17.8	**39.2**	18.3	24.6	20.8	10.4	**90.4**	**2330**	9.26	24.5
Potassium	--	--	--	mg/kg		2270	1400	1650	2540	1270	1360	4470	1620	447	1870	937	800	1460	1220	709
Selenium	**3.9**	1500	4	mg/kg		1.46	1.41	1.62	1.11 U	1.12 U	1.13 U	1.15 U	2.83 U	2.84 U	2.87 U	2.79 U	2.93 U	2.91 U	2.56 U	3.19 U
Silver	**2**	1500	8.3	mg/kg		0.588 U	0.588 U	0.357 J	0.557 U	0.558 U	0.565 U	0.573 U	0.567 U	0.567 U	0.574 U	0.557 U	0.586 U	0.582 U	0.513 U	0.637 U
Sodium	--	--	--	mg/kg		342	325	889	411	1200	765	1240	522	816	519	253	867	858	178	995
Thallium	--	--	--	mg/kg		0.588 U	0.588 U	0.617 U	1.11 U	1.12 U	1.13 U	1.15 U	2.83 U	2.84 U	2.87 U	2.79 U	5.03	2.91 U	2.56 U	3.19 U
Vanadium	--	--	--	mg/kg		23	22.7	29	36.5	16.8	29.9	37.5	20	14.7	19.1	11	25.9	18.5	8.03	20.5
Zinc	**109**	10000	2480	mg/kg		**587**	71.4	**1120**	**1730**	32.5	**680**	**161**	**1330**	**315**	**354**	**803**	**874**	**947**	16	**1290**

Table 4. Summary of Metals in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	Sample Designation: / Sample Date: / Sample Depth (ft bls):	SB-58C 11/13/2018 -	SB-59A 11/13/2018 -	SB-59B 11/13/2018 -	SB-59C 11/13/2018 -	SB-60A 11/13/2018 -	SB-60B 11/13/2018 -	SB-60C 11/13/2018 -	SB-61A 11/13/2018 -	SB-61B 11/13/2018 -	SB-61C 11/13/2018 -	SB-64A 11/13/2018 -	SB-64B 11/13/2018 -	SB-65A 11/13/2018 -	SB-65B 11/13/2018 -
Aluminum	--	--	--	mg/kg		6640	4660	9530	5260	5460	7260	8620	7310	5100	8070	4240	7640	6970 B	3190 B
Antimony	--	--	--	mg/kg		2.96 U	2.72	2.74 U	2.58 U	2.63 U	2.82 U	2.91 U	2.69 U	2.93 U	4.56	2.6 U	2.79 U	2.76 U	2.58 U
Arsenic	**13**	16	16	mg/kg		6.01	5.36	7.64	1.55 U	3.33	4.87	12.5	3.91	3.96	**19.6**	1.69	8.18	10.8 B	3.54 B
Barium	**350**	400	820	mg/kg		**653**	279	**594**	66.8	244	**466**	202	263	**709**	**573**	14.2	**740**	**835**	43.6
Beryllium	7.2	590	47	mg/kg		0.059 U	0.054 U	2.36	0.052 U	0.271	0.056 U	0.13	1.42	0.059 U	0.203	0.052 U	0.056 U	0.055 U	0.052 U
Cadmium	**2.5**	9.3	7.5	mg/kg		2.34	1.82	1.85	0.31 U	0.981	1.39	0.857	1.24	1.24	**2.79**	0.481	1.42	1.14	0.31 U
Calcium	--	--	--	mg/kg		45200	12000	20900	16800	15500	15100	15900	16200	20600	8410	58900	48500	53500	13900
Chromium, Hexavalent	**1**	400	19	mg/kg		0.593 U	0.537 U	0.548 U	0.516 U	0.527 U	0.565 U	0.582 U	0.537 U	0.586 U	0.613 U	0.52 U	0.559 U	0.553 U	0.516 U
Chromium, Trivalent	**30**	1500	--	mg/kg		11.8	**110**	**44**	14	15.8	20.9	11.2	26.6	24	**37.2**	3.32	28.8	22	7.82
Chromium	**30**	1500	--	mg/kg		11.8	**110**	**44**	14	15.8	20.9	11.2	26.6	24	**37.2**	3.32	25.8	22	7.82
Cobalt	--	--	--	mg/kg		8.93	9.5	19.9	6.51	7.11	8.9	5.85	15.6	8.98	9.63	5.31	7.33	8.8	3.72
Copper	**50**	270	1720	mg/kg		**63.2**	**181**	**280**	9.75	**74**	**176**	**54.6**	**231**	**152**	**247**	25.5	**54.7**	**86**	**69.5**
Cyanide	27	27	40	mg/kg		0.593 U	0.693	0.548 U	0.516 U	0.527 U	0.565 U	0.582 U	0.543	0.586 U	2.23	0.52 U	0.559 U	0.912	0.516 U
Iron	--	--	--	mg/kg		13400	17300	25700	8340	12900	16600	10600	27200	44500	29100	9550	19900	16200	7620
Lead	**63**	1000	450	mg/kg		**2200**	**897**	**1050**	4.19	**411**	**772**	**691**	**596**	**2450**	**1670**	23.9	**686**	**1910**	19.6
Magnesium	--	--	--	mg/kg		3530	2010	3190	4780	2730	2590	2480	2890	1740	2900	29700	5400	5730	7520
Manganese	1600	10000	2000	mg/kg		326	282	325	559	226	240	362	290	323	416	134	299	276	140
Mercury	**0.18**	2.8	0.73	mg/kg		**0.572**	**0.957**	**0.734**	0.031 U	**0.339**	**1.02**	**0.224**	**0.469**	**2.53**	**4.78**	0.0332	**0.493**	**1.75**	**0.224**
Nickel	**30**	310	130	mg/kg		13.2	26.9	**42.4**	10.1	16.7	29.5	11.3	**46.6**	27.3	28.4	5.97	20.7	16.7	11.1
Potassium	--	--	--	mg/kg		1880	1160	2300	921	1370	1680	808	2380	668	894	591	1600	1470	635
Selenium	**3.9**	1500	4	mg/kg		2.96 U	2.69 U	2.74 U	2.58 U	2.63 U	2.82 U	2.91 U	2.69 U	2.93 U	3.07 U	**11.2**	2.79 U	2.76 U	2.58 U
Silver	**2**	1500	8.3	mg/kg		0.593 U	0.537 U	0.548 U	0.516 U	0.527 U	0.565 U	0.582 U	0.537 U	0.586 U	0.613 U	0.52 U	0.559 U	0.553 U	0.516 U
Sodium	--	--	--	mg/kg		901	705	1170	491	288	332	1130	538	1460	1270	746	757	498	494
Thallium	--	--	--	mg/kg		2.96 U	2.69 U	2.74 U	2.58 U	2.63 U	2.82 U	2.91 U	2.69 U	2.93 U	3.07 U	2.6 U	2.79 U	2.76 U	2.58 U
Vanadium	--	--	--	mg/kg		21.4	23.3	31	20.5	19	48.5	21.5	31.6	14.6	25.9	36.5	24.7	31.3	10.1
Zinc	**109**	10000	2480	mg/kg		**1160**	**897**	**2240**	79	**372**	**450**	**354**	**1330**	**425**	**833**	23.9	**572**	**594 B**	38.1 B

Table 4. Summary of Metals in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	Sample Designation: / Sample Date: / Sample Depth (ft bls):	SB-66A 11/13/2018 -	SB-66B 11/13/2018 -	SB-67A 11/13/2018 -	SB-67B 11/13/2018 -	SB-68A 11/13/2018 -	SB-68B 11/13/2018 -	SB-69A 11/13/2018 -	SB-69B 11/13/2018 -	SB-70A 11/14/2018 -	SB-70B 11/14/2018 -	SB-71A 11/14/2018 -	SB-71B 11/14/2018 -	SB-72A 11/14/2018 -	SB-72B 11/14/2018 -
Aluminum	--	--	--	mg/kg		3540 B	10500 B	3200 B	10200 B	2760 B	6630 B	8220 B	8020 B	6230	8780	7990	10400	8240	6790
Antimony	--	--	--	mg/kg		2.7 U	2.88 U	2.6 U	2.81 U	2.57 U	2.76 U	2.51 U	2.71 U	2.69 U	2.77 U	4.32	3.02 U	2.74 U	2.77 U
Arsenic	**13**	16	16	mg/kg		2.65 B	1.73 U	2.03 B	1.69 U	2.63 B	2.33 B	1.51 U	8.33 B	4.52	2.01	10.3	8.65	**39.6**	1.66 U
Barium	**350**	400	820	mg/kg		67.9	88	19.7	266	115	127	13	**425**	**530**	71.3	**717**	283	**433**	134
Beryllium	7.2	590	47	mg/kg		0.054 U	0.058 U	0.052 U	0.056 U	0.051 U	0.055 U	0.05 U	0.054 U	0.855	0.055 U	2.03	0.513	4.34	0.484
Cadmium	**2.5**	9.3	7.5	mg/kg		0.324 U	0.569	0.312 U	0.437	0.677	0.442	0.304	1.58	1.59	0.332 U	**3.81**	1.62	1.29	0.333 U
Calcium	--	--	--	mg/kg		7440	29700	31200	3250	59400	49600	50300	13300	30700	9990	34300	6960	25500	3230
Chromium, Hexavalent	**1**	400	19	mg/kg		0.54 U	0.576 U	**4.49**	0.562 U	0.514 U	0.551 U	0.503 U	0.542 U	0.537 U	0.553 U	**12.5**	**3.04**	0.548 U	**2.4**
Chromium, Trivalent	**30**	1500	--	mg/kg		7.08	19.1	15.8	20.5	9.98	14.4	2.19	**43.1**	**55.3**	14.2	**180**	**223**	**40.5**	15.9
Chromium	**30**	1500	--	mg/kg		7.08	19.1	15.8	25	9.98	14.3	2.19	**43.1**	**55.3**	14.2	**193**	**226**	**40.5**	18.3
Cobalt	--	--	--	mg/kg		4.43	7.69	4.67	16.8	4.25	7.74	10.2	14.6	26.2	7.13	21.9	10.1	13.1	7.62
Copper	**50**	270	1720	mg/kg		17.2	43.8	34.4	**72.2**	**56.7**	39.6	**59.6**	**144**	**329**	37	**385**	**100**	**232**	**61.1**
Cyanide	27	27	40	mg/kg		0.54 U	0.576 U	0.519 U	0.742	0.751	0.551 U	25.1	0.726	0.537 U	0.553 U	0.56	0.604 U	1.26	0.555 U
Iron	--	--	--	mg/kg		6260	17000	9490	24300	7880	14700	19300	26000	25500	14600	36000	22100	24100	12100
Lead	**63**	1000	450	mg/kg		**126**	**533**	**81.8**	**160**	**179**	57.5	8.9	**3420**	**944**	**153**	**1830**	**531**	**1090**	**458**
Magnesium	--	--	--	mg/kg		1580	3160	16500	6090	28000	7950	27300	4460	4670	2800	3460	2600	5330	2160
Manganese	1600	10000	2000	mg/kg		223	223	123	468	107	153	205	263	297	179	337	355	343	267
Mercury	**0.18**	2.8	0.73	mg/kg		0.0608	0.0897	0.0597	**0.228**	0.171	0.056	0.0302 U	**0.572**	**0.475**	**0.2**	**0.52**	**0.322**	**0.643**	0.0856
Nickel	**30**	310	130	mg/kg		7.71	17.8	8.56	**34**	9.33	10.5	6.64	**39**	**39.9**	14.9	**71.9**	**35.2**	29.7	16.1
Potassium	--	--	--	mg/kg		1190	2730	504	6760	504	3680	355	3430	1550 B	1560 B	1650 B	1450 B	1100 B	919 B
Selenium	**3.9**	1500	4	mg/kg		2.7 U	2.88 U	3.3	2.81 U	**11.2**	2.76 U	2.51 U	2.71 U	2.69 U	2.77 U	2.69 U	3.02 U	2.74 U	2.77 U
Silver	**2**	1500	8.3	mg/kg		0.54 U	0.576 U	0.519 U	0.562 U	0.514 U	0.551 U	0.503 U	0.542 U	0.537 U	0.553 U	0.538 U	**2.28**	0.548 U	**3.73**
Sodium	--	--	--	mg/kg		474	672	396	352	343	879	1110	350	851	407	664	1550	874	497
Thallium	--	--	--	mg/kg		2.7 U	2.88 U	2.6 U	2.81 U	2.57 U	2.76 U	2.51 U	2.71 U	2.69 U	2.77 U	2.69 U	3.02 U	2.74 U	2.77 U
Vanadium	--	--	--	mg/kg		10	24.1	29.6	44	19.1	35.3	54.8	36.6	37.8	19	41.4	32.2	26.4	16.6
Zinc	**109**	10000	2480	mg/kg		**169 B**	80.2 B	40.6 B	76.7 B	**253 B**	79.4 B	13.5 B	**860 B**	**1990**	70.6	**2570**	**588**	**1560**	**344**

Table 4. Summary of Metals in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	Sample Designation: / Sample Date: / Sample Depth (ft bls):	SB-72C 11/14/2018 -	SB-73A 11/14/2018 -	SB-73B 11/14/2018 -	SB-73C 11/14/2018 -	SB-74A 11/15/2018 -	SB-74B 11/15/2018 -	SB-75A 11/15/2018 -	SB-75B 11/15/2018 -	SB-76A 11/15/2018 -	SB-76B 11/15/2018 -	SB-77A 11/15/2018 -	SB-77B 11/15/2018 -	SB-77C 11/15/2018 -
Aluminum	--	--	--	mg/kg		3910	8200	5090	7520	6550	2170	5730	10700	6330	5640	15000	9940	5700
Antimony	--	--	--	mg/kg		2.67 U	2.72 U	2.84 U	2.8 U	10.4	34	2.65 U	4.89	2.63 U	2.95 U	5.89	3.1	2.66 U
Arsenic	**13**	16	16	mg/kg		1.6 U	9.18	**42.6**	1.68 U	9.07	3.38	3.57	4.41	4.43	5.98	8.18	3.12	1.59 U
Barium	**350**	400	820	mg/kg		34	**421**	217	54.7	**587**	159	139	208	309	77.1	**497**	166	50.6
Beryllium	7.2	590	47	mg/kg		0.053 U	0.277	0.374	0.081	1.06	0.059 U	0.057	0.06 U	0.211	0.132	**10.3**	0.191	0.055
Cadmium	**2.5**	9.3	7.5	mg/kg		0.321 U	0.664	0.42	0.363	1.16	**22.6**	0.627	1.8	0.903	0.464	0.857	0.444	0.319 U
Calcium	--	--	--	mg/kg		1080	57700	9290	12200	34500	1050	15700	21500	21100	2630	15800	42000	1110
Chromium, Hexavalent	**1**	400	19	mg/kg		0.534 U	0.545 U	0.568 U	0.561 U	0.548 U	0.586 U	0.53 U	0.597 U	0.526 U	0.589 U	0.544 U	0.571 U	0.531 U
Chromium, Trivalent	**30**	1500	--	mg/kg		7.55	12.5	14	12.8	22.5	**177**	11.9	**45**	15.4	10.6	**146**	17.3	9.96
Chromium	**30**	1500	--	mg/kg		7.55	12.5	14	12.8	22.5	**177**	11.9	**45**	15.4	10.6	**146**	17.3	9.96
Cobalt	--	--	--	mg/kg		4.15	7.31	6.09	7.08	9.09	24.8	5.42	6.12	5.41	6.19	77.5	8.13	5.43
Copper	**50**	270	1720	mg/kg		9.3	**106**	**141**	23.5	**170**	**1380**	47.3	37.2	**69.7**	**76.6**	**1870**	**82.2**	13.2
Cyanide	27	27	40	mg/kg		0.534 U	0.67	0.573	0.561 U	1.18	0.703	0.53 U	0.597 U	0.737	0.589 U	0.914	0.571 U	0.531 U
Iron	--	--	--	mg/kg		7290	17300	16000	12200	14000	109000	11800	20100	10500	16200	74200	15900	10100
Lead	**63**	1000	450	mg/kg		3.62	**656**	**283**	19.9	**1770**	**2680**	**268**	**2300**	**514**	**90.6**	**1480**	**432**	8.95
Magnesium	--	--	--	mg/kg		1550	9100	1460	2310	2810	308	3180	3280	3790	1830	4920	3760	1770
Manganese	1600	10000	2000	mg/kg		214	273	129	284	263	400	228	110	225	246	663	255	157
Mercury	**0.18**	2.8	0.73	mg/kg		0.0321 U	**0.259**	**0.588**	0.0538	**0.375**	**0.471**	**0.203**	**0.329**	**0.249**	**0.313**	**0.615**	**0.467**	**0.209**
Nickel	**30**	310	130	mg/kg		8.08	19.6	17.3	**35.7**	22.2	**76.5**	14	**33.4**	12.6	18	**185**	20.8	11.1
Potassium	--	--	--	mg/kg		837 B	2280 B	756 B	1260 B	1260 B	562 B	1230 B	2590 B	860 B	817 B	1620 B	1610 B	1110 B
Selenium	**3.9**	1500	4	mg/kg		2.67 U	2.72 U	2.84 U	2.8 U	2.74 U	2.93 U	2.65 U	2.99 U	2.63 U	2.95 U	2.72 U	2.85 U	2.66 U
Silver	**2**	1500	8.3	mg/kg		0.534 U	0.545 U	0.568 U	0.561 U	0.548 U	**2.76**	0.53 U	0.597 U	0.526 U	0.589 U	0.544 U	0.571 U	0.531 U
Sodium	--	--	--	mg/kg		321	2530	889	701	559	1320	458	1110	452	313	2120	1240	331
Thallium	--	--	--	mg/kg		2.67 U	2.72 U	2.84 U	2.8 U	2.74 U	2.93 U	2.65 U	2.99 U	2.63 U	2.95 U	2.72 U	2.85 U	2.66 U
Vanadium	--	--	--	mg/kg		11.3	25.9	17	17	27.4	20.8	20.5	28.1	19.3	16.4	43.4	21.2	15
Zinc	**109**	10000	2480	mg/kg		51.2	**479**	**275**	**186**	**1170**	**6980 D**	**190**	**130**	**476**	**365**	**14600 D**	**553**	22.8

Table 5. Summary of Polychlorinated Biphenyls in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	**Sample Designation:**	COMPOSITE	Dup 1114	HL-1	SB-11	SB-12	SB-13	SB-15	SB-19	SB-31D	SB-31S	SB-32D	SB-32D1	SB-32S	SB-33D
					Sample Date:	12/20/2017	11/15/2018	5/22/2019	10/24/2017	10/24/2017	10/24/2017	10/24/2017	10/24/2017	12/18/2017	12/18/2017	12/18/2017	12/18/2017	12/18/2017	12/18/2017
					Sample Depth (ft bls):	-	-	-	-	-	-	-	-	8 - 8.5	2 - 2.5	8 - 8.5	12 - 12.5	2 - 2.5	8 - 8.5
Aroclor-1016	--	--	--	mg/kg		0.022 U	0.0179 U	5 U	0.024 U	0.022 U	0.021 U	0.021 U	0.021 U	0.07 U	0.069 U	0.065 U	0.025 U	0.064 U	0.069 U
Aroclor-1221	--	--	--	mg/kg		0.022 U	0.0179 U	5 U	0.024 U	0.022 U	0.021 U	0.021 U	0.021 U	0.07 U	0.069 U	0.065 U	0.025 U	0.064 U	0.069 U
Aroclor-1232	--	--	--	mg/kg		0.022 U	0.0179 U	5 U	0.024 U	0.022 U	0.021 U	0.021 U	0.021 U	0.07 U	0.069 U	0.065 U	0.025 U	0.064 U	0.069 U
Aroclor-1242	--	--	--	mg/kg		0.022 U	0.0179 U	5 U	0.024 U	0.022 U	0.021 U	0.021 U	0.021 U	0.07 U	0.069 U	0.065 U	0.025 U	0.064 U	0.069 U
Aroclor-1248	--	--	--	mg/kg		0.022 U	0.0179 U	5 U	0.024 U	0.022 U	0.021 U	0.021 U	0.021 U	0.07 U	0.069 U	0.065 U	0.025 U	0.064 U	0.069 U
Aroclor-1254	--	--	--	mg/kg		0.022 U	0.0179 U	5 U	0.024 U	0.022 U	0.021 U	0.021 U	0.021 U	0.07 U	0.069 U	0.065 U	0.025 U	0.064 U	0.069 U
Aroclor-1260	--	--	--	mg/kg		0.022 U	0.031	5 U	0.024 U	0.022 U	0.021 U	0.021 U	0.021 U	0.07 U	0.069 U	0.065 U	0.025 U	0.064 U	0.069 U
Aroclor-1262	--	--	--	mg/kg		0.022 U	NA	NA	0.024 U	0.022 U	0.021 U	0.021 U	0.021 U	0.07 U	0.069 U	0.065 U	0.025 U	0.064 U	0.069 U
Aroclor-1268	--	--	--	mg/kg		0.022 U	NA	NA	0.024 U	0.022 U	0.021 U	0.021 U	0.021 U	0.07 U	0.069 U	0.065 U	0.025 U	0.064 U	0.069 U
Aroclor (Total)	0.1	1	3.2	mg/kg		0.022 U	0.031	5 U	0.024 U	0.022 U	0.021 U	0.021 U	0.021 U	0.07 U	0.069 U	0.065 U	0.025 U	0.064 U	0.069 U

Table 5. Summary of Polychlorinated Biphenyls in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	**Sample Designation:**	SB-33S	SB-34D	SB-34S	SB-35D	SB-35S	SB-36D	SB-36S	SB-37D	SB-37S	SB-38(D)	SB-38(S)	SB-39(D)	SB-39(S)	SB-40(D)
					Sample Date:	12/18/2017	12/18/2017	12/18/2017	12/18/2017	12/18/2017	12/18/2017	12/18/2017	12/18/2017	12/18/2017	12/20/2017	12/20/2017	12/20/2017	12/20/2017	12/20/2017
					Sample Depth (ft bls):	2 - 2.5	8 - 8.5	2 - 2.5	8 - 8.5	2 - 2.5	8 - 8.5	2 - 2.5	8 - 8.5	2 - 2.5	-	-	-	-	-
Aroclor-1016	--	--	--	mg/kg		0.023 U	0.022 U	0.065 U	0.023 U	0.065 U	0.023 U	0.022 U	0.022 U	0.067 U	0.022 U	0.021 U	0.066 U	0.022 U	0.067 U
Aroclor-1221	--	--	--	mg/kg		0.023 U	0.022 U	0.065 U	0.023 U	0.065 U	0.023 U	0.022 U	0.022 U	0.067 U	0.022 U	0.021 U	0.066 U	0.022 U	0.067 U
Aroclor-1232	--	--	--	mg/kg		0.023 U	0.022 U	0.065 U	0.023 U	0.065 U	0.023 U	0.022 U	0.022 U	0.067 U	0.022 U	0.021 U	0.066 U	0.022 U	0.067 U
Aroclor-1242	--	--	--	mg/kg		0.023 U	0.022 U	0.065 U	0.023 U	0.065 U	0.023 U	0.022 U	0.022 U	0.067 U	0.022 U	0.021 U	0.066 U	0.022 U	0.067 U
Aroclor-1248	--	--	--	mg/kg		0.023 U	0.022 U	0.065 U	0.023 U	0.065 U	0.023 U	0.022 U	0.022 U	0.067 U	0.022 U	0.021 U	0.066 U	0.022 U	0.067 U
Aroclor-1254	--	--	--	mg/kg		0.023 U	0.022 U	0.065 U	0.023 U	0.065 U	0.023 U	0.022 U	0.022 U	0.067 U	0.022 U	0.021 U	0.066 U	0.022 U	0.067 U
Aroclor-1260	--	--	--	mg/kg		0.023 U	0.022 U	0.065 U	0.023 U	0.065 U	0.023 U	0.022 U	0.022 U	0.067 U	0.022 U	0.021 U	0.066 U	0.022 U	0.067 U
Aroclor-1262	--	--	--	mg/kg		0.023 U	0.022 U	0.065 U	0.023 U	0.065 U	0.023 U	0.022 U	0.022 U	0.067 U	0.022 U	0.021 U	0.066 U	0.022 U	0.067 U
Aroclor-1268	--	--	--	mg/kg		0.023 U	0.022 U	0.065 U	0.023 U	0.065 U	0.023 U	0.022 U	0.022 U	0.067 U	0.022 U	0.021 U	0.066 U	0.022 U	0.067 U
Aroclor (Total)	0.1	1	3.2	mg/kg		0.023 U	0.022 U	0.065 U	0.023 U	0.065 U	0.023 U	0.022 U	0.022 U	0.067 U	0.022 U	0.021 U	0.066 U	0.022 U	0.067 U

Table 5. Summary of Polychlorinated Biphenyls in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	**Sample Designation:**	SB-40(S)	SB42-A	SB42-B	SB43-A	SB43-B	SB-5	SB-56A	SB-56B	SB-56C	SB-57A	SB-57B	SB-57C	SB-58A	SB-58B	SB-58C
					Sample Date:	12/20/2017	5/15/2018	5/15/2018	5/15/2018	5/15/2018	10/23/2017	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018
					Sample Depth (ft bls):	-	-	-	-	-	15 - 15.5	-	-	-	-	-	-	-	-	-
Aroclor-1016	--	--	--	mg/kg		0.022 U	0.0186 U	0.0186 U	0.0188 U	0.0191 U	0.047 U	0.0189 U	0.0189 U	0.0191 U	0.0186 U	0.0195 U	0.0194 U	0.0171 U	0.0212 U	0.0197 U
Aroclor-1221	--	--	--	mg/kg		0.022 U	0.0186 U	0.0186 U	0.0188 U	0.0191 U	0.047 U	0.0189 U	0.0189 U	0.0191 U	0.0186 U	0.0195 U	0.0194 U	0.0171 U	0.0212 U	0.0197 U
Aroclor-1232	--	--	--	mg/kg		0.022 U	0.0186 U	0.0186 U	0.0188 U	0.0191 U	0.047 U	0.0189 U	0.0189 U	0.0191 U	0.0186 U	0.0195 U	0.0194 U	0.0171 U	0.0212 U	0.0197 U
Aroclor-1242	--	--	--	mg/kg		0.022 U	0.0186 U	0.0186 U	0.0188 U	0.0191 U	0.047 U	0.0189 U	0.0189 U	0.0191 U	0.0186 U	0.0195 U	0.0194 U	0.0171 U	0.0212 U	0.0197 U
Aroclor-1248	--	--	--	mg/kg		0.022 U	0.0186 U	0.0186 U	0.0188 U	0.0191 U	0.047 U	0.0189 U	0.0189 U	0.0191 U	0.0186 U	0.0195 U	0.0194 U	0.0171 U	0.0212 U	0.0197 U
Aroclor-1254	--	--	--	mg/kg		0.022 U	0.0186 U	0.0186 U	0.0188 U	0.0191 U	0.047 U	0.0189 U	0.0189 U	0.0191 U	0.0666	0.0195 U	0.0194 U	0.0171 U	0.0212 U	0.0197 U
Aroclor-1260	--	--	--	mg/kg		0.022 U	0.041	0.0186 U	0.0617	0.0191 U	0.047 U	0.0189 U	0.0189 U	0.0191 U	0.0186 U	0.0195 U	0.0194 U	0.0171 U	0.0212 U	0.0197 U
Aroclor-1262	--	--	--	mg/kg		0.022 U	NA	NA	NA	NA	0.047 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1268	--	--	--	mg/kg		0.022 U	NA	NA	NA	NA	0.047 U	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor (Total)	0.1	1	3.2	mg/kg		0.022 U	0.041	0.0186 U	0.0617	0.0191 U	0.047 U	0.0189 U	0.0189 U	0.0191 U	0.0666	0.0195 U	0.0194 U	0.0171 U	0.0212 U	0.0197 U

Table 5. Summary of Polychlorinated Biphenyls in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	**Sample Designation:**	SB-59A	SB-59B	SB-59C	SB-6	SB-60A	SB-60B	SB-60C	SB-61A	SB-61B	SB-61C	SB-64A	SB-64B	SB-65A	SB-65B
					Sample Date:	11/13/2018	11/13/2018	11/13/2018	10/23/2017	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018
					Sample Depth (ft bls):	-	-	-	11 - 11.5	-	-	-	-	-	-	-	-	-	-
Aroclor-1016	--	--	--	mg/kg		0.0179 U	0.0182 U	0.0172 U	0.045 U	0.0175 U	0.0188 U	0.0194 U	0.0178 U	0.0195 U	0.0204 U	0.0173 U	0.0186 U	0.0184 U	0.0172 U
Aroclor-1221	--	--	--	mg/kg		0.0179 U	0.0182 U	0.0172 U	0.045 U	0.0175 U	0.0188 U	0.0194 U	0.0178 U	0.0195 U	0.0204 U	0.0173 U	0.0186 U	0.0184 U	0.0172 U
Aroclor-1232	--	--	--	mg/kg		0.0179 U	0.0182 U	0.0172 U	0.045 U	0.0175 U	0.0188 U	0.0194 U	0.0178 U	0.0195 U	0.0204 U	0.0173 U	0.0186 U	0.0184 U	0.0172 U
Aroclor-1242	--	--	--	mg/kg		0.0179 U	0.0182 U	0.0172 U	0.045 U	0.0175 U	0.0188 U	0.0194 U	0.0178 U	0.0195 U	0.0204 U	0.0173 U	0.0186 U	0.0184 U	0.0172 U
Aroclor-1248	--	--	--	mg/kg		0.0179 U	0.0182 U	0.0172 U	0.045 U	0.0175 U	0.0188 U	0.0194 U	0.0178 U	0.0195 U	0.0204 U	0.0173 U	0.0186 U	0.0184 U	0.0172 U
Aroclor-1254	--	--	--	mg/kg		0.0179 U	0.0182 U	0.0172 U	0.045 U	0.0175 U	0.0188 U	0.0194 U	0.0178 U	0.0195 U	0.0204 U	0.0173 U	0.0186 U	0.0184 U	0.0172 U
Aroclor-1260	--	--	--	mg/kg		0.0179 U	0.0182 U	0.0172 U	0.045 U	0.0175 U	0.0236	0.0194 U	0.0178 U	0.0195 U	0.0204 U	0.0173 U	0.0186 U	0.0192	0.0172 U
Aroclor-1262	--	--	--	mg/kg		NA	NA	NA	0.045 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1268	--	--	--	mg/kg		NA	NA	NA	0.045 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor (Total)	0.1	1	3.2	mg/kg		0.0179 U	0.0182 U	0.0172 U	0.045 U	0.0175 U	0.0236	0.0194 U	0.0178 U	0.0195 U	0.0204 U	0.0173 U	0.0186 U	0.0192	0.0172 U

Table 5. Summary of Polychlorinated Biphenyls in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	**Sample Designation:**	SB-66A	SB-66B	SB-67A	SB-67B	SB-68A	SB-68B	SB-69A	SB-69B	SB-70A	SB-70B	SB-71A	SB-71B	SB-72A	SB-72B
					Sample Date:	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/14/2018	11/14/2018	11/14/2018	11/14/2018	11/14/2018	11/14/2018
					Sample Depth (ft bls):	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Aroclor-1016	--	--	--	mg/kg		0.0179 U	0.0192 U	0.0173 U	0.0187 U	0.0171 U	0.0184 U	0.0168 U	0.018 U	0.0179 U	0.0184 U	0.0179 U	0.0201 U	0.0182 U	0.0185 U
Aroclor-1221	--	--	--	mg/kg		0.0179 U	0.0192 U	0.0173 U	0.0187 U	0.0171 U	0.0184 U	0.0168 U	0.018 U	0.0179 U	0.0184 U	0.0179 U	0.0201 U	0.0182 U	0.0185 U
Aroclor-1232	--	--	--	mg/kg		0.0179 U	0.0192 U	0.0173 U	0.0187 U	0.0171 U	0.0184 U	0.0168 U	0.018 U	0.0179 U	0.0184 U	0.0179 U	0.0201 U	0.0182 U	0.0185 U
Aroclor-1242	--	--	--	mg/kg		0.0179 U	0.0192 U	0.0173 U	0.0187 U	0.0171 U	0.0184 U	0.0168 U	0.018 U	0.0179 U	0.0184 U	0.0179 U	0.0201 U	0.0182 U	0.0185 U
Aroclor-1248	--	--	--	mg/kg		0.0179 U	0.0192 U	0.0173 U	0.0187 U	0.0171 U	0.0184 U	0.0168 U	0.018 U	0.0179 U	0.0184 U	0.0179 U	0.0201 U	0.0182 U	0.0185 U
Aroclor-1254	--	--	--	mg/kg		0.0179 U	0.0192 U	0.0173 U	0.0187 U	0.0171 U	0.0184 U	0.0168 U	0.018 U	0.0179 U	0.0184 U	0.0179 U	0.0201 U	0.0182 U	0.0185 U
Aroclor-1260	--	--	--	mg/kg		0.0179 U	0.0192 U	0.0173 U	0.0187 U	0.0171 U	0.0184 U	0.0168 U	0.0741	0.0226	0.0184 U	0.0242	0.0201 U	0.0182 U	0.0185 U
Aroclor-1262	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1268	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor (Total)	0.1	1	3.2	mg/kg		0.0179 U	0.0192 U	0.0173 U	0.0187 U	0.0171 U	0.0184 U	0.0168 U	0.0741	0.0226	0.0184 U	0.0242	0.0201 U	0.0182 U	0.0185 U

Table 5. Summary of Polychlorinated Biphenyls in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	**Sample Designation:**	SB-72C	SB-73A	SB-73B	SB-73C	SB-74A	SB-74B	SB-75A	SB-75B	SB-76A	SB-76B	SB-77A	SB-77B	SB-77C
					Sample Date:	11/14/2018	11/14/2018	11/14/2018	11/14/2018	11/15/2018	11/15/2018	11/15/2018	11/15/2018	11/15/2018	11/15/2018	11/15/2018	11/15/2018	11/15/2018
					Sample Depth (ft bls):	-	-	-	-	-	-	-	-	-	-	-	-	-
Aroclor-1016	--	--	--	mg/kg		0.0177 U	0.0181 U	0.0189 U	0.0187 U	0.0183 U	0.0195 U	0.0176 U	0.0199 U	0.0175 U	0.0196 U	0.0181 U	0.019 U	0.0176 U
Aroclor-1221	--	--	--	mg/kg		0.0177 U	0.0181 U	0.0189 U	0.0187 U	0.0183 U	0.0195 U	0.0176 U	0.0199 U	0.0175 U	0.0196 U	0.0181 U	0.019 U	0.0176 U
Aroclor-1232	--	--	--	mg/kg		0.0177 U	0.0181 U	0.0189 U	0.0187 U	0.0183 U	0.0195 U	0.0176 U	0.0199 U	0.0175 U	0.0196 U	0.0181 U	0.019 U	0.0176 U
Aroclor-1242	--	--	--	mg/kg		0.0177 U	0.0181 U	0.0189 U	0.0187 U	0.0183 U	0.0195 U	0.0176 U	0.0199 U	0.0175 U	0.0196 U	0.0181 U	0.019 U	0.0176 U
Aroclor-1248	--	--	--	mg/kg		0.0177 U	0.0181 U	0.0189 U	0.0187 U	0.0183 U	0.0195 U	0.0176 U	0.0199 U	0.0175 U	0.0196 U	0.0181 U	0.019 U	0.0176 U
Aroclor-1254	--	--	--	mg/kg		0.0177 U	0.0181 U	0.0189 U	0.0187 U	0.0183 U	0.0195 U	0.0176 U	0.0199 U	0.0175 U	0.0196 U	0.0181 U	0.019 U	0.0176 U
Aroclor-1260	--	--	--	mg/kg		0.0177 U	0.0181 U	0.0189 U	0.0187 U	0.0183 U	0.0195 U	0.0176 U	0.0199 U	0.0186	0.0196 U	0.0181 U	0.019 U	0.0176 U
Aroclor-1262	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1268	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor (Total)	0.1	1	3.2	mg/kg		0.0177 U	0.0181 U	0.0189 U	0.0187 U	0.0183 U	0.0195 U	0.0176 U	0.0199 U	0.0186	0.0196 U	0.0181 U	0.019 U	0.0176 U

Table 6. Summary of Pesticides and Herbicides in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	**Sample Designation:**	Dup 1114	SB-31D	SB-31S	SB-32D	SB-32D1	SB-32S	SB-33D	SB-33S	SB-34D	SB-34S	SB-35D	SB-35S	SB-36D	SB-36S
					Sample Date:	11/15/2018	12/18/2017	12/18/2017	12/18/2017	12/18/2017	12/18/2017	12/18/2017	12/18/2017	12/18/2017	12/18/2017	12/18/2017	12/18/2017	12/18/2017	12/18/2017
					Sample Depth (ft bls):	-	8 - 8.5	2 - 2.5	8 - 8.5	12 - 12.5	2 - 2.5	8 - 8.5	2 - 2.5	8 - 8.5	2 - 2.5	8 - 8.5	2 - 2.5	8 - 8.5	2 - 2.5
4,4'-DDD	**0.0033**	92	14	mg/kg		0.00165 U	0.00466 U	0.00458 U	**0.00473**	0.00489 U	**0.03**	0.00457 U	0.00455 U	0.00447 U	**0.021**	0.00458 U	0.00431 U	0.00454 U	0.00438 U
4,4'-DDE	**0.0033**	62	17	mg/kg		0.00165 U	0.00466 U	0.00458 U	**0.00688**	0.00489 U	**0.068**	0.00457 U	0.00455 U	0.00447 U	**0.046**	0.00458 U	0.00255 J	0.00454 U	0.00438 U
4,4'-DDT	**0.0033**	47	136	mg/kg		**0.0415 D**	0.00466 U	0.00458 U	**0.015**	0.00489 U	**0.174**	0.00457 U	0.00455 U	0.00447 U	**0.081**	0.00458 U	**0.00736**	0.00454 U	**0.00338 J**
Aldrin	0.005	0.68	0.19	mg/kg		0.00165 U	0.00466 U	0.00458 U	0.0043 U	0.00489 U	0.00427 U	0.00457 U	0.00455 U	0.00447 U	0.00431 U	0.00458 U	0.00431 U	0.00454 U	0.00438 U
alpha-BHC	0.02	3.4	0.02	mg/kg		0.00165 U	0.00466 U	0.00458 U	0.0043 U	0.00489 U	0.00427 U	0.00457 U	0.00455 U	0.00447 U	0.00431 U	0.00458 U	0.00431 U	0.00454 U	0.00438 U
alpha-Chlordane	0.094	24	2.9	mg/kg		0.00165 U	0.00466 U	0.00458 U	0.0043 U	0.00489 U	0.00427 U	0.00457 U	0.00455 U	0.00447 U	0.00431 U	0.00458 U	0.00431 U	0.00454 U	0.00438 U
beta-BHC	0.036	3	0.09	mg/kg		0.00165 U	0.00466 U	0.00458 U	0.0043 U	0.00489 U	0.00427 U	0.00457 U	0.00455 U	0.00447 U	0.00431 U	0.00458 U	0.00431 U	0.00454 U	0.00438 U
Chlordane	--	--	--	mg/kg		NA	0.00466 U	0.00458 U	0.0043 U	0.00489 U	0.00427 U	0.00457 U	0.00455 U	0.00447 U	0.00431 U	0.00458 U	0.00431 U	0.00454 U	0.00438 U
delta-BHC	0.04	500	0.25	mg/kg		0.00165 U	0.00466 U	0.00458 U	0.0043 U	0.00489 U	0.00427 U	0.00457 U	0.00455 U	0.00447 U	0.00431 U	0.00458 U	0.00431 U	0.00454 U	0.00438 U
Dieldrin	0.005	1.4	0.1	mg/kg		0.00165 U	0.00466 U	0.00458 U	0.0043 U	0.00489 U	0.00427 U	0.00457 U	0.00455 U	0.00447 U	0.00431 U	0.00458 U	0.00431 U	0.00454 U	0.00438 U
Endosulfan I	2.4	200	102	mg/kg		0.00165 U	0.00466 U	0.00458 U	0.0043 U	0.00489 U	0.00427 U	0.00457 U	0.00455 U	0.00447 U	0.00431 U	0.00458 U	0.00431 U	0.00454 U	0.00438 U
Endosulfan II	2.4	200	102	mg/kg		0.00165 U	0.00466 U	0.00458 U	0.0043 U	0.00489 U	0.00427 U	0.00457 U	0.00455 U	0.00447 U	0.00431 U	0.00458 U	0.00431 U	0.00454 U	0.00438 U
Endosulfan sulfate	2.4	200	1000	mg/kg		0.00165 U	0.00466 U	0.00458 U	0.0043 U	0.00489 U	0.00427 U	0.00457 U	0.00455 U	0.00447 U	0.00431 U	0.00458 U	0.00431 U	0.00454 U	0.00438 U
Endosulfan	--	--	--	mg/kg		NA	0.00466 U	0.00458 U	0.0043 U	0.00489 U	0.00427 U	0.00457 U	0.00455 U	0.00447 U	0.00431 U	0.00458 U	0.00431 U	0.00454 U	0.00438 U
Endrin aldehyde	--	--	--	mg/kg		NA	0.00466 U	0.00458 U	0.0043 U	0.00489 U	0.00427 U	0.00457 U	0.00455 U	0.00447 U	0.00431 U	0.00458 U	0.00431 U	0.00454 U	0.00438 U
Endrin ketone	--	--	--	mg/kg		NA	0.00466 U	0.00458 U	0.0043 U	0.00489 U	0.00427 U	0.00457 U	0.00455 U	0.00447 U	0.00431 U	0.00458 U	0.00431 U	0.00454 U	0.00438 U
Endrin	0.014	89	0.06	mg/kg		0.00165 U	0.00466 U	0.00458 U	0.0043 U	0.00489 U	0.00427 U	0.00457 U	0.00455 U	0.00447 U	0.00431 U	0.00458 U	0.00431 U	0.00454 U	0.00438 U
gamma-BHC (Lindane)	0.1	9.2	0.1	mg/kg		0.00165 U	0.00466 U	0.00458 U	0.0043 U	0.00489 U	0.00427 U	0.00457 U	0.00455 U	0.00447 U	0.00431 U	0.00458 U	0.00431 U	0.00454 U	0.00438 U
gamma-Chlordane	--	--	--	mg/kg		NA	0.00466 U	0.00458 U	0.0043 U	0.00489 U	0.00427 U	0.00457 U	0.00455 U	0.00447 U	0.00431 U	0.00458 U	0.00431 U	0.00454 U	0.00438 U
Heptachlor epoxide	--	--	--	mg/kg		NA	0.00466 U	0.00458 U	0.0043 U	0.00489 U	0.00427 U	0.00457 U	0.00455 U	0.00447 U	0.00431 U	0.00458 U	0.00431 U	0.00454 U	0.00438 U
Heptachlor	0.042	15	0.38	mg/kg		0.00165 U	0.00466 U	0.00458 U	0.0043 U	0.00489 U	0.00427 U	0.00457 U	0.00455 U	0.00447 U	0.00431 U	0.00458 U	0.00431 U	0.00454 U	0.00438 U
Methoxychlor	--	--	--	mg/kg		NA	0.00466 U	0.00458 U	0.0043 U	0.00489 U	0.00427 U	0.00457 U	0.00455 U	0.00447 U	0.00431 U	0.00458 U	0.00431 U	0.00454 U	0.00438 U
Toxaphene	--	--	--	mg/kg		NA	0.058 U	0.057 U	0.054 U	0.061 U	0.053 U	0.057 U	0.057 U	0.056 U	0.054 U	0.057 U	0.054 U	0.057 U	0.055 U

Table 6. Summary of Pesticides and Herbicides in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	Sample Designation:	SB-37D	SB-37S	SB-38(D)	SB-38(S)	SB-39(D)	SB-39(S)	SB-40(D)	SB-40(S)	SB42-A	SB42-B	SB43-A	SB43-B	SB-56A	SB-56B	SB-56C
					Sample Date:	12/18/2017	12/18/2017	12/20/2017	12/20/2017	12/20/2017	12/20/2017	12/20/2017	12/20/2017	5/15/2018	5/15/2018	5/15/2018	5/15/2018	11/13/2018	11/13/2018	11/13/2018
					Sample Depth (ft bls):	8 - 8.5	2 - 2.5	-	-	-	-	-	-	-	-	-	-	-	-	-
4,4'-DDD	**0.0033**	92	14	mg/kg		0.0044 U	**0.027**	0.00434 U	**0.00922**	0.00436 U	0.00431 U	0.00449 U	0.0043 U	0.00184 U	0.00184 U	0.00187 U	0.00189 U	0.00165 U	0.00165 U	0.00165 U
4,4'-DDE	**0.0033**	62	17	mg/kg		**0.00402 J**	**0.1**	0.00434 U	**0.018**	0.00436 U	**0.00994**	0.00449 U	**0.00694**	0.00184 U	0.00184 U	0.00187 U	0.00189 U	0.00165 U	0.00165 U	0.00165 U
4,4'-DDT	**0.0033**	47	136	mg/kg		**0.00891**	**0.201**	0.00434 U	**0.061**	0.00436 U	**0.065**	0.00449 U	**0.046**	0.00184 U	0.00184 U	0.00187 U	0.00189 U	**0.124 D**	0.00165 U	0.00165 U
Aldrin	0.005	0.68	0.19	mg/kg		0.0044 U	0.00448 U	0.00434 U	0.00421 U	0.00436 U	0.00431 U	0.00449 U	0.0043 U	0.00184 U	0.00184 U	0.00187 U	0.00189 U	0.00165 U	0.00165 U	0.00165 U
alpha-BHC	0.02	3.4	0.02	mg/kg		0.0044 U	0.00448 U	0.00434 U	0.00421 U	0.00436 U	0.00431 U	0.00449 U	0.0043 U	0.00184 U	0.00184 U	0.00187 U	0.00189 U	0.00165 U	0.00165 U	0.00165 U
alpha-Chlordane	0.094	24	2.9	mg/kg		0.0044 U	0.00448 U	0.00434 U	0.00421 U	0.00436 U	0.00431 U	0.00449 U	0.0043 U	0.00184 U	0.00184 U	0.00187 U	0.00189 U	0.00165 U	0.00165 U	0.00165 U
beta-BHC	0.036	3	0.09	mg/kg		0.0044 U	0.00448 U	0.00434 U	0.00421 U	0.00436 U	0.00431 U	0.00449 U	0.0043 U	0.00184 U	0.00184 U	0.00187 U	0.00189 U	0.00165 U	0.00165 U	0.00165 U
Chlordane	--	--	--	mg/kg		0.0044 U	0.00448 U	0.00434 U	0.00421 U	0.00436 U	0.00431 U	0.00449 U	0.0043 U	0.0368 U	0.0369 U	0.0373 U	0.0378 U	NA	NA	NA
delta-BHC	0.04	500	0.25	mg/kg		0.0044 U	0.00448 U	0.00434 U	0.00421 U	0.00436 U	0.00431 U	0.00449 U	0.0043 U	0.00184 U	0.00184 U	0.00187 U	0.00189 U	0.00165 U	0.00165 U	0.00165 U
Dieldrin	0.005	1.4	0.1	mg/kg		0.0044 U	0.00448 U	0.00434 U	0.00421 U	0.00436 U	0.00431 U	0.00449 U	0.0043 U	0.00184 U	0.00184 U	0.00187 U	0.00189 U	0.00165 U	0.00165 U	0.00165 U
Endosulfan I	2.4	200	102	mg/kg		0.0044 U	0.00448 U	0.00434 U	0.00421 U	0.00436 U	0.00431 U	0.00449 U	0.0043 U	0.00184 U	0.00184 U	0.00187 U	0.00189 U	0.00165 U	0.00165 U	0.00165 U
Endosulfan II	2.4	200	102	mg/kg		0.0044 U	0.00448 U	0.00434 U	0.00421 U	0.00436 U	0.00431 U	0.00449 U	0.0043 U	0.00184 U	0.00184 U	0.00187 U	0.00189 U	0.00165 U	0.00165 U	0.00165 U
Endosulfan sulfate	2.4	200	1000	mg/kg		0.0044 U	0.00448 U	0.00434 U	0.00421 U	0.00436 U	0.00431 U	0.00449 U	0.0043 U	0.00184 U	0.00184 U	0.00187 U	0.00189 U	0.00165 U	0.00165 U	0.00165 U
Endosulfan	--	--	--	mg/kg		0.0044 U	0.00448 U	0.00434 U	0.00421 U	0.00436 U	0.00431 U	0.00449 U	0.0043 U	NA	NA	NA	NA	NA	NA	NA
Endrin aldehyde	--	--	--	mg/kg		0.0044 U	0.00448 U	0.00434 U	0.00421 U	0.00436 U	0.00431 U	0.00449 U	0.0043 U	0.00184 U	0.00184 U	0.00187 U	0.00189 U	NA	NA	NA
Endrin ketone	--	--	--	mg/kg		0.0044 U	0.00448 U	0.00434 U	0.00421 U	0.00436 U	0.00431 U	0.00449 U	0.0043 U	0.00184 U	0.00184 U	0.00187 U	0.00189 U	NA	NA	NA
Endrin	0.014	89	0.06	mg/kg		0.0044 U	0.00448 U	0.00434 U	0.00421 U	0.00436 U	0.00431 U	0.00449 U	0.0043 U	0.00184 U	0.00184 U	0.00187 U	0.00189 U	0.00165 U	0.00165 U	0.00165 U
gamma-BHC (Lindane)	0.1	9.2	0.1	mg/kg		0.0044 U	0.00448 U	0.00434 U	0.00421 U	0.00436 U	0.00431 U	0.00449 U	0.0043 U	0.00184 U	0.00184 U	0.00187 U	0.00189 U	0.00165 U	0.00165 U	0.00165 U
gamma-Chlordane	--	--	--	mg/kg		0.0044 U	0.00448 U	0.00434 U	0.00421 U	0.00436 U	0.00431 U	0.00449 U	0.0043 U	0.00184 U	0.00184 U	0.00187 U	0.00189 U	NA	NA	NA
Heptachlor epoxide	--	--	--	mg/kg		0.0044 U	0.00448 U	0.00434 U	0.00421 U	0.00436 U	0.00431 U	0.00449 U	0.0043 U	0.00184 U	0.00184 U	0.00187 U	0.00189 U	NA	NA	NA
Heptachlor	0.042	15	0.38	mg/kg		0.0044 U	0.00448 U	0.00434 U	0.00421 U	0.00436 U	0.00431 U	0.00449 U	0.0043 U	0.00184 U	0.00184 U	0.00187 U	0.00189 U	0.00165 U	0.00165 U	0.00165 U
Methoxychlor	--	--	--	mg/kg		0.0044 U	0.00448 U	0.00434 U	0.00421 U	0.00436 U	0.00431 U	0.00449 U	0.0043 U	0.0092 U	0.00921 U	0.00933 U	0.00946 U	NA	NA	NA
Toxaphene	--	--	--	mg/kg		0.055 U	0.056 U	0.054 U	0.053 U	0.055 U	0.054 U	0.056 U	0.054 U	0.0931 U	0.0933 U	0.0944 U	0.0957 U	NA	NA	NA

Table 6. Summary of Pesticides and Herbicides in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	Sample Designation:	SB-57A	SB-57B	SB-57C	SB-58A	SB-58B	SB-58C	SB-59A	SB-59B	SB-59C	SB-60A	SB-60B	SB-60C	SB-61A	SB-61B
					Sample Date:	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018
					Sample Depth (ft bls):	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4,4'-DDD	**0.0033**	92	14	mg/kg		0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U
4,4'-DDE	**0.0033**	62	17	mg/kg		0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U
4,4'-DDT	**0.0033**	47	136	mg/kg		0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	**0.0143 D**	**0.0204 DP**	0.00165 U	**0.0153 D**	**0.0133 D**	0.00165 U	0.00164 U	0.00165 U
Aldrin	0.005	0.68	0.19	mg/kg		0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U
alpha-BHC	0.02	3.4	0.02	mg/kg		0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U
alpha-Chlordane	0.094	24	2.9	mg/kg		0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U
beta-BHC	0.036	3	0.09	mg/kg		0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U
Chlordane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
delta-BHC	0.04	500	0.25	mg/kg		0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U
Dieldrin	0.005	1.4	0.1	mg/kg		0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U
Endosulfan I	2.4	200	102	mg/kg		0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U
Endosulfan II	2.4	200	102	mg/kg		0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U
Endosulfan sulfate	2.4	200	1000	mg/kg		0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U
Endosulfan	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin aldehyde	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin ketone	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin	0.014	89	0.06	mg/kg		0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U
gamma-BHC (Lindane)	0.1	9.2	0.1	mg/kg		0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U
gamma-Chlordane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor epoxide	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor	0.042	15	0.38	mg/kg		0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U
Methoxychlor	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toxaphene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 6. Summary of Pesticides and Herbicides in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	Sample Designation:	SB-61C	SB-64A	SB-64B	SB-65A	SB-65B	SB-66A	SB-66B	SB-67A	SB-67B	SB-68A	SB-68B	SB-69A	SB-69B	SB-70A
					Sample Date:	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/13/2018	11/14/2018
					Sample Depth (ft bls):	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4,4'-DDD	**0.0033**	92	14	mg/kg		0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U
4,4'-DDE	**0.0033**	62	17	mg/kg		0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U
4,4'-DDT	**0.0033**	47	136	mg/kg		0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	**0.026 D**	**0.0369 D**
Aldrin	0.005	0.68	0.19	mg/kg		0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U
alpha-BHC	0.02	3.4	0.02	mg/kg		0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U
alpha-Chlordane	0.094	24	2.9	mg/kg		0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U
beta-BHC	0.036	3	0.09	mg/kg		0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U
Chlordane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
delta-BHC	0.04	500	0.25	mg/kg		0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U
Dieldrin	0.005	1.4	0.1	mg/kg		0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U
Endosulfan I	2.4	200	102	mg/kg		0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U
Endosulfan II	2.4	200	102	mg/kg		0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U
Endosulfan sulfate	2.4	200	1000	mg/kg		0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U
Endosulfan	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin aldehyde	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin ketone	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin	0.014	89	0.06	mg/kg		0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U
gamma-BHC (Lindane)	0.1	9.2	0.1	mg/kg		0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U
gamma-Chlordane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor epoxide	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor	0.042	15	0.38	mg/kg		0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00165 U
Methoxychlor	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toxaphene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 6. Summary of Pesticides and Herbicides in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	Sample Designation:	SB-70B	SB-71A	SB-71B	SB-72A	SB-72B	SB-72C	SB-73A	SB-73B	SB-73C	SB-74A	SB-74B	SB-75A	SB-75B	SB-76A
					Sample Date:	11/14/2018	11/14/2018	11/14/2018	11/14/2018	11/14/2018	11/14/2018	11/14/2018	11/14/2018	11/14/2018	11/15/2018	11/15/2018	11/15/2018	11/15/2018	11/15/2018
					Sample Depth (ft bls):	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4,4'-DDD	**0.0033**	92	14	mg/kg		0.00165 U	0.00164 U	0.00165 U	0.00164 U	0.00165 U	0.00164 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00164 U	0.00165 U	0.00165 U
4,4'-DDE	**0.0033**	62	17	mg/kg		0.00165 U	0.00164 U	0.00165 U	0.00164 U	0.00165 U	0.00164 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00164 U	0.00165 U	0.00165 U
4,4'-DDT	**0.0033**	47	136	mg/kg		0.00165 U	**0.0354 D**	0.00165 U	0.00164 U	0.00165 U	0.00164 U	0.00245 DP	0.00164 U	0.00165 U	0.00165 U	0.00164 U	**0.00785 D**	0.00165 U	0.00165 U
Aldrin	0.005	0.68	0.19	mg/kg		0.00165 U	0.00164 U	0.00165 U	0.00164 U	0.00165 U	0.00164 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00164 U	0.00165 U	0.00165 U
alpha-BHC	0.02	3.4	0.02	mg/kg		0.00165 U	0.00164 U	0.00165 U	0.00164 U	0.00165 U	0.00164 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00164 U	0.00165 U	0.00165 U
alpha-Chlordane	0.094	24	2.9	mg/kg		0.00165 U	0.00164 U	0.00165 U	0.00164 U	0.00165 U	0.00164 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00164 U	0.00165 U	0.00165 U
beta-BHC	0.036	3	0.09	mg/kg		0.00165 U	0.00164 U	0.00165 U	0.00164 U	0.00165 U	0.00164 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00164 U	0.00165 U	0.00165 U
Chlordane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
delta-BHC	0.04	500	0.25	mg/kg		0.00165 U	0.00164 U	0.00165 U	0.00164 U	0.00165 U	0.00164 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00164 U	0.00165 U	0.00165 U
Dieldrin	0.005	1.4	0.1	mg/kg		0.00165 U	0.00164 U	0.00165 U	0.00164 U	0.00165 U	0.00164 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00164 U	0.00165 U	0.00165 U
Endosulfan I	2.4	200	102	mg/kg		0.00165 U	0.00164 U	0.00165 U	0.00164 U	0.00165 U	0.00164 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00164 U	0.00165 U	0.00165 U
Endosulfan II	2.4	200	102	mg/kg		0.00165 U	0.00164 U	0.00165 U	0.00164 U	0.00165 U	0.00164 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00164 U	0.00165 U	0.00165 U
Endosulfan sulfate	2.4	200	1000	mg/kg		0.00165 U	0.00164 U	0.00165 U	0.00164 U	0.00165 U	0.00164 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00164 U	0.00165 U	0.00165 U
Endosulfan	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin aldehyde	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin ketone	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Endrin	0.014	89	0.06	mg/kg		0.00165 U	0.00164 U	0.00165 U	0.00164 U	0.00165 U	0.00164 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00164 U	0.00165 U	0.00165 U
gamma-BHC (Lindane)	0.1	9.2	0.1	mg/kg		0.00165 U	0.00164 U	0.00165 U	0.00164 U	0.00165 U	0.00164 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00164 U	0.00165 U	0.00165 U
gamma-Chlordane	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor epoxide	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Heptachlor	0.042	15	0.38	mg/kg		0.00165 U	0.00164 U	0.00165 U	0.00164 U	0.00165 U	0.00164 U	0.00165 U	0.00164 U	0.00165 U	0.00165 U	0.00164 U	0.00164 U	0.00165 U	0.00165 U
Methoxychlor	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Toxaphene	--	--	--	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Table 6. Summary of Pesticides and Herbicides in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	**Sample Designation:**	SB-76B	SB-77A	SB-77B	SB-77C
					Sample Date:	11/15/2018	11/15/2018	11/15/2018	11/15/2018
					Sample Depth (ft bls):	-	-	-	-
4,4'-DDD	**0.0033**	92	14	mg/kg		0.00165 U	0.00165 U	0.00164 U	0.00164 U
4,4'-DDE	**0.0033**	62	17	mg/kg		0.00165 U	0.00165 U	0.00164 U	0.00164 U
4,4'-DDT	**0.0033**	47	136	mg/kg		0.00165 U	**0.0121 D**	0.00164 U	0.00164 U
Aldrin	0.005	0.68	0.19	mg/kg		0.00165 U	0.00165 U	0.00164 U	0.00164 U
alpha-BHC	0.02	3.4	0.02	mg/kg		0.00165 U	0.00165 U	0.00164 U	0.00164 U
alpha-Chlordane	0.094	24	2.9	mg/kg		0.00165 U	0.00165 U	0.00164 U	0.00164 U
beta-BHC	0.036	3	0.09	mg/kg		0.00165 U	0.00165 U	0.00164 U	0.00164 U
Chlordane	--	--	--	mg/kg		NA	NA	NA	NA
delta-BHC	0.04	500	0.25	mg/kg		0.00165 U	0.00165 U	0.00164 U	0.00164 U
Dieldrin	0.005	1.4	0.1	mg/kg		0.00165 U	0.00165 U	0.00164 U	0.00164 U
Endosulfan I	2.4	200	102	mg/kg		0.00165 U	0.00165 U	0.00164 U	0.00164 U
Endosulfan II	2.4	200	102	mg/kg		0.00165 U	0.00165 U	0.00164 U	0.00164 U
Endosulfan sulfate	2.4	200	1000	mg/kg		0.00165 U	0.00165 U	0.00164 U	0.00164 U
Endosulfan	--	--	--	mg/kg		NA	NA	NA	NA
Endrin aldehyde	--	--	--	mg/kg		NA	NA	NA	NA
Endrin ketone	--	--	--	mg/kg		NA	NA	NA	NA
Endrin	0.014	89	0.06	mg/kg		0.00165 U	0.00165 U	0.00164 U	0.00164 U
gamma-BHC (Lindane)	0.1	9.2	0.1	mg/kg		0.00165 U	0.00165 U	0.00164 U	0.00164 U
gamma-Chlordane	--	--	--	mg/kg		NA	NA	NA	NA
Heptachlor epoxide	--	--	--	mg/kg		NA	NA	NA	NA
Heptachlor	0.042	15	0.38	mg/kg		0.00165 U	0.00165 U	0.00164 U	0.00164 U
Methoxychlor	--	--	--	mg/kg		NA	NA	NA	NA
Toxaphene	--	--	--	mg/kg		NA	NA	NA	NA

Table 7. Summary of Petroleum Hydrocarbons in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC Part 375 Unrestricted Use SCO	NYSDEC Part 375 Commercial SCO	NYSDEC Part 375 Protection of Groundwater SCO	Units	**Sample Designation:**	COMPOSITE	SB-62	SB-63
					Sample Date:	12/20/2017	11/13/2018	11/13/2018
					Sample Depth (ft bls):	-	-	-
C28-C40	--	--	--	mg/kg		155	NA	NA
C9-C28	--	--	--	mg/kg		140	NA	NA
C9-C40 Total	--	--	--	mg/kg		295	NA	NA
Petroleum Hydrocarbons	--	--	--	Unknown		NA	ND	ND

Table 8. Summary of TCLP Metals in Soil, 27-10 49th Avenue, Hunters Point, New York

Parameter (Concentrations in mg/L)	USEPA Regulatory Levels (mg/L)	**Sample Designation:** COMPOSITE **Sample Date:** 12/20/2017
Arsenic	5	0.1 U
Barium	100	0.309
Cadmium	1	0.1 U
Chromium	5	0.1 U
Lead	5	0.325
Mercury	0.2	0.025 U
Selenium	1	0.4 U
Silver	5	0.1 U

Table 9. Summary of Volatile Organic Compounds in Groundwater, 27-10 49th Avenue, Hunters Point, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	Sample Designation:	MW-1	MW-1	MW-2	MW-2	MW-3	MW-3	MW-4	MW-4 DUP	MW-5	MW-6	MW-7	MW-8	MW-9	MW-10	SB-15-AQ PHASE	SB-2
		Sample Date:	11/29/2017	11/28/2018	11/29/2017	11/28/2018	11/29/2017	11/28/2018	11/27/2018	11/27/2018	11/28/2018	11/27/2018	11/27/2018	11/27/2018	11/27/2018	11/27/2018	10/24/2017	10/23/2017
1,1,1,2-Tetrachloroethane	5		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,1,1-Trichloroethane	5		0.5 U	0.2 U	0.5 U	0.2 U	0.5 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	2.5 U	0.5 U
1,1,2,2-Tetrachloroethane	5		0.5 U	NA	0.5 U	NA	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.5 U	0.5 U
1,1,2-Trichloroethane	1		0.5 U	NA	0.5 U	NA	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	5 U	1 U
1,1-Dichloroethane	5		0.5 U	0.2 U	0.5 U	0.2 U	0.5 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	2.5 U	0.5 U
1,1-Dichloroethene	5		0.5 U	0.2 U	0.5 U	0.2 U	0.5 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	2.5 U	0.5 U
1,2,3-Trichlorobenzene	5		1 U	NA	1 U	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.5 U	1 U
1,2,3-Trichloropropane	0.04		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,2,4-Trichlorobenzene	5		1 U	NA	1 U	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.5 U	1 U
1,2,4-Trimethylbenzene	5		NA	0.2 U	NA	0.2 U	NA	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	NA	NA
1,2-Dibromoethane	0.0006		0.015 U	NA	0.015 U	NA	0.015 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.015 U	0.5 U
1,2-Dichlorobenzene	3		0.608	0.2 U	0.5 U	0.2 U	0.5 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	2.5 U	0.5 U
1,2-Dichloroethane	0.6		0.5 U	0.2 U	0.5 U	0.2 U	0.5 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	2.5 U	0.5 U
1,2-Dichloropropane	1		0.5 U	NA	0.5 U	NA	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.5 U	0.5 U
1,3,5-Trimethylbenzene	5		NA	0.2 U	NA	0.2 U	NA	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	NA	NA
1,3-Dichlorobenzene	3		0.5 U	0.2 U	0.5 U	0.2 U	0.5 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	2.5 U	0.5 U
1,3-Dichloropropene	0.4		0.5 U	NA	0.5 U	NA	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.5 U	0.5 U
1,4-Dichlorobenzene	3		0.5 U	0.2 U	0.5 U	0.2 U	0.5 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	2.5 U	0.5 U
1,4-Dioxane	--		100 U	40 U	100 U	40 U	100 U	40 U	40 U	40 U	40 U	40 U	40 U	40 U	40 U	40 U	500 U	100 U
2-Butanone (MEK)	50		2 U	0.2 U	2 U	0.2 U	2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	10 U	2 U
2-Hexanone	50		1 U	NA	1 U	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	5 U	2 U
4-Methyl-2-pentanone (MIBK)	--		1 U	NA	1 U	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	5 U	2 U
Acetone	50		2 U	1 U	2 U	1 U	2 U	1 U	1 U	1 U	5.9	11	11	1 U	1 U	1 U	10 U	2 U
Acrolein	5		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acrylonitrile	5		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzene	1		0.708	0.2 U	0.5 U	0.2 U	0.689	0.2 U	0.2 U	0.2 U	0.37 J	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	2.5 U	0.5 U
Bromochloromethane	5		1 U	NA	1 U	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	5 U	1 U
Bromodichloromethane	50		0.5 U	NA	0.5 U	NA	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.5 U	0.5 U
Bromoform	50		0.5 U	NA	0.5 U	NA	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.5 U	0.5 U
Bromomethane	5		1 U	NA	1 U	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	5 U	1 U
Carbon disulfide	60		1 U	NA	1 U	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.5 U	0.5 U
Carbon tetrachloride	5		0.5 U	0.2 U	0.5 U	0.2 U	0.5 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	2.5 U	0.5 U
Chlorobenzene	5		0.5 U	0.2 U	0.5 U	0.2 U	0.5 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	2.5 U	0.5 U
Chloroethane	5		0.5 U	NA	0.5 U	NA	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.5 U	0.5 U
Chloroform	7		0.5 U	0.2 U	0.5 U	0.2 U	0.5 U	0.2 U	0.2 U	0.2 U	0.2 U	0.42 J	0.43 J	0.2 U	0.2 U	0.2 U	2.5 U	0.5 U
Chloromethane	5		0.5 U	NA	0.5 U	NA	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.5 U	0.5 U
cis-1,2-Dichloroethene	5		0.5 U	0.2 U	0.768	0.57	0.49 J	0.44 J	0.22 J	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.44 J	2.5 U	0.5 U
cis-1,3-Dichloropropene	--		0.5 U	NA	0.5 U	NA	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.5 U	0.5 U
Cyclohexane	--		1.44	NA	0.5 U	NA	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	13.4 D	1 U
Dibromochloromethane	50		0.5 U	NA	0.5 U	NA	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	5 U	1 U
Dibromochloropropane	0.04		0.015 U	NA	0.015 U	NA	0.015 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.015 U	1 U
Dibromomethane	5		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dichlorodifluoromethane	5		1 U	NA	1 U	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	5 U	1 U
Ethylbenzene	5		0.5 U	0.2 U	0.5 U	0.2 U	0.5 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	2.5 U	0.5 U
Freon 113	5		1 U	NA	1 U	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	5 U	1 U
Hexachlorobutadiene	0.5		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Isopropylbenzene	5		2.5	NA	0.5 U	NA	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	**26.1 D**	0.5 U
m+p-Xylene	5		NA	0.5 U	NA	0.5 U	NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	NA	NA
Methyl acetate	--		0.5 U	NA	0.5 U	NA	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.5 U	0.5 U
Methylcyclohexane	--		1.15	NA	1 U	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	14.9 D	1 U
Methylene chloride	5		1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	5 U	1 U
MTBE	10		0.5 U	0.2 U	0.5 U	0.2 U	1.55	0.9	2.8	2.6	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	2.5 U	0.5 U
Naphthalene	10		NA	1 U	NA	1 U	NA	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	NA	NA

Table 9. Summary of Volatile Organic Compounds in Groundwater, 27-10 49th Avenue, Hunters Point, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Designation:** / **Sample Date:**	MW-1 11/29/2017	MW-1 11/28/2018	MW-2 11/29/2017	MW-2 11/28/2018	MW-3 11/29/2017	MW-3 11/28/2018	MW-4 11/27/2018	MW-4 DUP 11/27/2018	MW-5 11/28/2018	MW-6 11/27/2018	MW-7 11/27/2018	MW-8 11/27/2018	MW-9 11/27/2018	MW-10 11/27/2018	SB-15-AQ PHASE 10/24/2017	SB-2 10/23/2017
n-Butylbenzene	5		NA	0.2 U	NA	0.2 U	NA	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	NA	NA
n-Propylbenzene	5		NA	0.55	NA	0.2 U	NA	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	NA	NA
o-Xylene	5		NA	0.2 U	NA	0.2 U	NA	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	NA	NA
P-CYMENE (P-ISOPROPYLTOLUENE)	--		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
sec-Butylbenzene	5		NA	0.2 U	NA	0.2 U	NA	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	NA	NA
Styrene	5		0.5 U	NA	0.5 U	NA	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.5 U	0.5 U
t-Butyl Alcohol	--		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
tert-Butylbenzene	5		NA	0.2 U	NA	0.2 U	NA	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	NA	NA
Tetrachloroethene	5		0.679	0.2 U	0.484 J	2	0.5 U	0.62	0.68	0.64	3.3	0.53	0.71	1.2	0.2 U	0.26 J	2.5 U	2.48
Toluene	5		0.5 U	0.2 U	0.5 U	0.2 U	0.5 U	0.2 U	0.2 U	0.2 U	0.21 J	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	2.5 U	0.5 U
trans-1,2-Dichloroethene	5		0.5 U	0.2 U	0.5 U	0.2 U	0.5 U	0.43 J	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	2.5 U	0.5 U
trans-1,3-Dichloropropene	--		0.5 U	NA	0.5 U	NA	0.5 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.5 U	0.5 U
trans-1,4-Dichloro-2-butene	5		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Trichloroethene	5		0.5 U	0.2 U	0.5 U	0.36 J	0.5 U	1.1	0.2 U	0.2 U	0.2 U	0.2 U	0.21 J	0.2 U	0.2 U	0.26 J	2.5 U	0.5 U
Trichlorofluoromethane	5		1 U	NA	1 U	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.5 U	0.5 U
Vinyl chloride	2		1 U	0.2 U	1.62	0.85	1 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	5 U	1 U
Xylenes (total)	5		1 U	0.6 U	1 U	0.6 U	1 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	0.6 U	5 U	1 U

Table 9. Summary of Volatile Organic Compounds in Groundwater, 27-10 49th Avenue, Hunters Point, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Designation:** **Sample Date:**	SB-38 12/20/2017	SB-39 12/20/2017	TW-4 5/15/2018
1,1,1,2-Tetrachloroethane	5		NA	NA	0.2 U
1,1,1-Trichloroethane	5		0.5 U	0.5 U	0.2 U
1,1,2,2-Tetrachloroethane	5		0.5 U	0.5 U	0.2 U
1,1,2-Trichloroethane	1		0.5 U	0.5 U	0.2 U
1,1-Dichloroethane	5		0.5 U	0.5 U	0.2 U
1,1-Dichloroethene	5		0.5 U	0.5 U	0.2 U
1,2,3-Trichlorobenzene	5		1 U	1 U	0.2 U
1,2,3-Trichloropropane	0.04		NA	NA	0.2 U
1,2,4-Trichlorobenzene	5		1 U	1 U	0.2 U
1,2,4-Trimethylbenzene	5		NA	NA	0.2 U
1,2-Dibromoethane	0.0006		0.5 U	0.5 U	0.2 U
1,2-Dichlorobenzene	3		0.5 U	0.5 U	0.2 U
1,2-Dichloroethane	0.6		0.5 U	0.5 U	0.2 U
1,2-Dichloropropane	1		0.5 U	0.5 U	0.2 U
1,3,5-Trimethylbenzene	5		NA	NA	0.2 U
1,3-Dichlorobenzene	3		0.5 U	0.5 U	0.2 U
1,3-Dichloropropene	0.4		0.5 U	0.5 U	NA
1,4-Dichlorobenzene	3		0.5 U	0.5 U	0.2 U
1,4-Dioxane	--		100 U	100 U	40 U
2-Butanone (MEK)	50		2 U	2 U	0.2 U
2-Hexanone	50		1 U	1 U	0.2 U
4-Methyl-2-pentanone (MIBK)	--		1 U	1 U	0.2 U
Acetone	50		2 U	2 U	2.3
Acrolein	5		NA	NA	0.2 U
Acrylonitrile	5		NA	NA	0.2 U
Benzene	1		0.5 U	0.5 U	0.2 U
Bromochloromethane	5		1 U	1 U	0.2 U
Bromodichloromethane	50		0.5 U	0.5 U	0.2 U
Bromoform	50		0.5 U	0.5 U	0.2 U
Bromomethane	5		1 U	1 U	0.2 U
Carbon disulfide	60		1 U	1 U	0.2 U
Carbon tetrachloride	5		0.5 U	0.5 U	0.2 U
Chlorobenzene	5		0.5 U	0.5 U	0.2 U
Chloroethane	5		0.5 U	0.5 U	0.2 U
Chloroform	7		0.5 U	0.5 U	0.2 U
Chloromethane	5		1.32	1.2	0.2 U
cis-1,2-Dichloroethene	5		0.5 U	0.5 U	0.2 U
cis-1,3-Dichloropropene	--		0.5 U	0.5 U	0.2 U
Cyclohexane	--		2.91	0.5 U	0.2 U
Dibromochloromethane	50		0.5 U	0.5 U	0.2 U
Dibromochloropropane	0.04		1 U	1 U	0.2 U
Dibromomethane	5		NA	NA	0.2 U
Dichlorodifluoromethane	5		1 U	1 U	0.2 U
Ethylbenzene	5		0.5 U	0.5 U	0.2 U
Freon 113	5		1 U	1 U	0.2 U
Hexachlorobutadiene	0.5		NA	NA	0.2 U
Isopropylbenzene	5		0.5 U	0.5 U	0.2 U
m+p-Xylene	5		NA	NA	0.5 U
Methyl acetate	--		0.5 U	0.5 U	0.2 U
Methylcyclohexane	--		2.89	1 U	0.2 U
Methylene chloride	5		1 U	1 U	1 U
MTBE	10		0.874	8.77	0.2 U
Naphthalene	10		NA	NA	NA

Table 9. Summary of Volatile Organic Compounds in Groundwater, 27-10 49th Avenue, Hunters Point, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Designation:** **Sample Date:**	SB-38 12/20/2017	SB-39 12/20/2017	TW-4 5/15/2018
n-Butylbenzene	5		NA	NA	0.2 U
n-Propylbenzene	5		NA	NA	0.2 U
o-Xylene	5		NA	NA	0.2 U
P-CYMENE (P-ISOPROPYLTOLUENE)	--		NA	NA	0.2 U
sec-Butylbenzene	5		NA	NA	0.2 U
Styrene	5		0.5 U	0.5 U	0.2 U
t-Butyl Alcohol	--		NA	NA	0.5 U
tert-Butylbenzene	5		NA	NA	0.2 U
Tetrachloroethene	5		3.88	1.56	**7.4**
Toluene	5		0.5 U	0.5 U	0.2 U
trans-1,2-Dichloroethene	5		0.5 U	0.5 U	0.2 U
trans-1,3-Dichloropropene	--		0.5 U	0.5 U	0.2 U
trans-1,4-Dichloro-2-butene	5		NA	NA	0.2 U
Trichloroethene	5		0.5 U	0.944	1.1
Trichlorofluoromethane	5		0.5 U	0.5 U	0.2 U
Vinyl chloride	2		1 U	1 U	0.2 U
Xylenes (total)	5		1 U	1 U	0.6 U

Table 10. Summary of Semivolatile Organic Compounds in Groundwater, 27-10 49th Avenue, Hunters Point, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Designation:**	MW-1	MW-1	MW-2	MW-2	MW-3	MW-3	MW-4	MW-4 DUP	MW-5	MW-6	MW-7	MW-8	MW-9	MW-10	SB-15-AQ PHASE	SB-2	TW-4
		Sample Date:	11/29/2017	11/28/2018	11/29/2017	11/28/2018	11/29/2017	11/28/2018	11/27/2018	11/27/2018	11/28/2018	11/27/2018	11/27/2018	11/27/2018	11/27/2018	11/27/2018	10/24/2017	10/23/2017	5/15/2018
1,1'-Biphenyl	5		0.161 J	NA	1 U	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	2.94 U
1,2,4,5-Tetrachlorobenzene	5		1 U	NA	1 U	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	2.94 U
1,2,4-Trichlorobenzene	5		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.94 U
1,2-Dichlorobenzene	3		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.94 U
1,2-Diphenylhydrazine	--		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.94 U
1,3-Dichlorobenzene	3		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.94 U
1,4-Dichlorobenzene	3		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.94 U
2,3,4,6-Tetrachlorophenol	--		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.94 U
2,4,5-Trichlorophenol	--		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.94 U
2,4,6-Trichlorophenol	--		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.94 U
2,4-Dichlorophenol	5		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.94 U
2,4-Dimethylphenol	50		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.94 U
2,4-Dinitrophenol	10		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.94 U
2,4-Dinitrotoluene	5		1 U	NA	1 U	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	2.94 U
2,6-Dinitrotoluene	5		1 U	NA	1 U	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	2.94 U
2-Chloronaphthalene	10		1 U	NA	1 U	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	2.94 U
2-Chlorophenol	--		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.94 U
2-Methylnaphthalene	--		2.2	NA	1 U	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	345 D	1 U	2.94 U
2-Methylphenol	--		NA	2.56 U	NA	2.56 U	NA	2.56 U	2.56 U	2.56 U	2.56 U	2.56 U	2.56 U	2.56 U	2.56 U	2.56 U	NA	NA	2.94 U
2-Nitroaniline	5		1 U	NA	1 U	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	2.94 U
2-Nitrophenol	--		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.94 U
3&4-Methylphenol	--		NA	2.56 U	NA	2.56 U	NA	2.56 U	2.56 U	2.56 U	2.56 U	2.56 U	2.56 U	2.56 U	2.56 U	2.56 U	NA	NA	2.94 U
3,3'-Dichlorobenzidine	5		1 U	NA	1 U	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	2.94 U
3-Nitroaniline	5		1 U	NA	1 U	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	2.94 U
4,6-Dinitro-2-methylphenol	--		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.94 U
4-Bromophenyl phenyl ether	--		1 U	NA	1 U	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	2.94 U
4-Chloro-3-methylphenol	--		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.94 U
4-Chloroaniline	5		1 U	NA	1 U	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	2.94 U
4-Chlorophenyl phenyl ether	--		1 U	NA	1 U	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	2.94 U
4-Nitroaniline	5		1 U	NA	1 U	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	2.94 U
4-Nitrophenol	--		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.94 U
Acenaphthene	20		4.71	4.66	1 U	0.0513 U	1 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0615	**334 D**	0.967 J	0.0588 U
Acenaphthylene	20		1 U	0.0718	1 U	0.0513 U	1 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.113	0.0513 U	0.0513 U	1 U	0.602 J	0.259
Acetophenone	--		1 U	NA	1 U	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	2.94 U
Aniline	5		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.94 U
Anthracene	50		0.724 J	0.964	1 U	0.0615	1 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.164	0.0513 U	0.0615	**305 D**	1.28	0.306
Atrazine	7.5		1 U	NA	1 U	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	0.588 U
Benzaldehyde	--		1 U	NA	1 U	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	2.94 U
Benzidine	5		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	11.8 U
Benzo[a]anthracene	0.002		0.1 U	**0.144**	0.1 U	0.0513 U	0.1 U	0.0513 U	0.0513 U	0.0513 U	**0.0615**	0.0513 U	0.0513 U	**0.338**	0.0513 U	0.0513 U	**218 D**	**2.98**	**0.706**
Benzo[a]pyrene	0		0.1 U	**0.0923**	0.1 U	0.0513 U	0.1 U	0.0513 U	0.0513 U	0.0513 U	**0.0615**	0.0513 U	0.0513 U	**0.421**	**0.0513**	0.0513 U	**68.1**	**1.97**	**1.29**
Benzo[b]fluoranthene	0.002		0.1 U	**0.0615**	0.1 U	0.0513 U	0.1 U	0.0513 U	0.0513 U	0.0513 U	**0.0615**	0.0513 U	0.0513 U	**0.503**	0.0513 U	0.0513 U	**40.7**	**2.54**	**1.62**
Benzo[g,h,i]perylene	--		1 U	0.0513	1 U	0.0513 U	1 U	0.0513 U	0.0513 U	0.0513 U	0.0513	0.0513 U	0.0513 U	0.328	0.0513 U	0.0513 U	29.7	3.89	0.8
Benzo[k]fluoranthene	0.002		0.1 U	**0.0718**	0.1 U	0.0513 U	0.1 U	0.0513 U	0.0513 U	0.0513 U	**0.0615**	0.0513 U	0.0513 U	**0.4**	0.0513 U	0.0513 U	**48.1**	**1.13**	**1.28**
Benzoic Acid	--		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	29.4 U
Benzyl Alcohol	--		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.94 U
Bis(2-chloro-1-methylethyl)ether	5		1 U	NA	1 U	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	2.94 U
Bis(2-chloroethoxy)methane	5		1 U	NA	1 U	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	2.94 U
Bis(2-chloroethyl) ether	--		1 U	NA	1 U	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	2.94 U
Bis(2-ethylhexyl) phthalate	5		1 U	NA	1 U	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	**11.4**	1 U	0.588 U
Butylbenzyl phthalate	50		1 U	NA	1 U	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	2.94 U
Caprolactam	--		1 U	NA	1 U	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	2.94 U
Carbazole	--		1.34	NA	1 U	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.77	0.713 J	2.94 U

Table 10. Summary of Semivolatile Organic Compounds in Groundwater, 27-10 49th Avenue, Hunters Point, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	Sample Designation:	MW-1	MW-1	MW-2	MW-2	MW-3	MW-3	MW-4	MW-4 DUP	MW-5	MW-6	MW-7	MW-8	MW-9	MW-10	SB-15-AQ PHASE	SB-2	TW-4
		Sample Date:	11/29/2017	11/28/2018	11/29/2017	11/28/2018	11/29/2017	11/28/2018	11/27/2018	11/27/2018	11/28/2018	11/27/2018	11/27/2018	11/27/2018	11/27/2018	11/27/2018	10/24/2017	10/23/2017	5/15/2018
Chrysene	0.002		1 U	**0.144**	1 U	0.0513 U	1 U	0.0513 U	0.0513 U	0.0513 U	**0.0821**	0.0513 U	0.0513 U	**0.451**	**0.0513**	0.0513 U	**123**	**9.28**	**0.882**
Dibenzo[a,h]anthracene	--		0.1 U	0.0513 U	0.1 U	0.0513 U	0.1 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0923	0.0513 U	0.0513 U	12	1.45	0.318
Dibenzofuran	--		0.792 J	2.56 U	1 U	2.56 U	1 U	2.56 U	2.56 U	2.56 U	2.56 U	2.56 U	2.56 U	2.56 U	2.56 U	2.56 U	99.9	1 U	2.94 U
Diethyl phthalate	50		1 U	NA	1 U	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	6.18	2.94 U
Dimethyl phthalate	50		1 U	NA	1 U	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	2.94 U
Di-n-butyl phthalate	50		1 U	NA	1 U	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	2.94 U
Di-n-octyl phthalate	--		1 U	NA	1 U	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	2.94 U
Fluoranthene	50		0.526 J	0.872	1 U	0.0615	1 U	0.0513 U	0.0513 U	0.0513 U	0.164	0.0718	0.0718	0.636	0.0923	0.0821	**652 D**	9.3	0.765
Fluorene	50		2.31	2.49	1 U	0.0513 U	1 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	**272 D**	0.506 J	0.0588 U
Hexachlorobenzene	0.04		0.02 U	0.0205 U	0.02 U	0.0205 U	0.02 U	0.0205 U	0.0205 U	0.0205 U	0.0205 U	0.0205 U	0.0205 U	0.0205 U	0.0205 U	0.0205 U	1 U	0.02 U	0.0235 U
Hexachlorobutadiene	0.5		1 U	NA	1 U	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	0.588 U
Hexachlorocyclopentadiene	5		1 U	NA	1 U	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	2.94 U
Hexachloroethane	5		1 U	NA	1 U	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	0.588 U
Indeno[1,2,3-cd]pyrene	0.002		0.1 U	0.0513 U	0.1 U	0.0513 U	0.1 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	**0.308**	0.0513 U	0.0513 U	**24.4**	**1.77**	**0.824**
Isophorone	50		1 U	NA	1 U	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	2.94 U
Naphthalene	10		1.2	0.256	1 U	0.0513 U	1 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513	0.0513 U	0.0513 U	1 U	1 U	0.0588 U
Nitrobenzene	0.4		1 U	NA	1 U	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	0.294 U
n-Nitrosodimethylamine	--		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.588 U
n-Nitrosodi-n-propylamine	--		1 U	NA	1 U	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	2.94 U
n-Nitrosodiphenylamine	50		1 U	NA	1 U	NA	1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	1 U	1 U	2.94 U
Pentachlorophenol	1		NA	0.256 U	NA	0.256 U	NA	0.256 U	0.256 U	0.256 U	0.256 U	0.256 U	0.256 U	0.256 U	0.256 U	0.256 U	NA	NA	0.294 U
Phenanthrene	50		3.63	4.53	1 U	0.0513 U	1 U	0.0513 U	0.0513 U	0.0513 U	0.123	0.0513	0.0513 U	0.226	0.0821	0.164	**1010 D**	4.88	0.153
Phenols (Total)	1		NA	2.56 U	NA	2.56 U	NA	2.56 U	2.56 U	2.56 U	2.56 U	2.56 U	2.56 U	2.56 U	2.56 U	2.56 U	NA	NA	2.94 U
Pyrene	50		0.483 J	0.944	1 U	0.133	1 U	0.0513 U	0.0513	0.0615	0.154	0.0615	0.0718	0.667	0.185	0.0923	**721 D**	10.7	0.659

1. It should be noted that these results may not accurately reflect Site conditions as the previous consultant, AESI, used incorrect purging methods resulting in over-turbid samples.

Table 10B. Summary of Polycyclic Aromatic Hydrocarbons in Groundwater, 27-10 49th Avenue, Long Island City, New York

Sample Designation:			MW-1	MW-2	MW-4	MW-4	MW-8	MW-9
Sample Date:			05/29/2024	05/29/2024	05/29/2024	05/29/2024	05/29/2024	05/29/2024
Normal Sample or Field Duplicate:			N	N	N	FD	N	N
Parameter	NYSDEC Ambient Water Quality Standards and Guidance	Units						
2-Chloronaphthalene	10	UG/L	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
2-Methylnaphthalene	--	UG/L	0.86	0.06 J	0.03 U	0.03 U	0.03 U	0.03 U
Acenaphthene	20	UG/L	3.8	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Acenaphthylene	20	UG/L	0.03 J	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Anthracene	50	UG/L	0.56	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Benzo(A)Anthracene	0.002	UG/L	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U
Benzo(A)Pyrene	0	UG/L	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Benzo(B)Fluoranthene	0.002	UG/L	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U
Benzo(G,H,I)Perylene	--	UG/L	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Benzo(K)Fluoranthene	0.002	UG/L	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U
Chrysene	0.002	UG/L	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U
Dibenz(A,H)Anthracene	--	UG/L	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Fluoranthene	50	UG/L	0.39	0.03 U	0.03 U	0.03 U	0.04 J	0.03 U
Fluorene	50	UG/L	1.8	0.03 U	0.03 U	0.03 U	0.03 U	0.03 U
Indeno(1,2,3-C,D)Pyrene	0.002	UG/L	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U	0.02 U
Naphthalene	10	UG/L	0.08 J	0.34	0.03 J	0.02 U	0.11	0.02 U
Phenanthrene	50	UG/L	1.2	0.04 U	0.04 U	0.04 U	0.04 U	0.04 U
Pyrene	50	UG/L	0.34	0.04 U	0.04 U	0.04 U	0.04 U	0.17

Table 11. Summary of Metals in Groundwater, 27-10 49th Avenue, Hunters Point, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Designation:**	MW-1	MW-1	MW-2	MW-2	MW-3	MW-3	MW-4	MW-4	MW-4 DUP	MW-4 DUP	MW-5	MW-5	MW-6	MW-6	MW-7	MW-7	MW-8	MW-8
		Sample Date:	11/28/2018	11/28/2018	11/28/2018	11/28/2018	11/28/2018	11/28/2018	11/27/2018	11/27/2018	11/27/2018	11/27/2018	11/28/2018	11/28/2018	11/27/2018	11/27/2018	11/27/2018	11/27/2018	11/27/2018	11/27/2018
			Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved	Total	Dissolved
Aluminum	--		483	55.6 U	105	94	86.3	118	2290	103	993	59.4	1190	55.6 U	55.6 U	55.6 U	55.6 U	55.6 U	55.6 U	55.6 U
Antimony	3		1.11 U	1.11 U	1.11 U	1.11 U	1.81	1.34	1.11 U	1.11 U	1.11 U	1.11 U	1.11 U	1.11 U	1.11 U	1.11 U	1.11 U	1.11 U	**4.58**	**4.25**
Arsenic	25		3.61	2.67	1.12	1.11 U	4.55	2.83	1.12	1.11 U	1.11 U	1.26	1.8	1.74	1.92	1.95	2.05	1.55	5.09	2.09
Barium	1000		317	895	27.8 U	323	27.8 U	112	208	506	299	505	483	305	27.8 U	27.8 U	58.8	27.8 U	78.6	216
Beryllium	3		0.333 U	0.333 U	0.333 U	0.333 U	0.333 U	0.333 U	0.333 U	0.333 U	0.333 U	0.333 U	0.333 U	0.333 U	0.333 U	0.333 U	0.333 U	0.333 U	0.333 U	0.333 U
Cadmium	5		0.556 U	0.556 U	0.556 U	0.556 U	1.46	0.556 U	0.556 U	0.556 U	0.556 U	0.556 U	0.556 U	0.556 U	0.556 U	0.556 U	0.556 U	0.556 U	1.87	0.556 U
Calcium	--		238000	376000	108000	665000	115000	702000	257000	474000	490000	472000	591000	235000	55.6 U	107000	104000	117000	86700	253000
Chromium, Hexavalent	50		10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA	10 U	NA
Chromium, Trivalent	--		0.01 U	NA	0.01 U	NA	0.01 U	NA	0.0204	NA	0.01 U	NA	0.01 U	NA	0.01 U	NA	0.01 U	NA	0.01 U	NA
Chromium	50		6.53	5.56 U	5.56 U	5.56 U	5.56 U	5.56 U	20.4	5.56 U	5.56 U	5.56 U	5.56 U	5.56 U	5.56 U	5.56 U	5.56 U	5.56 U	5.56 U	10
Cobalt	--		4.44 U	4.44 U	4.44 U	4.44 U	4.44 U	4.44 U	4.44 U	4.44 U	4.44 U	4.44 U	4.44 U	4.44 U	4.44 U	4.44 U	4.44 U	4.44 U	4.44 U	4.44 U
Copper	200		22.2 U	22.2 U	22.2 U	22.2 U	22.2 U	22.2 U	143	22.2 U	22.2 U	22.2 U	22.2 U	22.2 U	22.2 U	22.2 U	22.2 U	22.2 U	22.2 U	22.2 U
Cyanide	200		0.0261	NA	0.01 U	NA	0.01 U	NA	0.01 U	NA	0.01 U	NA	0.01 U	NA	0.01 U	NA	0.01 U	NA	0.01 U	NA
Iron	300		**12900**	**75700**	278 U	**3280**	278 U	**2290**	**4920**	**15200**	**2560**	**15500**	**3920**	**12900**	278 U	278 U	**360**	278 U	**907**	**455**
Lead	25		19.4	5.56 U	5.56 U	5.62	11.1	5.56 U	**728**	5.56 U	14	5.56 U	12.7	5.56 U	5.56 U	5.56 U	5.56 U	5.56 U	5.56 U	5.56 U
Magnesium	35000		**161000**	**115000**	**272000**	**157000**	**278000**	**251000**	**404000**	**108000**	**44200**	**107000**	**159000**	**173000**	55.6 U	**275000**	18000	**287000**	15800	**404000**
Manganese	300		**2840**	**1290**	16.8	**2030**	24.7	**929**	**1300**	**779**	**963**	**797**	**1730**	**2770**	5.56 U	13.7	173	23	**511**	**1160**
Mercury	0.7		0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U	0.2 U
Nickel	100		11.1 U	11.1 U	11.1 U	11.1 U	11.1 U	11.1 U	11.1 U	11.1 U	11.1 U	11.1 U	11.1 U	11.1 U	11.1 U	11.1 U	11.1 U	11.1 U	11.1 U	11.1 U
Potassium	--		73500	79000	101000	52700	104000	155000	151000	50800	39500	50200	69400	80400	712	105000	10500	108000	9400	154000
Selenium	10		**20.6**	**32.1**	**37.1**	**43.1**	**50.3**	**77.7**	**28.8**	**37.6**	**29**	**26**	**55.5**	**41.1**	**60.5**	**80.5**	**73.8**	**83.6**	**103**	**115**
Silver	50		5.56 U	5.56 U	5.56 U	5.56 U	5.56 U	5.56 U	5.56 U	5.56 U	5.56 U	5.56 U	5.56 U	5.56 U	5.56 U	5.56 U	5.56 U	5.56 U	5.56 U	5.56 U
Sodium	20000		**1260000 D**	**931000**	**1140000 D**	**835000**	**3890000 D**	**5230000 D**	**1380000 D**	**929000**	**1210000 D**	**930000**	**2340000 D**	**2870000 D**	2180	**4570000 D**	**94700**	**4800000 D**	**86400**	**5960000 D**
Thallium	0.5		1.11 U	1.11 U	1.11 U	1.11 U	1.11 U	1.11 U	1.11 U	1.11 U	1.11 U	1.11 U	1.11 U	1.11 U	1.11 U	1.11 U	1.11 U	1.11 U	1.11 U	1.11 U
Vanadium	--		11.1 U	11.1 U	11.1 U	11.1 U	11.1 U	11.1 U	14.6	11.1 U	11.1 U	11.1 U	11.1 U	11.1 U	11.1 U	11.1 U	11.1 U	11.1 U	11.1 U	11.1 U
Zinc	2000		27.8 U	27.8 U	50	49.2	48.7	27.8 U	244	27.8 U	30	27.8 U	27.8 U	27.8 U	27.8 U	44.2	89.1	40	27.8 U	33.6

Table 11. Summary of Metals in Groundwater, 27-10 49th Avenue, Hunters Point, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Designation:** **Sample Date:**	MW-9 11/27/2018 Total	MW-9 11/27/2018 Dissolved	MW-10 11/27/2018 Total	MW-10 11/27/2018 Dissolved	TW-4 5/15/2018 Total
Aluminum	--		354	220	55.6 U	114	16400
Antimony	3		1.11 U	1.11 U	1.11 U	1.11 U	**12**
Arsenic	25		1.28	1.2	4.06	4.35	6
Barium	1000		50.2	297	27.8 U	477	226
Beryllium	3		0.333 U	0.333 U	0.333 U	0.333 U	3
Cadmium	5		0.556 U	0.556 U	0.556 U	0.556 U	3 U
Calcium	--		34600	481000	7710	577000	47300
Chromium, Hexavalent	50		10 U	NA	10 U	NA	NA
Chromium, Trivalent	--		0.01 U	NA	0.01 U	NA	NA
Chromium	50		8.35	5.56 U	5.56 U	5.56 U	**232**
Cobalt	--		4.44 U	4.44 U	4.44 U	4.44 U	73
Copper	200		22.2 U	22.2 U	22.2 U	22.2 U	98
Cyanide	200		0.0207	NA	0.01 U	NA	NA
Iron	300		**1450**	**1250**	278 U	**1960**	**26500**
Lead	25		6.29	5.56 U	5.56 U	5.56 U	**72**
Magnesium	35000		2770	**42400**	1860	**156000**	6410
Manganese	300		168	**914**	5.56 U	**1690**	**2580**
Mercury	0.7		0.2 U	0.2 U	0.2 U	0.2 U	0.26
Nickel	100		11.1 U	11.1 U	11.1 U	11.1 U	45
Potassium	--		4190	42300	2050	69800	6220
Selenium	10		**44.4**	**54.5**	**40.8**	**63.6**	11 U
Silver	50		5.56 U	5.56 U	5.56 U	5.56 U	6 U
Sodium	20000		**26500**	**2850000 D**	**20200**	**1170000**	**99200**
Thallium	0.5		1.11 U	1.11 U	1.11 U	1.11 U	6 U
Vanadium	--		11.1 U	11.1 U	11.1 U	11.1 U	18
Zinc	2000		48.7	27.8 U	27.8 U	27.8 U	37

Table 12. Summary of Polychlorinated Biphenyls in Groundwater, 27-10 49th Avenue, Hunters Point, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Designation:**	MW-1	MW-1	MW-2	MW-2	MW-3	MW-3	MW-4	MW-4 DUP	MW-5	MW-6	MW-7	MW-8	MW-9	MW-10	TW-4
		Sample Date:	11/29/2017	11/28/2018	11/29/2017	11/28/2018	11/29/2017	11/28/2018	11/27/2018	11/27/2018	11/28/2018	11/27/2018	11/27/2018	11/27/2018	11/27/2018	11/27/2018	5/15/2018
Aroclor-1016	--		0.05 U	0.0513 U	0.05 U	0.0513 U	0.05 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0606 U
Aroclor-1221	--		0.05 U	0.0513 U	0.05 U	0.0513 U	0.05 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0606 U
Aroclor-1232	--		0.05 U	0.0513 U	0.05 U	0.0513 U	0.05 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0606 U
Aroclor-1242	--		0.05 U	0.0513 U	0.05 U	0.0513 U	0.05 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0606 U
Aroclor-1248	--		0.05 U	0.0513 U	0.05 U	0.0513 U	0.05 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0606 U
Aroclor-1254	--		0.05 U	0.0513 U	0.05 U	0.0513 U	0.05 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.528
Aroclor-1260	--		0.05 U	0.0513 U	0.05 U	0.0513 U	0.05 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.445
Aroclor-1262	--		0.05 U	NA	0.05 U	NA	0.05 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor-1268	--		0.05 U	NA	0.05 U	NA	0.05 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Aroclor (Total)	0.09		0.05 U	0.0513 U	0.05 U	0.0513 U	0.05 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	0.0513 U	**0.972**

Table 13. Summary of Pesticides and Herbicides in Groundwater, 27-10 49th Avenue, Hunters Point, New York

Parameter (Concentrations in µg/L)	NYSDEC AWQSGVs (µg/L)	**Sample Designation:** MW-1	MW-2	MW-3	MW-4	MW-4 DUP	MW-5	MW-6	MW-7	MW-8	MW-9	MW-10	TW-4
		Sample Date: 11/28/2018	11/28/2018	11/28/2018	11/27/2018	11/27/2018	11/28/2018	11/27/2018	11/27/2018	11/27/2018	11/27/2018	11/27/2018	5/15/2018
2,4,5-T	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	NA
2,4,5-TP	0.26	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	NA
2,4-D	50	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	NA
4,4'-DDD	0.3	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.00485 U
4,4'-DDE	0.2	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.00485 U
4,4'-DDT	0.2	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.00485 U
Aldrin	0	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.00485 U
alpha-BHC	0.01	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.00485 U
alpha-Chlordane	--	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.00485 U
beta-BHC	0.04	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.00485 U
Chlordane	0.05	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0242 U
delta-BHC	0.04	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.00485 U
Dieldrin	0.004	0.00205 U	0.00205 U	0.00205 U	0.00205 U	0.00205 U	0.00205 U	0.00205 U	0.00205 U	0.00205 U	0.00205 U	0.00205 U	0.00242 U
Endosulfan I	--	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.00485 U
Endosulfan II	--	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.00485 U
Endosulfan sulfate	--	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.00485 U
Endrin aldehyde	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0121 U
Endrin ketone	5	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0121 U
Endrin	0	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.00485 U
gamma-BHC (Lindane)	0.05	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.00485 U
gamma-Chlordane	--	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0121 U
Heptachlor epoxide	0.03	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00485 U
Heptachlor	0.04	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.0041 U	0.00485 U
Methoxychlor	35	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.00485 U
Toxaphene	0.06	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.121 U

Table 14. Summary of Emerging Contaminants (Per- and Polyfluoroalkyl Substances and 1,4-Dioxane) in Groundwater
27-10 49th Avenue, Hunters Point, New York

Parameter	NYSDEC AWQSGVs	Units	Sample Designation: / Sample Date:	MW-1 11/28/2018	MW-2 11/28/2018	MW-3 11/28/2018	MW-4 DUP 11/27/2018	MW-4 11/27/2018	MW-5 11/28/2018	MW-6 11/27/2018	MW-7 11/27/2018	MW-8 11/27/2018	MW-9 11/27/2018	MW-10 11/27/2018
1,4-Dioxane	0.35	µg/L		**1.1**	**1.2**	0.21 U	**0.97**	**1**	0.2 U	0.2 U	0.2 U	0.2 U	**0.88**	0.21
N-Ethyl Perfluorooctanesulfonamidoacetic Acid (NETFOSAA)	--	ng/L		2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
N-Methyl Perfluorooctanesulfonamidoacetic Acid (NMEFOSAA)	--	ng/L		2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Perfluorobutanesulfonic Acid (PFBS)	--	ng/L		3.3	3.5	4.3	5.3	10	2 U	2.5	3.8	2.5	7.5	24
Perfluorobutanoic Acid (PFBA)	--	ng/L		4.4	18	5.7	3.4	4.1	7.7	2 U	2 U	4.9	15	6.2
Perfluorodecanesulfonic Acid (PFDS)	--	ng/L		2.7	2 U	4.5	2 U	2 U	2 U	16	17	2 U	2 U	2 U
Perfluorodecanoic Acid (PFDA)	--	ng/L		2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Perfluorododecanoic Acid (PFDOA)	--	ng/L		2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Perfluoroheptanesulfonic Acid (PFHPS)	--	ng/L		2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Perfluoroheptanoic Acid (PFHPA)	--	ng/L		89	31	10	26	24	5.6	3.5	3.5	6.6	200	22
Perfluorohexanesulfonic Acid (PFHXS)	--	ng/L		2.9	2 U	4.2	3.5	2.1	3	2 U	2 U	2 U	3.4	6.3
Perfluorohexanoic Acid (PFHxA)	--	ng/L		41	60	26	23	22	9.2	5.3	6.3	8.7	86	15
Perfluorononanoic Acid (PFNA)	--	ng/L		10	2 U	2.8	2 U	2 U	2 U	3	2.1	2.3	12	2 U
Perfluorooctanesulfonamide (FOSA)	--	ng/L		2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Perfluorooctanesulfonic Acid (PFOS)	2.7	ng/L		**9.5**	**4**	**15**	**8.3**	**9.6**	**12**	**8.2**	**6.3**	**7.9**	**12**	2 U
Perfluorooctanoic Acid (PFOA)	6.7	ng/L		**48**	**21**	**26**	**25**	**24**	**18**	**11**	**10**	**20**	**110**	**14**
Perfluoropentanoic Acid (PFPEA)	--	ng/L		34	120	27	37	43	16	7.6	8.5	13	62	12
Perfluorotetradecanoic Acid (PFTA)	--	ng/L		2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Perfluorotridecanoic Acid (PFTRDA)	--	ng/L		2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Perfluoroundecanoic Acid (PFUNA)	--	ng/L		2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Sodium 1H,1H,2H,2H-Perfluoro-1-[1,2-13C2]-Decane Sulfonate (8:2)	--	ng/L		2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U	2 U
Sodium 1H,1H,2H,2H-Perfluoro-1-[1,2-13C2]-Octane Sulfonate (6:2)	--	ng/L		8.3	8.4	2 U	2	2.6	2 U	2 U	2 U	2 U	2 U	2 U

Table 15. Summary of Volatile Organic Compounds in Soil Vapor (ppbv), 27-10 49th Avenue, Hunters Point, New York

Parameter	Units	Sample Designation: / Sample Date:	SV1-a 5/15/2018	SV2-a 5/15/2018	SV3-a 5/15/2018	SV-4 5/15/2018	SV-5 5/15/2018
1,1,1,2-Tetrachloroethane	ppbv		1.6 U	1.5 U	1.6 U	1.7 U	1.6 U
1,1,1-Trichloroethane	ppbv		1.6 U	1.5 U	1.6 U	1.7 U	1.6 U
1,1,2,2-Tetrachloroethane	ppbv		1.6 U	1.5 U	1.6 U	1.7 U	1.6 U
1,1,2-Trichloroethane	ppbv		1.6 U	1.5 U	1.6 U	1.7 U	1.6 U
1,1-Dichloroethane	ppbv		1.6 U	1.5 U	1.6 U	1.7 U	1.6 U
1,1-Dichloroethene	ppbv		0.41 U	0.38 U	0.4 U	0.43 U	0.41 U
1,2,4-Trichlorobenzene	ppbv		1.6 U	1.5 U	1.6 U	1.7 U	1.6 U
1,2,4-Trimethylbenzene	ppbv		**14 D**	**10 D**	**13 D**	**32 D**	**27 D**
1,2-Dibromoethane	ppbv		1.6 U	1.5 U	1.6 U	1.7 U	1.6 U
1,2-Dichlorobenzene	ppbv		1.6 U	1.5 U	1.6 U	1.7 U	1.6 U
1,2-Dichloroethane	ppbv		**4.1 D**	**3.0 D**	**4.0 D**	**7.7 D**	**7.5 D**
1,2-Dichloropropane	ppbv		1.6 U	1.5 U	1.6 U	1.7 U	1.6 U
1,3,5-Trimethylbenzene	ppbv		**4.8 D**	**3.0 D**	**4.0 D**	**9.4 D**	**7.9 D**
1,3-Butadiene	ppbv		4.9 U	4.5 U	4.8 U	5.1 U	4.9 U
1,3-Dichlorobenzene	ppbv		1.6 U	1.5 U	1.6 U	1.7 U	1.6 U
1,3-Dichloropropane	ppbv		1.6 U	1.5 U	1.6 U	1.7 U	1.6 U
1,4-Dichlorobenzene	ppbv		1.6 U	1.5 U	1.6 U	1.7 U	1.6 U
1,4-Dioxane	ppbv		3.3 U	3 U	3.2 U	3.4 U	3.3 U
2-Butanone (MEK)	ppbv		**40 D**	**31 D**	**32 D**	**630 D**	**210 D**
2-Hexanone	ppbv		**18 D**	**7.8 D**	**6.3 D**	**110 D**	**44 D**
3-Chloropropene	ppbv		8.2 U	7.5 U	8.1 U	8.5 U	8.2 U
4-Ethyltoluene	ppbv		**16 D**	**11 D**	**14 D**	**34 D**	**29 D**
4-Methyl-2-pentanone (MIBK)	ppbv		**3.9 D**	1.5 U	**3.2 D**	1.7 U	**5.4 D**
Acetone	ppbv		**140 D**	**69 D**	**82 D**	**150 D**	**89 D**
Acrylonitrile	ppbv		1.6 U	1.5 U	1.6 U	1.7 U	1.6 U
Benzene	ppbv		**3.0 D**	**11 D**	**170 D**	**8.9 D**	**6.9 D**
Benzyl chloride	ppbv		1.6 U	1.5 U	1.6 U	1.7 U	1.6 U
Bromodichloromethane	ppbv		1.6 U	1.5 U	1.6 U	1.7 U	1.6 U
Bromoethene	ppbv		1.6 U	1.5 U	1.6 U	1.7 U	1.6 U
Bromoform	ppbv		1.6 U	1.5 U	1.6 U	1.7 U	1.6 U
Bromomethane	ppbv		1.6 U	1.5 U	1.6 U	1.7 U	1.6 U
Carbon disulfide	ppbv		**8.2 D**	**29 D**	**6.1 D**	**5.8 D**	**20 D**
Carbon tetrachloride	ppbv		0.41 U	0.38 U	0.4 U	0.43 U	0.41 U
Chlorobenzene	ppbv		1.6 U	1.5 U	1.6 U	1.7 U	1.6 U
Chloroethane	ppbv		1.6 U	1.5 U	1.6 U	1.7 U	1.6 U
Chloroform	ppbv		1.6 U	**2.4 D**	**2.3 D**	**11 D**	**11 D**
Chloromethane	ppbv		1.6 U	**1.6 D**	1.6 U	1.7 U	**7.9 D**

Table 15. Summary of Volatile Organic Compounds in Soil Vapor (ppbv), 27-10 49th Avenue, Hunters Point, New York

Parameter	Units	Sample Designation: / Sample Date:	SV1-a 5/15/2018	SV2-a 5/15/2018	SV3-a 5/15/2018	SV-4 5/15/2018	SV-5 5/15/2018
cis-1,2-Dichloroethene	ppbv		0.41 U	0.38 U	0.4 U	**770 D**	**130 D**
cis-1,3-Dichloropropene	ppbv		1.6 U	1.5 U	1.6 U	1.7 U	1.6 U
Cyclohexane	ppbv		**2.0 D**	**19 D**	**1.6 D**	1.7 U	**5.4 D**
Dibromochloromethane	ppbv		1.6 U	1.5 U	1.6 U	1.7 U	1.6 U
Dichlorodifluoromethane	ppbv		1.6 U	1.5 U	1.6 U	1.7 U	1.6 U
Ethyl Acetate	ppbv		3.3 U	3 U	3.2 U	3.4 U	3.3 U
Ethylbenzene	ppbv		**44 D**	**23 D**	**37 D**	**66 D**	**58 D**
Freon 113	ppbv		1.6 U	1.5 U	1.6 U	1.7 U	1.6 U
Freon 114	ppbv		1.6 U	1.5 U	1.6 U	1.7 U	1.6 U
Hexachlorobutadiene	ppbv		1.6 U	1.5 U	1.6 U	1.7 U	1.6 U
ISOPROPANOL	ppbv		**20 D**	**3.3 D**	**6.8 D**	3.4 U	3.3 U
m+p-Xylene	ppbv		**130 D**	**69 D**	**100 D**	**190 D**	**170 D**
Methyl Methacrylate	ppbv		1.6 U	1.5 U	1.6 U	1.7 U	1.6 U
Methylene chloride	ppbv		3.3 U	3 U	3.2 U	3.4 U	3.3 U
MTBE	ppbv		1.6 U	1.5 U	1.6 U	1.7 U	1.6 U
N-HEPTANE	ppbv		**4.4 D**	**4.6 D**	**2.7 D**	**8.2 D**	**10 D**
n-Hexane	ppbv		**3.4 D**	**7.4 D**	**1.6 D**	**6.0 D**	**13 D**
o-Xylene	ppbv		**44 D**	**24 D**	**36 D**	**69 D**	**59 D**
Propene	ppbv		**8.0 D**	**26 D**	**58 D**	**61 D**	**85 D**
Styrene	ppbv		**250 D**	**160 D**	**220 D**	**410 D**	**390 D**
Tetrachloroethene	ppbv		**310 D**	**400 D**	**190 D**	**6200 D**	**3100 D**
Tetrahydrofuran	ppbv		3.3 U	3 U	3.2 U	3.4 U	3.3 U
Toluene	ppbv		**61 D**	**18 D**	**200 D**	**160 D**	**41 D**
trans-1,2-Dichloroethene	ppbv		1.6 U	1.5 U	1.6 U	**34 D**	**6.9 D**
trans-1,3-Dichloropropene	ppbv		1.6 U	1.5 U	1.6 U	1.7 U	1.6 U
Trichloroethene	ppbv		**16 D**	**63 D**	**4.8 D**	**790 D**	**300 D**
Trichlorofluoromethane	ppbv		1.6 U	1.5 U	1.6 U	1.7 U	1.6 U
Vinyl acetate	ppbv		1.6 U	1.5 U	1.6 U	1.7 U	1.6 U
Vinyl chloride	ppbv		0.41 U	0.38 U	0.4 U	0.43 U	0.41 U

Table 16. Summary of Volatile Organic Compounds in Soil Vapor (µg/m^3), 27-10 49th Avenue, Hunters Point, New York

Parameter	Units	Sample Designation:	11-6-DUP	A1	A1	A2	A2	A3	A3	A4	A4	A10	AA	AA	B12	B14	B-2	B-4	B6	C11	C3
		Sample Date:	11/6/2018	1/10/2018	6/23/2021	1/10/2018	6/23/2021	1/10/2018	6/23/2021	1/10/2018	6/23/2021	11/7/2018	11/6/2018	6/23/2021	11/7/2018	11/7/2018	11/6/2018	11/6/2018	11/7/2018	11/7/2018	11/7/2018
1,1,1,2-Tetrachloroethane	ug/m3		0.57 U	NA	0.66 U	NA	0.62 U	NA	0.65 U	NA	0.51 U	1.1 U	0.53 U	0.59 U	1.1 U	0.94 U	0.53 U	0.68 U	1.2 U	1.2 U	1.1 U
1,1,1-Trichloroethane	ug/m3		0.45 U	1.1 U	0.53 U	1.1 U	0.49 U	1.1 U	0.51 U	1.1 U	0.4 U	**1.5 D**	0.42 U	0.47 U	**1.8 D**	**1.7 D**	0.42 U	**6.6 D**	**12 D**	0.93 U	**1.7 D**
1,1,2,2-Tetrachloroethane	ug/m3		0.57 U	1.4 U	0.66 U	1.4 U	0.62 U	1.4 U	0.65 U	1.4 U	0.51 U	1.1 U	0.53 U	0.59 U	1.1 U	0.94 U	0.53 U	0.68 U	1.2 U	1.2 U	1.1 U
1,1,2-Trichloroethane	ug/m3		0.45 U	1.1 U	0.53 U	1.1 U	0.49 U	1.1 U	0.51 U	1.1 U	0.4 U	0.9 U	0.42 U	0.47 U	0.88 U	0.74 U	0.42 U	0.54 U	0.95 U	0.93 U	0.86 U
1,1-Dichloroethane	ug/m3		0.34 U	0.81 U	0.39 U	0.81 U	0.37 U	0.81 U	0.38 U	0.81 U	0.3 U	0.67 U	0.31 U	0.35 U	0.65 U	0.55 U	0.31 U	**4.4 D**	0.71 U	0.69 U	0.64 U
1,1-Dichloroethene	ug/m3		0.082 U	0.79 U	0.095 U	0.79 U	0.089 U	0.79 U	0.093 U	0.79 U	0.073 U	**0.52 D**	0.077 U	0.085 U	0.16 U	0.14 U	0.077 U	**0.43 D**	0.17 U	0.17 U	0.16 U
1,2,4-Trichlorobenzene	ug/m3		0.62 U	1.5 U	0.71 U	1.5 U	0.67 U	1.5 U	0.7 U	1.5 U	0.55 U	1.2 U	0.58 U	0.63 U	1.2 U	1 U	0.58 U	0.74 U	1.3 U	1.3 U	1.2 U
1,2,4-Trimethylbenzene	ug/m3		**0.98 D**	**2.3**	**3.6 D**	0.98 U	**1.1 D**	**2.5**	**1.2 D**	0.98 U	**0.98 D**	**6.4 D**	**0.65 D**	0.42 U	**6.0 D**	**5.6 D**	**0.88 D**	**1.3 D**	**4.7 D**	0.83 U	**9.0 D**
1,2-Dibromoethane	ug/m3		0.64 U	1.5 U	0.74 U	1.5 U	0.69 U	1.5 U	0.72 U	1.5 U	0.57 U	1.3 U	0.6 U	0.66 U	1.2 U	1 U	0.6 U	0.76 U	1.3 U	1.3 U	1.2 U
1,2-Dichlorobenzene	ug/m3		0.5 U	1.2 U	0.58 U	1.2 U	0.54 U	1.2 U	0.57 U	1.2 U	0.44 U	0.99 U	0.47 U	0.51 U	0.97 U	0.82 U	0.47 U	0.6 U	1.1 U	1 U	0.95 U
1,2-Dichloroethane	ug/m3		0.34 U	0.81 U	0.39 U	0.81 U	0.37 U	0.81 U	0.38 U	0.81 U	0.3 U	0.67 U	0.31 U	0.35 U	0.65 U	0.55 U	0.31 U	0.4 U	0.71 U	0.69 U	0.64 U
1,2-Dichloropropane	ug/m3		0.38 U	0.92 U	0.44 U	0.92 U	0.42 U	0.92 U	0.43 U	0.92 U	0.34 U	0.76 U	0.36 U	0.39 U	0.74 U	0.63 U	0.36 U	0.46 U	0.81 U	0.78 U	0.73 U
1,3,5-Trimethylbenzene	ug/m3		0.41 U	0.98 U	**1.9 D**	0.98 U	0.44 U	0.98 U	0.46 U	0.98 U	0.36 U	**6.4 D**	0.38 U	0.42 U	**1.6 D**	**1.4 D**	0.38 U	0.49 U	**1.2 D**	0.83 U	**3.0 D**
1,3-Butadiene	ug/m3		0.55 U	0.44 U	0.64 U	0.44 U	0.6 U	0.44 U	0.62 U	0.44 U	0.49 U	1.1 U	0.52 U	0.57 U	1.1 U	0.9 U	0.52 U	0.66 U	1.2 U	1.1 U	1 U
1,3-Dichlorobenzene	ug/m3		0.5 U	1.2 U	0.58 U	1.2 U	0.54 U	1.2 U	0.57 U	1.2 U	0.44 U	0.99 U	0.47 U	0.51 U	0.97 U	0.82 U	0.47 U	0.6 U	1.1 U	1 U	0.95 U
1,3-Dichloropropane	ug/m3		0.38 U	NA	0.45 U	NA	0.42 U	NA	0.43 U	NA	0.34 U	0.76 U	0.36 U	0.39 U	0.74 U	0.63 U	0.36 U	0.46 U	0.81 U	0.78 U	0.73 U
1,3-Hexachlorobutadiene	ug/m3		NA	2.1 U	NA	2.1 U	NA	2.1 U	NA	2.1 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
1,4-Dichlorobenzene	ug/m3		0.5 U	1.2 U	0.58 U	1.2 U	0.54 U	1.2 U	0.57 U	1.2 U	0.44 U	0.99 U	0.47 U	0.51 U	0.97 U	0.82 U	0.47 U	0.6 U	1.1 U	1 U	0.95 U
1,4-Dioxane	ug/m3		0.6 U	0.72 U	0.69 U	0.72 U	0.65 U	0.72 U	0.68 U	0.72 U	0.53 U	1.2 U	0.56 U	0.62 U	1.2 U	0.98 U	0.56 U	0.72 U	1.3 U	1.2 U	1.1 U
2,2,4-Trimethylpentane	ug/m3		NA	**2.5**	NA	**1.4**	NA	**2.5**	NA	**0.93**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Butanone (MEK)	ug/m3		**1.1 D**	**1**	**1.4 D**	**1.1**	**1.3 D**	**1**	**1.2 D**	**1.2**	**0.78 D**	**1.7 D**	**0.94 D**	**0.93 D**	**1.6 D**	**1.3 D**	**1.1 D**	**1.4 D**	**1.4 D**	**1.5 D**	**5.3 D**
2-Hexanone	ug/m3		0.68 U	NA	0.79 U	NA	0.74 U	NA	0.77 U	NA	0.61 U	1.4 U	**1.3 D**	0.7 U	1.3 U	1.1 U	0.64 U	0.81 U	1.4 U	1.4 U	**4.1 D**
3-Chloropropene	ug/m3		1.3 U	NA	1.5 U	NA	1.4 U	NA	1.5 U	NA	1.2 U	2.6 U	1.2 U	1.3 U	2.5 U	2.1 U	1.2 U	1.6 U	2.7 U	2.7 U	2.5 U
4-Ethyltoluene	ug/m3		**0.90 D**	NA	**4.8 D**	NA	**0.89 D**	NA	**0.93 D**	NA	**0.73 D**	**5.3 D**	0.38 U	0.42 U	**4.5 D**	**4.2 D**	**0.80 D**	**1.2 D**	**3.6 D**	0.83 U	**6.6 D**
4-Methyl-2-pentanone (MIBK)	ug/m3		0.34 U	0.82 U	0.39 U	0.82 U	**0.63 D**	0.82 U	**0.62 D**	**2**	**0.42 D**	0.68 U	0.32 U	**0.35 D**	0.66 U	0.56 U	0.32 U	**0.41 D**	0.72 U	0.69 U	**1.3 D**
Acetone	ug/m3		**8.0 D**	**10**	**73 D**	**13**	**100 D**	**13**	**92 D**	**7.6**	**44 D**	**7.6 D**	**6.5 D**	**7.7 D**	**7.6 D**	**4.8 D**	**7.2 D**	**8.3 D**	**3.5 D**	**11 D**	**37 D**
Acrylonitrile	ug/m3		0.18 U	NA	0.21 U	NA	0.2 U	NA	0.2 U	NA	0.16 U	0.36 U	0.17 U	0.19 U	0.35 U	0.3 U	0.17 U	0.22 U	0.38 U	0.37 U	0.34 U
Benzene	ug/m3		**0.82 D**	**0.96**	**1.4 D**	**0.96**	**0.46 D**	**0.86**	**0.42 D**	**1.4**	**0.33 D**	**7.8 D**	**0.82 D**	**0.35 D**	**4.6 D**	**1.1 D**	**0.77 D**	**0.95 D**	**0.84 D**	**0.65 D**	**0.86 D**
Benzyl chloride	ug/m3		0.43 U	NA	0.5 U	NA	0.47 U	NA	0.49 U	NA	0.38 U	0.86 U	0.4 U	0.44 U	0.83 U	0.71 U	0.4 U	0.51 U	0.9 U	0.88 U	0.82 U
Bromodichloromethane	ug/m3		0.56 U	1.3 U	0.65 U	1.3 U	0.6 U	1.3 U	0.63 U	1.3 U	0.5 U	1.1 U	0.52 U	0.57 U	1.1 U	0.91 U	0.52 U	0.67 U	1.2 U	1.1 U	1.1 U
Bromoethene	ug/m3		0.36 U	NA	0.42 U	NA	0.39 U	NA	0.41 U	NA	0.32 U	0.72 U	0.34 U	0.37 U	0.7 U	0.6 U	0.34 U	0.43 U	0.76 U	0.74 U	0.69 U
Bromoform	ug/m3		0.86 U	2.1 U	1 U	2.1 U	0.93 U	2.1 U	0.97 U	2.1 U	0.76 U	1.7 U	0.8 U	0.88 U	1.7 U	1.4 U	0.8 U	1 U	1.8 U	1.8 U	1.6 U
Bromomethane	ug/m3		0.32 U	0.78 U	0.37 U	0.78 U	0.35 U	0.78 U	0.37 U	0.78 U	0.29 U	0.64 U	0.3 U	0.33 U	0.62 U	0.53 U	0.3 U	0.39 U	0.68 U	0.66 U	0.61 U
Carbon disulfide	ug/m3		0.26 U	0.62 U	0.3 U	0.62 U	0.28 U	0.62 U	0.29 U	0.62 U	0.23 U	**7.0 D**	0.24 U	0.27 U	**9.1 D**	**6.5 D**	0.24 U	0.31 U	**18 D**	**2.5 D**	**79 D**
Carbon tetrachloride	ug/m3		**0.31 D**	**0.38**	**0.42 D**	**0.38**	**0.34 D**	**0.38**	**0.41 D**	**0.38**	**0.37 D**	0.26 U	**0.34 D**	**0.32 D**	0.25 U	0.21 U	**0.34 D**	**0.44 D**	0.27 U	0.27 U	0.25 U
Chlorobenzene	ug/m3		0.38 U	0.92 U	0.44 U	0.92 U	0.42 U	0.92 U	0.43 U	0.92 U	0.34 U	0.76 U	0.36 U	0.39 U	**0.81 D**	0.63 U	0.36 U	0.46 U	0.8 U	0.78 U	0.73 U
Chloroethane	ug/m3		0.22 U	0.53 U	0.25 U	0.53 U	0.24 U	0.53 U	0.25 U	0.53 U	0.19 U	0.44 U	0.21 U	0.23 U	0.42 U	0.36 U	0.21 U	0.26 U	0.46 U	0.45 U	0.42 U
Chloroform	ug/m3		0.41 U	0.98 U	0.47 U	0.98 U	0.44 U	0.98 U	0.46 U	0.98 U	0.36 U	**21 D**	0.38 U	0.42 U	**11 D**	**9.0 D**	0.38 U	0.48 U	**43 D**	0.83 U	**15 D**
Chloromethane	ug/m3		0.17 U	0.41 U	**0.86 D**	0.41 U	**0.88 D**	0.41 U	**0.78 D**	0.41 U	**1.0 D**	0.34 U	**0.87 D**	**0.97 D**	0.33 U	0.28 U	**1.7 D**	0.21 U	0.36 U	0.35 U	0.33 U
cis-1,2-Dichloroethene	ug/m3		0.082 U	0.79 U	0.095 U	0.79 U	0.089 U	0.79 U	0.093 U	0.79 U	0.073 U	**940 D**	**0.12 D**	0.085 U	**810 D**	**240 D**	0.077 U	0.098 U	0.17 U	**0.67 D**	0.16 U
cis-1,3-Dichloropropene	ug/m3		0.38 U	0.91 U	0.44 U	0.91 U	0.41 U	0.91 U	0.43 U	0.91 U	0.34 U	0.75 U	0.35 U	0.39 U	0.73 U	0.62 U	0.35 U	0.45 U	0.79 U	0.77 U	0.72 U
Cyclohexane	ug/m3		**0.40 D**	0.69 U	**19 D**	**0.69**	0.31 U	0.69 U	0.32 U	0.69 U	0.25 U	**1.1 D**	**0.37 D**	**0.35 D**	**0.72 D**	**0.66 D**	**0.35 D**	**0.48 D**	**0.96 D**	0.58 U	**0.60 D**
Dibromochloromethane	ug/m3		0.71 U	1.7 U	0.82 U	1.7 U	0.77 U	1.7 U	0.8 U	1.7 U	0.63 U	1.4 U	0.66 U	0.73 U	1.4 U	1.2 U	0.66 U	0.85 U	1.5 U	1.4 U	1.3 U
Dichlorodifluoromethane	ug/m3		**1.6 D**	0.99 U	**2.1 D**	**2.4**	**2.3 D**	**2.5**	**2.1 D**	**2.4**	**2.2 D**	**1.9 D**	**1.7 D**	**2.1 D**	**2.0 D**	**1.8 D**	**1.3 D**	**1.6 D**	**1.8 D**	**1.8 D**	**2.0 D**
Ethyl Acetate	ug/m3		**0.81 D**	NA	**4.2 D**	NA	**0.78 D**	NA	**0.78 D**	NA	**0.53 D**	1.2 U	**0.59 D**	**0.71 D**	1.2 U	0.98 U	**0.62 D**	**0.82 D**	1.3 U	1.2 U	1.1 U
Ethylbenzene	ug/m3		**0.72 D**	**1.5**	**2.2 D**	0.87 U	**0.43 D**	**1.7**	**0.41 D**	0.87 U	0.32 U	**2.9 D**	**0.64 D**	0.37 U	**1.2 D**	**1.0 D**	**0.71 D**	**0.91 D**	**1.2 D**	0.74 U	**2.7 D**
Freon 113	ug/m3		0.64 U	1.5 U	0.74 U	1.5 U	0.69 U	1.5 U	0.72 U	1.5 U	0.57 U	1.3 U	0.6 U	0.65 U	1.2 U	1 U	0.6 U	0.76 U	1.3 U	1.3 U	1.2 U
Freon 114	ug/m3		0.58 U	1.4 U	0.67 U	1.4 U	0.63 U	1.4 U	0.66 U	1.4 U	0.52 U	1.2 U	**2.9 D**	0.6 U	1.1 U	0.95 U	0.54 U	0.69 U	1.2 U	1.2 U	1.1 U
Hexachlorobutadiene	ug/m3		0.89 U	NA	1 U	NA	0.96 U	NA	1 U	NA	0.79 U	1.8 U	0.83 U	0.91 U	1.7 U	1.5 U	0.83 U	1.1 U	1.9 U	1.8 U	1.7 U
Isopropanol	ug/m3		**4.0 D**	NA	**6.6 D**	NA	**5.8 D**	NA	**6.6 D**	NA	**2.4 D**	0.81 U	**2.2 D**	**3.4 D**	0.79 U	0.67 U	**2.7 D**	**3.4 D**	0.86 U	0.83 U	**3.2 D**
m+p-Xylene	ug/m3		**2.4 D**	**5.4**	**24 D**	0.87 U	**1.4 D**	**6.2**	**1.3 D**	**1.8**	**0.77 D**	**4.9 D**	**2.0 D**	**1.1 D**	**4.3 D**	**3.4 D**	**2.3 D**	**3.0 D**	**4.0 D**	**1.8 D**	**12 D**
Methyl Methacrylate	ug/m3		**0.37 D**	NA	0.39 U	NA	0.37 U	NA	0.39 U	NA	0.3 U	0.68 U	**0.64 D**	0.35 U	0.66 U	0.56 U	**1.2 D**	0.41 U	0.72 U	0.69 U	0.65 U
Methylene chloride	ug/m3		**4.3 D**	**3.2**	**21 D**	**3.1**	**6.2 D**	**4.2**	**3.4 D**	**4.2**	**1.4 D**	1.1 U	**5.0 D**	**1.2 D**	1.1 U	0.95 U	**12 D**	**2.3 D**	1.2 U	1.2 U	1.1 U

Table 16. Summary of Volatile Organic Compounds in Soil Vapor (µg/m^3), 27-10 49th Avenue, Hunters Point, New York

Parameter	Units	Sample Designation:	11-6-DUP	A1	A1	A2	A2	A3	A3	A4	A4	A10	AA	AA	B12	B14	B-2	B-4	B6	C11	C3
		Sample Date:	11/6/2018	1/10/2018	6/23/2021	1/10/2018	6/23/2021	1/10/2018	6/23/2021	1/10/2018	6/23/2021	11/7/2018	11/6/2018	6/23/2021	11/7/2018	11/7/2018	11/6/2018	11/6/2018	11/7/2018	11/7/2018	11/7/2018
MTBE	ug/m3		0.3 U	0.72 U	0.35 U	0.72 U	0.33 U	0.72 U	0.34 U	0.72 U	0.27 U	0.6 U	0.28 U	0.31 U	0.58 U	0.49 U	0.28 U	0.36 U	0.63 U	0.61 U	0.57 U
N-Heptane	ug/m3		**0.58 D**	0.82 U	**24 D**	0.82 U	**0.74 D**	0.82 U	**0.66 D**	0.82 U	**0.39 D**	0.68 U	**0.67 D**	**0.56 D**	0.66 U	0.56 U	**0.48 D**	**0.69 D**	0.72 U	0.7 U	**2.5 D**
n-Hexane	ug/m3		**1.0 D**	**0.95**	**52 D**	**1.1**	**0.89 D**	**0.88**	**0.63 D**	**1.2**	**0.42 D**	0.58 U	**0.93 D**	**0.84 D**	0.57 U	0.48 U	**0.82 D**	**1.1 D**	**2.8 D**	**0.66 D**	**11 D**
o-Xylene	ug/m3		**0.76 D**	**2.3**	**8.7 D**	0.87 U	**0.47 D**	**2.6**	**0.49 D**	0.87 U	0.32 U	**4.6 D**	**0.64 D**	**0.37 D**	**1.7 D**	**1.4 D**	**0.78 D**	**0.99 D**	**1.6 D**	0.74 U	**6.2 D**
Propene	ug/m3		**1.9 D**	NA	0.17 U	NA	0.16 U	NA	0.16 U	NA	0.13 U	**2.0 D**	**1.7 D**	0.15 U	**2.5 D**	**1.3 D**	**1.6 D**	**1.9 D**	0.3 U	**1.5 D**	**1.6 D**
Styrene	ug/m3		0.35 U	0.85 U	0.41 U	0.85 U	0.38 U	0.85 U	0.4 U	0.85 U	0.31 U	**1.2 D**	0.33 U	0.36 U	**1.4 D**	**1.3 D**	0.33 U	**0.42 D**	**0.74 D**	0.72 U	**1.8 D**
Tert-butyl alcohol	ug/m3		NA	0.61 U	NA	0.61 U	NA	0.61 U	NA	0.61 U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Tetrachloroethene	ug/m3		**10 D**	**12**	**0.78 D**	**8.3**	0.61 U	**16**	0.64 U	1.4 U	0.5 U	**22000 D**	**1.1 D**	0.58 U	**8900 D**	**6200 D**	**10 D**	**96 D**	**7400 D**	**15 D**	**2800 D**
Tetrahydrofuran	ug/m3		0.49 U	NA	0.57 U	NA	0.53 U	NA	0.56 U	NA	0.44 U	0.98 U	0.46 U	0.5 U	0.95 U	0.8 U	0.46 U	0.59 U	1 U	1 U	**1.8 D**
Toluene	ug/m3		**4.5 D**	**5**	**27 D**	**2.6**	**2.5 D**	**5.5**	**2.4 D**	**4.2**	**2.1 D**	**3.4 D**	**3.7 D**	**2.0 D**	**2.3 D**	**1.6 D**	**4.5 D**	**5.3 D**	**2.0 D**	**2.8 D**	**4.8 D**
trans-1,2-Dichloroethene	ug/m3		0.33 U	0.79 U	0.38 U	0.79 U	0.36 U	0.79 U	0.37 U	0.79 U	0.29 U	**27 D**	0.31 U	0.34 U	**17 D**	**17 D**	0.31 U	0.39 U	0.69 U	0.67 U	0.62 U
trans-1,3-Dichloropropene	ug/m3		0.38 U	0.91 U	0.44 U	0.91 U	0.41 U	0.91 U	0.43 U	0.91 U	0.34 U	0.75 U	0.35 U	0.39 U	0.73 U	0.62 U	0.35 U	0.45 U	0.79 U	0.77 U	0.72 U
Trichloroethene	ug/m3		**0.27 D**	**0.38**	0.13 U	**0.38**	0.12 U	**0.48**	0.13 U	0.25 U	0.099 U	**860 D**	0.1 U	0.11 U	**490 D**	**280 D**	**0.63 D**	**11 D**	**1100 D**	**0.55 D**	**29 D**
Trichlorofluoromethane	ug/m3		**1.2 D**	**1.5**	**1.1 D**	**1.4**	**1.1 D**	**1.2**	**1.2 D**	**1.4**	**1.0 D**	**1.4 D**	**1.2 D**	**0.96 D**	**1.2 D**	**1.1 D**	**1.1 D**	**1.8 D**	**4.0 D**	0.95 U	0.89 U
Vinyl acetate	ug/m3		0.29 U	0.87 U	0.34 U	0.87 U	0.32 U	0.87 U	0.33 U	0.87 U	0.26 U	0.58 U	0.27 U	0.3 U	0.57 U	0.48 U	0.27 U	0.35 U	0.62 U	0.6 U	0.55 U
Vinyl chloride	ug/m3		0.053 U	0.51 U	0.12 U	0.51 U	0.12 U	0.51 U	0.12 U	0.51 U	0.094 U	0.11 U	0.05 U	0.11 U	**40 D**	0.087 U	0.05 U	0.063 U	0.11 U	0.11 U	0.1 U

Table 16. Summary of Volatile Organic Compounds in Soil Vapor (µg/m^3), 27-10 49th Avenue, Hunters Point, New York

Parameter	Units	Sample Designation: / Sample Date:	C5 11/7/2018	C-7 11/6/2018	D1 11/7/2018	DUP 11/7/2018	SV-1 12/20/2017	SV-2 12/20/2017	SV-3 12/20/2017
1,1,1,2-Tetrachloroethane	ug/m3		1.2 U	0.65 U	1 U	1.1 U	NA	NA	NA
1,1,1-Trichloroethane	ug/m3		**2.7 D**	0.51 U	0.81 U	**3.2 D**	11 U	11 U	**33 D**
1,1,2,2-Tetrachloroethane	ug/m3		1.2 U	0.65 U	1 U	1.1 U	14 U	14 U	14 U
1,1,2-Trichloroethane	ug/m3		0.92 U	0.51 U	0.81 U	0.88 U	11 U	11 U	11 U
1,1-Dichloroethane	ug/m3		0.68 U	0.38 U	0.6 U	0.65 U	8.1 U	8.1 U	8.1 U
1,1-Dichloroethene	ug/m3		0.17 U	0.093 U	0.15 U	0.16 U	7.9 U	7.9 U	7.9 U
1,2,4-Trichlorobenzene	ug/m3		1.3 U	0.7 U	1.1 U	1.2 U	15 U	15 U	15 U
1,2,4-Trimethylbenzene	ug/m3		**4.9 D**	**0.74 D**	**5.7 D**	**4.8 D**	9.8 U	9.8 U	9.8 U
1,2-Dibromoethane	ug/m3		1.3 U	0.72 U	1.1 U	1.2 U	15 U	15 U	15 U
1,2-Dichlorobenzene	ug/m3		1 U	0.57 U	0.9 U	0.97 U	12 U	12 U	12 U
1,2-Dichloroethane	ug/m3		0.68 U	0.38 U	0.6 U	0.65 U	8.1 U	8.1 U	8.1 U
1,2-Dichloropropane	ug/m3		0.78 U	0.43 U	0.69 U	0.74 U	9.2 U	9.2 U	9.2 U
1,3,5-Trimethylbenzene	ug/m3		**1.1 D**	0.46 U	**1.8 D**	**1.2 D**	9.8 U	9.8 U	9.8 U
1,3-Butadiene	ug/m3		1.1 U	0.62 U	0.99 U	1.1 U	4.4 U	4.4 U	4.4 U
1,3-Dichlorobenzene	ug/m3		1 U	0.57 U	0.9 U	0.97 U	12 U	12 U	12 U
1,3-Dichloropropane	ug/m3		0.78 U	0.43 U	0.69 U	0.74 U	NA	NA	NA
1,3-Hexachlorobutadiene	ug/m3		NA	NA	NA	NA	21 U	21 U	21 U
1,4-Dichlorobenzene	ug/m3		**1.7 D**	0.57 U	0.9 U	**1.2 D**	12 U	12 U	12 U
1,4-Dioxane	ug/m3		1.2 U	0.68 U	1.1 U	1.2 U	7.2 U	7.2 U	7.2 U
2,2,4-Trimethylpentane	ug/m3		NA	NA	NA	NA	9.3 U	9.3 U	9.3 U
2-Butanone (MEK)	ug/m3		**2.6 D**	**1.2 D**	**12 D**	**2.2 D**	**59 D**	**76 D**	**110 D**
2-Hexanone	ug/m3		1.4 U	0.77 U	**2.8 D**	1.3 U	NA	NA	NA
3-Chloropropene	ug/m3		2.6 U	1.5 U	2.3 U	2.5 U	NA	NA	NA
4-Ethyltoluene	ug/m3		**3.7 D**	**0.74 D**	**4.6 D**	**3.2 D**	NA	NA	NA
4-Methyl-2-pentanone (MIBK)	ug/m3		0.69 U	0.39 U	**3.0 D**	0.66 U	8.2 U	8.2 U	8.2 U
Acetone	ug/m3		**6.3 D**	**8.0 D**	**59 D**	**3.9 D**	**33 D**	**110 D**	**530 D**
Acrylonitrile	ug/m3		0.37 U	0.2 U	0.32 U	0.35 U	NA	NA	NA
Benzene	ug/m3		**3.2 D**	**0.81 D**	**0.86 D**	**3.4 D**	6.4 U	**35 D**	**160 D**
Benzyl chloride	ug/m3		0.87 U	0.49 U	0.77 U	0.83 U	NA	NA	NA
Bromodichloromethane	ug/m3		1.1 U	0.63 U	1 U	1.1 U	13 U	13 U	13 U
Bromoethene	ug/m3		0.74 U	0.41 U	0.65 U	0.7 U	NA	NA	NA
Bromoform	ug/m3		1.7 U	0.97 U	1.5 U	1.7 U	21 U	21 U	21 U
Bromomethane	ug/m3		0.66 U	0.37 U	0.58 U	0.62 U	7.8 U	7.8 U	7.8 U
Carbon disulfide	ug/m3		**13 D**	0.29 U	**230 D**	**15 D**	**24 D**	**40 D**	**110 D**
Carbon tetrachloride	ug/m3		0.27 U	**0.30 D**	0.23 U	0.25 U	2.5 U	2.5 U	2.5 U
Chlorobenzene	ug/m3		0.78 U	0.43 U	0.69 U	0.74 U	9.2 U	9.2 U	9.2 U
Chloroethane	ug/m3		0.45 U	0.25 U	0.39 U	0.42 U	5.3 U	5.3 U	5.3 U
Chloroform	ug/m3		**9.6 D**	0.46 U	**5.4 D**	**12 D**	9.8 U	**13 D**	**19 D**
Chloromethane	ug/m3		0.35 U	0.19 U	0.31 U	0.33 U	4.1 U	4.1 U	4.1 U
cis-1,2-Dichloroethene	ug/m3		0.17 U	0.093 U	0.15 U	0.16 U	7.9 U	7.9 U	7.9 U
cis-1,3-Dichloropropene	ug/m3		0.77 U	0.43 U	0.68 U	0.73 U	9.1 U	9.1 U	9.1 U
Cyclohexane	ug/m3		**2.6 D**	**0.39 D**	**0.62 D**	**2.3 D**	**13 D**	**120 D**	**160 D**
Dibromochloromethane	ug/m3		1.4 U	0.8 U	1.3 U	1.4 U	17 U	17 U	17 U
Dichlorodifluoromethane	ug/m3		**1.8 D**	**1.6 D**	**2.0 D**	**1.7 D**	9.9 U	9.9 U	9.9 U
Ethyl Acetate	ug/m3		1.2 U	**0.75 D**	1.1 U	1.2 U	NA	NA	NA
Ethylbenzene	ug/m3		**1.4 D**	**0.69 D**	**1.8 D**	**0.91 D**	8.7 U	8.7 U	8.7 U
Freon 113	ug/m3		1.3 U	0.72 U	1.1 U	1.2 U	15 U	15 U	15 U
Freon 114	ug/m3		1.2 U	0.66 U	1 U	1.1 U	14 U	14 U	14 U
Hexachlorobutadiene	ug/m3		1.8 U	1 U	1.6 U	1.7 U	NA	NA	NA
Isopropanol	ug/m3		**0.83 D**	**2.9 D**	**3.8 D**	0.79 U	NA	NA	NA
m+p-Xylene	ug/m3		**5.1 D**	**2.1 D**	**7.0 D**	**3.5 D**	8.7 U	8.7 U	8.7 U
Methyl Methacrylate	ug/m3		0.69 U	**0.77 D**	0.61 U	0.66 U	NA	NA	NA
Methylene chloride	ug/m3		**4.7 D**	**8.3 D**	**1.8 D**	**2.3 D**	**19 D**	6.9 U	6.9 U

Table 16. Summary of Volatile Organic Compounds in Soil Vapor (µg/m^3), 27-10 49th Avenue, Hunters Point, New York

Parameter	Units	Sample Designation: / Sample Date:	C5 11/7/2018	C-7 11/6/2018	D1 11/7/2018	DUP 11/7/2018	SV-1 12/20/2017	SV-2 12/20/2017	SV-3 12/20/2017
MTBE	ug/m3		0.61 U	0.34 U	0.54 U	0.58 U	7.2 U	7.2 U	7.2 U
N-Heptane	ug/m3		0.69 U	**0.54 D**	**7.6 D**	0.66 U	8.2 U	**9.8 D**	**35 D**
n-Hexane	ug/m3		**2.3 D**	**0.96 D**	**38 D**	**2.8 D**	**9.9 D**	**20 D**	**42 D**
o-Xylene	ug/m3		**2.3 D**	**0.69 D**	**2.7 D**	**1.7 D**	8.7 U	8.7 U	8.7 U
Propene	ug/m3		**0.70 D**	**1.8 D**	**1.2 D**	**0.50 D**	NA	NA	NA
Styrene	ug/m3		0.72 U	0.4 U	**1.3 D**	0.68 U	8.5 U	8.5 U	8.5 U
Tert-butyl alcohol	ug/m3		NA	NA	NA	NA	6.1 U	**35 D**	**58 D**
Tetrachloroethene	ug/m3		**11000 D**	**10 D**	**740 D**	**11000 D**	**660 D**	**480 D**	**1100 D**
Tetrahydrofuran	ug/m3		1 U	0.55 U	0.88 U	0.95 U	NA	NA	NA
Toluene	ug/m3		**5.1 D**	**4.4 D**	**6.7 D**	**3.4 D**	**24 D**	**26 D**	**31 D**
trans-1,2-Dichloroethene	ug/m3		0.67 U	0.37 U	0.59 U	0.64 U	7.9 U	7.9 U	7.9 U
trans-1,3-Dichloropropene	ug/m3		0.77 U	0.43 U	0.68 U	0.73 U	9.1 U	9.1 U	9.1 U
Trichloroethene	ug/m3		**1100 D**	0.13 U	**5.9 D**	**1400 D**	**49 D**	**120 D**	**39 D**
Trichlorofluoromethane	ug/m3		**1.2 D**	**1.2 D**	**1.3 D**	**1.4 D**	11 U	11 U	11 U
Vinyl acetate	ug/m3		0.59 U	0.33 U	0.52 U	0.57 U	8.7 U	8.7 U	8.7 U
Vinyl chloride	ug/m3		0.11 U	0.06 U	0.095 U	0.1 U	5.1 U	5.1 U	5.1 U

Notes Utilized Throughout Tables	
Soil Vapor/Ambient Air	
J -	Estimated value
U -	The analyte was analyzed for, but was not detected above the level of the associated reported quantitation limit
D -	Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte
R -	Sample results rejected by validator
FD -	Duplicate sample
ug/m3 -	Micrograms per cubic meter
Bold data indicates that parameter was detected	

Table 17. Summary of Volatile Organic Compounds in Soil Vapor and Indoor Air, 27-10 49th Avenue, Long Island City, New York

Sample Designation:		AA-1	EFF-SVE-1	IA-1	IA-1	IA-2	SSV-1	SSV-2
Sample Date:		03/10/2025	03/10/2025	03/10/2025	03/10/2025	03/10/2025	03/10/2025	03/10/2025
Normal or Field Duplicate:		N	N	N	FD	N	N	N
Parameter	Units							
1,1,1-Trichloroethane (TCA)	UG/M3	0.24 U	2.4 U	1.8 R	0.24 U	0.24 U	0.24 U	0.24 U
1,1,2,2-Tetrachloroethane	UG/M3	0.3 U	3 U	2.2 R	0.3 U	0.3 U	0.3 U	0.3 U
1,1,2-Trichloro-1,2,2-Trifluoroethane	UG/M3	**0.49 J**	**4.9 J**	3 R	**0.48 J**	**0.47 J**	**0.46 J**	**0.5 J**
1,1,2-Trichloroethane	UG/M3	0.4 U	4 U	3 R	0.4 U	0.4 U	0.4 U	0.4 U
1,1-Dichloroethane	UG/M3	0.1 U	1 U	0.75 R	0.1 U	0.1 U	0.1 U	0.1 U
1,1-Dichloroethene	UG/M3	0.1 U	1 U	0.76 R	0.1 U	0.1 U	0.1 U	0.1 U
1,2,4-Trichlorobenzene	UG/M3	2.4 U	24 U	18 R	2.4 U	2.4 U	2.4 U	2.4 U
1,2,4-Trimethylbenzene	UG/M3	0.39 U	3.9 U	2.9 R	0.39 U	0.39 U	**0.94 J**	**1.3**
1,2-Dibromoethane (Ethylene Dibromide)	UG/M3	0.32 U	3.2 U	2.4 R	0.32 U	0.32 U	0.32 U	0.32 U
1,2-Dichlorobenzene	UG/M3	0.4 U	4 U	2.9 R	0.4 U	0.4 U	0.4 U	0.4 U
1,2-Dichloroethane	UG/M3	0.38 U	3.8 U	2.8 R	0.38 U	0.38 U	0.38 U	0.38 U
1,2-Dichloropropane	UG/M3	0.43 U	4.3 U	3.2 R	0.43 U	0.43 U	0.43 U	0.43 U
1,2-Dichlorotetrafluoroethane	UG/M3	0.34 U	3.4 U	2.5 R	0.34 U	0.34 U	0.34 U	0.34 U
1,3,5-Trimethylbenzene (Mesitylene)	UG/M3	0.23 U	2.3 U	1.7 R	0.23 U	0.23 U	0.23 U	**0.25 J**
1,3-Butadiene	UG/M3	**0.089 J**	**0.87 J**	0.64 R	**0.15 J**	**0.099 J**	0.086 U	0.086 U
1,3-Dichlorobenzene	UG/M3	0.44 U	4.4 U	3.3 R	0.44 U	0.44 U	0.44 U	0.44 U
1,4-Dichlorobenzene	UG/M3	0.54 U	5.4 U	3.9 R	0.54 U	0.54 U	0.54 U	0.54 U
1,4-Dioxane (P-Dioxane)	UG/M3	0.3 U	3 U	2.2 R	0.3 U	0.3 U	**3.6 J**	**16 J**
2,2,4-Trimethylpentane	UG/M3	**0.39 J**	**8.9 J**	1.3 R	**0.47 J**	**0.34 J**	0.18 U	**0.37 J**
2-Chlorotoluene	UG/M3	0.24 U	2.4 U	1.8 R	0.24 U	0.24 U	0.24 U	0.24 U
2-Hexanone	UG/M3	0.61 U	6.1 U	4.5 R	0.61 U	0.61 U	0.61 U	0.61 U
4-Ethyltoluene	UG/M3	0.24 U	2.4 U	1.8 R	0.24 U	0.24 U	0.24 U	**0.31 J**
Acetone	UG/M3	**13**	**140**	28 R	**12**	**9.9 J**	**24**	**120 D**
Allyl Chloride (3-Chloropropene)	UG/M3	0.38 U	3.8 U	2.8 R	0.38 U	0.38 U	0.38 U	0.38 U
Benzene	UG/M3	**0.64**	**3.3 J**	1 R	**0.74**	**0.65**	**0.46 J**	**0.49 J**
Benzyl Chloride	UG/M3	0.46 U	4.6 U	3.4 R	0.46 U	0.46 U	0.46 U	0.46 U
Bromodichloromethane	UG/M3	0.34 U	3.4 U	2.5 R	0.34 U	0.34 U	0.34 U	0.34 U
Bromoform	UG/M3	1.2 U	12 U	9.1 R	1.2 U	1.2 U	1.2 U	1.2 U
Bromomethane	UG/M3	0.28 U	2.8 U	2 R	0.28 U	0.28 U	0.28 U	0.28 U
Butane	UG/M3	**6.3**	**28**	**6.2 R**	**6.4**	**6.1**	**0.8 J**	**5**
Carbon Disulfide	UG/M3	0.4 U	4 U	3 R	0.4 U	0.4 U	**9.3**	**8.5**
Carbon Tetrachloride	UG/M3	**0.32**	**3.5**	1 R	**0.4**	**0.37**	**0.4**	**0.42**
Chlorobenzene	UG/M3	0.2 U	2 U	1.5 R	0.2 U	0.2 U	0.2 U	0.2 U
Chlorodifluoromethane	UG/M3	**1.2 J**	**12 J**	3.1 R	**1.3 J**	**1.3 J**	**1.7 J**	**1.3 J**
Chloroethane	UG/M3	0.47 U	4.7 U	3.5 R	0.47 U	0.47 U	0.47 U	0.47 U
Chloroform	UG/M3	0.2 U	**4.7 J**	1.5 R	0.2 U	0.2 U	0.2 U	0.2 U
Chloromethane	UG/M3	**1.5**	**7.2 J**	2.3 R	**1.4**	**1.4**	**0.61 J**	0.31 U

Table 17. Summary of Volatile Organic Compounds in Soil Vapor and Indoor Air, 27-10 49th Avenue, Long Island City, New York

Sample Designation:		AA-1	EFF-SVE-1	IA-1	IA-1	IA-2	SSV-1	SSV-2
Sample Date:		03/10/2025	03/10/2025	03/10/2025	03/10/2025	03/10/2025	03/10/2025	03/10/2025
Normal or Field Duplicate:		N	N	N	FD	N	N	N
Parameter	Units							
Cis-1,2-Dichloroethylene	UG/M3	0.083 U	0.83 U	0.61 R	0.083 U	0.083 U	0.083 U	0.083 U
Cis-1,3-Dichloropropene	UG/M3	0.2 U	2 U	1.5 R	0.2 U	0.2 U	0.2 U	0.2 U
Cyclohexane	UG/M3	0.2 U	2 U	1.5 R	0.2 U	0.2 U	0.2 U	**0.29 J**
Cymene	UG/M3	0.33 U	3.3 U	2.5 R	0.33 U	0.33 U	0.33 U	0.33 U
Dibromochloromethane	UG/M3	0.54 U	5.4 U	4 R	0.54 U	0.54 U	0.54 U	0.54 U
Dichlorodifluoromethane	UG/M3	**2.1 J**	**22 J**	4 R	**2.2 J**	**2.4 J**	**2.3 J**	**2.4 J**
Ethylbenzene	UG/M3	**0.78 J**	3 U	2.2 R	**0.47 J**	**0.67 J**	**1.4**	**1.4**
Hexachlorobutadiene	UG/M3	1.2 U	12 U	8.6 R	1.2 U	1.2 U	1.2 U	1.2 U
Isopropanol	UG/M3	3.9 U	39 U	29 R	**6.8 J**	3.9 U	**10 J**	**43**
Isopropylbenzene (Cumene)	UG/M3	0.2 U	2 U	1.5 R	0.2 U	0.2 U	0.2 U	0.2 U
m,p-Xylene	UG/M3	**3.3**	**12 J**	3 R	**1.8 J**	**3.1**	**5.8**	**6.2**
Methyl Ethyl Ketone (2-Butanone)	UG/M3	1.4 U	**21**	11 R	1.4 U	1.4 U	**2.7**	**6.1**
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	UG/M3	0.53 U	5.3 U	3.9 R	0.53 U	0.53 U	0.53 U	**0.98 J**
Methyl Methacrylate	UG/M3	0.57 U	5.7 U	4.2 R	0.57 U	0.57 U	0.57 U	0.57 U
Methylene Chloride	UG/M3	**0.85 J**	**6.6 J**	4.6 R	**0.85 J**	**0.69 J**	0.63 U	0.63 U
Naphthalene	UG/M3	1.6 U	16 U	12 R	1.6 U	1.6 U	1.6 U	1.6 U
N-Butylbenzene	UG/M3	0.6 U	6 U	4.5 R	0.6 U	0.6 U	0.6 U	0.6 U
N-Heptane	UG/M3	**0.46 J**	**4 J**	1.7 R	**0.52 J**	**0.34 J**	**0.75 NJ**	**1**
N-Hexane	UG/M3	**0.49 J**	3.9 U	2.9 R	**0.59 J**	**0.4 J**	**0.42 J**	**0.65 J**
N-Propylbenzene	UG/M3	0.23 U	2.3 U	1.7 R	0.23 U	0.23 U	**0.24 J**	0.23 U
O-Xylene (1,2-Dimethylbenzene)	UG/M3	**0.99**	**4 J**	2 R	**0.56 J**	**0.92**	**1.5**	**1.8**
Sec-Butylbenzene	UG/M3	0.25 U	2.5 U	1.8 R	0.25 U	0.25 U	0.25 U	0.25 U
Styrene	UG/M3	0.25 U	2.5 U	1.9 R	0.25 U	0.25 U	0.25 U	**0.59 J**
T-Butylbenzene	UG/M3	0.26 U	2.6 U	1.9 R	0.26 U	0.26 U	0.26 U	0.26 U
Tert-Butyl Alcohol	UG/M3	3.6 U	36 U	27 R	3.6 U	3.6 U	3.6 U	**17**
Tert-Butyl Methyl Ether	UG/M3	0.13 U	1.3 U	0.96 R	0.13 U	0.13 U	0.13 U	0.13 U
Tetrachloroethylene (PCE)	UG/M3	**0.79 J**	**690**	1 R	**0.57 J**	**0.93 J**	**2.4**	**2.9**
Tetrahydrofuran	UG/M3	3.8 U	**68 J**	28 R	3.8 U	3.8 U	3.8 U	3.8 U
Toluene	UG/M3	**1.2**	**3.1 J**	1.7 R	**1.1**	**1.1**	**3.1**	**2.9**
Trans-1,2-Dichloroethene	UG/M3	**2.6**	**5.4 J**	0.67 R	0.091 U	0.091 U	0.091 U	0.091 U
Trans-1,3-Dichloropropene	UG/M3	0.25 U	2.5 U	1.8 R	0.25 U	0.25 U	0.25 U	0.25 U
Trichloroethylene (TCE)	UG/M3	0.13 U	**19**	0.99 R	0.13 U	0.13 U	0.13 U	0.13 U
Trichlorofluoromethane	UG/M3	**1.1**	**12**	2.1 R	**1.2**	**1.3**	**1.2**	**1.2**
Vinyl Bromide	UG/M3	0.22 U	2.2 U	1.6 R	0.22 U	0.22 U	0.22 U	0.22 U
Vinyl Chloride	UG/M3	0.054 U	0.54 U	0.4 R	0.054 U	0.054 U	0.054 U	0.054 U

Table 18. DER/DAR Air Emissions Analysis Worksheet
27-10 49th Avenue, Long Island City, NY

Calculations based on SVES effluent sample results from 3/10/2025.

Chemical Name	CAS Number	µg/m3	Molar Mass (g/mol)	PPMv	SGC (µg/m3)	AGC (µg/m3)
1,1,2-Trichlorotrifluoroethane	00076-13-1	4.90	187.370	0.0006	960000.00	180000.00
1,3-Butadiene	00106-99-0	0.87	54.092	0.0004	N/A	0.03
2,2,4-Trimethylpentane (Isooctane)	00540-84-1	8.90	114.232	0.0019	N/A	3300.00
Acetone	00067-64-1	140.00	58.080	0.0580	180000.00	30000.00
Benzene	00071-43-2	3.30	78.114	0.0010	27.00	0.13
Carbon Tetrachloride	00056-23-5	3.50	153.810	0.0005	1900.00	0.17
Chlorodifluoromethane	00075-45-6	12.00	86.470	0.0033	N/A	50000.00
Chloroform	00067-66-3	4.70	119.370	0.0009	150.00	14.70
Chloromethane	00074-87-3	7.20	50.490	0.0034	22000.00	90.00
Dichlorodifluoromethane	00075-71-8	22.00	120.910	0.0044	N/A	12000.00
m,p-Xylene (M-, O- & P- Mixture)	01330-20-7	12.00	106.160	0.0027	22000.00	100.00
Methyl Ethyl Ketone (2-Butanone)	00078-93-3	21.00	72.107	0.0070	13000.00	5000.00
Methylene Chloride (Dichloromethane)	00075-09-2	6.60	84.930	0.0019	14000.00	46.00
n-Butane	00106-97-8	28.00	58.124	0.0116	N/A	N/A
n-Heptane	00142-82-5	4.00	100.205	0.0010	210000.00	3900.00
o-Xylene (1,2-Dimethylbenzene)	00095-47-6	4.00	106.168	0.0009	22000.00	100.00
Tetrachloroethylene (PCE)	00127-18-4	690.00	165.820	0.1001	300.00	3.80
Tetrahydrofuran	00109-99-9	68.00	72.107	0.0227	30000.00	350.00
Toluene	00108-88-3	3.10	92.141	0.0008	37000.00	5000.00
Trans-1,2-Dichloroethene (Dichloroethylene)	00156-60-5	5.40	96.950	0.0013	N/A	63.0
Trichloroethylene (TCE)	00079-01-6	19.00	131.380	0.0035	20.00	0.21
Trichlorofluoromethane	00075-69-4	12.00	137.360	0.0021	9000.00	5000.00

Calculate Emission Rate in Pounds/Hour (lb/hr):

Flow Rate = 450 cfm (max flow of AB-850 blower at design flow/vacuum)
Emission Rate (lb/hr) = Flow Rate (cfm) * Concentration (PPMv) * Molecular Weight (g/mol) * 1.581E-07
Note that 1.581E-07 = $1/10^6$ ppm-v * 60 minutes/hour * 1 lb-mole/379.5 ft^3

Emission Rates for:	Q	Qa	Part 212-2.2 Table 2 HTAC Mass Emission Limit	
1,1,2-Trichlorotrifluoroethane	0.0000084 lb/hr or	0.073 lb/yr	N/A lb/yr	OK
1,3-Butadiene	0.0000015 lb/hr or	0.013 lb/yr	25 lb/yr	OK
2,2,4-Trimethylpentane (Isooctane)	0.0000152 lb/hr or	0.133 lb/yr	N/A lb/yr	OK
Acetone	0.0002395 lb/hr or	2.098 lb/yr	N/A lb/yr	OK
Benzene	0.0000056 lb/hr or	0.049 lb/yr	100 lb/yr	OK
Carbon Tetrachloride	0.0000060 lb/hr or	0.052 lb/yr	100 lb/yr	OK
Chlorodifluoromethane	0.0000205 lb/hr or	0.180 lb/yr	N/A lb/yr	OK
Chloroform	0.0000080 lb/hr or	0.070 lb/yr	N/A lb/yr	OK
Chloromethane	0.0000123 lb/hr or	0.108 lb/yr	N/A lb/yr	OK
Dichlorodifluoromethane	0.0000376 lb/hr or	0.330 lb/yr	N/A lb/yr	OK
m,p-Xylene (M-, O- & P- Mixture)	0.0000205 lb/hr or	0.180 lb/yr	N/A lb/yr	OK
Methyl Ethyl Ketone (2-Butanone)	0.0000359 lb/hr or	0.315 lb/yr	N/A lb/yr	OK
Methylene Chloride (Dichloromethane)	0.0000113 lb/hr or	0.099 lb/yr	N/A lb/yr	OK
n-Butane	0.0000479 lb/hr or	0.420 lb/yr	N/A lb/yr	OK
n-Heptane	0.0000068 lb/hr or	0.060 lb/yr	N/A lb/yr	OK
o-Xylene (1,2-Dimethylbenzene)	0.0000068 lb/hr or	0.060 lb/yr	N/A lb/yr	OK
Tetrachloroethylene (PCE)	0.0011806 lb/hr or	10.342 lb/yr	1000 lb/yr	OK
Tetrahydrofuran	0.0001164 lb/hr or	1.019 lb/yr	N/A lb/yr	OK
Toluene	0.0000053 lb/hr or	0.046 lb/yr	N/A lb/yr	OK
Trans-1,2-Dichloroethene (Dichloroethylene)	0.0000092 lb/hr or	0.081 lb/yr	N/A lb/yr	OK
Trichloroethylene (TCE)	0.0000325 lb/hr or	0.285 lb/yr	500 lb/yr	OK
Trichlorofluoromethane	0.0000205 lb/hr or	0.180 lb/yr	N/A lb/yr	OK

Since the remedial system does not have the potential to emit greater than 0.1 lb/hr of a HTAC, nor 0.5 lb/hr of a non-HTAC VOC, and the annual total emissions do not exceed the HTAC Mass Emission Limits, no treatment is necessary.

FIGURES

1. Site Location Map
2. Site Plan
3. Historic Groundwater Flow Direction Map
4A. Remaining Soil Contamination – Western Building Locations
4B. Remaining Soil Contamination – Eastern Building Locations
4C. Remaining Soil Contamination – Outdoor Locations
5. Excavation Areas
6. Backfill Areas
7. Groundwater Results Map
8A. Post-IRM Soil Vapor Concentrations
8B. Remaining Contamination – Soil Vapor Detections and Monitoring Results
9. Site Cover System Plan
10. Proposed Indoor and Ambient Air Sample Locations

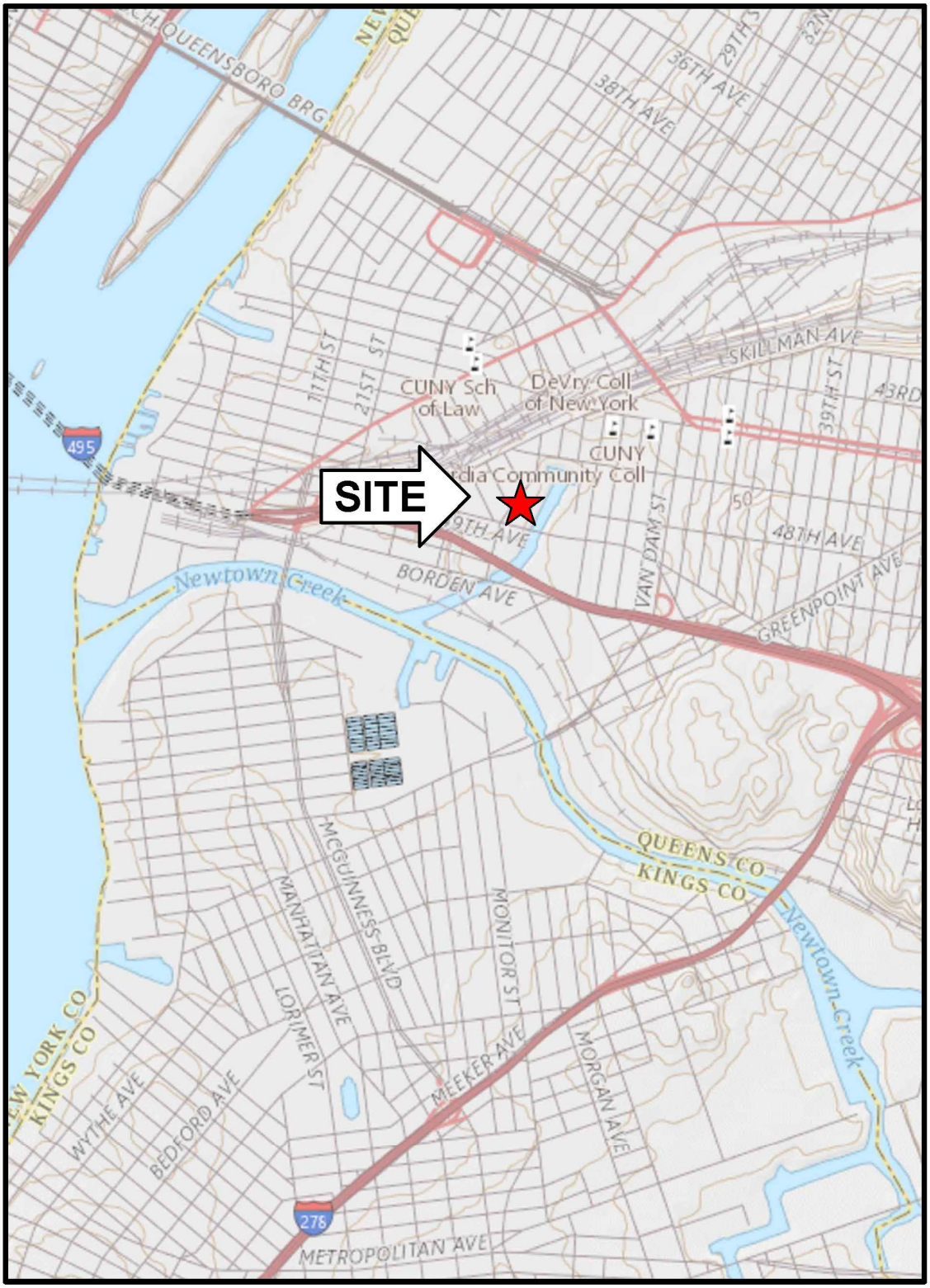






**FIGURE ADAPTED FROM DRAWINGS BY ATLANTIC ENVIRONMENTAL SOLUTIONS INC.*

Title:

SITE LOCATION MAP

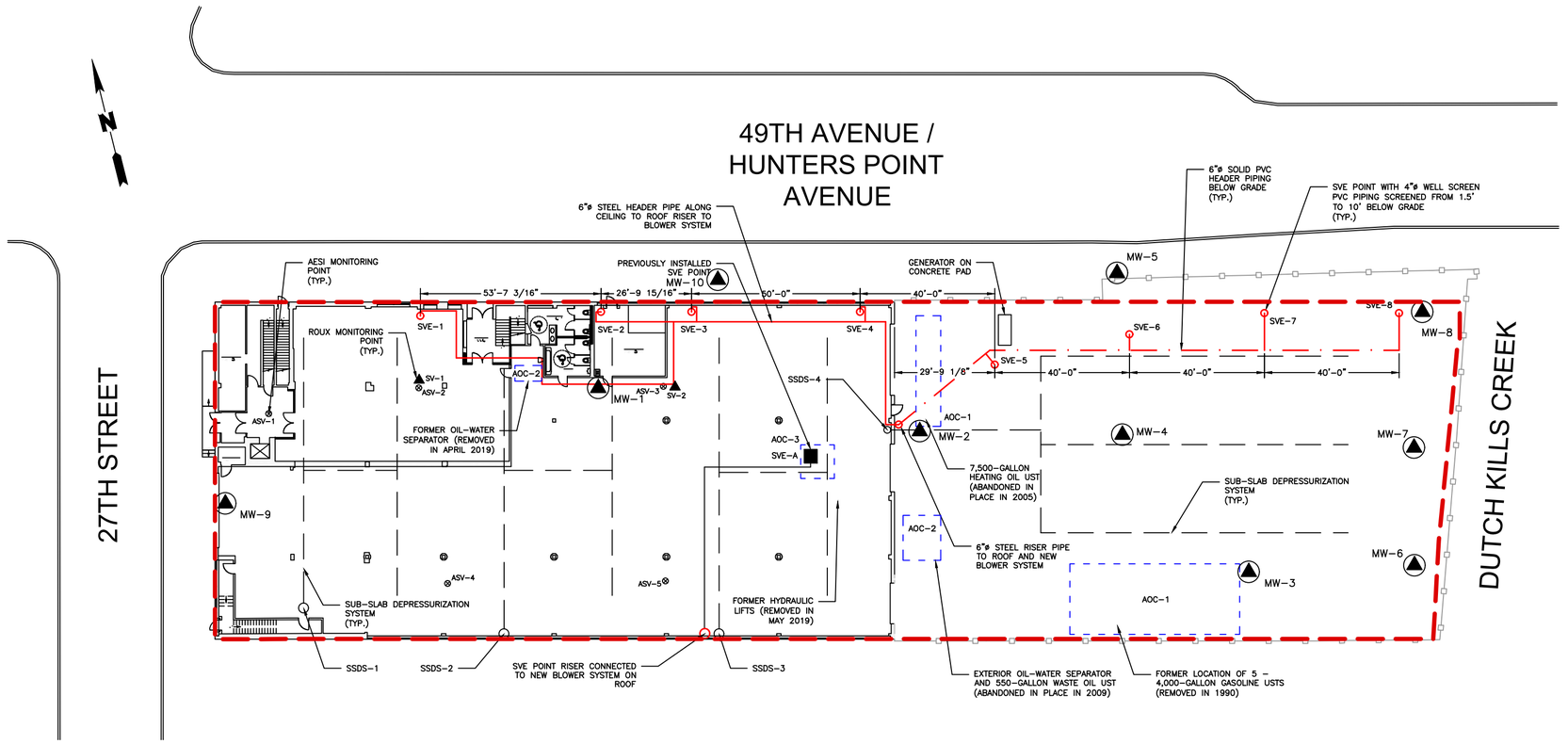
27-10 49TH AVENUE
LONG ISLAND CITY, NY

Prepared for:

HUNTERS POINT SG, LLC

ROUX

Compiled by: R.M.	Date: 07/28/25	FIGURE
Prepared by: M.S.R.	Scale: AS SHOWN	1
Project Mgr: S.S..	Project: 3446.0008Y000	
File: 3446.0008Y125.ppt		



LEGEND

- SITE BOUNDARY
- FENCE
- APPROXIMATE TANK AREAS (AS PER ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.)
- SVES EXPANSION COMPONENTS
- AESI INSTALLED MONITORING POINT
- SV–1 ROUX INSTALLED MONITORING POINT
- MW–9 GROUNDWATER MONITORING WELL
- BUILDING COLUMN

30' 0 30'

STATE OF NEW YORK DAVID ERIC KAISER 097317 LICENSED PROFESSIONAL ENGINEER

Title:

SITE PLAN

27-10 49TH AVENUE
LONG ISLAND CITY, NY

Prepared for:

HUNTERS POINT SG, LLC

ROUX

Compiled by: S.S.	Date: 6/18/2026	FIGURE
Prepared by: G.M.	Scale: AS SHOWN	2
Project Mgr: S.S.	Project: 3446.0008Y000	
File: 3446.0008Y125.04-REV 1.DWG		

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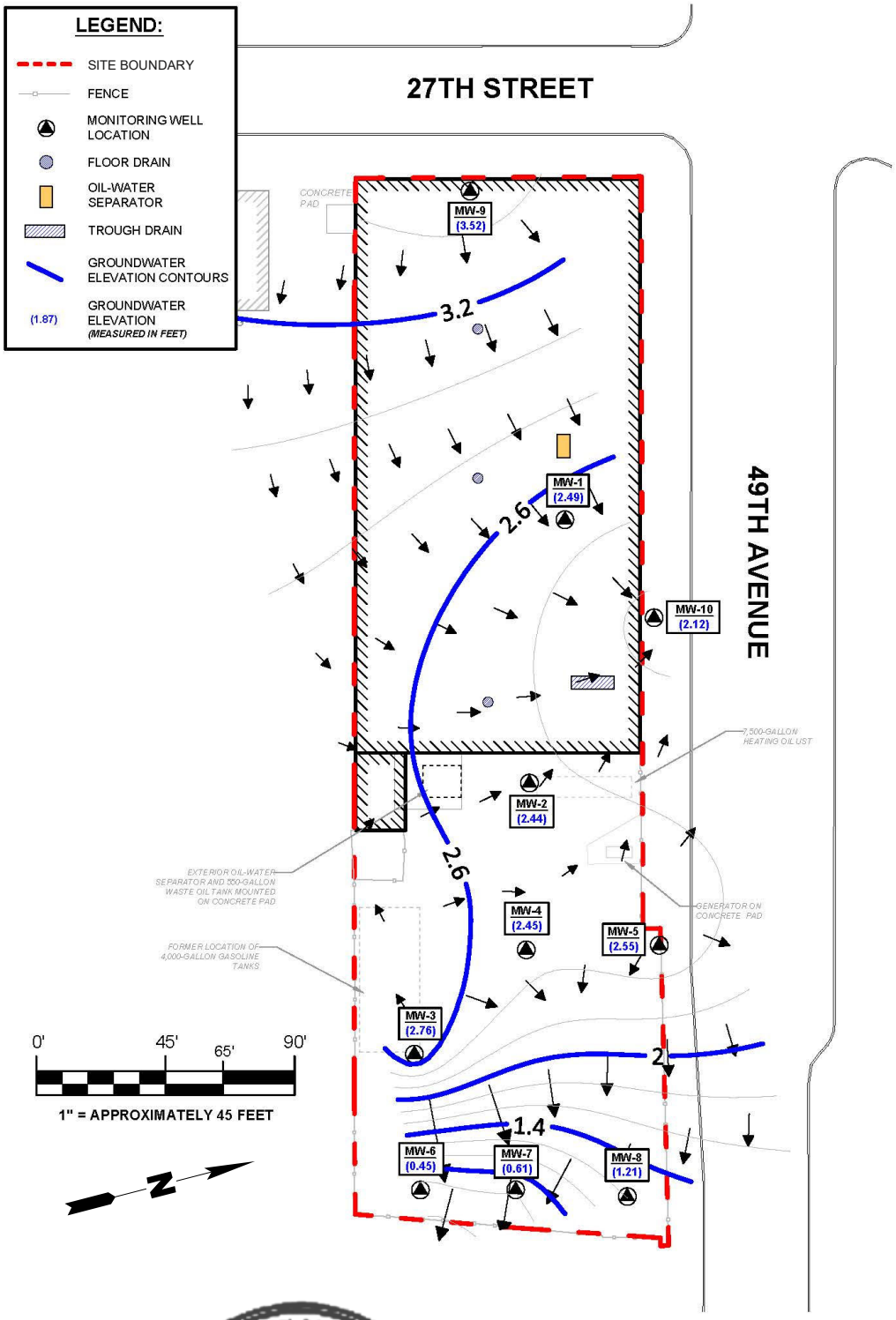




**FIGURE ADAPTED FROM DRAWINGS BY ATLANTIC ENVIRONMENTAL SOLUTIONS INC.*

Title:

HISTORIC GROUNDWATER FLOW DIRECTION MAP

27-10 49TH AVENUE
LONG ISLAND CITY, NY

Prepared for:

HUNTERS POINT SG, LLC

ROUX

Compiled by: R.M.	Date: 07/28/25	FIGURE
Prepared by: M.S.R.	Scale: AS SHOWN	3
Project Mgr: S.S..	Project: 3446.0008Y000	
File: 3446.0008Y125.ppt		

COMPOSITE[1]	12/20/17
Depth (ft bls)	-
SVOCs	
Benzo[a]anthracene	1.01
Benzo[a]pyrene	1.06
Benzo[k]fluoranthene	0.897
Chrysene	1.06
Indeno[1,2,3-cd]pyrene	0.637
Pentachlorophenol	1.69
Metals	
Barium	718
Chromium	66.5
Copper	83.9
Lead	745
Mercury	0.327
Zinc	667

Dup 1114[1]	11/15/18
Depth (ft bls)	-
SVOCs	
Benzo[a]anthracene	1.11 D
Benzo[a]pyrene	1.1 D
Benzo[k]fluoranthene	0.91 D
Chrysene	1.11 D
Indeno[1,2,3-cd]pyrene	0.591 D
Metals	
Barium	420
Cadmium	11.3
Chromium, Hexavalent	142
Chromium, Trivalent	1230
Chromium	1370
Copper	191
Lead	2900
Mercury	0.474
Nickel	134
Silver	15.9
Zinc	3070
Pesticides/Herbicides	
4,4'-DDT	0.0415 D

OWS-PE-4[1]	6/3/19
Depth (ft bls)	-
SVOCs	
Indeno[1,2,3-cd]pyrene	0.557 D

NOTE:

1. SAMPLES COMPOSITE, DUP 1114 AND OWS–PE–4 WERE COLLECTED BY THE PREVIOUS REMEDIAL CONSULTANT, AESI. THE LOCATIONS OF THESE SAMPLES ARE UNKNOWN. BASED ON SAMPLE COLLECTION DATES, IT IS ASSUMED THAT COMPOSITE AND DUP 1114 WERE COLLECTED DURING REMEDIAL INVESTIGATION ACTIVITIES. OWS–PE–4 WAS COLLECTED AS AN ENDPOINT SAMPLE FOLLOWING THE REMOVAL OF THE OIL–WATER SEPARATOR.

SB-75A	11/15/18
Depth (ft bls)	2 - 2.5
Metals	
Lead	268
Mercury	0.203
Zinc	190
Pesticides/Herbicides	
4,4'-DDT	0.00785 D

SB-75B	11/15/18
Depth (ft bls)	8 - 8.5
Metals	
Chromium, Trivalent	45
Chromium	45
Lead	2300
Mercury	0.329
Nickel	33.4
Zinc	130

SB-76B	11/15/18
Depth (ft bls)	8 - 8.5
Metals	
Copper	76.6
Lead	90.6
Mercury	0.313
Zinc	365

SB-76A	11/15/18
Depth (ft bls)	2 - 2.5
Metals	
Copper	69.7
Lead	514
Mercury	0.249
Zinc	476

SB-32A	12/13/17
Depth (ft bls)	7.5 - 8
SVOCs	
Benzo[a]anthracene	2.2
Benzo[a]pyrene	1.62
Benzo[b]fluoranthene	1.45
Benzo[k]fluoranthene	1.27
Chrysene	2.18
Dibenzo[a,h]anthracene	0.378
Indeno[1,2,3-cd]pyrene	0.982

SB-72B	11/14/18
Depth (ft bls)	4 - 4.5
Metals	
Chromium, Hexavalent	2.4
Copper	61.1
Lead	458
Silver	3.73
Zinc	344

SB-72A	11/14/18
Depth (ft bls)	2 - 2.5
SVOCs	
Indeno[1,2,3-cd]pyrene	0.547 D
Metals	
Arsenic	39.6
Barium	433
Chromium, Trivalent	40.5
Chromium	40.5
Copper	232
Lead	1090
Mercury	0.643
Zinc	1560

SB-77A	11/15/18
Depth (ft bls)	2 - 2.5
SVOCs	
Benzo[a]anthracene	2.55 D
Benzo[a]pyrene	2.87 D
Benzo[b]fluoranthene	2.65 D
Benzo[k]fluoranthene	2.3 D
Chrysene	2.4 D
Dibenzo[a,h]anthracene	0.597 D
Indeno[1,2,3-cd]pyrene	1.57 D
Metals	
Barium	497
Beryllium	10.3
Chromium, Trivalent	146
Chromium	146
Copper	1870
Lead	1480
Mercury	0.615
Nickel	185
Zinc	14600 D
Pesticides/Herbicides	
4,4'-DDT	0.0121 D

SB-77B	11/15/18
Depth (ft bls)	5 - 5.5
Metals	
Copper	82.2
Lead	432
Mercury	0.467
Zinc	553

SB-77C	11/15/18
Depth (ft bls)	8 - 8.5
Metals	
Mercury	0.209

SB-31A	12/13/17
Depth (ft bls)	7.5 - 8
SVOCs	
Benzo[a]anthracene	41.2 D
Benzo[a]pyrene	26.1 D
Benzo[b]fluoranthene	25.7 D
Benzo[k]fluoranthene	20.8 D
Chrysene	36.8 D
Dibenzo[a,h]anthracene	5.63 D
Indeno[1,2,3-cd]pyrene	14.1 D

SB-73A	11/14/18
Depth (ft bls)	2 - 2.5
Metals	
Barium	421
Copper	106
Lead	656
Mercury	0.259
Zinc	479

SB-73B	11/14/18
Depth (ft bls)	4 - 4.5
SVOCs	
Benzo[a]anthracene	1.04 D
Chrysene	1.11 D
Indeno[1,2,3-cd]pyrene	0.673 D
Metals	
Arsenic	42.6
Copper	141
Lead	283
Mercury	0.588
Zinc	275

SB-73C	11/14/18
Depth (ft bls)	8 - 8.5
Metals	
Nickel	35.7
Zinc	186

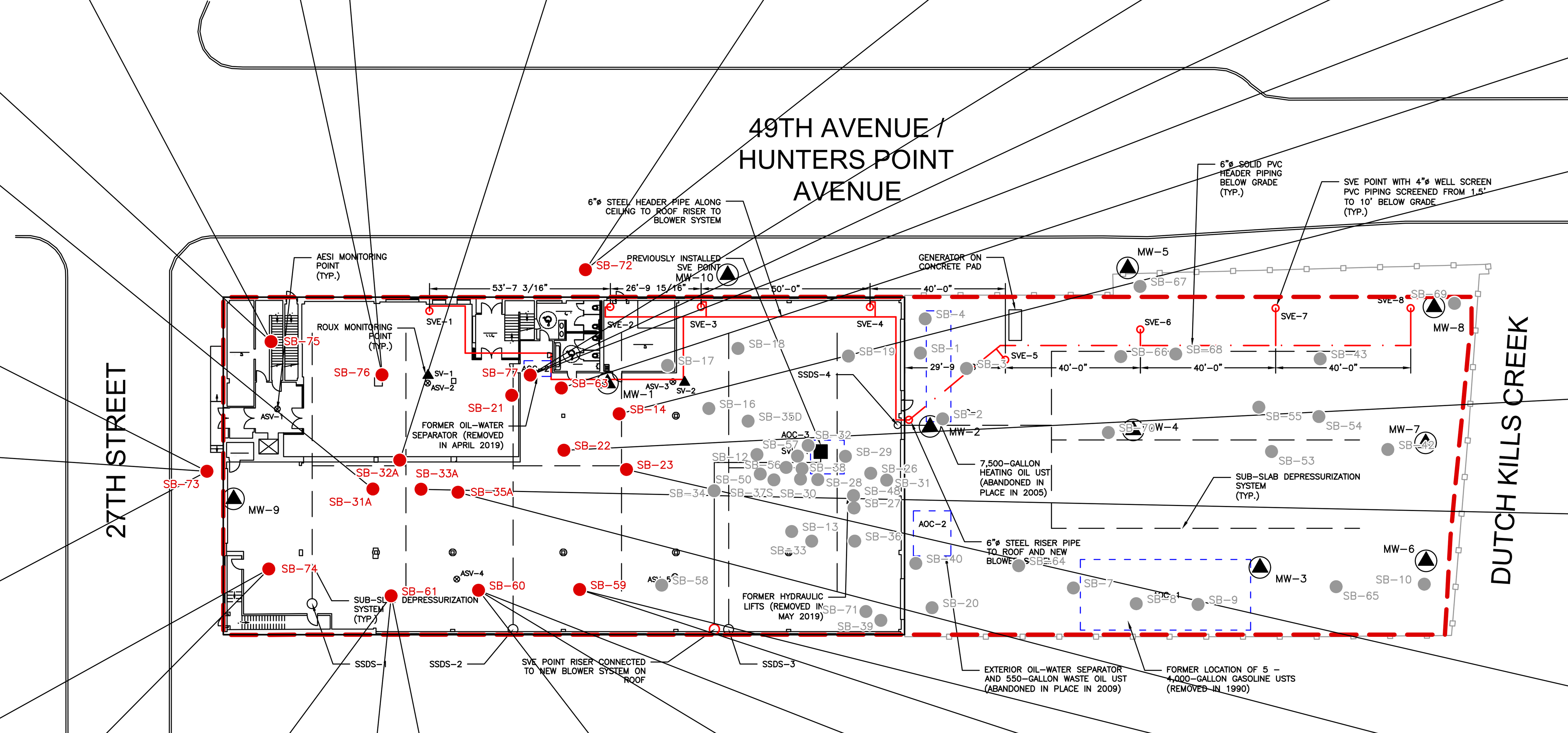
SB-63	11/13/18
Depth (ft bls)	8 - 8.5
VOCs	
Acetone	0.051

SB-14	10/24/17
Depth (ft bls)	3.5 - 4
VOCs	
Tetrachloroethene	10.9
Trichloroethene	0.956
SVOCs	
Benzo[a]anthracene	2.87 D
Benzo[a]pyrene	1.97 D
Benzo[b]fluoranthene	1.55 D
Benzo[k]fluoranthene	1.67 D
Chrysene	2.77 D
Dibenzo[a,h]anthracene	0.37 D
Indeno[1,2,3-cd]pyrene	1.22 D

SB-22	11/10/17
Depth (ft bls)	11.5 - 12
VOCs	
Acetone	0.053

SB-33A	12/13/17
Depth (ft bls)	7.5 - 8
SVOCs	
Benzo[a]anthracene	3.64
Benzo[a]pyrene	3.17
Benzo[b]fluoranthene	2.68
Benzo[k]fluoranthene	2.28
Chrysene	3.46
Dibenzo[a,h]anthracene	0.693
Indeno[1,2,3-cd]pyrene	1.84

SB-23	11/10/17
Depth (ft bls)	11.5 - 12
VOCs	
Acetone	0.065



SB-74A	11/15/18
Depth (ft bls)	12 - 12.5
Metals	
Barium	587
Copper	170
Lead	1770
Mercury	0.375
Zinc	1170

SB-74B	11/15/18
Depth (ft bls)	8 - 8.5
Metals	
Cadmium	22.6
Chromium, Trivalent	177
Chromium	177
Copper	1380
Lead	2680
Mercury	0.471
Nickel	76.5
Silver	2.76
Zinc	6980 D

SB-61A	11/13/18
Depth (ft bls)	2 - 2.5
SVOCs	
Benzo[a]anthracene	1.84 D
Benzo[a]pyrene	1.78 D
Benzo[b]fluoranthene	1.65 D
Benzo[k]fluoranthene	1.46 D
Chrysene	1.82 D
Indeno[1,2,3-cd]pyrene	1.19 D
Metals	
Copper	231
Lead	596
Mercury	0.469
Nickel	46.6
Zinc	1330

SB-61B	11/13/18
Depth (ft bls)	6 - 6.5
SVOCs	
Benzo[a]anthracene	7.94 D
Benzo[a]pyrene	7.46 D
Benzo[b]fluoranthene	5.89 D
Benzo[k]fluoranthene	6.18 D
Chrysene	8.43 D
Dibenzo[a,h]anthracene	1.58 D
Indeno[1,2,3-cd]pyrene	4.62 D
Metals	
Barium	709
Copper	152
Lead	2450
Mercury	2.53
Zinc	425

SB-61C	11/13/18
Depth (ft bls)	8 - 8.5
SVOCs	
Benzo[a]anthracene	3.93 D
Benzo[a]pyrene	4.21 D
Benzo[b]fluoranthene	3.67 D
Benzo[k]fluoranthene	3.61 D
Chrysene	4.51 D
Dibenzo[a,h]anthracene	1.01 D
Indeno[1,2,3-cd]pyrene	2.47 D
Metals	
Arsenic	19.6
Barium	573
Cadmium	2.79
Chromium, Trivalent	37.2
Chromium	37.2
Copper	247
Lead	1670
Mercury	4.78
Zinc	833

SB-60A	11/13/18
Depth (ft bls)	2 - 2.5
SVOCs	
Indeno[1,2,3-cd]pyrene	0.572 D
Metals	
Copper	74
Lead	411
Mercury	0.339
Zinc	372
Pesticides/Herbicides	
4,4'-DDT	0.0153 D

SB-60B	11/13/18
Depth (ft bls)	4 - 4.5
SVOCs	
Indeno[1,2,3-cd]pyrene	0.624 D
Metals	
Barium	466
Copper	176
Lead	772
Mercury	1.02
Zinc	450
Pesticides/Herbicides	
4,4'-DDT	0.0133 D

SB-60C	11/13/18
Depth (ft bls)	8 - 8.5
Metals	
Copper	54.6
Lead	691
Mercury	0.224
Zinc	354

SB-59A	11/13/18
Depth (ft bls)	2 - 2.5
SVOCs	
Benzo[a]anthracene	19.1 D
Benzo[a]pyrene	21 D
Benzo[b]fluoranthene	17.3 D
Benzo[k]fluoranthene	13.3 D
Chrysene	18.1 D
Dibenzo[a,h]anthracene	2.53 D
Indeno[1,2,3-cd]pyrene	12.8 D
Metals	
Chromium, Trivalent	110
Chromium	110
Copper	181
Lead	897
Mercury	0.957
Zinc	897
Pesticides/Herbicides	
4,4'-DDT	0.0143 D

SB-59B	11/13/18
Depth (ft bls)	2.5 - 3
SVOCs	
Indeno[1,2,3-cd]pyrene	0.629 D
Metals	
Barium	594
Chromium, Trivalent	44
Chromium	44
Copper	280
Lead	1050
Mercury	0.734
Nickel	42.4
Zinc	2240
Pesticides/Herbicides	
4,4'-DDT	0.0204 DP

SB-35A	12/13/17
Depth (ft bls)	7.5 - 8
SVOCs	
Benzo[a]pyrene	1.44
Benzo[b]fluoranthene	1.83
Benzo[k]fluoranthene	1.14
Chrysene	1.12
Dibenzo[a,h]anthracene	0.911
Indeno[1,2,3-cd]pyrene	2.3

LEGEND

- SITE BOUNDARY
- FENCE
- APPROXIMATE TANK AREAS (AS PER ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.)
- SVES EXPANSION COMPONENTS
- AESI INSTALLED MONITORING POINT
- SV–1 ROUX INSTALLED MONITORING POINT
- MW–9 GROUNDWATER MONITORING WELL
- SB–23 AESI SOIL BORING*
- SB–34 AESI SOIL BORING OUTSIDE OF FIGURE FOCUS AREA
- BUILDING COLUMN

* AESI SOIL BORINGS WITH NO ASSOCIATED RESULTS BOX INDICATES THERE WERE NO EXCEEDANCES ABOVE SOIL CLEANUP OBJECTIVES AT THAT LOCATION

Parameter	NYSDEC Part 375 Unrestricted Use Soil Cleanup Objectives	NYSDEC Part 375 Commercial Soil Cleanup Objectives	NYSDEC Part 375 Protection of Groundwater Soil Cleanup Objectives	Units
VOCs				
2-Butanone (MEK)	0.12	500	0.12	mg/kg
Acetone	0.05	500	0.05	mg/kg
Benzene	0.06	44	0.06	mg/kg
Tetrachloroethene	1.3	150	1.3	mg/kg
Trichloroethene	0.47	200	0.47	mg/kg
Xylenes (total)	0.26	500	1.6	mg/kg
SVOCs				
Benzo[a]anthracene	1	5.6	1	mg/kg
Benzo[a]pyrene	1	1	22	mg/kg
Benzo[b]fluoranthene	1	5.6	1.7	mg/kg
Benzo[k]fluoranthene	0.8	56	1.7	mg/kg
Chrysene	1	56	1	mg/kg
Dibenzo[a,h]anthracene	0.33	0.56	1000	mg/kg
Indeno[1,2,3-cd]pyrene	0.5	5.6	8.2	mg/kg
Pentachlorophenol	0.8	6.7	0.8	mg/kg
Pyrene	100	500	1000	mg/kg
Metals				
Arsenic	13	16	16	mg/kg
Barium	350	400	820	mg/kg
Beryllium	7.2	590	47	mg/kg
Cadmium	2.5	9.3	7.5	mg/kg
Chromium, Hexavalent	1	400	19	mg/kg
Chromium, Trivalent	30	1500	--	mg/kg
Chromium	30	1500	--	mg/kg
Copper	50	270	1720	mg/kg
Lead	63	1000	450	mg/kg
Mercury	0.18	2.8	0.73	mg/kg
Nickel	30	310	130	mg/kg
Selenium	3.9	1500	4	mg/kg
Silver	2	1500	8.3	mg/kg
Zinc	109	10000	2480	mg/kg
PCBs	NE	NE	NE	mg/kg
Pesticides/Herbicides				
4,4'-DDD	0.0033	92	14	mg/kg
4,4'-DDE	0.0033	62	17	mg/kg
4,4'-DDT	0.0033	47	136	mg/kg

mg/kg – MILLIGRAMS PER KILOGRAM

NYSDEC – NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

– – NO NYSDEC PART 375 SOIL CLEANUP OBJECTIVES AVAILABLE

J – ESTIMATED VALUE

D – A SECONDARY ANALYSIS AFTER DILUTION DUE TO EXCEEDANCE OF THE CALIBRATION RANGE IN THE ORIGINAL SAMPLE.

B – THE ANALYTE WAS FOUND IN AN ASSOCIATED BLANK AS WELL AS IN THE SAMPLE

VOCS – VOLATILE ORGANIC COMPOUNDS

SVOCS – SEMIVOLATILE ORGANIC COMPOUNDS

PCBS – POLYCHLORINATED BIPHENYLS

NE – NO EXCEEDANCE

ND – NO DETECTION

FT BLS – FEET BELOW LAND SURFACE

30' 0 30'



Title:

REMAINING SOIL CONTAMINATION WESTERN BUILDING LOCATIONS

27-10 49TH AVENUE
LONG ISLAND CITY, NY

Prepared for:

HUNTERS POINT SG, LLC

ROUX

Compiled by: S.S	Date: 6/18/2026	FIGURE
Prepared by: G.M.	Scale: AS SHOWN	4A
Project Mgr: S.S.	Project: 3446.0008Y000	
File: 3446.0008Y125.06-REV 1.DWG		

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NOTE:

1. SAMPLES COMPOSITE, DUP 1114 AND OWS-PE-4 WERE COLLECTED BY THE PREVIOUS REMEDIAL CONSULTANT, AESI. THE LOCATIONS OF THESE SAMPLES ARE UNKNOWN. BASED ON SAMPLE COLLECTION DATES, IT IS ASSUMED THAT COMPOSITE AND DUP 1114 WERE COLLECTED DURING REMEDIAL INVESTIGATION ACTIVITIES. OWS-PE-4 WAS COLLECTED AS AN ENDPOINT SAMPLE FOLLOWING THE REMOVAL OF THE OIL-WATER SEPARATOR.

COMPOSITE[1]	12/20/17
Depth (ft bls)	-
SVOCs	
Benzo[a]anthracene	1.01
Benzo[a]pyrene	1.06
Benzo[k]fluoranthene	0.897
Chrysene	1.06
Indeno[1,2,3-cd]pyrene	0.637
Pentachlorophenol	1.69
Metals	
Barium	718
Chromium	66.5
Copper	83.9
Lead	745
Mercury	0.327
Zinc	667

Dup 1114[1]	11/15/18
Depth (ft bls)	-
SVOCs	
Benzo[a]anthracene	1.11 D
Benzo[a]pyrene	1.1 D
Benzo[k]fluoranthene	0.91 D
Chrysene	1.11 D
Indeno[1,2,3-cd]pyrene	0.591 D
Metals	
Barium	420
Cadmium	11.3
Chromium, Hexavalent	142
Chromium, Trivalent	1230
Chromium	1370
Copper	191
Lead	2900
Mercury	0.474
Nickel	134
Silver	15.9
Zinc	3070
Pesticides/Herbicides	
4,4'-DDT	0.0415 D

OWS-PE-4[1]	6/3/19
Depth (ft bls)	-
SVOCs	
Indeno[1,2,3-cd]pyrene	0.557 D

SB-16	10/24/17
Depth (ft bls)	11.5 - 12
VOCs	
Acetone	0.202

SB-17	10/24/17
Depth (ft bls)	11.5 - 12
VOCs	
Tetrachloroethene	2.66

SB-18	10/24/17
Depth (ft bls)	11.5 - 12
VOCs	
Acetone	0.154

SB-35S	12/18/17
Depth (ft bls)	2 - 2.5
SVOCs	
Benzo[a]anthracene	1.14
Chrysene	1.14
Metals	
Arsenic	78.4
Barium	696
Lead	620
Mercury	0.421
Zinc	470
Pesticides/Herbicides	
4,4'-DDT	0.00736

SB-35D	12/18/17
Depth (ft bls)	8 - 8.5
VOCs	
Acetone	0.086

SB-12	10/24/17
Depth (ft bls)	3.5 - 4
VOCs	
Acetone	0.06

SB-14	10/24/17
Depth (ft bls)	3.5 - 4
VOCs	
Tetrachloroethene	10.9
Trichloroethene	0.956
SVOCs	
Benzo[a]anthracene	2.87 D
Benzo[a]pyrene	1.97 D
Benzo[b]fluoranthene	1.55 D
Benzo[k]fluoranthene	1.67 D
Chrysene	2.77 D
Dibenzo[a,h]anthracene	0.37 D
Indeno[1,2,3-cd]pyrene	1.22 D

SB-21	11/10/17
Depth (ft bls)	11 - 11.5
No exceedances above NYSDEC Part 375 Unrestricted Use, Commercial or protection of Groundwater Soil Cleanup Objectives	

SB-50a	5/24/18
Depth (ft bls)	-
VOCs	
Tetrachloroethene	21

SB-50c	5/24/18
Depth (ft bls)	-
VOCs	
Acetone	0.064

SB-23	11/10/17
Depth (ft bls)	11.5 - 12
VOCs	
Acetone	0.065

SB-34S	12/18/17
Depth (ft bls)	2 - 2.5
SVOCs	
Benzo[a]anthracene	1.81
Benzo[a]pyrene	1.12
Benzo[b]fluoranthene	1.21
Benzo[k]fluoranthene	1.22
Chrysene	2.08
Metals	
Chromium	39
Copper	322
Lead	592
Mercury	0.422
Nickel	44
Zinc	2290
Pesticides/Herbicides	
4,4'-DDD	0.021
4,4'-DDE	0.046
4,4'-DDT	0.081

SB-56B	11/13/18
Depth (ft bls)	7 - 7.5
VOCs	
Tetrachloroethene	14 D
Metals	
Copper	481
Lead	430
Mercury	0.375
Zinc	315

SB-56C	11/13/18
Depth (ft bls)	8 - 8.5
Metals	
Lead	200
Mercury	0.298
Zinc	354

SB-56A	11/13/18
Depth (ft bls)	2 - 2.5
SVOCs	
Benzo[a]anthracene	1.59 D
Benzo[a]pyrene	1.53 D
Benzo[b]fluoranthene	1.38 D
Benzo[k]fluoranthene	1.23 D
Chrysene	1.56 D
Dibenzo[a,h]anthracene	0.356 D
Indeno[1,2,3-cd]pyrene	1.01 D
Metals	
Barium	1540
Chromium, Hexavalent	2.72
Copper	76.4
Lead	896
Mercury	0.719
Zinc	1330
Pesticides/Herbicides	
4,4'-DDT	0.124 D

SB-57A	11/13/18
Depth (ft bls)	2 - 2.5
Metals	
Barium	945
Lead	627
Mercury	0.38
Zinc	803

SB-57B	11/13/18
Depth (ft bls)	6.5 - 7
Metals	
Cadmium	7.19
Copper	116
Lead	381
Mercury	0.39
Nickel	90.4
Zinc	874

SB-57C	11/13/18
Depth (ft bls)	8 - 8.5
VOCs	
Tetrachloroethene	12 D
Metals	
Copper	855
Mercury	0.253
Nickel	2330
Zinc	947

SB-19	10/24/17
Depth (ft bls)	3.5 - 4
VOCs	
2-Butanone (MEK)	0.218
Tetrachloroethene	1.84
SVOCs	
Benzo[a]anthracene	1.66
Benzo[a]pyrene	1.09
Benzo[k]fluoranthene	0.943
Chrysene	1.71
Indeno[1,2,3-cd]pyrene	0.674

SB-32S	12/18/17
Depth (ft bls)	2 - 2.5
SVOCs	
Benzo[a]anthracene	1.86
Benzo[a]pyrene	1.18
Benzo[b]fluoranthene	1.24
Benzo[k]fluoranthene	0.995
Chrysene	1.82
Indeno[1,2,3-cd]pyrene	0.573
Metals	
Arsenic	14.3
Barium	935
Chromium	34.6
Copper	172
Lead	970
Mercury	0.65
Zinc	1760
Pesticides/Herbicides	
4,4'-DDD	0.03
4,4'-DDE	0.068
4,4'-DDT	0.174

SB-32D	12/18/17
Depth (ft bls)	8 - 8.5
Metals	
Lead	98.7
Nickel	95.2
Zinc	119
Pesticides/Herbicides	
4,4'-DDD	0.00473
4,4'-DDE	0.00688
4,4'-DDT	0.015

SB-38(S)	12/20/17
Depth (ft bls)	2 - 2.5
VOCs	
Tetrachloroethene	1.82
Pesticides/Herbicides	
4,4'-DDD	0.00922
4,4'-DDE	0.018
4,4'-DDT	0.061

SB-29	12/13/17
Depth (ft bls)	7.5 - 8
VOCs	
Tetrachloroethene	45.5 D
Trichloroethene	0.625
SVOCs	
Benzo[a]anthracene	1.33
Chrysene	1.41
Indeno[1,2,3-cd]pyrene	0.528

SB-28	12/13/17
Depth (ft bls)	7.5 - 8
VOCs	
Tetrachloroethene	15

SB-26	12/13/17
Depth (ft bls)	7.5 - 8
VOCs	
Tetrachloroethene	29 D
SVOCs	
Benzo[a]anthracene	1.01
Chrysene	1.09

SB-31S	12/18/17
Depth (ft bls)	2 - 2.5
SVOCs	
Benzo[a]anthracene	2.63
Benzo[a]pyrene	1.73
Benzo[b]fluoranthene	1.94
Benzo[k]fluoranthene	1.98
Chrysene	3.13
Dibenzo[a,h]anthracene	0.403
Indeno[1,2,3-cd]pyrene	1.04
Metals	
Barium	385
Chromium	41.5
Lead	566
Mercury	0.346
Zinc	1070

SB-31D	12/18/17
Depth (ft bls)	8 - 8.5
SVOCs	
Benzo[a]anthracene	2.54
Benzo[a]pyrene	1.54
Benzo[b]fluoranthene	1.62
Benzo[k]fluoranthene	1.43
Chrysene	2.53
Indeno[1,2,3-cd]pyrene	0.788
Metals	
Lead	167
Mercury	0.241
Zinc	246

SB-48a	5/24/18
Depth (ft bls)	-
VOCs	
Tetrachloroethene	39

SB-27	12/13/17
Depth (ft bls)	7.5 - 8
VOCs	
Tetrachloroethene	14.8

SB-36S	12/18/17
Depth (ft bls)	2 - 2.5
Metals	
Barium	524
Lead	1020
Zinc	557
Pesticides/Herbicides	
4,4'-DDT	0.00338 J

SB-37D	12/18/17
Depth (ft bls)	8 - 8.5
Metals	
Lead	94.3
Mercury	0.274
Pesticides/Herbicides	
4,4'-DDE	0.00402 J
4,4'-DDT	0.00891

SB-37S	12/18/17
Depth (ft bls)	2 - 2.5
VOCs	
Tetrachloroethene	2.41 D
Xylenes (total)	0.767 D
SVOCs	
Benzo[a]anthracene	1.55
Benzo[k]fluoranthene	1.07
Chrysene	1.36
Metals	
Barium	680
Chromium	44.9
Copper	147
Lead	751
Mercury	0.467
Zinc	1120
Pesticides/Herbicides	
4,4'-DDD	0.027
4,4'-DDE	0.1
4,4'-DDT	0.201

SB-58C	11/13/18
Depth (ft bls)	8 - 8.5
SVOCs	
Benzo[a]anthracene	1.16 D
Benzo[a]pyrene	1.18 D
Benzo[b]fluoranthene	1.15 D
Benzo[k]fluoranthene	1.17 D
Chrysene	1.43 D
Indeno[1,2,3-cd]pyrene	0.878 D
Metals	
Barium	653
Copper	63.2
Lead	2260
Mercury	0.572
Zinc	1160

SB-58A	11/13/18
Depth (ft bls)	2 - 2.5
VOCs	
Acetone	0.12

SB-58B	11/13/18
Depth (ft bls)	9.5 - 10
VOCs	
Tetrachloroethene	9.6 D
SVOCs	
Benzo[a]anthracene	48.1 D
Benzo[a]pyrene	47.3 D
Benzo[b]fluoranthene	39.4 D
Benzo[k]fluoranthene	29.1 D
Chrysene	48.4 D
Dibenzo[a,h]anthracene	8.71 D
Indeno[1,2,3-cd]pyrene	29.5 D
Pyrene	110 D
Metals	
Barium	546
Cadmium	3.61
Copper	331
Lead	1220
Mercury	1.68
Zinc	1290

SB-30	12/13/17
Depth (ft bls)	7.5 - 8
VOCs	
Tetrachloroethene	61.6 D
Trichloroethene	0.946
SVOCs	
Benzo[a]anthracene	1.22
Chrysene	1.32
Indeno[1,2,3-cd]pyrene	0.613

SB-13	10/24/17
Depth (ft bls)	3.5 - 4
SVOCs	
Benzo[a]anthracene	1.07
Benzo[k]fluoranthene	0.806
Chrysene	1.13

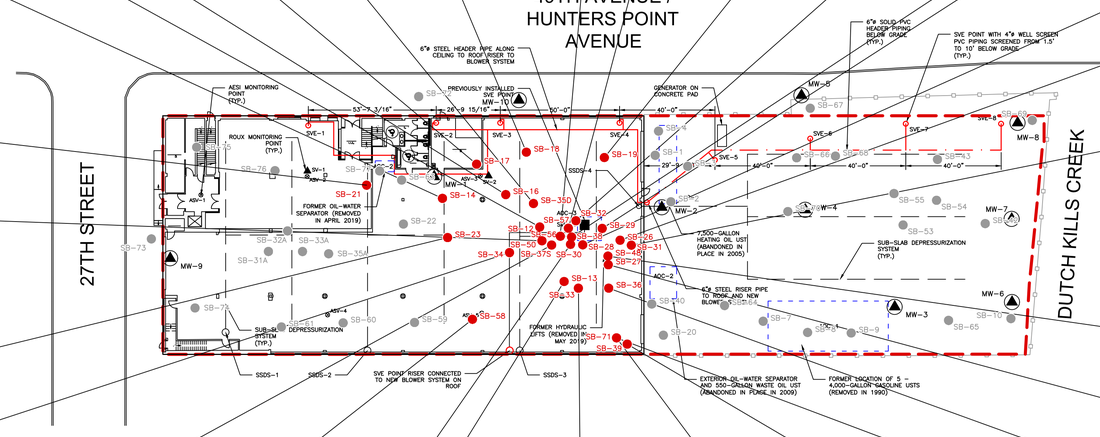
SB-33D	12/18/17
Depth (ft bls)	8 - 8.5
Metals	
Arsenic	19.2
Barium	509
Lead	2360
Mercury	1.41
Zinc	963

SB-33S	12/18/17
Depth (ft bls)	2 - 2.5
Metals	
Arsenic	21.7
Barium	707
Lead	2730
Mercury	1.59
Zinc	1260

SB-71A	11/14/18
Depth (ft bls)	2 - 2.5
SVOCs	
Benzo[a]anthracene	1.11 D
Benzo[a]pyrene	1.15 D
Benzo[b]fluoranthene	1.02 D
Benzo[k]fluoranthene	1 D
Chrysene	1.2 D
Indeno[1,2,3-cd]pyrene	0.832 D
Metals	
Barium	717
Cadmium	3.81
Chromium, Hexavalent	12.5
Chromium, Trivalent	180
Chromium	193
Copper	385
Lead	1830
Mercury	0.52
Nickel	71.9
Zinc	2570
Pesticides/Herbicides	
4,4'-DDT	0.0354 D

SB-39(S)	12/20/17
Depth (ft bls)	2 - 2.5
VOCs	
Tetrachloroethene	2.95
Pesticides/Herbicides	
4,4'-DDE	0.00994
4,4'-DDT	0.065

SB-71B	11/14/18
Depth (ft bls)	8 - 8.5
SVOCs	
Benzo[a]anthracene	12.8 D
Benzo[a]pyrene	12.2 D
Benzo[b]fluoranthene	11.2 D
Benzo[k]fluoranthene	10.5 D
Chrysene	13.5 D
Dibenzo[a,h]anthracene	2.78 D
Indeno[1,2,3-cd]pyrene	7.71 D
Metals	
Chromium, Hexavalent	3.04
Chromium, Trivalent	223
Chromium	226
Copper	100
Lead	531
Mercury	0.322
Nickel	35.2
Silver	2.28
Zinc	588



LEGEND

- SITE BOUNDARY
- FENCE
- APPROXIMATE TANK AREAS (AS PER ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.)
- SVES EXPANSION COMPONENTS
- AESI INSTALLED MONITORING POINT
- SV-1 ROUX INSTALLED MONITORING POINT
- MW-9 GROUNDWATER MONITORING WELL
- SB-36 AESI SOIL BORING*
- SB-40 AESI SOIL BORING OUTSIDE OF FIGURE FOCUS AREA
- BUILDING COLUMN

* AESI SOIL BORINGS WITH NO ASSOCIATED RESULTS BOX INDICATES THERE WERE NO EXCEEDANCES ABOVE SOIL CLEANUP OBJECTIVES AT THAT LOCATION

Parameter	NYSDEC Part 375 Unrestricted Use Soil Cleanup Objectives	NYSDEC Part 375 Commercial Soil Cleanup Objectives	NYSDEC Part 375 Protection of Groundwater Soil Cleanup Objectives	Units
VOCs				
2-Butanone (MEK)	0.12	500	0.12	mg/kg
Acetone	0.05	500	0.05	mg/kg
Benzene	0.06	44	0.06	mg/kg
Tetrachloroethene	1.3	150	1.3	mg/kg
Trichloroethene	0.47	200	0.47	mg/kg
Xylenes (total)	0.26	500	1.6	mg/kg
SVOCs				
Benzo[a]anthracene	1	5.6	1	mg/kg
Benzo[a]pyrene	1	1	22	mg/kg
Benzo[b]fluoranthene	1	5.6	1.7	mg/kg
Benzo[k]fluoranthene	0.8	56	1.7	mg/kg
Chrysene	1	56	1	mg/kg
Dibenzo[a,h]anthracene	0.33	0.56	1000	mg/kg
Indeno[1,2,3-cd]pyrene	0.5	5.6	8.2	mg/kg
Pentachlorophenol	0.8	6.7	0.8	mg/kg
Pyrene	100	500	1000	mg/kg
Metals				
Arsenic	13	16	16	mg/kg
Barium	350	400	820	mg/kg
Beryllium	7.2	590	47	mg/kg
Cadmium	2.5	9.3	7.5	mg/kg
Chromium, Hexavalent	1	400	19	mg/kg
Chromium, Trivalent	30	1500	--	mg/kg
Chromium	30	1500	--	mg/kg
Copper	50	270	1720	mg/kg
Lead	63	1000	450	mg/kg
Mercury	0.18	2.8	0.73	mg/kg
Nickel	30	310	130	mg/kg
Selenium	3.9	1500	4	mg/kg
Silver	2	1500	8.3	mg/kg
Zinc	109	10000	2480	mg/kg
PCBs	NE	NE	NE	mg/kg
Pesticides/Herbicides				
4,4'-DDD	0.0033	92	14	mg/kg
4,4'-DDE	0.0033	62	17	mg/kg
4,4'-DDT	0.0033	47	136	mg/kg

mg/kg – MILLIGRAMS PER KILOGRAM

NYSDEC – NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

– – NO NYSDEC PART 375 SOIL CLEANUP OBJECTIVES AVAILABLE

J – ESTIMATED VALUE

D – A SECONDARY ANALYSIS AFTER DILUTION DUE TO EXCEEDANCE OF THE CALIBRATION RANGE IN THE ORIGINAL SAMPLE.

B – THE ANALYTE WAS FOUND IN AN ASSOCIATED BLANK AS WELL AS IN THE SAMPLE

VOCS – VOLATILE ORGANIC COMPOUNDS

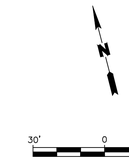
SVOCS – SEMIVOLATILE ORGANIC COMPOUNDS

PCBS – POLYCHLORINATED BIPHENYLS

NE – NO EXCEEDANCE

ND – NO DETECTION

FT BLS – FEET BELOW LAND SURFACE





Title:

REMAINING SOIL CONTAMINATION EASTERN BUILDING LOCATIONS

27-10 49TH AVENUE
LONG ISLAND CITY, NY

Prepared for:

HUNTERS POINT SG, LLC

ROUX

Compiled by: S.S	Date: 6/18/2026	FIGURE
Prepared by: G.M.	Scale: AS SHOWN	4B
Project Mgr: S.S.	Project: 3446.0008Y000	
File: 3446.0008Y125.06-REV 1.DWG		

X:\CAD\PROJECTS\3446\Y\0008Y\125\3446.0008Y125.06-REV 1.DWG DKAISER

NOTE:

1. SAMPLES COMPOSITE, DUP 1114 AND OWS-PE-4 WERE COLLECTED BY THE PREVIOUS REMEDIAL CONSULTANT, AESI. THE LOCATIONS OF THESE SAMPLES ARE UNKNOWN. BASED ON SAMPLE COLLECTION DATES, IT IS ASSUMED THAT COMPOSITE AND DUP 1114 WERE COLLECTED DURING REMEDIAL INVESTIGATION ACTIVITIES. OWS-PE-4 WAS COLLECTED AS AN ENDPOINT SAMPLE FOLLOWING THE REMOVAL OF THE OIL-WATER SEPARATOR.

COMPOSITE[1]	12/20/17
Depth (ft bls)	-
SVOCs	
Benzo[a]anthracene	1.01
Benzo[a]pyrene	1.06
Benzo[k]fluoranthene	0.897
Chrysene	1.06
Indeno[1,2,3-cd]pyrene	0.637
Pentachlorophenol	1.69
Metals	
Barium	718
Chromium	66.5
Copper	83.9
Lead	745
Mercury	0.327
Zinc	667

Dup 1114[1]	11/15/18
Depth (ft bls)	-
SVOCs	
Benzo[a]anthracene	1.11 D
Benzo[a]pyrene	1.1 D
Benzo[k]fluoranthene	0.91 D
Chrysene	1.11 D
Indeno[1,2,3-cd]pyrene	0.591 D
Metals	
Barium	420
Cadmium	11.3
Chromium, Hexavalent	142
Chromium, Trivalent	1230
Chromium	1370
Copper	191
Lead	2900
Mercury	0.474
Nickel	134
Silver	15.9
Zinc	3070
Pesticides/Herbicides	
4,4'-DDT	0.0415 D

OWS-PE-4[1]	6/3/19
Depth (ft bls)	-
SVOCs	
Indeno[1,2,3-cd]pyrene	0.557 D

SB-2	10/23/17
Depth (ft bls)	15.5 - 16
VOCs	
Acetone	0.337
SVOCs	
Benzo[a]anthracene	1.72
Chrysene	2.89
Dibenzo[a,h]anthracene	0.477

SB-1	10/23/17
Depth (ft bls)	7.5 - 8
VOCs	
Tetrachloroethene	10.5
SVOCs	
Benzo[a]anthracene	2.29
Benzo[a]pyrene	1.2
Benzo[k]fluoranthene	1.09
Chrysene	2.04
Dibenzo[a,h]anthracene	0.332
Indeno[1,2,3-cd]pyrene	0.707

SB-3	10/23/17
Depth (ft bls)	15 - 15.5
VOCs	
Acetone	0.06

SB-29	12/13/17
Depth (ft bls)	7.5 - 8
VOCs	
Tetrachloroethene	45.5 D
Trichloroethene	0.625
SVOCs	
Benzo[a]anthracene	1.33
Chrysene	1.41
Indeno[1,2,3-cd]pyrene	0.528

SB-4	10/23/17
Depth (ft bls)	15.5 - 16
VOCs	
Acetone	0.115

SB-70B	11/14/18
Depth (ft bls)	8 - 8.5
Metals	
Lead	153
Mercury	0.2

SB-70A	11/14/18
Depth (ft bls)	2 - 2.5
Metals	
Barium	530
Chromium, Trivalent	55.3
Chromium	55.3
Copper	329
Lead	944
Mercury	0.475
Nickel	39.9
Zinc	1990
Pesticides/Herbicides	
4,4'-DDT	0.0369 D

SB-66A	11/13/18
Depth (ft bls)	2 - 2.5
Metals	
Lead	126
Zinc	169 B

SB-66B	11/13/18
Depth (ft bls)	8 - 8.5
SVOCs	
Benzo[a]anthracene	31.6 D
Benzo[a]pyrene	32 D
Benzo[b]fluoranthene	26.5 D
Benzo[k]fluoranthene	26.8 D
Chrysene	32.6 D
Dibenzo[a,h]anthracene	6.96 D
Indeno[1,2,3-cd]pyrene	20.3 D
Metals	
Lead	533

SB-67A	11/13/18
Depth (ft bls)	2 - 2.5
SVOCs	
Benzo[a]anthracene	3.52 D
Benzo[a]pyrene	3.9 D
Benzo[b]fluoranthene	4.21 D
Benzo[k]fluoranthene	3.88 D
Chrysene	4.61 D
Dibenzo[a,h]anthracene	0.886 D
Indeno[1,2,3-cd]pyrene	2.84 D
Metals	
Chromium, Hexavalent	4.49
Lead	81.8

SB-67B	11/13/18
Depth (ft bls)	8 - 8.5
SVOCs	
Benzo[a]pyrene	1.04 D
Benzo[k]fluoranthene	0.902 D
Chrysene	1.12 D
Indeno[1,2,3-cd]pyrene	0.601 D
Metals	
Copper	72.2
Lead	160
Mercury	0.228
Nickel	34

SB-68B	11/13/18
Depth (ft bls)	8 - 8.5
SVOCs	
Benzo[a]pyrene	1.08 D
Benzo[b]fluoranthene	1.37 D
Benzo[k]fluoranthene	1.08 D
Chrysene	1.29 D
Dibenzo[a,h]anthracene	0.348 D
Indeno[1,2,3-cd]pyrene	0.885 D

SB-68A	11/13/18
Depth (ft bls)	2 - 2.5
SVOCs	
Benzo[k]fluoranthene	0.805 D
Indeno[1,2,3-cd]pyrene	0.691 D
Metals	
Copper	56.7
Lead	179
Selenium	11.2
Zinc	253 B

SB-69A	11/13/18
Depth (ft bls)	2 - 2.5
SVOCs	
Benzo[a]pyrene	1.4 D
Benzo[b]fluoranthene	1.73 D
Benzo[k]fluoranthene	1.37 D
Chrysene	1.44 D
Dibenzo[a,h]anthracene	0.466 D
Indeno[1,2,3-cd]pyrene	1.18 D
Metals	
Copper	59.6

SB-69B	11/13/18
Depth (ft bls)	8 - 8.5
SVOCs	
Benzo[a]anthracene	1.47 D
Benzo[a]pyrene	2.16 D
Benzo[b]fluoranthene	2.35 D
Benzo[k]fluoranthene	2.08 D
Chrysene	1.91 D
Dibenzo[a,h]anthracene	0.691 D
Indeno[1,2,3-cd]pyrene	1.72 D
Metals	
Barium	425
Chromium, Trivalent	43.1
Chromium	43.1
Copper	144
Lead	3420
Mercury	0.572
Nickel	39
Zinc	860 B
Pesticides/Herbicides	
4,4'-DDT	0.026 D

SB43-A	5/15/18
Depth (ft bls)	-
SVOCs	
Benzo[a]anthracene	2.89
Benzo[a]pyrene	2.47
Benzo[b]fluoranthene	2.17
Benzo[k]fluoranthene	2.15
Chrysene	2.61
Dibenzo[a,h]anthracene	0.545
Indeno[1,2,3-cd]pyrene	1.44
Metals	
Barium	1410
Copper	54.1
Lead	1070
Mercury	1.14
Zinc	680

SB43-B	5/15/18
Depth (ft bls)	-
Metals	
Chromium	34.7
Copper	57.2
Lead	161
Mercury	1.31
Nickel	39.2
Zinc	161

SB42-A	5/15/18
Depth (ft bls)	-
SVOCs	
Benzo[a]anthracene	1.17
Benzo[a]pyrene	1.06
Benzo[k]fluoranthene	0.944
Chrysene	1.14
Indeno[1,2,3-cd]pyrene	0.694
Metals	
Barium	465
Chromium	121
Copper	229
Lead	3630
Mercury	0.782
Nickel	48.4
Zinc	1730

SB-40(S)	12/20/17
Depth (ft bls)	2 - 2.5
VOCs	
Tetrachloroethene	1.55
Pesticides/Herbicides	
4,4'-DDE	0.00694
4,4'-DDT	0.046

SB-64A	11/13/18
Depth (ft bls)	2 - 2.5
Metals	
Selenium	11.2

SB-64B	11/13/18
Depth (ft bls)	8 - 8.5
SVOCs	
Benzo[a]anthracene	1.95 D
Benzo[a]pyrene	1.98 D
Benzo[b]fluoranthene	1.7 D
Benzo[k]fluoranthene	1.73 D
Chrysene	2.18 D
Dibenzo[a,h]anthracene	0.493 D
Indeno[1,2,3-cd]pyrene	1.3 D
Metals	
Barium	740
Copper	54.7
Lead	686
Mercury	0.493
Zinc	572

SB-7	10/23/17
Depth (ft bls)	10 - 10.5
VOCs	
2-Butanone (MEK)	0.389
Tetrachloroethene	7.78
SVOCs	
Benzo[a]anthracene	5.03 D
Benzo[a]pyrene	3.42 D
Benzo[b]fluoranthene	3.11 D
Benzo[k]fluoranthene	3.27 D
Chrysene	5.16 D
Dibenzo[a,h]anthracene	0.74 D
Indeno[1,2,3-cd]pyrene	2.85 D

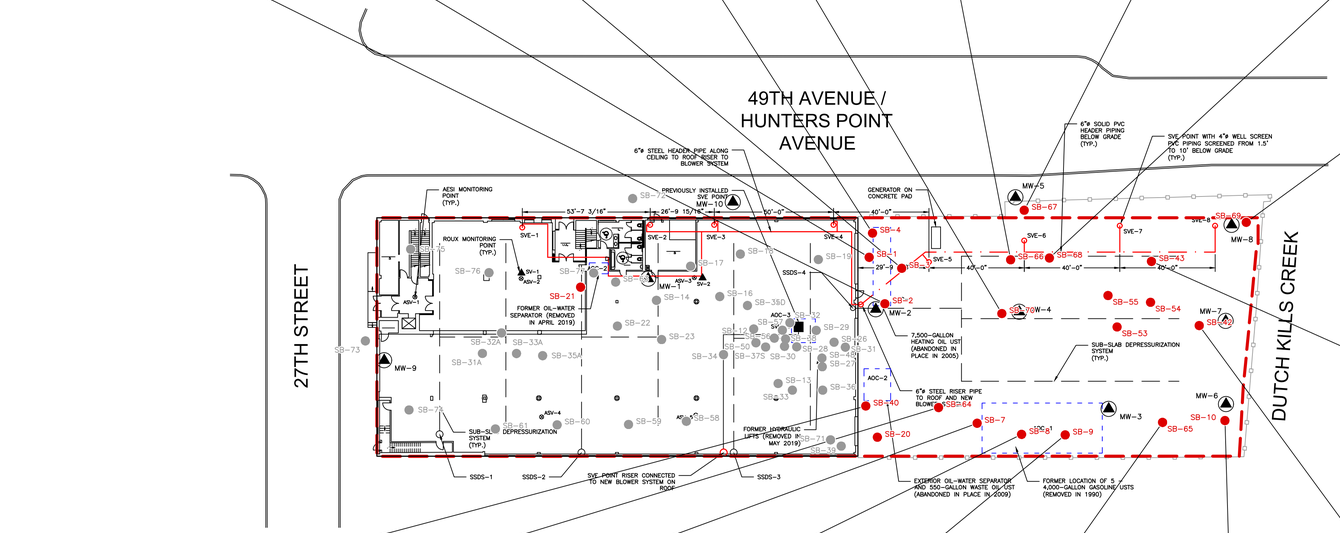
SB-8	10/23/17
Depth (ft bls)	10 - 10.5
VOCs	
Benzene	0.065

SB-9	10/23/17
Depth (ft bls)	11.5 - 12
SVOCs	
Benzo[a]anthracene	5.92 D
Benzo[a]pyrene	4.31 D
Benzo[b]fluoranthene	3.59 D
Benzo[k]fluoranthene	3.56 D
Chrysene	5.13 D
Dibenzo[a,h]anthracene	1.03 D
Indeno[1,2,3-cd]pyrene	2.65 D

SB-65A	11/13/18
Depth (ft bls)	2 - 2.5
SVOCs	
Benzo[a]anthracene	20.3 D
Benzo[a]pyrene	18.7 D
Benzo[b]fluoranthene	14.4 D
Benzo[k]fluoranthene	17.2 D
Chrysene	20.8 D
Dibenzo[a,h]anthracene	4.28 D
Indeno[1,2,3-cd]pyrene	10.7 D
Metals	
Barium	835
Copper	86
Lead	1910
Mercury	1.75
Zinc	594 B

SB-65B	11/13/18
Depth (ft bls)	8 - 8.5
Metals	
Copper	69.5
Mercury	0.224

SB-10	10/23/17
Depth (ft bls)	11.5 - 12
SVOCs	
Benzo[a]anthracene	1.12
Chrysene	1.13



LEGEND

- SITE BOUNDARY
- FENCE
- APPROXIMATE TANK AREAS (AS PER ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.)
- SVES EXPANSION COMPONENTS
- AESI INSTALLED MONITORING POINT
- SV-1 ROUX INSTALLED MONITORING POINT
- MW-9 GROUNDWATER MONITORING WELL
- SB-40 AESI SOIL BORING*
- SB-19 AESI SOIL BORING OUTSIDE OF FIGURE FOCUS AREA
- BUILDING COLUMN

* AESI SOIL BORINGS WITH NO ASSOCIATED RESULTS BOX INDICATES THERE WERE NO EXCEEDANCES ABOVE SOIL CLEANUP OBJECTIVES AT THAT LOCATION

Parameter	NYSDEC Part 375 Unrestricted Use Soil Cleanup Objectives	NYSDEC Part 375 Commercial Soil Cleanup Objectives	NYSDEC Part 375 Protection of Groundwater Soil Cleanup Objectives	Units
VOCs				
2-Butanone (MEK)	0.12	500	0.12	mg/kg
Acetone	0.05	500	0.05	mg/kg
Benzene	0.06	44	0.06	mg/kg
Tetrachloroethene	1.3	150	1.3	mg/kg
Trichloroethene	0.47	200	0.47	mg/kg
Xylenes (total)	0.26	500	1.6	mg/kg
SVOCs				
Benzo[a]anthracene	1	5.6	1	mg/kg
Benzo[a]pyrene	1	1	22	mg/kg
Benzo[b]fluoranthene	1	5.6	1.7	mg/kg
Benzo[k]fluoranthene	0.8	56	1.7	mg/kg
Chrysene	1	56	--	mg/kg
Dibenzo[a,h]anthracene	0.33	0.56	1000	mg/kg
Indeno[1,2,3-cd]pyrene	0.5	5.6	8.2	mg/kg
Pentachlorophenol	0.8	6.7	0.8	mg/kg
Pyrene	100	500	1000	mg/kg
Metals				
Arsenic	13	16	16	mg/kg
Barium	350	400	820	mg/kg
Beryllium	7.2	590	47	mg/kg
Cadmium	2.5	9.3	7.5	mg/kg
Chromium, Hexavalent	1	400	19	mg/kg
Chromium, Trivalent	30	1500	--	mg/kg
Chromium	30	1500	--	mg/kg
Copper	50	270	1720	mg/kg
Lead	63	1000	450	mg/kg
Mercury	0.18	2.8	0.73	mg/kg
Nickel	30	310	130	mg/kg
Selenium	3.9	1500	4	mg/kg
Silver	2	1500	8.3	mg/kg
Zinc	109	10000	2480	mg/kg
PCBs	NE	NE	NE	mg/kg
Pesticides/Herbicides				
4,4'-DDD	0.0033	92	14	mg/kg
4,4'-DDE	0.0033	62	17	mg/kg
4,4'-DDT	0.0033	47	136	mg/kg

mg/kg – MILLIGRAMS PER KILOGRAM

NYSDEC – NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

– – NO NYSDEC PART 375 SOIL CLEANUP OBJECTIVES AVAILABLE

J – ESTIMATED VALUE

D – A SECONDARY ANALYSIS AFTER DILUTION DUE TO EXCEEDANCE OF THE CALIBRATION RANGE IN THE ORIGINAL SAMPLE.

B – THE ANALYTE WAS FOUND IN AN ASSOCIATED BLANK AS WELL AS IN THE SAMPLE

VOCS – VOLATILE ORGANIC COMPOUNDS

SVOCS – SEMIVOLATILE ORGANIC COMPOUNDS

PCBS – POLYCHLORINATED BIPHENYLS

NE – NO EXCEEDANCE

ND – NO DETECTION

FT BLS – FEET BELOW LAND SURFACE

N

30' 0 30'

STATE OF NEW YORK · DAVID ERIC KAISER · 087317 · LICENSED PROFESSIONAL ENGINEER

Title:

REMAINING SOIL CONTAMINATION OUTDOOR LOCATIONS

27-10 49TH AVENUE
LONG ISLAND CITY, NY

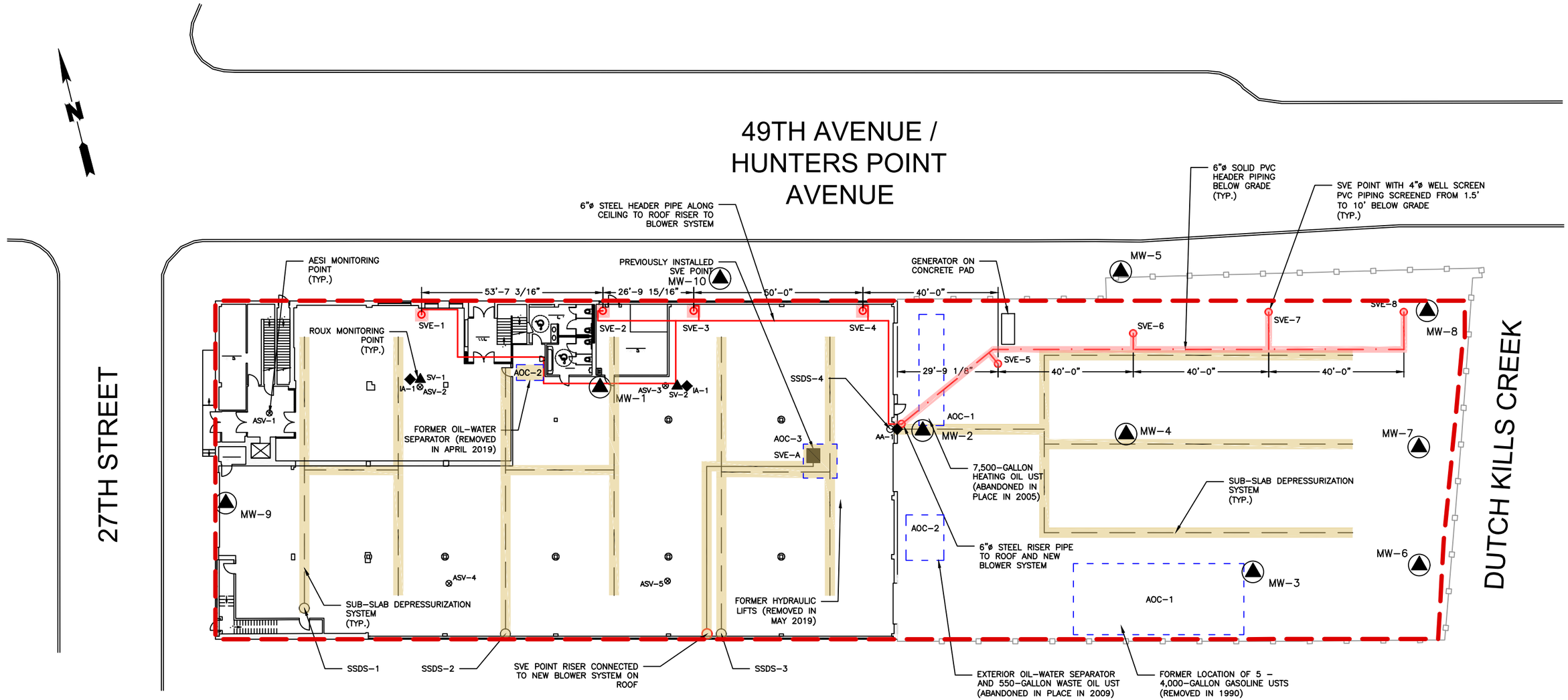
Prepared for:

HUNTERS POINT SG, LLC

ROUX

Compiled by: S.S	Date: 6/18/2026	FIGURE
Prepared by: G.M.	Scale: AS SHOWN	4C
Project Mgr: S.S.	Project: 3446.0008Y000	
File: 3446.0008Y125.06-REV 1.DWG		

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LEGEND

- SITE BOUNDARY
- FENCE
- APPROXIMATE TANK AREAS (AS PER ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.)
- SVES EXPANSION COMPONENTS
- SVES EXPANSION EXCAVATION AREA
- IRM EXCAVATION AREAS (AS PER ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.)
- ⊗ AESI INSTALLED MONITORING POINT
- SV-1 ROUX INSTALLED MONITORING POINT
- MW-9 GROUNDWATER MONITORING WELLS
- BUILDING COLUMN

30' 0 30'

STATE OF NEW YORK
DAVID ERIC KAISER
097317
LICENSED PROFESSIONAL ENGINEER

Title:

EXCAVATION AREAS

27-10 49TH AVENUE
LONG ISLAND CITY, NY

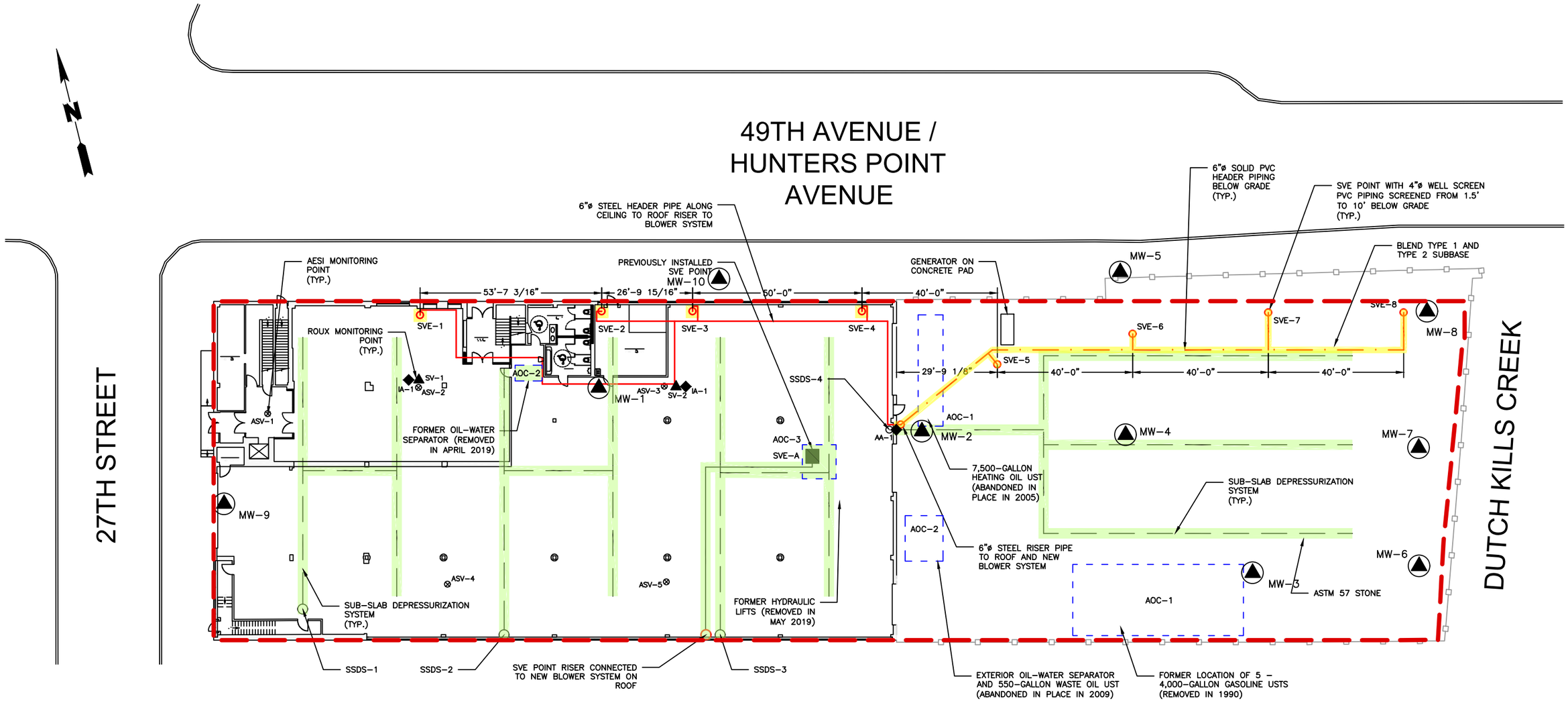
Prepared for:

HUNTERS POINT SG, LLC

ROUX

Compiled by: S.S.	Date: 09MAY25	FIGURE
Prepared by: G.M.	Scale: AS SHOWN	5
Project Mgr: S.S.	Project: 3446.0008Y000	
File: 3446.0008Y128.02-REV 1.DWG		

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LEGEND

- SITE BOUNDARY
- FENCE
- APPROXIMATE TANK AREAS (AS PER ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.)
- SVES EXPANSION COMPONENTS
- SVES EXPANSION BACKFILL AREA (BLEND TYPE 1 AND 2 SUBBASE)
- IRM BACKFILL AREAS (ASTM 57 STONE)
- ⊗ AESI INSTALLED MONITORING POINT
- SV-1 ▲ ROUX INSTALLED MONITORING POINT
- MW-9 ◉ GROUNDWATER MONITORING WELL
- BUILDING COLUMN

30' 0 30'

STATE OF NEW YORK
DAVID ERIC KAISER
097317
LICENSED PROFESSIONAL ENGINEER

Title:

BACKFILL AREAS

27-10 49TH AVENUE
LONG ISLAND CITY, NY

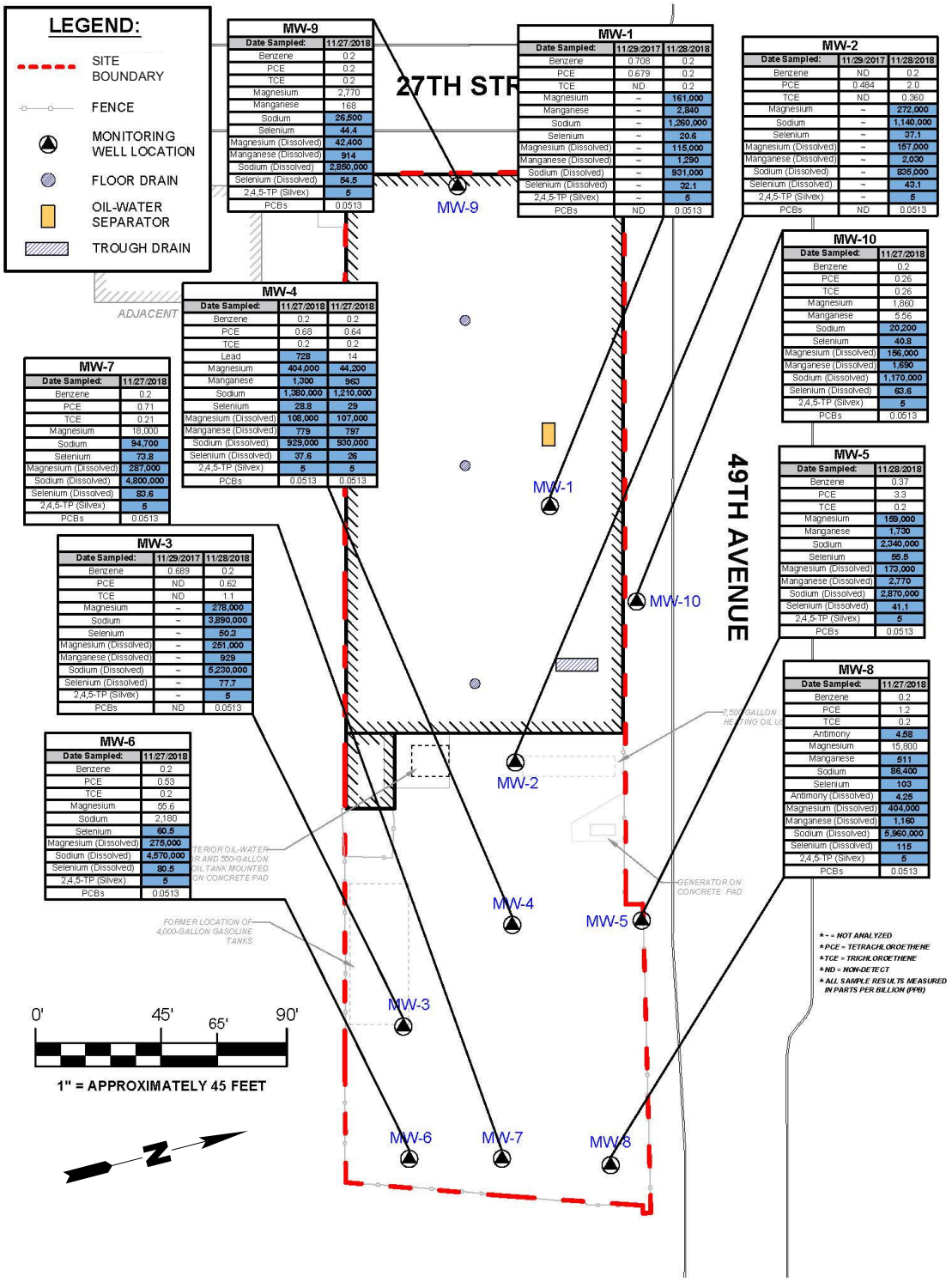
Prepared for:

HUNTERS POINT SG, LLC

ROUX

Compiled by: S.S.	Date: 09MAY25	FIGURE
Prepared by: G.M.	Scale: AS SHOWN	6
Project Mgr: S.S.	Project: 3446.0008Y000	
File: 3446.0008Y125.04-REV 1.DWG		

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MW-9	
Date Sampled:	11/27/2018
Benzene	0.2
PCE	0.2
TCE	0.2
Magnesium	2,770
Manganese	168
Sodium	26,500
Selenium	44.4
Magnesium (Dissolved)	42,400
Manganese (Dissolved)	914
Sodium (Dissolved)	2,850,000
Selenium (Dissolved)	54.5
2,4,5-TP (Silvex)	5
PCBs	0.0513

MW-1		
Date Sampled:	11/29/2017	11/28/2018
Benzene	0.708	0.2
PCE	0.679	0.2
TCE	ND	0.2
Magnesium	~	161,000
Manganese	~	2,840
Sodium	~	1,260,000
Selenium	~	20.6
Magnesium (Dissolved)	~	115,000
Manganese (Dissolved)	~	1,290
Sodium (Dissolved)	~	931,000
Selenium (Dissolved)	~	32.1
2,4,5-TP (Silvex)	~	5
PCBs	ND	0.0513

MW-2		
Date Sampled:	11/29/2017	11/28/2018
Benzene	ND	0.2
PCE	0.484	2.0
TCE	ND	0.360
Magnesium	~	272,000
Sodium	~	1,140,000
Selenium	~	37.1
Magnesium (Dissolved)	~	157,000
Manganese (Dissolved)	~	2,030
Sodium (Dissolved)	~	835,000
Selenium (Dissolved)	~	43.1
2,4,5-TP (Silvex)	~	5
PCBs	ND	0.0513

MW-10	
Date Sampled:	11/27/2018
Benzene	0.2
PCE	0.26
TCE	0.26
Magnesium	1,860
Manganese	5.56
Sodium	20,200
Selenium	40.8
Magnesium (Dissolved)	156,000
Manganese (Dissolved)	1,690
Sodium (Dissolved)	1,170,000
Selenium (Dissolved)	63.6
2,4,5-TP (Silvex)	5
PCBs	0.0513

MW-4		
Date Sampled:	11/27/2018	11/27/2018
Benzene	0.2	0.2
PCE	0.68	0.64
TCE	0.2	0.2
Lead	728	14
Magnesium	404,000	44,200
Manganese	1,300	960
Sodium	1,380,000	1,210,000
Selenium	28.8	29
Magnesium (Dissolved)	108,000	107,000
Manganese (Dissolved)	779	797
Sodium (Dissolved)	929,000	930,000
Selenium (Dissolved)	37.6	26
2,4,5-TP (Silvex)	5	5
PCBs	0.0513	0.0513

MW-5	
Date Sampled:	11/28/2018
Benzene	0.37
PCE	3.3
TCE	0.2
Magnesium	159,000
Manganese	1,730
Sodium	2,340,000
Selenium	55.5
Magnesium (Dissolved)	173,000
Manganese (Dissolved)	2,770
Sodium (Dissolved)	2,870,000
Selenium (Dissolved)	41.1
2,4,5-TP (Silvex)	5
PCBs	0.0513

MW-7	
Date Sampled:	11/27/2018
Benzene	0.2
PCE	0.71
TCE	0.21
Magnesium	18,000
Sodium	94,700
Selenium	73.8
Magnesium (Dissolved)	287,000
Sodium (Dissolved)	4,800,000
Selenium (Dissolved)	83.6
2,4,5-TP (Silvex)	5
PCBs	0.0513

MW-3		
Date Sampled:	11/29/2017	11/28/2018
Benzene	0.689	0.2
PCE	ND	0.62
TCE	ND	1.1
Magnesium	~	278,000
Sodium	~	3,890,000
Selenium	~	50.3
Magnesium (Dissolved)	~	251,000
Manganese (Dissolved)	~	929
Sodium (Dissolved)	~	5,230,000
Selenium (Dissolved)	~	77.7
2,4,5-TP (Silvex)	~	5
PCBs	ND	0.0513

MW-8	
Date Sampled:	11/27/2018
Benzene	0.2
PCE	1.2
TCE	0.2
Antimony	4.58
Magnesium	15,800
Manganese	511
Sodium	86,400
Selenium	103
Antimony (Dissolved)	4.25
Magnesium (Dissolved)	404,000
Manganese (Dissolved)	1,160
Sodium (Dissolved)	5,960,000
Selenium (Dissolved)	115
2,4,5-TP (Silvex)	5
PCBs	0.0513

MW-6	
Date Sampled:	11/27/2018
Benzene	0.2
PCE	0.53
TCE	0.2
Magnesium	55.6
Sodium	2,180
Selenium	60.5
Magnesium (Dissolved)	275,000
Sodium (Dissolved)	4,570,000
Selenium (Dissolved)	80.5
2,4,5-TP (Silvex)	5
PCBs	0.0513

*~ = NOT ANALYZED
*PCE = TETRACHLOROETHENE
*TCE = TRICHLOROETHENE
*ND = NON-DETECT
* ALL SAMPLE RESULTS MEASURED IN PARTS PER BILLION (PPB)



FIGURE ADAPTED FROM DRAWINGS BY ATLANTIC ENVIRONMENTAL SOLUTIONS INC.

Title:

GROUNDWATER RESULTS MAP

27-10 49TH AVENUE
LONG ISLAND CITY, NY

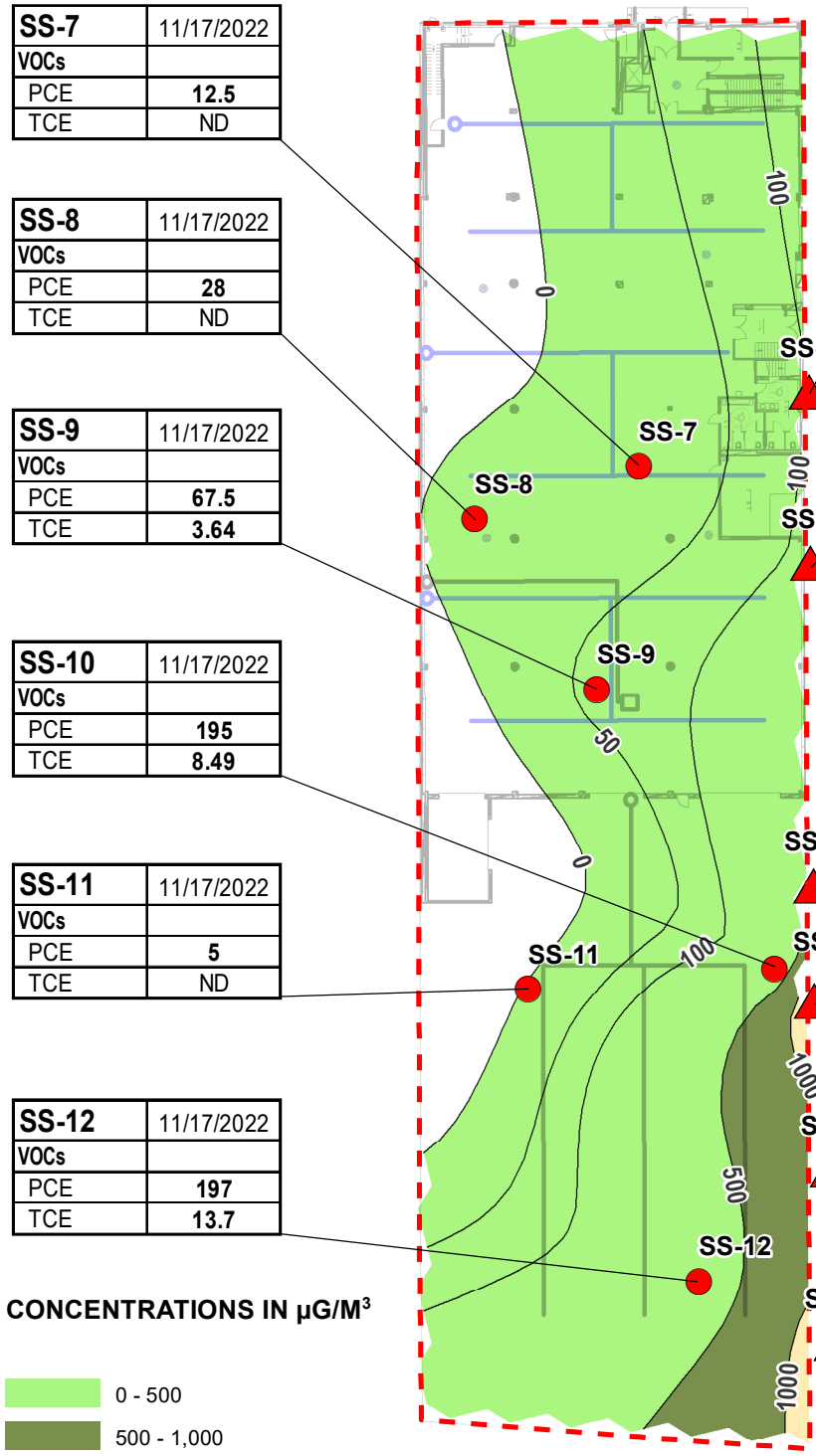
Prepared for:

HUNTERS POINT SG, LLC

ROUX

Compiled by: R.M.	Date: 07/28/25
Prepared by: M.S.R.	Scale: AS SHOWN
Project Mgr: S.S.	Project: 3446.0008Y000
File: 3446.0008Y125.ppt	

FIGURE 7



SS-7	11/17/2022
VOCs	
PCE	**12.5**
TCE	ND

SS-8	11/17/2022
VOCs	
PCE	**28**
TCE	ND

SS-9	11/17/2022
VOCs	
PCE	**67.5**
TCE	**3.64**

SS-10	11/17/2022
VOCs	
PCE	**195**
TCE	**8.49**

SS-11	11/17/2022
VOCs	
PCE	**5**
TCE	ND

SS-12	11/17/2022
VOCs	
PCE	**197**
TCE	**13.7**

SS-1	08/11/2022
VOCs	
1,2-Dichloroethane	ND
PCE	**100**
TCE	**0.53**
Vinyl Chloride	ND

SS-2	08/11/2022
VOCs	
1,2-Dichloroethane	ND
PCE	**120**
TCE	**0.33**
Vinyl Chloride	ND

SS-3	08/11/2022
VOCs	
1,2-Dichloroethane	ND
PCE	**420 D**
TCE	ND
Vinyl Chloride	ND

SS-4	08/11/2022
VOCs	
1,2-Dichloroethane	ND
PCE	**1,400 D**
TCE	ND
Vinyl Chloride	ND

SS-5	08/11/2022
VOCs	
1,2-Dichloroethane	ND
PCE	**880 D**
TCE	**1.4**
Vinyl Chloride	ND

SS-6	08/11/2022
VOCs	
1,2-Dichloroethane	ND
PCE	**1,300 D**
TCE	**4.1**
Vinyl Chloride	ND

CONCENTRATIONS IN µG/M³

- 0 - 500
- 500 - 1,000
- > 1,000

LEGEND

- SUB-SLAB VAPOR SAMPLE LOCATION
- SIDEWALK SAMPLE LOCATION
- CONTOUR LINE OF PCE CONCENTRATION
- SITE BOUNDARY

N

CONCENTRATIONS IN µG/M³

UG/M3 - MICROGRAMS PER CUBIC METER
VOCS - VOLATILE ORGANIC COMPOUNDS
ND - COMPOUND WAS NOT DETECTED
PCE - TETRACHLOROETHYLENE
TCE - TRICHLOROETHYLENE
D - CONCENTRATION OF ANALYTE WAS QUANTIFIED FROM DILUTED ANALYSIS
BOLD DATA - INDICATES PARAMETER WAS DETECTED

50 0 50'

Title:

POST-IRM SOIL VAPOR CONCENTRATIONS

27-10 49TH AVENUE
NEW YORK, NY

Prepared for:

HUNTERS POINT SG, LLC

ROUX

Compiled by: S.S.	Date: 06/18/2026
Prepared by: M.S.R.	Scale: AS SHOWN
Project Mgr: C.P.	Project: 3446.0008Y000
File: 3446.0008Y125.8A.mxd	

FIGURE **8A**

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SSV-1	03/10/2025
VOCs	
1,1,2-Trichloro-1,2,2-Trifluoroethane	**0.46 J**
1,2,4-Trimethylbenzene	**0.94 J**
1,4-Dioxane (P-Dioxane)	**3.6 J**
Acetone	**24**
Benzene	**0.46 J**
Butane	**0.8 J**
Carbon Disulfide	**9.3**
Carbon Tetrachloride	**0.4**
Chlorodifluoromethane	**1.7 J**
Chloromethane	**0.61 J**
Dichlorodifluoromethane	**2.3 J**
Ethylbenzene	**1.4**
Isopropanol	**10 J**
m,p-Xylene	**5.8**
Methyl Ethyl Ketone (2-Butanone)	**2.7**
N-Heptane	**0.75 J**
N-Hexane	**0.42 J**
N-Propylbenzene	**0.24 J**
O-Xylene (1,2-Dimethylbenzene)	**1.5**
Tetrachloroethylene (PCE)	**2.4**
Toluene	**3.1**
Trichlorofluoromethane	**1.2**

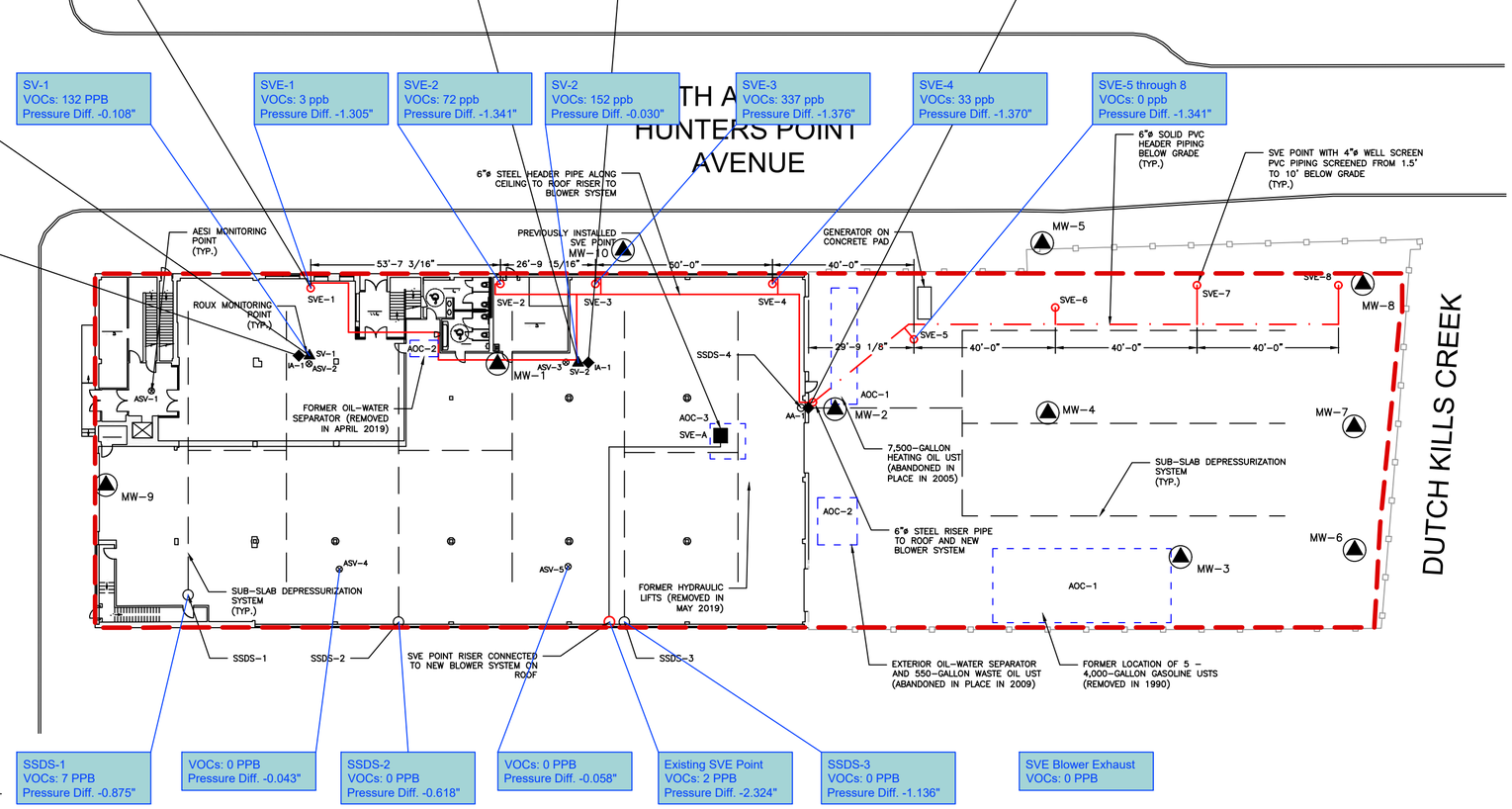
EFF-SVE-1	03/10/2025
VOCs	
1,1,2-Trichloro-1,2,2-Trifluoroethane	**4.9 J**
1,3-Butadiene	**0.87 J**
2,2,4-Trimethylpentane	**8.9 J**
Acetone	**140**
Benzene	**3.3 J**
Butane	**28**
Carbon Tetrachloride	**3.5**
Chlorodifluoromethane	**12 J**
Chloroform	**4.7 J**
Chloromethane	**7.2 J**
Dichlorodifluoromethane	**22 J**
m,p-Xylene	**12 J**
Methyl Ethyl Ketone (2-Butanone)	**21**
Methylene Chloride	**6.6 J**
N-Heptane	**4 J**
O-Xylene (1,2-Dimethylbenzene)	**4 J**
Tetrachloroethylene (PCE)	**690**
Tetrahydrofuran	**68 J**
Toluene	**3.1 J**
Trans-1,2-Dichloroethene	**5.4 J**
Trichloroethylene (TCE)	**19**
Trichlorofluoromethane	**12**

SSV-2	03/10/2025
VOCs	
1,1,2-Trichloro-1,2,2-Trifluoroethane	**0.5 J**
1,2,4-Trimethylbenzene	**1.3**
1,3,5-Trimethylbenzene (Mesitylene)	**0.25 J**
1,4-Dioxane (P-Dioxane)	**16 J**
2,2,4-Trimethylpentane	**0.37 J**
4-Ethyltoluene	**0.31 J**
Acetone	**120 D**
Benzene	**0.49 J**
Butane	**5**
Carbon Disulfide	**8.5**
Carbon Tetrachloride	**0.42**
Chlorodifluoromethane	**1.3 J**
Cyclohexane	**0.29 J**
Dichlorodifluoromethane	**2.4 J**
Ethylbenzene	**1.4**
Isopropanol	**43**
m,p-Xylene	**6.2**
Methyl Ethyl Ketone (2-Butanone)	**6.1**
Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	**0.98 J**
N-Heptane	**1**
N-Hexane	**0.65 J**
O-Xylene (1,2-Dimethylbenzene)	**1.8**
Styrene	**0.59 J**
Tert-Butyl Alcohol	**17**
Tetrachloroethylene (PCE)	**2.9**
Toluene	**2.9**
Trichlorofluoromethane	**1.2**

IA-2	03/10/2025
VOCs	
1,1,2-Trichloro-1,2,2-Trifluoroethane	**0.47 J**
1,3-Butadiene	**0.099 J**
2,2,4-Trimethylpentane	**0.34 J**
Acetone	**9.9 J**
Benzene	**0.65**
Butane	**6.1**
Carbon Tetrachloride	**0.37**
Chlorodifluoromethane	**1.3 J**
Chloromethane	**1.4**
Dichlorodifluoromethane	**2.4 J**
Ethylbenzene	**0.67 J**
m,p-Xylene	**3.1**
Methylene Chloride	**0.69 J**
N-Heptane	**0.34 J**
N-Hexane	**0.4 J**
O-Xylene (1,2-Dimethylbenzene)	**0.92**
Tetrachloroethylene (PCE)	**0.93 J**
Toluene	**1.1**
Trichlorofluoromethane	**1.3**

AA-1	03/10/2025
VOCs	
1,1,2-Trichloro-1,2,2-Trifluoroethane	**0.49 J**
1,3-Butadiene	**0.089 J**
2,2,4-Trimethylpentane	**0.39 J**
Acetone	**13**
Benzene	**0.64**
Butane	**6.3**
Carbon Tetrachloride	**0.32**
Chlorodifluoromethane	**1.2 J**
Chloromethane	**1.5**
Dichlorodifluoromethane	**2.1 J**
Ethylbenzene	**0.78 J**
m,p-Xylene	**3.3**
Methylene Chloride	**0.85 J**
N-Heptane	**0.46 J**
N-Hexane	**0.49 J**
O-Xylene (1,2-Dimethylbenzene)	**0.99**
Tetrachloroethylene (PCE)	**0.79 J**
Toluene	**1.2**
Trans-1,2-Dichloroethene	**2.6**
Trichlorofluoromethane	**1.1**

IA-1	03/10/2025	03/10/2025 DUP
VOCs		
1,1,2-Trichloro-1,2,2-Trifluoroethane	ND	**0.48 J**
1,3-Butadiene	ND	**0.15 J**
2,2,4-Trimethylpentane	ND	**0.47 J**
Acetone	ND	**12**
Benzene	ND	**0.74**
Butane	**6.2 J**	**6.4**
Carbon Tetrachloride	ND	**0.4**
Chlorodifluoromethane	ND	**1.3 J**
Chloromethane	ND	**1.4**
Dichlorodifluoromethane	ND	**2.2 J**
Ethylbenzene	ND	**0.47 J**
Isopropanol	ND	**6.8 J**
m,p-Xylene	ND	**1.8 J**
Methylene Chloride	ND	**0.85 J**
N-Heptane	ND	**0.52 J**
N-Hexane	ND	**0.59 J**
O-Xylene (1,2-Dimethylbenzene)	ND	**0.56 J**
Tetrachloroethylene (PCE)	ND	**0.57 J**
Toluene	ND	**1.1**
Trichlorofluoromethane	ND	**1.2**



LEGEND

- SITE BOUNDARY
- FENCE
- APPROXIMATE TANK AREAS (AS PER ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.)
- SVES EXPANSION COMPONENTS
- AESI INSTALLED MONITORING POINT
- SV-1 ROUX INSTALLED MONITORING POINT
- IA-1 INDOOR AIR/AMBIENT AIR MONITORING LOCATION
- MW-9 GROUNDWATER MONITORING WELL
- BUILDING COLUMN

CONCENTRATIONS IN ug/m³

ug/m³ – MICROGRAMS PER CUBIC METER

VOCs – VOLATILE ORGANIC COMPOUNDS

ND – COMPOUND WAS ANALYZED FOR BUT NOT DETECTED

30' 0 30'

STATE OF NEW YORK · DAVID ERIC KAISER · 097317 · LICENSED PROFESSIONAL ENGINEER

Title:

REMAINING CONTAMINATION SOIL VAPOR DETECTIONS AND MONITORING RESULTS

27-10 49TH AVENUE
LONG ISLAND CITY, NY

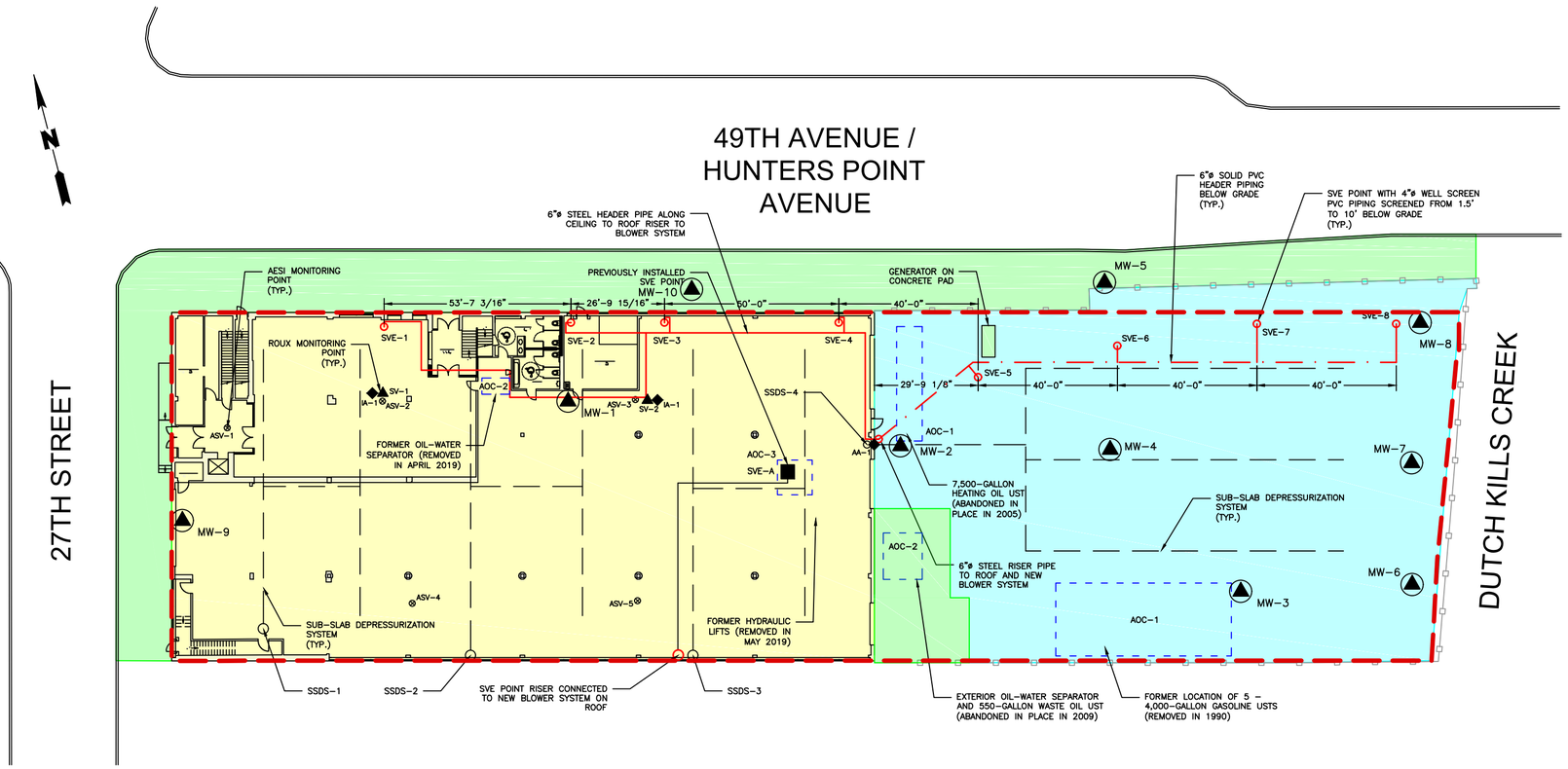
Prepared for:

HUNTERS POINT SG, LLC

ROUX

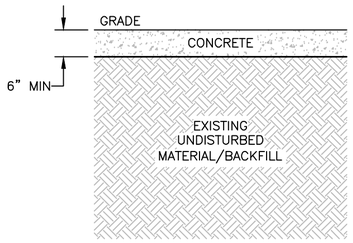
Compiled by: S.S.	Date: 6/18/2026	FIGURE
Prepared by: G.M.	Scale: AS SHOWN	8B
Project Mgr: S.S.	Project: 3446.0008Y000	
File: 3446.0008Y125.04-REV 1.DWG		

V:\CAD\PROJECTS\3446\Y0008\Y125\3446.0008Y125.04-REV 1.DWG DKAISER



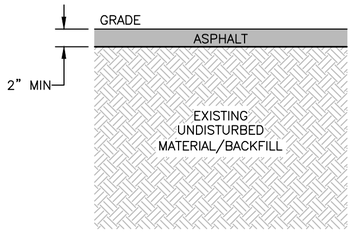
LEGEND

- BUILDING FOUNDATION
- ASPHALT PARKING LOT
- CONCRETE PAVED AREA
- SITE BOUNDARY
- FENCE
- APPROXIMATE TANK AREAS (AS PER ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.)
- SVES EXPANSION COMPONENTS
- AESI INSTALLED MONITORING POINT
- SV-1 ROUX INSTALLED MONITORING POINT
- MW-9 GROUNDWATER MONITORING WELL
- BUILDING COLUMN



1 TYPICAL BUILDING SLAB ON GRADE FOUNDATION AND CONCRETE PAVED AREA COVER SYSTEM DETAIL

SCALE: 1"=2'



2 TYPICAL ASPHALT COVER SYSTEM DETAIL

SCALE: 1"=2'

30' 0 30'

Title:

SITE WIDE COVER SYSTEM PLAN

27-10 49TH AVENUE
LONG ISLAND CITY, NY

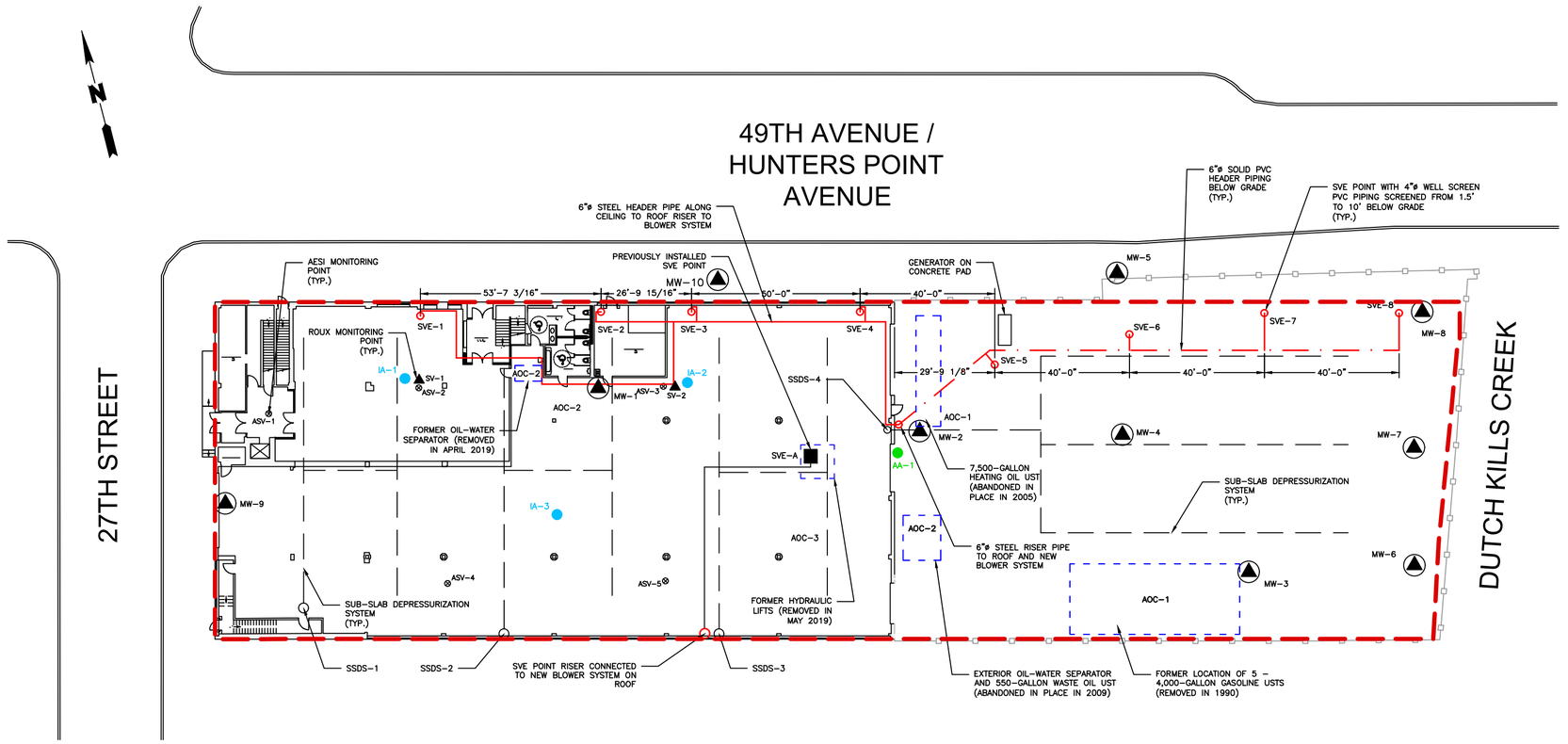
Prepared for:

HUNTERS POINT SG, LLC

ROUX

Compiled by: S.S.	Date: 6/18/2026	FIGURE
Prepared by: G.M.	Scale: AS SHOWN	9
Project Mgr: S.S.	Project: 3446.0008Y000	
File: 3446.0008Y128.02-REV 1.DWG		

V:\CAD\PROJECTS\3446\Y0008\Y128\3446.0008Y128.02-REV 1.DWG DKAISER



LEGEND

- SITE BOUNDARY
- FENCE
- APPROXIMATE TANK AREAS (AS PER ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.)
- SVES EXPANSION COMPONENTS
- AMBIENT AIR SAMPLING LOCATION
- INDOOR AIR SAMPLING LOCATION
- AESI INSTALLED MONITORING POINT
- SV-1 ROUX INSTALLED MONITORING POINT
- MW-9 GROUNDWATER MONITORING WELLS
- BUILDING COLUMN

30' 0 30'

STATE OF NEW YORK DAVID ERIC KAISER 097317 LICENSED PROFESSIONAL ENGINEER

Title:

PROPOSED INDOOR AND AMBIENT AIR SAMPLING LOCATIONS

27-10 49TH AVENUE
LONG ISLAND CITY, NY

Prepared for:

HUNTERS POINT SG, LLC

ROUX

Compiled by: S.S.	Date: 6/18/2026	FIGURE
Prepared by: G.M.	Scale: AS SHOWN	10
Project Mgr: S.S.	Project: 3446.0008Y000	
File: 3446.0008Y125.01-REV 1.DWG		

V:\CAD\PROJECTS\3446Y\0008Y\125\3446.0008Y125.01-REV 1.DWG DKAISER

APPENDICES

A. Environmental Easement
B. List of Site Contacts
C. Soil Boring and Well Construction Logs
D. SSDS/SVES and Expanded SVES As-Builts and Component Manuals
   D1. SSDS/SVES As-Built and Component Manual
   D2. Expanded SVES As-Built and Component Manual
E. Excavation Work Plan
F. Health and Safety Plan and Community Air Monitoring Plan
G. Quality Assurance Project Plan and Field Sampling Plan
H. Site Management Forms
I. Remedial System Optimization Table of Contents

APPENDIX A

Environmental Easement

NYC DEPARTMENT OF FINANCE
OFFICE OF THE CITY REGISTER

This page is part of the instrument. The City Register will rely on the information provided by you on this page for purposes of indexing this instrument.The information on this page will control for indexing purposes in the event of any conflict with the rest of the document.

2025072500148001002E5CDE

RECORDING AND ENDORSEMENT COVER PAGE **PAGE 1 OF 10**

Document ID: 2025072500148001 Document Date: 06-04-2025 Preparation Date: 08-06-2025
Document Type: EASEMENT
Document Page Count: 9

PRESENTER:
SIVE PAGET & RIESEL, P.C.
560 LEXINGTON AVENUE, 15TH FLOOR
NEW YORK, NY 10022
212-421-2150
NDUNCAN@SPRLAW.COM

RETURN TO:
SIVE PAGET & RIESEL, P.C.
560 LEXINGTON AVENUE, 15TH FLOOR
NEW YORK, NY 10022
212-421-2150
NDUNCAN@SPRLAW.COM

PROPERTY DATA

Borough	Block	Lot	Unit	Address
QUEENS	113	35	Entire Lot	27-10 49 AVENUE

Property Type: INDUSTRIAL BUILDING Easement

CROSS REFERENCE DATA

CRFN_____ *or* DocumentID_____ *or* _____ Year_____ Reel____ Page_____ *or* File Number_____

PARTIES

GRANTOR/SELLER:
HUNTERS POINT SG, LLC
C/O: SITEX GROUP LLC, 10 W. FOREST AVENUE
ENGLEWOOD, NJ 07631

GRANTEE/BUYER:
PEOPLE OF NEW YORK BY DEPT. ENVIRONMENTAL CONSERVA
625 BROADWAY
ALBANY, NY 12233

FEES AND TAXES

Mortgage :

Mortgage Amount:	$	0.00
Taxable Mortgage Amount:	$	0.00
Exemption:		
TAXES: County (Basic):	$	0.00
City (Additional):	$	0.00
Spec (Additional):	$	0.00
TASF:	$	0.00
MTA:	$	0.00
NYCTA:	$	0.00
Additional MRT:	$	0.00
TOTAL:	$	0.00
Recording Fee:	$	82.00
Affidavit Fee:	$	0.00

Filing Fee: $ 100.00

NYC Real Property Transfer Tax: $ 0.00

NYS Real Estate Transfer Tax: $ 0.00

RECORDED OR FILED IN THE OFFICE OF THE CITY REGISTER OF THE CITY OF NEW YORK
Recorded/Filed 08-11-2025 09:37
City Register File No.(CRFN): **2025000214037**

City Register Official Signature

ENVIRONMENTAL EASEMENT GRANTED PURSUANT TO ARTICLE 71, TITLE 36 OF THE NEW YORK STATE ENVIRONMENTAL CONSERVATION LAW

THIS INDENTURE made as of this 4th day of June, 2025, between Owner, Hunters Point SG, LLC, having an office at c/o Sitex Group LLC, 10 W. Forest Ave., Englewood, NJ 07631 (the "Grantor"), and The People of the State of New York (the "Grantee."), acting through their Commissioner of the Department of Environmental Conservation (the "Commissioner", or "NYSDEC" or "Department" as the context requires) with its headquarters located at 625 Broadway, Albany, New York 12233,

WHEREAS, the Legislature of the State of New York has declared that it is in the public interest to encourage the remediation of abandoned and likely contaminated properties ("sites") that threaten the health and vitality of the communities they burden while at the same time ensuring the protection of public health and the environment; and

WHEREAS, the Legislature of the State of New York has declared that it is in the public interest to establish within the Department a statutory environmental remediation program that includes the use of Environmental Easements as an enforceable means of ensuring the performance of operation, maintenance, and/or monitoring requirements and the restriction of future uses of the land, when an environmental remediation project leaves residual contamination at levels that have been determined to be safe for a specific use, but not all uses, or which includes engineered structures that must be maintained or protected against damage to perform properly and be effective, or which requires groundwater use or soil management restrictions; and

WHEREAS, the Legislature of the State of New York has declared that Environmental Easement shall mean an interest in real property, created under and subject to the provisions of Article 71, Title 36 of the New York State Environmental Conservation Law ("ECL") which contains a use restriction and/or a prohibition on the use of land in a manner inconsistent with engineering controls which are intended to ensure the long term effectiveness of a site remedial program or eliminate potential exposure pathways to hazardous waste or petroleum; and

WHEREAS, Grantor, is the owner of real property located at the address of 27-10 49th Avenue, Long Island City in the City of New York, County of Queens and State of New York, known and designated on the tax map of the New York City Department of Finance as tax map parcel number: Block 113 Lot 35, being the same as that property conveyed to Grantor by deed dated April 10, 2018 and recorded in the City Register of the City of New York as CRFN #2018000140492. The property subject to this Environmental Easement (the "Controlled Property") comprises approximately .87 +/- acres, and is hereinafter more fully described in the Land Title Survey dated October 6, 2020 prepared by Paul Fisher, License No. 050784-1, of Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C., which will be attached to the Site Management Plan. The Controlled Property description is set forth in and attached hereto as Schedule A; and

WHEREAS, the Department accepts this Environmental Easement in order to ensure the protection of public health and the environment and to achieve the requirements for remediation established for the Controlled Property until such time as this Environmental Easement is

extinguished pursuant to ECL Article 71, Title 36; and

NOW THEREFORE, in consideration of the mutual covenants contained herein and the terms and conditions of Brownfield Cleanup Agreement Number: C241219-10-16, Grantor conveys to Grantee a permanent Environmental Easement pursuant to ECL Article 71, Title 36 in, on, over, under, and upon the Controlled Property as more fully described herein ("Environmental Easement").

1. Purposes. Grantor and Grantee acknowledge that the Purposes of this Environmental Easement are: to convey to Grantee real property rights and interests that will run with the land in perpetuity in order to provide an effective and enforceable means of encouraging the reuse and redevelopment of this Controlled Property at a level that has been determined to be safe for a specific use while ensuring the performance of operation, maintenance, and/or monitoring requirements; and to ensure the restriction of future uses of the land that are inconsistent with the above-stated purpose.

2. Institutional and Engineering Controls. The controls and requirements listed in the Department approved Site Management Plan ("SMP") including any and all Department approved amendments to the SMP are incorporated into and made part of this Environmental Easement. These controls and requirements apply to the use of the Controlled Property, run with the land, are binding on the Grantor and the Grantor's successors and assigns, and are enforceable in law or equity against any owner of the Controlled Property, any lessees and any person using the Controlled Property.

A. (1) The Controlled Property may be used for:

Commercial as described in 6 NYCRR Part 375-1.8(g)(2)(iii) and Industrial as described in 6 NYCRR Part 375-1.8(g)(2)(iv)

(2) All Engineering Controls must be operated and maintained as specified in the Site Management Plan (SMP);

(3) All Engineering Controls must be inspected at a frequency and in a manner defined in the SMP;

(4) The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the NYSDOH or the New York City Department of Health and Mental Hygiene to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the Department;

(5) Groundwater and other environmental or public health monitoring must be performed as defined in the SMP;

(6) Data and information pertinent to Site Management of the Controlled Property must be reported at the frequency and in a manner defined in the SMP;

(7) All future activities on the property that will disturb remaining

contaminated material must be conducted in accordance with the SMP;

(8) Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in the SMP;

(9) Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical components of the remedy shall be performed as defined in the SMP;

(10) Access to the site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by this Environmental Easement.

B. The Controlled Property shall not be used for Residential or Restricted Residential purposes as defined in 6NYCRR 375-1.8(g)(2)(i) and (ii), and the above-stated engineering controls may not be discontinued without an amendment or extinguishment of this Environmental Easement.

C. The SMP describes obligations that the Grantor assumes on behalf of Grantor, its successors and assigns. The Grantor's assumption of the obligations contained in the SMP which may include sampling, monitoring, and/or operating a treatment system, and providing certified reports to the NYSDEC, is and remains a fundamental element of the Department's determination that the Controlled Property is safe for a specific use, but not all uses. The SMP may be modified in accordance with the Department's statutory and regulatory authority. The Grantor and all successors and assigns, assume the burden of complying with the SMP and obtaining an up-to-date version of the SMP from:

Site Control Section
Division of Environmental Remediation
NYSDEC
625 Broadway
Albany, New York 12233
Phone: (518) 402-9553

D. Grantor must provide all persons who acquire any interest in the Controlled Property a true and complete copy of the SMP that the Department approves for the Controlled Property and all Department-approved amendments to that SMP.

E. Grantor covenants and agrees that until such time as the Environmental Easement is extinguished in accordance with the requirements of ECL Article 71, Title 36 of the ECL, the property deed and all subsequent instruments of conveyance relating to the Controlled Property shall state in at least fifteen-point bold-faced type:

This property is subject to an Environmental Easement held by the New York State Department of Environmental Conservation pursuant to Title 36 of Article 71 of the Environmental Conservation

Law.

F. Grantor covenants and agrees that this Environmental Easement shall be incorporated in full or by reference in any leases, licenses, or other instruments granting a right to use the Controlled Property.

G. Grantor covenants and agrees that it shall, at such time as NYSDEC may require, submit to NYSDEC a written statement by an expert the NYSDEC may find acceptable certifying under penalty of perjury, in such form and manner as the Department may require, that:

(1) the inspection of the site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under the direction of the individual set forth at 6 NYCRR Part 375-1.8(h)(3).

(2) the institutional controls and/or engineering controls employed at such site:

(i) are in-place;

(ii) are unchanged from the previous certification, or that any identified changes to the controls employed were approved by the NYSDEC and that all controls are in the Department-approved format; and

(iii) that nothing has occurred that would impair the ability of such control to protect the public health and environment;

(3) the owner will continue to allow access to such real property to evaluate the continued maintenance of such controls;

(4) nothing has occurred that would constitute a violation or failure to comply with any site management plan for such controls;

(5) the report and all attachments were prepared under the direction of, and reviewed by, the party making the certification;

(6) to the best of his/her knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program, and generally accepted engineering practices; and

(7) the information presented is accurate and complete.

3. Right to Enter and Inspect. Grantee, its agents, employees, or other representatives of the State may enter and inspect the Controlled Property in a reasonable manner and at reasonable times to assure compliance with the above-stated restrictions.

4. Reserved Grantor's Rights. Grantor reserves for itself, its assigns, representatives, and successors in interest with respect to the Property, all rights as fee owner of the Property, including:

A. Use of the Controlled Property for all purposes not inconsistent with, or limited by the terms of this Environmental Easement;

B. The right to give, sell, assign, or otherwise transfer part or all of the underlying fee interest to the Controlled Property, subject and subordinate to this Environmental Easement;

5. Enforcement

A. This Environmental Easement is enforceable in law or equity in perpetuity by Grantor, Grantee, or any affected local government, as defined in ECL Section 71-3603, against

the owner of the Property, any lessees, and any person using the land. Enforcement shall not be defeated because of any subsequent adverse possession, laches, estoppel, or waiver. It is not a defense in any action to enforce this Environmental Easement that: it is not appurtenant to an interest in real property; it is not of a character that has been recognized traditionally at common law; it imposes a negative burden; it imposes affirmative obligations upon the owner of any interest in the burdened property; the benefit does not touch or concern real property; there is no privity of estate or of contract; or it imposes an unreasonable restraint on alienation.

B. If any person violates this Environmental Easement, the Grantee may revoke the Certificate of Completion with respect to the Controlled Property.

C. Grantee shall notify Grantor of a breach or suspected breach of any of the terms of this Environmental Easement. Such notice shall set forth how Grantor can cure such breach or suspected breach and give Grantor a reasonable amount of time from the date of receipt of notice in which to cure. At the expiration of such period of time to cure, or any extensions granted by Grantee, the Grantee shall notify Grantor of any failure to adequately cure the breach or suspected breach, and Grantee may take any other appropriate action reasonably necessary to remedy any breach of this Environmental Easement, including the commencement of any proceedings in accordance with applicable law.

D. The failure of Grantee to enforce any of the terms contained herein shall not be deemed a waiver of any such term nor bar any enforcement rights.

6. Notice. Whenever notice to the Grantee (other than the annual certification) or approval from the Grantee is required, the Party providing such notice or seeking such approval shall identify the Controlled Property by referencing the following information:

County, NYSDEC Site Number, NYSDEC Brownfield Cleanup Agreement, State Assistance Contract or Order Number, and the County tax map number or the Liber and Page or computerized system identification number.

Parties shall address correspondence to:

Site Number: C241219
Office of General Counsel
NYSDEC
625 Broadway
Albany New York 12233-5500

With a copy to:

Site Control Section
Division of Environmental Remediation
NYSDEC
625 Broadway
Albany, NY 12233

All notices and correspondence shall be delivered by hand, by registered mail or by Certified mail and return receipt requested. The Parties may provide for other means of receiving and communicating notices and responses to requests for approval.

7. Recordation. Grantor shall record this instrument, within thirty (30) days of execution of this instrument by the Commissioner or her/his authorized representative in the office of the

recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

8. Amendment. Any amendment to this Environmental Easement may only be executed by the Commissioner of the New York State Department of Environmental Conservation or the Commissioner's Designee, and filed with the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

9. Extinguishment. This Environmental Easement may be extinguished only by a release by the Commissioner of the New York State Department of Environmental Conservation, or the Commissioner's Designee, and filed with the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

10. Joint Obligation. If there are two or more parties identified as Grantor herein, the obligations imposed by this instrument upon them shall be joint and several.

11. Consistency with the SMP. To the extent there is any conflict or inconsistency between the terms of this Environmental Easement and the SMP, regarding matters specifically addressed by the SMP, the terms of the SMP will control.

Remainder of Page Intentionally Left Blank

IN WITNESS WHEREOF, Grantor has caused this instrument to be signed in its name.

Hunters Point SG, LLC, a Delaware limited liability company:

By: Hunters Point Holdings SG, LLC, a Delaware limited liability company, its sole member

By: _____

Name: Brian D. Milberg

Title: Manager Date: May 22, 2025

Grantor's Acknowledgment

STATE OF ~~NEW YORK~~ NJ)
) ss:
COUNTY OF Bergen)

On the 22nd day of May, in the year 2025, before me, the undersigned, personally appeared Brian Milberg personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Yana Lysogorsky
Notary Public - State of ~~New York~~ NJ

YANA LYSOGORSKY
Commission # 50080596
Notary Public, State of New Jersey
My Commission Expires
April 13, 2028

THIS ENVIRONMENTAL EASEMENT IS HEREBY ACCEPTED BY THE PEOPLE OF THE STATE OF NEW YORK, Acting By and Through the Department of Environmental Conservation as Designee of the Commissioner,

By: _____
Andrew O. Guglielmi, Director
Division of Environmental Remediation

Grantee's Acknowledgment

STATE OF NEW YORK)
) ss:
COUNTY OF ALBANY)

On the 4th day of June, in the year 2025 before me, the undersigned, personally appeared Andrew O. Guglielmi, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/ executed the same in his/her/ capacity as Designee of the Commissioner of the State of New York Department of Environmental Conservation, and that by his/her/ signature on the instrument, the individual, or the person upon behalf of which the individual acted, executed the instrument.

_____
Notary Public - State of New York

Cheryl A. Salem
Notary Public State of New York
Registration No. 01SA0002177
Qualified in Albany County
My Commission Expires March 3, 2027

SCHEDULE "A" PROPERTY DESCRIPTION

ALL that certain plot, piece or parcel of land, situate, lying and being in the Borough of Queens, County of Queens, City and State of New York, bounded and described as follows:

BEGINNING at the corner formed by the intersection of the southerly side of the 49th Avenue, formerly known as Hunters Point Avenue, with the easterly side of 27th Street, formerly known as Creek Street;

RUNNING THENCE southerly along the easterly side of 27th Street, 100 feet;

THENCE easterly on a line parallel with 49th Avenue, 367.10 feet to the westerly side of Dutch Kills Basin;

THENCE northerly along the westerly side of Dutch Kills Basin along a line which on its westerly side forms an interior angle of 101 degrees 16 minutes 34 seconds with the last described course, 101.97 feet to the southerly side of the 49th Avenue;

THENCE westerly along the southerly side of 49th Avenue, 387.02 feet to the point or place of BEGINNING.

NYC DEPARTMENT OF FINANCE
OFFICE OF THE CITY REGISTER

This page is part of the instrument. The City Register will rely on the information provided by you on this page for purposes of indexing this instrument.The information on this page will control for indexing purposes in the event of any conflict with the rest of the document.

2026060500564001001E7EB4

RECORDING AND ENDORSEMENT COVER PAGE **PAGE 1 OF 7**

Document ID: 2026060500564001 Document Date: 06-01-2026 Preparation Date: 06-05-2026
Document Type: EASEMENT
Document Page Count: 6

PRESENTER:
SIVE PAGET & RIESEL, P.C.
560 LEXINGTON AVENUE, 15TH FLOOR
NEW YORK, NY 10022
212-421-2150
NDUNCAN@SPRLAW.COM

RETURN TO:
SIVE PAGET & RIESEL, P.C.
560 LEXINGTON AVENUE, 15TH FLOOR
NEW YORK, NY 10022
212-421-2150
NDUNCAN@SPRLAW.COM

PROPERTY DATA

Borough	Block	Lot	Unit	Address
QUEENS	113	35	Partial Lot	27-10 49 AVENUE

Property Type: INDUSTRIAL BUILDING Easement

CROSS REFERENCE DATA

CRFN_____ *or* DocumentID_____ *or* _____ Year_____ Reel____ Page_____ *or* File Number_____

PARTIES

GRANTOR/SELLER:
HUNTERS POINT SG, LLC
C/O: SITEX GROUP LLC, 10 W. FOREST AVENUE
ENGLEWOOD, NJ 07631

GRANTEE/BUYER:
PEOPLE OF NEW YORK BY DEPT. ENVIRONMENTAL CONSERVA
625 BROADWAY
ALBANY, NY 12233

FEES AND TAXES

Mortgage :

Mortgage Amount:	$	0.00
Taxable Mortgage Amount:	$	0.00
Exemption:		
TAXES: County (Basic):	$	0.00
City (Additional):	$	0.00
Spec (Additional):	$	0.00
TASF:	$	0.00
MTA:	$	0.00
NYCTA:	$	0.00
Additional MRT:	$	0.00
TOTAL:	$	0.00
Recording Fee:	$	67.00
Affidavit Fee:	$	0.00

Filing Fee: $ 100.00

NYC Real Property Transfer Tax: $ 0.00

NYS Real Estate Transfer Tax: $ 0.00

RECORDED OR FILED IN THE OFFICE OF THE CITY REGISTER OF THE CITY OF NEW YORK
Recorded/Filed 06-10-2026 16:43
City Register File No.(CRFN): **2026000161038**

City Register Official Signature

AMENDMENT TO ENVIRONMENTAL EASEMENT

This Amendment to Environmental Easement is made as of this 1st day of June, 2026, by and between The People of the State of New York, acting through their Commissioner of the Department of Environmental Conservation ("NYSDEC" or the "Department") with its headquarters located at 625 Broadway, Albany, New York 12233, and Hunters Point SG, LLC (the "Grantor") with its offices located at c/o Sitex Group LLC, 10 W. Forest Ave., Englewood, NJ 07631.

RECITALS

1. Grantor, Hunters Point SG, LLC, is the owner of real property located at the address of 27-10 49th Avenue, Long Island City, in the City of New York, County of Queens and State of New York, known and designated on the tax map of the New York City Department of Finance as tax map parcel number: Block 113 Lot 35, being the same as that property conveyed to Grantor by deed dated April 10, 2018 and recorded in the City Register of the City of New York in CRFN: 2018000140492.

2. The property referenced above comprises approximately 0.87 +/- acres.

3. The Department and Grantor entered into that certain Environmental Easement ("Easement Agreement") dated as of June 4, 2025 and recorded in the in the City Register of the City of New York as CRFN: 2025000214037. Capitalized terms used herein without definition have the meanings ascribed to them in the Environmental Easement Agreement.

4. Pursuant to Section 1, 2, 3, 4, and 5 of the Easement Agreement, Grantor granted the Department rights and interests that run with the land in perpetuity in order to provide an effective and enforceable means of encouraging the reuse and redevelopment of the Controlled Property at a level that has been determined to be safe for a specific use while ensuring the performance of maintenance, monitoring or operation requirements; and to ensure the potential restriction of future uses of the land that are inconsistent with the stated purpose.

5. The Easement Agreement dated June 4, 2025 erroneously neglected to exclude the lands underwater from the Schedule "A" easement description.

6. This Amendment to Environmental Easement is filed solely in order to correct a mutual mistake between the Department and Grantor relating to the acreage and survey information in the fourth WHEREAS paragraph and Schedule "A" Easement Description to that Environmental Easement dated June 4, 2025 and recorded in the in the City Register of the City of New York as CRFN: 2025000214037.

7. Pursuant to Section 8 of the Easement Agreement, the Department agrees to amend the Easement Agreement in the manner prescribed by Article 9 of the Real Property Law.

AMENDMENT OF ENVIRONMENTAL EASEMENT

A. The above recitals are hereby incorporated into this Amendment of Environmental Easement.

B. The Department and Grantor hereby agree that the fourth WHEREAS paragraph of the Environmental Easement is hereby amended to read as follows:

WHEREAS, Grantor, is the owner of real property located at the address of 27-10 49th Avenue, Long Island City in the City of New York, County of Queens and State of New York, known and designated on the tax map of the New York City Department of Finance as tax map parcel number: Block 113 Lot 35, being the same as that property conveyed to Grantor by deed dated April 10, 2018 and recorded in the City Register of the City of New York as CRFN #2018000140492. The property subject to this Environmental Easement (the "Controlled Property") **comprises approximately 0.84 +/- acres**, and is hereinafter more fully described in the Land Title Survey dated October 1, 2020, last revised March 13, 2026, prepared by Timothy O'Connor, of Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C., which will be attached to the Site Management Plan. The Controlled Property description is set forth in and attached hereto as Schedule A; and

C. The Department and Grantor hereby agree that Schedule "A" of the Environmental Easement is hereby amended to read as follows:

BEGINNING AT THE CORNER FORMED BY THE INTERSECTION OF THE SOUTHERLY SIDE OF 49TH AVENUE (80' WIDE R.O.W.), FORMERLY KNOWN AS HUNTERS POINT AVENUE, WITH THE EASTERLY SIDE OF 27TH STREET (60' WIDE R.O.W.), FORMERLY KNOWN AS CREEK STREET AND ASHBURN STREET, AND RUNNING; THENCE

ALONG SAID EASTERLY SIDELINE OF 27TH STREET, SOUTH 14°14'57" WEST A DISTANCE OF 100.00 FEET TO A POINT WHERE THE SAME IS INTERSECTED BY THE DIVISION LINE BETWEEN LANDS HEREIN DESCRIBED AND LOT 1 BLOCK 113, LAND N/F 34-06 73RD LLC AS DESCRIBED IN DOCUMENT 2008100101336001;

THENCE ALONG SAID DIVISION LINE AND PARALLEL WITH THE SOUTHERLY SIDELINE OF SAID 49TH AVENUE, SOUTH 75°45'33" EAST A DISTANCE OF 361.61 FEET TO A POINT; THENCE

NORTH 17°27'51" EAST A DISTANCE OF 29.13 FEET TO A POINT; THENCE

NORTH 19°41'59" EAST A DISTANCE OF 57.29 FEET TO A POINT; THENCE

NORTH 66°05'24" EAST A DISTANCE OF 0.92 FEET TO A POINT; THENCE

NORTH 14°39'39" EAST A DISTANCE OF 13.32 FEET TO A POINT IN THE AFOREMENTIONED SOUTHERLY SIDELINE OF 49TH AVENUE; THENCE

ALONG SAID SOUTHERLY SIDELINE OF 49TH AVENUE, NORTH 75°45'33" WEST A DISTANCE OF 369.51 FEET TO THE POINT OR PLACE OF BEGINNING.

ENCOMPASSING AN AREA OF 36,542 SQUARE FEET OR 0.84 ACRES, MORE OR LESS.

D. All other terms of the June 4, 2025 Environmental Easement shall remain in effect.

E. This Amendment of Environmental Easement inures to and binds the parties hereto and their respective successors and assigns.

F. This Amendment of Environmental Easement shall be governed by and interpreted in accordance with the laws of the State of New York.

IN WITNESS WHEREOF, Grantor has caused this Amendment to Environmental Easement to be signed in its name.

Hunters Point SG, LLC, a Delaware limited liability company:

By: Hunters Point Holdings SG, LLC, a Delaware limited liability company, its sole member

By: _____

Print Name: Brian Milberg

Title: Manager Date: May 14th, 2026

Grantor's Acknowledgment

STATE OF ~~NEW YORK~~ NJ)
) ss:
COUNTY OF Bergen)

On the 14th day of May, in the year 2026 before me, the undersigned, personally appeared Brian Milberg personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

_____
Notary Public - State of ~~New York~~ NJ

YANA LYSOGORSKY
Commission # 50080596
Notary Public, State of New Jersey
My Commission Expires
April 13, 2028

THIS AMENDMENT OF THE ENVIRONMENTAL EASEMENT IS HEREBY ACCEPTED BY THE PEOPLE OF THE STATE OF NEW YORK, Acting By and Through the Department of Environmental Conservation as Designee of the Commissioner,

By: _____
Andrew O. Guglielmi, Director
Division of Environmental Remediation

Grantee's Acknowledgment

STATE OF NEW YORK)
) ss:
COUNTY OF ALBANY)

On the 18 day of June, in the year 2026, before me, the undersigned, personally appeared Andrew O. Guglielmi, personally known to me or proved to me on the basis of satisfactory evidence to be the individual whose name is subscribed to the within instrument and acknowledged to me that he executed the same in his capacity as Designee of the Commissioner of the State of New York Department of Environmental Conservation, and that by his signature on the instrument, the individual, or the person upon behalf of which the individual acted, executed the instrument.

_____
Notary Public - State of New York

Cheryl A. Salem
Notary Public State of New York
Registration No. 01SA0002177
Qualified in Albany County
My Commission Expires March 3, 2027

AMENDED SCHEDULE "A" PROPERTY DESCRIPTION

BEGINNING AT THE CORNER FORMED BY THE INTERSECTION OF THE SOUTHERLY SIDE OF 49TH AVENUE (80' WIDE R.O.W.), FORMERLY KNOWN AS HUNTERS POINT AVENUE, WITH THE EASTERLY SIDE OF 27TH STREET (60' WIDE R.O.W.), FORMERLY KNOWN AS CREEK STREET AND ASHBURN STREET, AND RUNNING; THENCE

ALONG SAID EASTERLY SIDELINE OF 27TH STREET, SOUTH 14°14'57" WEST A DISTANCE OF 100.00 FEET TO A POINT WHERE THE SAME IS INTERSECTED BY THE DIVISION LINE BETWEEN LANDS HEREIN DESCRIBED AND LOT 1 BLOCK 113, LAND N/F 34-06 73RD LLC AS DESCRIBED IN DOCUMENT 2008100101336001;

THENCE ALONG SAID DIVISION LINE AND PARALLEL WITH THE SOUTHERLY SIDELINE OF SAID 49TH AVENUE, SOUTH 75°45'33" EAST A DISTANCE OF 361.61 FEET TO A POINT; THENCE

NORTH 17°27'51" EAST A DISTANCE OF 29.13 FEET TO A POINT; THENCE

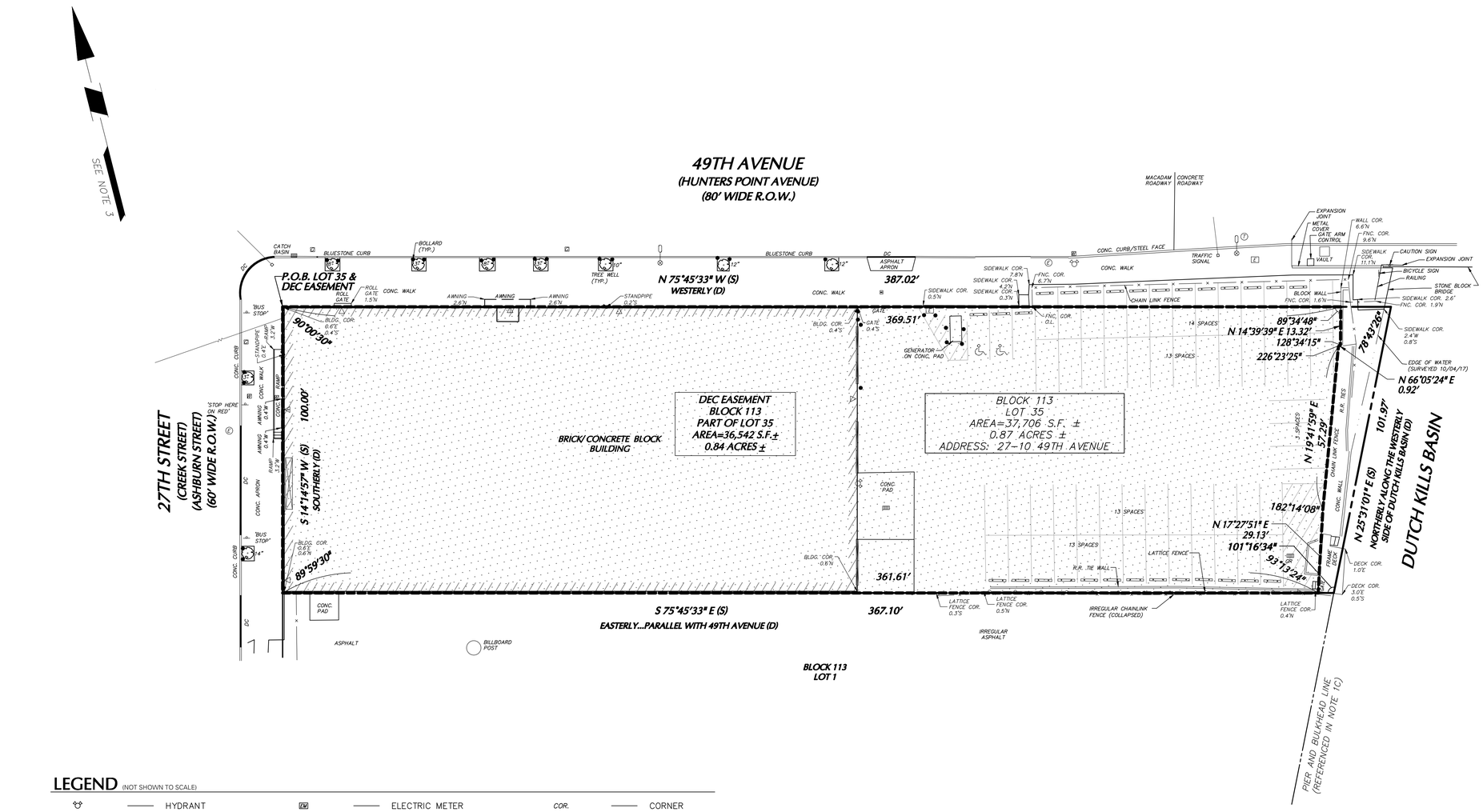
NORTH 19°41'59" EAST A DISTANCE OF 57.29 FEET TO A POINT; THENCE

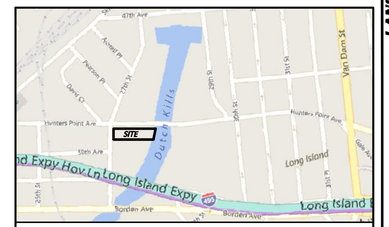
NORTH 66°05'24" EAST A DISTANCE OF 0.92 FEET TO A POINT; THENCE

NORTH 14°39'39" EAST A DISTANCE OF 13.32 FEET TO A POINT IN THE AFOREMENTIONED SOUTHERLY SIDELINE OF 49TH AVENUE; THENCE

ALONG SAID SOUTHERLY SIDELINE OF 49TH AVENUE, NORTH 75°45'33" WEST A DISTANCE OF 369.51 FEET TO THE POINT OR PLACE OF BEGINNING.

ENCOMPASSING AN AREA OF 36,542 SQUARE FEET OR 0.84 ACRES, MORE OR LESS.





PROJECT LOCATION MAP

SCALE: NOT TO SCALE

SOURCE: BING MAPS, MICROSOFT CORPORATION

NOTES

1. THIS SURVEY IS BASED UPON EXISTING PHYSICAL CONDITIONS FOUND AT THE SUBJECT SITE, AND THE FOLLOWING REFERENCES:
   A. BOROUGH OF QUEENS SECTION MAP NO. 31H.
   B. CURRENT NEW YORK CITY DEPARTMENT OF FINANCE TAX MAP FOR BLOCK 113 IN QUEENS.
   C. "PIERHEAD AND BULKHEAD LINES, NEWTOWN CREEK, NEW YORK, EAST RIVER TO CHERRY ST. AND HOBSON AVE., BOROUGHS OF BROOKLYN AND QUEENS, NEW YORK CITY AND DUTCH KILLS, NEW YORK, BOROUGH OF QUEENS, NEW YORK CITY", APPROVED 11/20/1940.
   D. TITLE REPORT ISSUED BY FIRST AMERICAN TITLE INSURANCE COMPANY, TITLE NO. NYFA19-3473, EFFECTIVE DATE: 07/21/2019.
   E. CRFN: 2018000140492, RECORDED/FILED: 04/27/18 09:40 ("VESTING DEED").
   F. ALTA/NSPS LAND TITLE SURVEY "27-10 49TH AVENUE", PREPARED BY LANGAN, DRAWING V4-101, DATED 11/09/17, LAST REVISED 10/02/19.
2. THE SURVEYED PROPERTY IS SUBJECT BUT NOT LIMITED TO THE FOLLOWING FACTS AS REVEALED BY THE HEREON REFERENCED INFORMATION. THE INFORMATION SHOWN HEREON DOES NOT CONSTITUTE A TITLE SEARCH BY THE SURVEYOR. ALL INFORMATION THAT MAY AFFECT THE QUALITY OF TITLE TO BOTH THE SUBJECT AND ADJOINING PARCELS SHOULD BE VERIFIED BY AN ACCURATE AND CURRENT TITLE REPORT.
3. THE MERIDIAN OF THIS SURVEY IS REFERENCED TO THE NEW YORK STATE PLANE COORDINATE SYSTEM NYLI NAD83 AS ESTABLISHED BY GPS METHODS.
4. STREET NAMES, R.O.W. WIDTHS, BLOCK, AND LOT NUMBERS AS PER MAPS REFERENCED IN NOTES 1A AND 1B.
5. PLANIMETRIC INFORMATION SHOWN HEREON HAS BEEN OBTAINED FROM GROUND SURVEYS BY LANGAN ENGINEERING, ENVIRONMENTAL, SURVEYING, LANDSCAPE ARCHITECTURE AND GEOLOGY, D.P.C. DURING OCTOBER 2017 AND UPDATED BY VISUAL INSPECTION OCTOBER 2019.

   SITE FEATURES HAVE NOT BEEN UPDATED PER CONTRACTUAL AGREEMENT.
6. OFFSETS (IF SHOWN) ARE FOR SURVEY REFERENCES ONLY AND ARE NOT TO BE USED IN CONSTRUCTION OF ANY TYPE.
7. WETLANDS, ENVIRONMENTAL, AND/OR HAZARDOUS MATERIALS LOCATION, IF ANY, NOT COVERED UNDER THIS CONTRACT.
8. UNLESS SPECIFICALLY NOTED HEREON, STORM AND SANITARY SEWER INFORMATION (INCLUDING PIPE INVERT, PIPE MATERIAL, AND PIPE SIZE) WAS OBSERVED AND MEASURED AT FIELD LOCATED STRUCTURES (MANHOLES/CATCH BASINS, ETC.) CONDITIONS CAN VARY FROM THOSE ENCOUNTERED AT THE TIMES WHEN AND THE LOCATIONS WHERE DATA WAS OBTAINED. DESPITE MEETING THE REQUIRED STANDARD OF CARE THE SURVEYOR CANNOT AND DOES NOT WARRANT THAT PIPE MATERIAL AND/OR PIPE SIZE THROUGHOUT THE PIPE RUN ARE THE SAME AS THOSE OBSERVED AT EACH STRUCTURE, OR THAT THE PIPE RUN IS STRAIGHT BETWEEN THE LOCATED STRUCTURES.

   ADDITIONAL UTILITY (WATER, GAS, ELECTRIC, ETC.) DATA MAY BE SHOWN FROM FIELD LOCATED SURFACE MARKINGS (BY OTHERS), EXISTING STRUCTURES, AND/OR FROM EXISTING DRAWINGS.

   UNLESS SPECIFICALLY NOTED HEREON THE SURVEYOR HAS NOT EXCAVATED TO PHYSICALLY LOCATE THE UNDERGROUND UTILITIES. THE SURVEYOR MAKES NO GUARANTEES THAT THE SHOWN UNDERGROUND UTILITIES ARE EITHER IN SERVICE, ABANDONED OR SUITABLE FOR USE, NOR ARE IN THE EXACT LOCATION OR CONFIGURATION INDICATED HEREON.

   PRIOR TO ANY DESIGN OR CONSTRUCTION THE PROPER UTILITY AGENCIES MUST BE CONTACTED FOR VERIFICATION OF UTILITY TYPE AND FOR FIELD LOCATIONS.

   UNLESS NOTED BELOW SUPPLEMENTAL DOCUMENTS WERE NOT USED TO COMPILE THE SUBSURFACE UTILITY INFORMATION SHOWN HEREON.
9. UNAUTHORIZED ALTERATION OR ADDITION TO A SURVEY MAP BEARING A LICENSED LAND SURVEYOR'S SEAL IS A VIOLATION OF SECTION 7209, SUB-DIVISION 2, OF THE NEW YORK STATE EDUCATION LAW.
10. THIS PLAN NOT VALID UNLESS EMBOSSED OR BLUE INK STAMPED WITH THE SEAL OF THE PROFESSIONAL.

LEGEND (NOT SHOWN TO SCALE)

HYDRANT		ELECTRIC METER	COR.	CORNER
STAND PIPE	GM	GAS METER	R.R.	RAILROAD
ROOF DRAIN	WM	WATER METER	FNC.	FENCE
FLAG POLE		TELEPHONE BOX	O.L.	ON LINE
PEDESTAL LIGHT		TRAFFIC SIGNAL POLE	N	NORTH
STREET LIGHT		MONITOR WELL	S	SOUTH
AREA LIGHT		BENCH	W	WEST
SIGNAL POLE		DOOR	E	EAST
POWER POLE		DOUBLE DOOR		OVERHEAD WIRE
GUY WIRE		ROLL UP DOOR		GUIDE RAIL WOOD
ANCHOR POLE		YARD DRAIN		GUIDE RAIL METAL
MANHOLE		MAILBOX		TREE LINE
(TYPE AS LABELED)	(S)	SURVEY DESCRIPTION		CHAINLINK FENCE
WATER VALVE	(D)	DEED DESCRIPTION		STOCKADE FENCE
GAS VALVE	DC	DROP CURB		FENCE (TYPE AS NOTED)
UNKNOWN VALVE	P.O.B.	POINT OF BEGINNING		EASEMENT LINE
CATCH BASIN	R.O.W.	RIGHT OF WAY		PROPERTY LINE
CLEAN OUT	BLDG.	BUILDING		RIGHT-OF-WAY LINE
METAL COVER	TYP.	TYPICAL		EDGE OF WATER
TREE	CONC.	CONCRETE		
SIGN	GR	GRATE		DEC EASEMENT
BOLLARD		PARKING BLOCK		
ELECTRIC BOX		HANDICAP PARKING SPACE		

BLOCK 113 LOT 35 SURVEY DESCRIPTION

BEGINNING AT THE CORNER FORMED BY THE INTERSECTION OF THE SOUTHERLY SIDE OF 49TH AVENUE (80' WIDE R.O.W.), FORMERLY KNOWN AS HUNTERS POINT AVENUE, WITH THE EASTERLY SIDE OF 27TH STREET (60' WIDE R.O.W.), FORMERLY KNOWN AS CREEK STREET AND ASHBURN STREET, AND RUNNING THENCE

ALONG THE SAID EASTERLY SIDELINE OF 27TH STREET, SOUTH 14°14'57" WEST A DISTANCE OF 100.00 FEET TO A POINT WHERE THE SAME IS INTERSECTED BY THE DIVISION LINE BETWEEN LANDS HEREIN DESCRIBED AND LOT 1 BLOCK 113, LAND N/F 34-06 73RD LLC AS DESCRIBED IN DOCUMENT 2008100101336001; THENCE

ALONG SAID DIVISION LINE AND PARALLEL WITH THE SOUTHERLY SIDELINE OF SAID 49TH AVENUE, SOUTH 75°45'33" EAST A DISTANCE OF 367.10 FEET TO A POINT IN THE PIER AND BULKHEAD LINE ON THE WESTERLY SIDE OF DUTCH KILLS BASIN, AS SHOWN ON A CERTAIN MAP TITLED "MAP SHOWING STREET SYSTEM FOR THE TERRITORY DESIGNATED AS SECTION 31H OF THE FINAL MAPS OF THE BOROUGH OF QUEENS, DATED: NEW YORK, MARCH 17, 1915" REVISED THROUGH FEBRUARY 23, 1941; THENCE

ALONG SAID PIER AND BULKHEAD LINE, NORTH 25°31'01" EAST A DISTANCE OF 101.97 FEET TO A POINT IN THE AFOREMENTIONED SOUTHERLY SIDELINE OF 49TH AVENUE; THENCE

ALONG SAID SOUTHERLY SIDELINE OF 49TH AVENUE, NORTH 75°45'33" WEST A DISTANCE OF 387.02 FEET TO THE POINT AND PLACE OF BEGINNING.

BLOCK 113 LOT 35 DEED DESCRIPTION (SEE NOTE 1E)

ALL THAT CERTAIN PLOT, PIECE OR PARCEL OF LAND, SITUATE, LYING AND BEING IN THE BOROUGH OF QUEENS, COUNTY OF QUEENS, CITY AND STATE OF NEW YORK, BOUNDED AND DESCRIBED AS FOLLOWS:

BEGINNING AT THE CORNER FORMED BY THE INTERSECTION OF THE SOUTHERLY SIDE OF THE 49TH AVENUE, FORMERLY KNOWN AS HUNTERS POINT AVENUE, WITH THE EASTERLY SIDE OF 27TH STREET, FORMERLY KNOWN AS CREEK STREET;

RUNNING THENCE SOUTHERLY ALONG THE EASTERLY SIDE OF 27TH STREET, 100 FEET;

THENCE EASTERLY ON A LINE PARALLEL WITH 49TH AVENUE, 367.10 FEET TO THE WESTERLY SIDE OF DUTCH KILLS BASIN;

THENCE NORTHERLY ALONG THE WESTERLY SIDE OF DUTCH KILLS BASIN, ALONG A LINE WHICH ON ITS WESTERLY SIDE FORMS AN INTERIOR ANGLE OF 101 DEGREES 16 MINUTES 34 SECONDS WITH THE LAST DESCRIBED COURSE, 101.97 FEET TO THE SOUTHERLY SIDE OF THE 49TH AVENUE;

THENCE WESTERLY ALONG THE SOUTHERLY SIDE OF 49TH AVENUE, 387.02 FEET TO THE POINT OR PLACE OF BEGINNING.

DEC EASEMENT DESCRIPTION BLOCK 113 PART OF LOT 35

BEGINNING AT THE CORNER FORMED BY THE INTERSECTION OF THE SOUTHERLY SIDE OF 49TH AVENUE (80' WIDE R.O.W.), FORMERLY KNOWN AS HUNTERS POINT AVENUE, WITH THE EASTERLY SIDE OF 27TH STREET (60' WIDE R.O.W.), FORMERLY KNOWN AS CREEK STREET AND ASHBURN STREET, AND RUNNING THENCE

ALONG SAID EASTERLY SIDELINE OF 27TH STREET, SOUTH 14°14'57" WEST A DISTANCE OF 100.00 FEET TO A POINT WHERE THE SAME IS INTERSECTED BY THE DIVISION LINE BETWEEN LANDS HEREIN DESCRIBED AND LOT 1 BLOCK 113, LAND N/F 34-06 73RD LLC AS DESCRIBED IN DOCUMENT 2008100101336001; THENCE

ALONG SAID DIVISION LINE AND PARALLEL WITH THE SOUTHERLY SIDELINE OF SAID 49TH AVENUE, SOUTH 75°45'33" EAST A DISTANCE OF 361.61 FEET TO A POINT; THENCE

NORTH 17°27'51" EAST A DISTANCE OF 29.13 FEET TO A POINT; THENCE

NORTH 19°41'59" EAST A DISTANCE OF 57.29 FEET TO A POINT; THENCE

NORTH 66°05'24" EAST A DISTANCE OF 0.92 FEET TO A POINT; THENCE

NORTH 14°39'39" EAST A DISTANCE OF 13.32 FEET TO A POINT IN THE AFOREMENTIONED SOUTHERLY SIDELINE OF 49TH AVENUE; THENCE

ALONG SAID SOUTHERLY SIDELINE OF 49TH AVENUE, NORTH 75°45'33" WEST A DISTANCE OF 369.51 FEET TO THE POINT OR PLACE OF BEGINNING.

ENCOMPASSING AN AREA OF 36,542 SQUARE FEET OR 0.84 ACRES, MORE OR LESS.

6.096 0 1.524 3.048 6.096
SCALE: 1 INCH = 6.096 METERS

20 0 5 10 20
SCALE: 1 INCH = 20 FEET

THIS PROPERTY IS SUBJECT TO AN ENVIRONMENTAL EASEMENT HELD BY THE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION PURSUANT TO TITLE 36 OF ARTICLE 71 OF THE NEW YORK ENVIRONMENTAL CONSERVATION LAW. THE ENGINEERING AND INSTITUTIONAL CONTROLS FOR THIS EASEMENT ARE SET FORTH IN THE SITE MANAGEMENT PLAN (SMP). A COPY OF THE SMP MUST BE OBTAINED BY ANY PARTY WITH AN INTEREST IN THE PROPERTY. THE SMP CAN BE OBTAINED FROM NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION, DIVISION OF ENVIRONMENTAL REMEDIATION, SITE CONTROL SECTION, 625 BROADWAY, ALBANY, NY 12233 OR AT derweb@dec.ny.gov.

Date	Description	No.
03/16/2026	REVISED DEC EASEMENT AREA, DESCRIPTION, AND CHANGE SURVEYOR OF RECORD ONLY	1

REVISIONS

"I hereby state that this plan is based on a field survey made by me or under my supervision in accordance with NYSPLS Code of Practice for Land Surveys, and to the best of my professional knowledge, information and belief, and in my professional opinion, correctly represents the conditions found on the date of the field survey and the subject property".

SIGNATURE: TIMOTHY E. O'CONNOR, LICENSED LAND SURVEYOR, 051194-01 — DATE SIGNED: 3-17-2026

PROFESSIONAL SURVEYOR NY Lic. No. 051194-01

LANGAN

Langan Engineering, Environmental, Surveying, Landscape Architecture and Geology, D.P.C.
368 Ninth Avenue, 8th Floor
New York, NY 10001
T: 212.479.5400 F: 212.479.5444 www.langan.com

Project	27-10 49TH AVENUE BLOCK No. 113, LOT No.35 BOROUGH OF QUEENS CITY OF NEW YORK QUEENS COUNTY NEW YORK
Drawing Title	DEC EASEMENT SURVEY
Project No.	170497901
Date	10/01/2020
Drawn By	JM, SA
Checked By	PDF, TO
Drawing No.	DEC-101
	Sheet 01 of 01

Filename: \\langan.com\data\NYC\data9\170497901\Project Data_Discipline\Survey\CAD\Existing\170497901-V-DEC01.dwg Date: 3/16/2026 Time: 15:16 User: sarabi Style Table: Langan.stb Layout: ARCH-D-BL

PROJECT NO. 170497901

LANGAN

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APPENDIX B

List of Site Contacts

APPENDIX B – LIST OF SITE CONTACTS

Name	Phone/Email Address
Zach McHugh Hunters Point SG, LLC	(929) 226-6906 ZMcHugh@sitexgroup.com
David Yudelson Sive, Paget & Riesel, P.C.	(917) 295-6449 dyudelson@sprlaw.com
David Kaiser, P.E. Roux Environmental Engineering and Geology, D.P.C.	(631) 232-2600 dkaiser@rouxinc.com
Daniel Nierenberg, P.G. Project Manager NYSDEC Division of Environmental Remediation	(518) 402-9554 daniel.nierenberg@dec.ny.gov
Sarah Quandt, P.E. Project Manager's Supervisor NYSDEC Division of Environmental Remediation	(518) 402-9116 Sarah.Quandt@dec.ny.gov
Megan Rivera Project Manager NYSDOH Bureau of Environmental Exposure Investigation	(518) 402-7877 Megan.Rivera@health.ny.gov

APPENDIX C

Soil Boring and Well Construction Logs

BORING SB-1

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue,
CLIENT: SG Industrial Acquisitions
DATE STARTED/COMPLETED: 10/23/17
CONTRACTOR: Tri-State Drilling

SATURATED SOIL AT: NA
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Sal DeLucia

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
	Fill		0	Fill Material (asphalt, brick, concrete)	2.5' Recovery
1					
2			1.4		
3			0		
4			0		
				Brown m-f sand with fill material (asphalt, brick, concrete)	3.75' Recovery
5			0		
6			0		
7			0		
					Sample SB-1 collceted at 7.5-8.0'
8			0		
				Brown m-f sand with fill material (asphalt, brick, concrete)	0.8' Recovery
9			0		
10			0		Refusal encountered at 12'
11			0		
12			0		

Notes:Backfilled on Completion.

ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.
5 Marine View Plaza-Suite 401
Hoboken, NJ 07030

LOG OF: **SB-1**

BORING SB-2

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue,
CLIENT: SG Industrial Acquisitions
DATE STARTED/COMPLETED: 10/23/17
CONTRACTOR: Tri-State Drilling

SATURATED SOIL AT: 11
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Sal DeLucia

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
1			0		2.5' Recovery
2			0	0-2' Asphalt and Concrete	
	Fill				
3			0		
				2-4' Brown m-f sand with fill material (asphalt, brick, concrete)	
4			0		
				Brown m-f sand with fill material (asphalt, brick, concrete, ash)	1.2' Recovery
5			0		
6	Fill		0		
7			0		
8			0		
					3.7' Recovery
9			0		
				8-9.5' brown m-f sand	
10	SM		0		
11			0		Water at 11.0'
				9.5-11.5' light brown fine sand with some silt	
12			0	11.5-12.0' brown-grey silt with some clay and sand	
					3.7' Recovery
13			0	12.0-13.0' brown-grey silty sand	
14	ML		0		Petroleum odor & light staining observed @ 15.5-16.0'
15			0		
					Sample SB-2 collected 15.5-16.0'
16			0	13.0-16.0' fine silt w/ some sand and clay	

Notes:Backfilled on Completion.

ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.

5 Marine View Plaza-Suite 401
Hoboken, NJ 07030

LOG OF: **SB-2**

BORING SB-3

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue,
CLIENT: SG Industrial Acquisitions
DATE STARTED/COMPLETED: 10/23/17
CONTRACTOR: Tri-State Drilling

SATURATED SOIL AT: 11
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Sal DeLucia

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
1			0		3.5' Recovery
2			0	0-2' Asphalt and Concrete	
3			0		
				2-4' Brown m-f sand with fill material (asphalt, brick, concrete)	
4			0		
				Brown m-f sand with fill material (asphalt, brick, concrete, ash)	3.5' Recovery
5	Fill		0		
6			0		
7			0		
8			0		
					3.5' Recovery
9			0		
10			0	8-10' brown m-f sand w/ fill material	
11			0		Saturated soil at 11'
12			0	10-12' fine brown sand w/ some silt and clay	
	SC				3.5' Recovery
13			0	12.0-13.5' Light brown m-c sand	
14			0		
					Sample SB-3 collected at 15.0-15.5' bgs
15			0		
16			0	13.5-16.0' Fine sand with silt and some clay	

Notes:Backfilled on Completion.

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Hoboken, NJ 07030

LOG OF: **SB-3**

BORING SB-4

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue,
CLIENT: SG Industrial Acquisitions
DATE STARTED/COMPLETED: 10/23/17
CONTRACTOR: Tri-State Drilling

SATURATED SOIL AT: 11
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Sal DeLucia

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
1			0		1.25' Recovery
2			0	0-2' Asphalt and Concrete	
3			0		
				2-4' Brown m-f sand with fill material (asphalt, brick, concrete)	
4			0		
				Brown m-f sand with fill material (asphalt, brick, concrete, ash)	3.5' Recovery
5	Fill		0		
6			0		
7			0.4		
8			0		
					3.5' Recovery
9			0		
10			0	8-12' brown m-f sand w/ fill material	
11			0		Saturated soil at 11'
12			0		
	SC				3.5' Recovery
13			0		
					Slight Petroleum Odor
14			0		
					Sample SB-4 collected at 15.5-16.0' bgs
15			0		
16			0	12.5-16.0' Fine sand with silt and some clay	

Notes:Backfilled on Completion.

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LOG OF: **SB-4**

BORING SB-5

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue,
CLIENT: SG Industrial Acquisitions
DATE STARTED/COMPLETED: 10/23/17
CONTRACTOR: Tri-State Drilling

SATURATED SOIL AT: 10
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Sal DeLucia

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
1	Fill		0	0-4' Fill material (concrete, asphalt, brick, ash)	2.4' Recovery
2			0		
3			0		
4			0		
5			0	4-8' Fill material (concrete, asphalt, brick, ash)	2.4' Recovery
6			0		
7			0		
8			0		
9			0	8-10' Fill material (concrete, asphalt, brick, ash)	4' Recovery
10			0		
11			0		Saturated soil at 10'
12			0	10-12' fine, silty sand	
13	SC		0	12-16' silty sand	2.4' Recovery
14			0		Sample SB-5 collected at 15.0-15.5' bgs
15			0		
16			0		

Notes:Backfilled on Completion.

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LOG OF: **SB-5**

BORING SB-6

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue,
CLIENT: SG Industrial Acquisitions
DATE STARTED/COMPLETED: 10/23/17
CONTRACTOR: Tri-State Drilling

SATURATED SOIL AT: 10
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Sal DeLucia

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
	Fill			0-4' Fill material (concrete, asphalt, brick, ash)	3.2' Recovery
1			0		
2			0		
3			0		
4			0		
				4-8' Fill material (concrete, asphalt, brick, ash)	2.0' Recovery
5			0		
6			0		
7			0		
8			0		
				8-12' dark brown sand with some silt	0.8' Recovery Saturated soil at 10' Sample SB-6 collected at 11.0-11.5'
9			0		
10			0		
11			0		
12			0		

Notes:Backfilled on Completion.

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LOG OF: **SB-6**

BORING SB-7

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue,
CLIENT: SG Industrial Acquisitions
DATE STARTED/COMPLETED: 10/23/17
CONTRACTOR: Tri-State Drilling

SATURATED SOIL AT: 10
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Sal DeLucia

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
	Fill			0-4' Fill material (concrete, asphalt, brick, ash)	2.0' Recovery
1			0		
2			0		
3			0		
4			0		
				4-8' Fill material (concrete, asphalt, brick, ash)	3.2' Recovery
5			0		
6			0		
7			0		
8			0		
				8-12' Fill material (concrete, asphalt, brick, ash)	0.8' Recovery
9			0		
					Saturated soil at 10'
10			0		
11			0		Sample SB-7 collected at 10-10.5'
12			0		

Notes:Backfilled on Completion.

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5 Marine View Plaza-Suite 401
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LOG OF: **SB-7**

BORING SB-8

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue,
CLIENT: SG Industrial Acquisitions
DATE STARTED/COMPLETED: 10/23/17
CONTRACTOR: Tri-State Drilling

SATURATED SOIL AT: 10
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Sal DeLucia

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
					1.2' Recovery
1			0		
2			0	0-4' medium to fine grained sand with Fill material (concrete, asphalt, brick, ash)	
3			0		
4			0		
					0.8' Recovery
5	Fill		0		
6			0	4-8' backfill material	
7			0		
8			0		
					2' Recovery
9			0		
10			0	8-10' backfill material	Sample SB-8 collected at 10-10.5' bgs
11			0		Saturated soil at 10'
12			0	10-12' fine, silty sand	
	SC				2' Recovery
13			0		
14			0	12-16' fine silty sand	
15			0		
16			0		

Notes:Backfilled on Completion.

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LOG OF: **SB-8**

BORING SB-9

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue,
CLIENT: SG Industrial Acquisitions
DATE STARTED/COMPLETED: 10/23/17
CONTRACTOR: Tri-State Drilling

SATURATED SOIL AT: 11
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Sal DeLucia

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
	Fill			0-4' Fill material (concrete, asphalt, brick, ash)	2' Recovery
1			0		
2			0		
3			0		
4			0		
				4-8' Fill material (concrete, asphalt, brick, ash)	2' Recovery
5			0		
6			0		
7			0		
8			0		
				8-12' Fill material (concrete, asphalt, brick, ash)	0.8' Recovery Sample SB-9 collected at 11.5-12' bgs Saturated soil at 11'
9			0		
10			0		
11			0		
12			0		

Notes:Backfilled on Completion.

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LOG OF: **SB-9**

BORING SB-10

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue,
CLIENT: SG Industrial Acquisitions
DATE STARTED/COMPLETED: 10/23/17
CONTRACTOR: Tri-State Drilling

SATURATED SOIL AT: 11
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Sal DeLucia

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
1			0		2' Recovery
2			0	0-4' Fill material (concrete, asphalt, brick, ash)	
3			0		
4			0		
5	Fill		0		2' Recovery
6			0	4-8' Fill material (concrete, asphalt, brick, ash)	
7			0		
8			0		
					0.8' Recovery
9			0		
					Sample SB-10 collected at 11.5-12' bgs
10			0		
11			0	8-12' Fill material (concrete, asphalt, brick, ash)	Saturated soil at 11'
	SC				
12			0		

Notes:Backfilled on Completion.

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LOG OF: **SB-10**

BORING SB-11

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue,
CLIENT: SG Industrial Acquisitions
DATE STARTED/COMPLETED: 10/24/17
CONTRACTOR: Tri-State Drilling

SATURATED SOIL AT: NA
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Sal DeLucia

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
	Fill				
1			0		
2			0	0-4' Fill material (concrete, asphalt, brick, ash)	
3			0		
4			0		
5			0		
6			0	4-8' Fill material (concrete, asphalt, brick, ash)	
7			0		
					Sample SB-11 Collected at 7.5-8.0'
8			0		
9			0		
10			0	Refusal at 8'	
11			0		
12			0		

Notes:Backfilled on Completion.

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LOG OF: **SB-11**

BORING SB-12

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue,
CLIENT: SG Industrial Acquisitions
DATE STARTED/COMPLETED: 10/24/17
CONTRACTOR: Tri-State Drilling

SATURATED SOIL AT: NA
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Sal DeLucia

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
	Fill			0-4' Fill material (concrete, asphalt, brick, ash)	Sample SB-12 collected at 3.5-4.0'
1			0		
2			0		
3			0		
4			0		
5			0	Refusal at 4' bgs	
6			0		
7			0		
8			0		
9			0		
10			0		
11			0		
12			0		

Notes:Backfilled on Completion.

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LOG OF: **SB-12**

BORING SB-13

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue,
CLIENT: SG Industrial Acquisitions
DATE STARTED/COMPLETED: 10/24/17
CONTRACTOR: Tri-State Drilling

SATURATED SOIL AT: NA
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Sal DeLucia

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
	Fill			0-4' Fill material (concrete, asphalt, brick, ash)	Sample SB-13 collected at 3.5-4.0'
1			0		
2			0		
3			0		
4			0		
5			0	Refusal at 4' bgs	
6			0		
7			0		
8			0		
9			0		
10			0		
11			0		
12			0		

Notes:Backfilled on Completion.

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LOG OF: **SB-13**

BORING SB-14

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue,
CLIENT: SG Industrial Acquisitions
DATE STARTED/COMPLETED: 10/24/17
CONTRACTOR: Tri-State Drilling

SATURATED SOIL AT: NA
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Sal DeLucia

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
	Fill			0-4' Fill material (concrete, asphalt, brick, ash)	Sample SB-14 collected at 3.5-4.0'
1			0		
2			0		
3			0		
4			0		
				Refusal at 4' bgs	
5			0		
6			0		
7			0		
8			0		
9			0		
10			0		
11			0		
12			0		

Notes:Backfilled on Completion.

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LOG OF: **SB-14**

BORING SB-15

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue,
CLIENT: SG Industrial Acquisitions
DATE STARTED/COMPLETED: 10/24/17
CONTRACTOR: Tri-State Drilling

SATURATED SOIL AT: 8
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Sal DeLucia

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
1	Fill			0-4' Fill material (concrete, asphalt, brick, ash)	
2					
			3.4		
3					
4					
5	SC			Black sandy clay	Petroleum Odors
6					
			180.1		
7					Wet at 8'
8					
9				Black sandy clay, with some gravel	Petroleum Odors
10					Sample SB-15 collected at 11.5-12.0'
			174.1		
11					
12					

Notes:Backfilled on Completion.

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Hoboken, NJ 07030

LOG OF: **SB-15**

BORING SB-16

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue,
CLIENT: SG Industrial Acquisitions
DATE STARTED/COMPLETED: 10/24/17
CONTRACTOR: Tri-State Drilling

SATURATED SOIL AT: 8
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Sal DeLucia

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
	Fill			0-4' Fill material (concrete, asphalt, brick, ash)	
1					
2					
			0		
3					
4					
	SC			Black sandy clay	Wet at 8'
5					
6					
			2.4		
7					
8					
				Black sandy clay, with some gravel	Slight petroleum Odors
9					
					Sample SB-16 collected at 11.5-12.0'
10					
			0		
11					
12					

Notes:Backfilled on Completion.

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Hoboken, NJ 07030

LOG OF: **SB-16**

BORING SB-17

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue,
CLIENT: SG Industrial Acquisitions
DATE STARTED/COMPLETED: 10/24/17
CONTRACTOR: Tri-State Drilling

SATURATED SOIL AT: 8
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Sal DeLucia

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
1	Fill		0	0-4' Fill material (concrete, asphalt, brick, ash)	
2					
3					
4					
5	SC		0.0	Black sandy clay	Wet at 8'
6					
7					
8					
9			0	Black sandy clay, with some gravel	Sample SB-17 collected at 11.5-12.0'
10					
11					
12					

Notes:Backfilled on Completion.

ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.

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LOG OF: **SB-17**

BORING SB-18

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue,
CLIENT: SG Industrial Acquisitions
DATE STARTED/COMPLETED: 10/24/17
CONTRACTOR: Tri-State Drilling

SATURATED SOIL AT: 8
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Sal DeLucia

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
1	Fill		0	0-4' Fill material (concrete, asphalt, brick, ash)	
2					
3					
4					
5	SC		0.0	Black sandy clay	Wet at 8'
6					
7					
8					
9			0	Black sandy clay, with some gravel	Sample SB-18 collected at 11.5-12.0'
10					
11					
12					

Notes:Backfilled on Completion.

ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.

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Hoboken, NJ 07030

LOG OF: **SB-18**

BORING SB-19

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue,
CLIENT: SG Industrial Acquisitions
DATE STARTED/COMPLETED: 10/24/17
CONTRACTOR: Tri-State Drilling

SATURATED SOIL AT: NA
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Sal DeLucia

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
	Fill			0-4' Fill material (concrete, asphalt, brick, ash)	Sample SB-19 collected at 3.5-4.0'
1			0		
2			0		
3			0		
4			0		
5			0	Refusal at 4' bgs	
6			0		
7			0		
8			0		
9			0		
10			0		
11			0		
12			0		

Notes:Backfilled on Completion.

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Hoboken, NJ 07030

LOG OF: **SB-19**

BORING SB-20

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue,
CLIENT: SG Industrial Acquisitions
DATE STARTED/COMPLETED: 10/24/17
CONTRACTOR: Tri-State Drilling

SATURATED SOIL AT: NA
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Sal DeLucia

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
	Fill			0-4' Fill material (concrete, asphalt, brick, ash)	Sample SB-20 collected at 3.5-4.0'
1			0		
2			0		
3			0		
4			0		
5			0	Refusal at 4' bgs	
6			0		
7			0		
8			0		
9			0		
10			0		
11			0		
12			0		

Notes:Backfilled on Completion.

ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.

5 Marine View Plaza-Suite 401
Hoboken, NJ 07030

LOG OF: **SB-20**

BORING SB-21

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue,
CLIENT: SG Industrial Acquisitions
DATE STARTED/COMPLETED: 11/10/17
CONTRACTOR: Tri-State Drilling

SATURATED SOIL AT: 11
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Sal DeLucia

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
	Fill				
1			0.4		2' Recovery
2			0.4	0-4' Fill material (concrete, asphalt, brick, ash)	
3			0.6		
4			0.3		
5			0.4		3' Recovery
6			0.5	4-8' Fill material (concrete, asphalt, brick, ash)	
					Wet at 8'
7			0.5		
8			0.4		
				8-9' Fill material (concrete, asphalt, brick, ash)	4' Recovery
9			25.2		
10			52.3	9-12' Grey silty sand	Slight petroleum odor at 10-12'
	SC				
11			90.8		Sample SB-21 collected at 11.0-11.5'
12			24.6		

Notes:Backfilled on Completion.

ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.

5 Marine View Plaza-Suite 401
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LOG OF: **SB-21**

BORING SB-22

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue,
CLIENT: SG Industrial Acquisitions
DATE STARTED/COMPLETED: 11/10/17
CONTRACTOR: Tri-State Drilling

SATURATED SOIL AT: 11
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Sal DeLucia

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
1	Fill		0.3	0-4' Fill material (concrete, asphalt, brick, ash)	2' Recovery
2			0.3		
3			0.3		
4			0.3		
5			0.3	4-8' Fill material (concrete, asphalt, brick, ash)	3.2' Recovery
6			0.3		
7			0.3		
8			0.3		
9	SC		0.3	8-12' Dark grey fine silty sand	4' Recovery Wet at 11'
10			0.3		
11			0.3		
12			0.3		Sample SB-22 collected at 11.5-12.0'

Notes:Backfilled on Completion.

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Hoboken, NJ 07030

LOG OF: **SB-22**

BORING SB-23

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue,
CLIENT: SG Industrial Acquisitions
DATE STARTED/COMPLETED: 11/10/17
CONTRACTOR: Tri-State Drilling

SATURATED SOIL AT: 11
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Sal DeLucia

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
1	Fill		0.3	0-4' Fill material (concrete, asphalt, brick, ash)	3' Recovery
2			0.3		
3			0.3		
4			0.3		
5			0.3	4-8' Fill material (concrete, asphalt, brick, ash)	2' Recovery
6			0.3		
7			0.3		
8			0.3		
9	SC		0.3	8-12' Dark grey fine silty sand	4' Recovery Wet at 11'
10			0.3		
11			0.3		
12			0.3		Sample SB-23 collected at 11.5-12.0'

Notes:Backfilled on Completion.

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Hoboken, NJ 07030

LOG OF: **SB-23**

BORING SB-24

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue,
CLIENT: SG Industrial Acquisitions
DATE STARTED/COMPLETED: 11/10/17
CONTRACTOR: Tri-State Drilling

SATURATED SOIL AT: 11
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Sal DeLucia

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
	Fill			0-4' Fill material (concrete, asphalt, brick, ash)	2' Recovery
1			0		
2			0		
3			0		
4			0		
				4-8' Fill material (concrete, asphalt, brick, ash)	3' Recovery
5			0		
6			0		
7			0		
8			0		
				8-12' Fill material (concrete, asphalt, brick, ash)	3.2' Recovery Wet at 11'
9			0		
10			0		
11			0		Sample SB-24 collected at 11.5-12.0'
12			0		

Notes:Backfilled on Completion.

ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.

5 Marine View Plaza-Suite 401
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LOG OF: **SB-24**

BORING SB-25

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue,
CLIENT: SG Industrial Acquisitions
DATE STARTED/COMPLETED: 11/10/17
CONTRACTOR: Tri-State Drilling

SATURATED SOIL AT: 11
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Sal DeLucia

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
	Fill			0-4' Fill material (concrete, asphalt, brick, ash)	2' Recovery
1			0		
2			0		
3			0		
4			0		
				4-8' Fill material (concrete, asphalt, brick, ash)	3' Recovery
5			0		
6			0		
7			0		
8			0		
				8-9' Fill material (concrete, asphalt, brick, ash)	3.2' Recovery
9			0		Wet at 11'
10			0	9-12' Grey silty sand	
11			0		
					Sample SB-25 collected at 11.5-12.0'
12			0		

Notes:Backfilled on Completion.

ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.

5 Marine View Plaza-Suite 401
Hoboken, NJ 07030

LOG OF: **SB-25**

BORING SB-26

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue,
CLIENT: SG Industrial Acquisitions
DATE STARTED/COMPLETED: 12/13/17
CONTRACTOR: Tri-State Drilling

SATURATED SOIL AT: 11
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Sal DeLucia

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
	Fill			0-4' Fill material (concrete, asphalt, brick, ash)	
1			0		
2			0		
3			0		
4			0		
				4-8' Fill material (concrete, asphalt, brick, ash)	Sample SB-26 collected at 7.5-8.0'
5			0		
6			0		
7			0		
8			0		
				8-12' Grey silty sand	Wet at 11'
9			0		
10			0		
11			0		
12			0		

Notes:Backfilled on Completion.

ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.

5 Marine View Plaza-Suite 401
Hoboken, NJ 07030

LOG OF: **SB-26**

BORING SB-27

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue,
CLIENT: SG Industrial Acquisitions
DATE STARTED/COMPLETED: 12/13/17
CONTRACTOR: Tri-State Drilling

SATURATED SOIL AT: 11
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Sal DeLucia

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
	Fill			0-4' Fill material (concrete, asphalt, brick, ash)	
1			0		
2			0		
3			0		
4			0		
				4-8' Fill material (concrete, asphalt, brick, ash)	Sample SB-27collected at 7.5-8.0'
5			0		
6			0		
7			0		
8			0		
				8-12' Grey silty sand	Wet at 11'
9			0		
10			0		
11			0		
12			0		

Notes:Backfilled on Completion.

ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.

5 Marine View Plaza-Suite 401
Hoboken, NJ 07030

LOG OF: **SB-27**

BORING SB-28

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue,
CLIENT: SG Industrial Acquisitions
DATE STARTED/COMPLETED: 12/13/17
CONTRACTOR: Tri-State Drilling

SATURATED SOIL AT: 11
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Sal DeLucia

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
	Fill			0-4' Fill material (concrete, asphalt, brick, ash)	
1			0		
2			0		
3			0		
4			0		
				4-8' Fill material (concrete, asphalt, brick, ash)	Sample SB-28 collected at 7.5-8.0'
5			0		
6			0		
7			0		
8			0		
				8-12' Grey silty sand	Wet at 11'
9			0		
10			0		
11			0		
12			0		

Notes:Backfilled on Completion.

ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.

5 Marine View Plaza-Suite 401
Hoboken, NJ 07030

LOG OF: **SB-28**

BORING SB-29

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue,
CLIENT: SG Industrial Acquisitions
DATE STARTED/COMPLETED: 12/13/17
CONTRACTOR: Tri-State Drilling

SATURATED SOIL AT: 11
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Sal DeLucia

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
	Fill			0-4' Fill material (concrete, asphalt, brick, ash)	
1			0		
2			0		
3			0		
4			0		
				4-8' Fill material (concrete, asphalt, brick, ash)	Sample SB-29 collected at 7.5-8.0'
5			0		
6			0		
7			0		
8			0		
				8-12' Grey silty sand	Wet at 11'
9			0		
10			0		
11			0		
12			0		

Notes:Backfilled on Completion.

ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.

5 Marine View Plaza-Suite 401
Hoboken, NJ 07030

LOG OF: **SB-29**

BORING SB-30

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue,
CLIENT: SG Industrial Acquisitions
DATE STARTED/COMPLETED: 12/13/17
CONTRACTOR: Tri-State Drilling

SATURATED SOIL AT: 11
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Sal DeLucia

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
	Fill			0-4' Fill material (concrete, asphalt, brick, ash)	
1			0		
2			0		
3			0		
4			0		
				4-8' Fill material (concrete, asphalt, brick, ash)	Sample SB-30 collected at 7.5-8.0'
5			0		
6			0		
7			0		
8			0		
				8-12' Grey silty sand	Wet at 11'
9			0		
10			0		
11			0		
12			0		

Notes:Backfilled on Completion.

ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.

5 Marine View Plaza-Suite 401
Hoboken, NJ 07030

LOG OF: **SB-30**

BORING SB-31A

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue,
CLIENT: SG Industrial Acquisitions
DATE STARTED/COMPLETED: 12/13/17
CONTRACTOR: Tri-State Drilling

SATURATED SOIL AT: 11
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Sal DeLucia

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
	Fill			0-4' Fill material (concrete, asphalt, brick, ash)	
1			0		
2			0		
3			0		
4			0		
				4-8' Fill material (concrete, asphalt, brick, ash)	Sample SB-31A collected at 7.5-8.0'
5			0		
6			0		
7			0		
8			0		
				8-12' Grey silty sand	Wet at 11'
9			0		
10			0		
11			0		
12			0		

Notes:Backfilled on Completion.

ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.

5 Marine View Plaza-Suite 401
Hoboken, NJ 07030

LOG OF: **SB-31A**

BORING SB-32A

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue,
CLIENT: SG Industrial Acquisitions
DATE STARTED/COMPLETED: 12/13/17
CONTRACTOR: Tri-State Drilling

SATURATED SOIL AT: 11
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Sal DeLucia

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
	Fill			0-4' Fill material (concrete, asphalt, brick, ash)	
1			0		
2			0		
3			0		
4			0		
				4-8' Fill material (concrete, asphalt, brick, ash)	Sample SB-32A collected at 7.5-8.0'
5			0		
6			0		
7			0		
8			0		
				8-12' Grey silty sand	Wet at 11'
9			0		
10			0		
11			0		
12			0		

Notes:Backfilled on Completion.

ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.

5 Marine View Plaza-Suite 401
Hoboken, NJ 07030

LOG OF: **SB-32A**

BORING SB-33A

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue,
CLIENT: SG Industrial Acquisitions
DATE STARTED/COMPLETED: 12/13/17
CONTRACTOR: Tri-State Drilling

SATURATED SOIL AT: 11
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Sal DeLucia

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
	Fill			0-4' Fill material (concrete, asphalt, brick, ash)	
1			0		
2			0		
3			0		
4			0		
				4-8' Fill material (concrete, asphalt, brick, ash)	Sample SB-33A collected at 7.5-8.0'
5			0		
6			0		
7			0		
8			0		
				8-12' Grey silty sand	Wet at 11'
9			0		
10			0		
11			0		
12			0		

Notes:Backfilled on Completion.

ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.

5 Marine View Plaza-Suite 401
Hoboken, NJ 07030

LOG OF: **SB-33A**

BORING SB-34A

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue,
CLIENT: SG Industrial Acquisitions
DATE STARTED/COMPLETED: 12/13/17
CONTRACTOR: Tri-State Drilling

SATURATED SOIL AT: 11
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Sal DeLucia

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
	Fill			0-4' Fill material (concrete, asphalt, brick, ash)	
1			0		
2			0		
3			0		
4			0		
				4-8' Fill material (concrete, asphalt, brick, ash)	Sample SB-34A collected at 7.5-8.0'
5			0		
6			0		
7			0		
8			0		
				8-12' Grey silty sand	Wet at 11'
9			0		
10			0		
11			0		
12			0		

Notes:Backfilled on Completion.

ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.

5 Marine View Plaza-Suite 401
Hoboken, NJ 07030

LOG OF: **SB-34A**

BORING SB-35A

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue,
CLIENT: SG Industrial Acquisitions
DATE STARTED/COMPLETED: 12/13/17
CONTRACTOR: Tri-State Drilling

SATURATED SOIL AT: 11
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Sal DeLucia

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
	Fill			0-4' Fill material (concrete, asphalt, brick, ash)	
1			0		
2			0		
3			0		
4			0		
				4-8' Fill material (concrete, asphalt, brick, ash)	Sample SB-35A collected at 7.5-8.0'
5			0		
6			0		
7			0		
8			0		
				8-12' Grey silty sand	Wet at 11'
9			0		
10			0		
11			0		
12			0		

Notes:Backfilled on Completion.

ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.

5 Marine View Plaza-Suite 401
Hoboken, NJ 07030

LOG OF: **SB-35A**

BORING SB-31

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue,
CLIENT: SG Industrial Acquisitions
DATE STARTED/COMPLETED: 12/18/17
CONTRACTOR: Tri-State Drilling

SATURATED SOIL AT: 11
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Sal DeLucia

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
	Fill				
1			0		1.8' Recovery
2			0	0-4' Fill material (concrete, asphalt, brick, ash)	Sample SB-31S collected at 2-2.5'
3			0		
4			0		
5			0		
6			0	4-8' Fill material (concrete, asphalt, brick, ash)	Sample SB-31D collected at 8-8.5'
7			0		
8			0		
				8-9' Fill material (concrete, asphalt, brick, ash)	
9			0		Wet at 11'
10			0	9-12' Grey silty sand	
11			0		
12			0		

Notes:Backfilled on Completion.

ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.

5 Marine View Plaza-Suite 401
Hoboken, NJ 07030

LOG OF: **SB-31**

BORING SB-32

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue,
CLIENT: SG Industrial Acquisitions
DATE STARTED/COMPLETED: 12/18/17
CONTRACTOR: Tri-State Drilling

SATURATED SOIL AT: 11
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Sal DeLucia

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
	Fill				
1			0		2' Recovery
2			0	0-4' Fill material (concrete, asphalt, brick, ash)	Sample SB-32S collected at 2-2.5'
3			0		
4			0		
					3.2' Recovery
5			0		
6			0	4-8' Fill material (concrete, asphalt, brick, ash)	Sample SB-32D collected at 8-8.5'
7			0		
8			0		
				8-9' Fill material (concrete, asphalt, brick, ash)	2.8' Recovery
9			0		Wet at 11'
10			0	9-12' Grey silty sand	Sample SB-32D collected at 12.0-12.5'
11			0		
12			0		

Notes:Backfilled on Completion.

ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.

5 Marine View Plaza-Suite 401
Hoboken, NJ 07030

LOG OF: **SB-32**

BORING SB-33

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue,
CLIENT: SG Industrial Acquisitions
DATE STARTED/COMPLETED: 12/18/17
CONTRACTOR: Tri-State Drilling

SATURATED SOIL AT: 11
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Sal DeLucia

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
	Fill				
1			0		2' Recovery
2			0		Sample SB-33S collected at 2-2.5'
				0-4' Fill material (concrete, asphalt, brick, ash)	
3			0		
4			0		
					2' Recovery
5			0		
6			0	4-8' Fill material (concrete, asphalt, brick, ash)	Sample SB-33D collected at 8-8.5'
7			0		
8			0		
				8-9' Fill material (concrete, asphalt, brick, ash)	4' Recovery
9			0		Wet at 11'
10			0	9-12' Grey silty sand	
11			0		
12			0		

Notes:Backfilled on Completion.

ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.

5 Marine View Plaza-Suite 401
Hoboken, NJ 07030

LOG OF: **SB-33**

BORING SB-34

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue,
CLIENT: SG Industrial Acquisitions
DATE STARTED/COMPLETED: 12/18/17
CONTRACTOR: Tri-State Drilling

SATURATED SOIL AT: 11
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Sal DeLucia

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
	Fill				
1			0		2' Recovery
2			0	0-4' Fill material (concrete, asphalt, brick, ash)	Sample SB-34S collected at 2-2.5'
3			0		
4			0		
					2' Recovery
5			0		
6			0	4-8' Fill material (concrete, asphalt, brick, ash)	Sample SB-34D collected at 8-8.5'
7			0		
8			0		
				8-9' Fill material (concrete, asphalt, brick, ash)	4' Recovery
9			0		Wet at 11'
10			0	9-12' Grey silty sand	
11			0		
12			0		

Notes:Backfilled on Completion.

ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.

5 Marine View Plaza-Suite 401
Hoboken, NJ 07030

LOG OF: **SB-34**

BORING SB-35

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue,
CLIENT: SG Industrial Acquisitions
DATE STARTED/COMPLETED: 12/18/17
CONTRACTOR: Tri-State Drilling

SATURATED SOIL AT: 11
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Sal DeLucia

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
	Fill				
1			0		1.7' Recovery
2			0	0-4' Fill material (concrete, asphalt, brick, ash)	Sample SB-35S collected at 2-2.5'
3			0		
4			0		
					2.8' Recovery
5			0		
6			0	4-8' Fill material (concrete, asphalt, brick, ash)	Sample SB-35D collected at 8-8.5'
7			0		
8			0		
				8-9' Fill material (concrete, asphalt, brick, ash)	4' Recovery
9			0		Wet at 11'
10			0	9-12' Grey silty sand	
11			0		
12			0		

Notes:Backfilled on Completion.

ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.

5 Marine View Plaza-Suite 401
Hoboken, NJ 07030

LOG OF: **SB-35**

BORING SB-36

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue,
CLIENT: SG Industrial Acquisitions
DATE STARTED/COMPLETED: 12/18/17
CONTRACTOR: Tri-State Drilling

SATURATED SOIL AT: 11
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Sal DeLucia

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
	Fill			0-4' Fill material (concrete, asphalt, brick, ash)	1.7' Recovery Sample SB-36S collected at 2-2.5'
1			0		
2			0		
3			0		
4			0		
				4-8' Fill material (concrete, asphalt, brick, ash)	2.8' Recovery Sample SB-36D collected at 8-8.5'
5			0		
6			0		
7			0		
8			0		
				8-12' Grey silty sand	4' Recovery Wet at 11'
9			0		
10			0		
11			0		
12			0		

Notes:Backfilled on Completion.

ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.

5 Marine View Plaza-Suite 401
Hoboken, NJ 07030

LOG OF: **SB-36**

BORING SB-37

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue,
CLIENT: SG Industrial Acquisitions
DATE STARTED/COMPLETED: 12/18/17
CONTRACTOR: Tri-State Drilling

SATURATED SOIL AT: 11
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Sal DeLucia

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
	Fill			0-4' Fill material (concrete, asphalt, brick, ash)	1.7' Recovery Sample SB-37S collected at 2-2.5'
1			0		
2			0		
3			0		
4			0		
5			0	4-8' Fill material (concrete, asphalt, brick, ash)	2.8' Recovery Sample SB-37D collected at 8-8.5'
6			0		
7			0		
8			0		
9			0	8-12' Grey silty sand	4' Recovery Wet at 11'
10			0		
11			0		
12			0		

Notes:Backfilled on Completion.

ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.

5 Marine View Plaza-Suite 401
Hoboken, NJ 07030

LOG OF: **SB-37**

BORING SB-38

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue,
CLIENT: SG Industrial Acquisitions
DATE STARTED/COMPLETED: 12/20/17
CONTRACTOR: Tri-State Drilling

SATURATED SOIL AT: 12
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Sal DeLucia

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
1	Fill			0-4' Fill material (concrete, asphalt, brick, ash)	Sample SB-38S collected at 2-2.5'
2					
			200		
3					
4					
5				4-8' Fill material (concrete, asphalt, brick, ash)	
			265		
6					
7					
8					
9				8-12' Grey silty sand	Wet at 12'
10					Sample SB-38D collected at 11-11.5'
			300		
11					
12					
13				12-16' Grey silty sand	
14			250		
15					
16					

Notes:Backfilled on Completion.

ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.

5 Marine View Plaza-Suite 401
Hoboken, NJ 07030

LOG OF: **SB-38**

BORING SB-39

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue,
CLIENT: SG Industrial Acquisitions
DATE STARTED/COMPLETED: 12/20/17
CONTRACTOR: Tri-State Drilling

SATURATED SOIL AT: 12
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Sal DeLucia

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
1	Fill		0	0-4' Fill material (concrete, asphalt, brick, ash)	Sample SB-39S collected at 2-2.5'
2					
3					
4					
5			0	4-8' Fill material (concrete, asphalt, brick, ash)	Sample SB-39D collected at 8.0-8.5'
6					
7					
8					
9			0	8-12' Red brown silty clay	Wet at 12'
10					
11					
12					
13			0	12-16' Red brown silty clay	
14					
15					
16					

Notes:Backfilled on Completion.

ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.

5 Marine View Plaza-Suite 401
Hoboken, NJ 07030

LOG OF: **SB-39**

BORING SB-40

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue,
CLIENT: SG Industrial Acquisitions
DATE STARTED/COMPLETED: 12/20/17
CONTRACTOR: Tri-State Drilling

SATURATED SOIL AT: 12
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Sal DeLucia

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
1	Fill		0	0-4' Fill material (concrete, asphalt, brick, ash)	Sample S40S collected at 2-2.5'
2					
3					
4					
5			0	4-8' Fill material (concrete, asphalt, brick, ash)	Sample SB-40D collected at 8.0-8.5'
6					
7					
8					
9			0	8-12' Red brown silty clay	Wet at 12'
10					
11					
12					
13			0	12-16' Red brown silty clay	
14					
15					
16					

Notes:Backfilled on Completion.

ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.

5 Marine View Plaza-Suite 401
Hoboken, NJ 07030

LOG OF: **SB-40**

NOTES FOR EXPLORATION LOGS

MAJOR DIVISIONS (BASED UPON ASTM D 2488)			SYMBOLS	
			GRAPHIC	LETTER
COARSE GRAINED SOILS (MORE THAN 50% OF MATERIAL IS LARGER THAN NO 200 SIEVE)	GRAVEL AND GRAVELLY SOILS (MORE THAN 50% OF COARSE FRACTION RETAINED ON THE NO 4 SIEVE)	CLEAN GRAVELS (LESS THAN 15% PASSING THE NO 200 SIEVE)		GW
				GP
		GRAVELS WITH FINES (MORE THAN 15% PASSING THE NO 200 SIEVE)		GM
				GC
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO 4 SIEVE)	CLEAN SANDS (LES THAN 15% PASSING THE NO 200 SIEVE)		SW
				SP
		SANDS WITH FINES (MORE THAN 15% PASSING THE NO 200 SIEVE)		SM
				SC
FINE GRAINED SOILS (MORE THAN 50% OF MATERIAL IS SMALLER THAN NO 200 SIEVE)	SILT OR CLAY (<15% RETAINED ON THE NO 200 SIEVE)	SILTS AND LEAN CLAYS(LIQUID LIMIT LESS THAN 50)		ML
				CL
	SILT OR CLAY WITH SAND OR GRAVEL (15% TO 30% RETAINED ON THE NO 200 SIEVE)			OL
	SANDY OR GRAVELLY SILT OR CLAY (>30% RETAINED ON THE NO 200 SIEVE)	ELASTIC SILTS AND FAT CLAYS (LIQUID LIMIT GREATER THAN 50)		MH
				CH
				OH
HIGHLY ORGANIC SOILS				PT

BORING SB-56

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue
CLIENT: Hunters Point SG, LLC
DATE STARTED/COMPLETED: 11/13/2018
CONTRACTOR: Eastern Environmental Solutions

SATURATED SOIL AT: 15
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Rebeca Garofalo

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
				0-3" Asphalt and Concrete	
1			0	3"-1' Brown M-F SAND	2.5' of recovery
2			0	1'-2' Fill material (Brick)	Sample SB-56A collected at 2-2.5'
3			0	2'-5' Brown M-F SAND with some silt and fill material (asphalt, brick, concrete, ash)	
4			0	Moist, No Odor	
5	Fill		0		
6			0	5-6' Brown M-F SAND with some fine gravel and trace of clay	4' of recovery
	SW				
7			0	6-7' Brown F SAND with some fine gravel	Sample SB-56B collected at 7-7.5'
8	Fill		0	7-10' Black M-F SILTY SAND with trace of clay (fill material)	
					Sample SB-56C collected at 8-8.5'
9			0		
				Moist, No Odor	
10			0		
11			0	10-15' Brown M-F SAND with some silt and a trace of clay	4' of recovery
12			0		
	SM				
13			0	Moist, No Odor	
14			0		
					Saturated soil at 15'
15			0		

Notes:Backfilled on Completion.

ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.

5 Marine View Plaza-Suite 401
Hoboken, NJ 07030

LOG OF: SB-56

BORING SB-57

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue
CLIENT: Hunters Point SG, LLC
DATE STARTED/COMPLETED: 11/13/2018
CONTRACTOR: Eastern Environmental Solutions

SATURATED SOIL AT: 12
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Rebeca Garofalo

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
	SM			0-3" Asphalt and Concrete	
1			0		2.0' of recovery
2			0		Sample SB-57A collected at 2-2.5'
				3"-5' Brown M-F SAND with a trace of silt	
3			0		
4			0	Moist, No Odor	
5			0		
6			0	5-6' Brown M-F SAND with a trace of silt	4' of recovery
7			0	6-9' Brown M- F SAND with fill material	Sample SB-57B collected at 6.5-7.0'
8	Fill		0		
					Sample SB-57C collected at 8-8.5'
9			0	9-10' Brown M-F SILTY SAND	
				Moist, No Odor	
10			0		
11			0	10-15' Brown M-F SILTY SAND	2' of recovery
	SM				
12			0		Saturated soil at 12'
13			0	Moist, No Odor	
14			0		
15			0		

Notes:Backfilled on Completion.

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LOG OF: SB-57

BORING SB-58

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue
CLIENT: Hunters Point SG, LLC
DATE STARTED/COMPLETED: 11/13/2018
CONTRACTOR: Eastern Environmental Solutions

SATURATED SOIL AT: NA
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Rebeca Garofalo

Depth (FT BGS)	US CS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
	SM			0-3" Asphalt and Concrete	
1			0		2' of recovery
2			0.1		Sample SB-58A collected at 2-2.5'
				3"-5' Brown M-F SAND with a trace of silt	
3			0		
4			0.1	Moist, No Odor	
5			0		
6			0	5-7.5' Fill material (asphalt, brick, concrete, ash)	2' of recovery
7			0	7.5-8.5' Gray F SAND with some silt and a trace of clay	
8	Fill		0		
				8.5-10' Fill material (asphalt, brick, concrete, ash)	Sample SB-58C collected at 8-8.5'
9			0		
				Moist, No Odor	Sample SB-58B collected at 9.5-10'
10			0		

Notes:Backfilled on Completion.

ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.

5 Marine View Plaza-Suite 401
Hoboken, NJ 07030

LOG OF: **SB-58**

BORING SB-59

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue
CLIENT: Hunters Point SG, LLC
DATE STARTED/COMPLETED: 11/13/2018
CONTRACTOR: Eastern Environmental Solutions

SATURATED SOIL AT: 15
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Rebeca Garofalo

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
				0-3" Asphalt and Concrete	
1			0.1		3' of recovery
	SM				
2			0.1	3"-2.5' Brown M-F SAND with a trace of silt	Sample SB-59A collected at 2-2.5'
3			0.1	2.5-5' Brown M-F SAND with fill material (asphalt, brick, concrete, ash)	Sample SB-59B collected at 2.5-3'
4			0.2	Moist, No Odor	
5	Fill		0		
6			0		1.5' of recovery
7			0	5-9' Red to Brown M-F SAND with trace of silt	
8	SM		0		
					Sample SB-59C collected at 8-8.5'
9			0		
				9-10' Black F SAND with trace of silt	
10			0	Moist, Decomposition odor	
11	OH		0	10-13' Gray F SAND with some clay and a trace of silt	4' of recovery
12			0		
13			0.2		
				13-15' Organic Material	
14			0		
				Moist, Decomposition odor	Saturated soil at 15'
15			0		

Notes:Backfilled on Completion.

ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.

5 Marine View Plaza-Suite 401
Hoboken, NJ 07030

LOG OF: **SB-59**

BORING SB-60

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue
CLIENT: Hunters Point SG, LLC
DATE STARTED/COMPLETED: 11/13/2018
CONTRACTOR: Eastern Environmental Solutions

SATURATED SOIL AT: 12
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Rebeca Garofalo

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
	SM			0-3" Asphalt and Concrete	
1			0.2		3' of recovery
2			0.2	3"-2.5' Brown M-F SAND with a trace of silt	Sample SB-60A collected at 2-2.5'
3			0.1	2.5-5' Brown M-F SAND with fill material (asphalt, brick, concrete, ash)	
	Fill				
4			0	Moist, No Odor	
					Sample SB-60B collected at 4-4.5'
5			0		
6			0		1.5' of recovery
7			0	5-9' Red to Brown M-F SAND with trace of silt	
8	SM		0		
					Sample SB-60C collected at 8-8.5'
9			0		
				9-10' Black F SAND with trace of silt	
10			0	Moist, Decomposition odor	
11			0	10-11' Fill material (asphalt, brick, concrete, ash)	3' of recovery
12			0	11-13' Brown M-F SAND with fill material (asphalt, brick, concrete, ash)	Saturated soil at 12'
13			0.2		
	Fill			13-15' Black F SAND with fill material (asphalt, brick, concrete, ash)	
14			0		
				Moist, No Odor	
15			0		

Notes:Backfilled on Completion.

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5 Marine View Plaza-Suite 401
Hoboken, NJ 07030

LOG OF: SB-60

BORING SB-61

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue
CLIENT: Hunters Point SG, LLC
DATE STARTED/COMPLETED: 11/13/2018
CONTRACTOR: Eastern Environmental Solutions

SATURATED SOIL AT: 15
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Rebeca Garofalo

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
	Fill			0-3" Asphalt and Concrete	
1			0		3' of recovery
2			0	3"-5' Brown M-F SAND with fill material (asphalt, brick, concrete, ash)	Sample SB-61A collected at 2-2.5'
3			0		
4			0		
				Moist, No Odor	
5			0		
6			0		3' of recovery
7			0	5-10' Red to Brown M-F SAND with trace of silt and fill material (asphalt, brick, concrete, ash)	Sample SB-61B collected at 6-6.5'
8			0		Sample SB-61C collected at 8-8.5'
9			0		
10			1.8	Moist, No Odor	
11			0		1.5' of recovery
12			0	10-15' Brown M-F SAND with trace of silt and some gravel	
13			0.2		
14			0		
				Moist, No Odor	
15			0		Saturated soil at 15'

Notes:Backfilled on Completion.

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Hoboken, NJ 07030

LOG OF: SB-61

BORING SB-62

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue
CLIENT: Hunters Point SG, LLC
DATE STARTED/COMPLETED: 11/13/2018
CONTRACTOR: Eastern Environmental Solutions

SATURATED SOIL AT: NA
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Rebeca Garofalo

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
				0-3" Asphalt and Concrete	
1	SM		0.1		3' of recovery
2			0.1	3"-2.5' Brown M-F SAND with a trace of silt	
3			0.1	2.5-5' Brown M-F SAND with fill material (asphalt, brick, concrete, ash)	
4			0.2	Moist, No Odor	
5	Fill		0		
6			102.1	5-6.5' Fill material (asphalt, brick, concrete, ash)	4.2' of recovery
7			396.7	6.5-10' Brown F SAND with some clay and a trace of silt	
8	SM		293.2		
					Sample SB-62 collected at 8-8.5'
9			256.9		
10			25	Moist, Petroleoum Odor	

Notes:Backfilled on Completion.

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Hoboken, NJ 07030

LOG OF: **SB-62**

BORING SB-63

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue
CLIENT: Hunters Point SG, LLC
DATE STARTED/COMPLETED: 11/13/2018
CONTRACTOR: Eastern Environmental Solutions

SATURATED SOIL AT: NA
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Rebeca Garofalo

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
	SM			0-3" Asphalt and Concrete	
1			0.1		2' of recovery
2			0.1	3"-2.5' Brown M-F SAND with a trace of silt	
3			0.1	2.5-5' Brown M-F SAND with fill material (asphalt, brick, concrete, ash)	
4			0.2	Moist, No Odor	
5	Fill		0		
6			113.6	5-10' Fill material (asphalt, brick, concrete, ash)	3.5' of recovery
7			247.8		
8			74.2		
					Sample SB-63 collected at 8-8.5'
9			56.3		
10			105.3	Moist, Petroleoum Odor	

Notes:Backfilled on Completion.

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Hoboken, NJ 07030

LOG OF: **SB-63**

BORING SB-64

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue
CLIENT: Hunters Point SG, LLC
DATE STARTED/COMPLETED: 11/13/2018
CONTRACTOR: Eastern Environmental Solutions

SATURATED SOIL AT: 12
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Rebeca Garofalo

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
	Fill			0-3" Asphalt and Concrete	
1			0		2.5' of recovery
2			0	3"-5' Fill material (asphalt, brick, concrete, ash)	Sample SB-64A collected at 2-2.5'
3			0		
4			0	Moist, No Odor	
5			0		
6			0	5-10' Fill material (asphalt, brick, concrete, ash)	3.5' of recovery
7			0		
8			0		
					Sample SB-64B collected at 8-8.5'
9			0		
10			0	Moist, No Odor	
11			0	10-15' Fill material (asphalt, brick, concrete, ash)	4' of recovery
12			0		Saturated soil at 12'
13			0		
14			0		
15			0	Moist, No Odor	

Notes: Backfilled on Completion. Fill material extended up to 10' therefore SB-64C was not collected

ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.
5 Marine View Plaza-Suite 401
Hoboken, NJ 07030

LOG OF: **SB-64**

BORING SB-65

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue
CLIENT: Hunters Point SG, LLC
DATE STARTED/COMPLETED: 11/13/2018
CONTRACTOR: Eastern Environmental Solutions

SATURATED SOIL AT: 11
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Rebeca Garofalo

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
	Fill			0-3" Asphalt and Concrete	
1			0		2.5' of recovery
2			0	3"-5' Fill material (asphalt, brick, concrete, ash)	Sample SB-65A collected at 2-2.5'
3			0		
4			0	Moist, No Odor	
5			0		
6			0	5-10' Fill material (asphalt, brick, concrete, ash)	3.5' of recovery
7			0		
8			0		
					Sample SB-65B collected at 8-8.5'
9			0		
10			0	Moist, No Odor	

Notes:Backfilled on Completion. Fill material extended up to 10' therefore SB-65C was not collected

ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.
5 Marine View Plaza-Suite 401
Hoboken, NJ 07030

LOG OF: SB-65

BORING SB-66

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue
CLIENT: Hunters Point SG, LLC
DATE STARTED/COMPLETED: 11/13/2018
CONTRACTOR: Eastern Environmental Solutions

SATURATED SOIL AT: 12
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Rebeca Garofalo

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
	Fill			0-3" Asphalt and Concrete	
1			0		2.5' of recovery
2			0	3"-5' Fill material (asphalt, brick, concrete, ash)	Sample SB-66A collected at 2-2.5'
3			0		
4			0	Moist, No Odor	
5			0		
6			0	5-10' Fill material (asphalt, brick, concrete, ash)	3.5' of recovery
7			0		
8			0		
					Sample SB-66B collected at 8-8.5'
9			0		
10			0	Moist, No Odor	
11			0	10-13' Fill material (asphalt, brick, concrete, ash)	3.5' of recovery
12			0		Saturated soil at 12'
13			0		
				13-15' Gray ORGANIC CLAY	
14	OH1		0		
15			0	Moist, No Odor	

Notes:Backfilled on Completion. Fill material extended up to 10' therefore SB-66C was not collected

ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.
5 Marine View Plaza-Suite 401
Hoboken, NJ 07030

LOG OF: **SB-66**

BORING SB-67

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue
CLIENT: Hunters Point SG, LLC
DATE STARTED/COMPLETED: 11/13/2018
CONTRACTOR: Eastern Environmental Solutions

SATURATED SOIL AT: 11
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Rebeca Garofalo

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
				0-3" Asphalt and Concrete	
1			0		2.5' of recovery
2	Fill		0	3"-2.5' Fill material (asphalt, brick, concrete, ash)	Sample SB-67A collected at 2-2.5'
3			0	2.5-5' BROWN F SAND with trace of silt	
4			0	Moist, No Odor	
5	SM		0		
6			0	5-7.5' BROWN F SAND with trace of silt	4.5' of recovery
7			0		
8	Fill		0		
				7.5-10' Black F SAND with fill material (asphalt, brick, concrete, ash)	Sample SB-67B collected at 8-8.5'
9			0		
10			0	Moist, No Odor	
11			0	10-15' Black F SAND with fill material (asphalt, brick, concrete, ash)	3.5' of recovery
12			0		Saturated soil at 12'
13			0		
14			0		
15			0	Moist, No Odor	

Notes:Backfilled on Completion. Fill material extended up to 10' therefore SB-67C was not collected

ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.
5 Marine View Plaza-Suite 401
Hoboken, NJ 07030

LOG OF: SB-67

BORING SB-68

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue
CLIENT: Hunters Point SG, LLC
DATE STARTED/COMPLETED: 11/13/2018
CONTRACTOR: Eastern Environmental Solutions

SATURATED SOIL AT: NA
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Rebeca Garofalo

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
	Fill			0-3" Asphalt and Concrete	
1			0		2.5' of recovery
2			0	3"-5' Fill material (asphalt, brick, concrete, ash)	Sample SB-68A collected at 2-2.5'
3			0		
4			0	Moist, No Odor	
5			0		
6			0	5-10' ' Fill material (asphalt, brick, concrete, ash)	4' of recovery
7			0		
8			0		
					Sample SB-68B collected at 8-8.5'
9			0		
10			0	Moist, No Odor	
11			0	10-15' ' Fill material (asphalt, brick, concrete, ash)	3.5' of recovery
12			0		
13			0		
14			0		
15			0	Moist, No Odor	

Notes:Backfilled on Completion. Fill material extended up to 10' therefore SB-68C was not collected

ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.
5 Marine View Plaza-Suite 401
Hoboken, NJ 07030

LOG OF: **SB-68**

BORING SB-69

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue
CLIENT: Hunters Point SG, LLC
DATE STARTED/COMPLETED: 11/13/2018
CONTRACTOR: Eastern Environmental Solutions

SATURATED SOIL AT: 13
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Rebeca Garofalo

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
	Fill			0-3" Asphalt and Concrete	
1			0		2.5' of recovery
2			0	3"-5' Fill material (asphalt, brick, concrete, ash)	Sample SB-69A collected at 2-2.5'
3			0		
4			0	Moist, No Odor	
5			0		
6			0	5-10' ' Fill material (asphalt, brick, concrete, ash)	4' of recovery
7			0		
8			0		
					Sample SB-69B collected at 8-8.5'
9			0		
10			0	Moist, No Odor	
11			0	10-15' ' Fill material (asphalt, brick, concrete, ash)	3.5' of recovery
12			0		
13			0		Saturated soil at 13'
14			0		
15			0	Moist, No Odor	

Notes:Backfilled on Completion. Fill material extended up to 10' therefore SB-69C was not collected

ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.
5 Marine View Plaza-Suite 401
Hoboken, NJ 07030

LOG OF: **SB-69**

BORING SB-70

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue
CLIENT: Hunters Point SG, LLC
DATE STARTED/COMPLETED: 11/14/2018
CONTRACTOR: Eastern Environmental Solutions

SATURATED SOIL AT: NA
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Rebeca Garofalo

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
	Fill			0-3" Asphalt and Concrete	
1			0		2.5' of recovery
2			0	3"-5' Fill material (asphalt, brick, concrete, ash)	Sample SB-70A collected at 2-2.5'
3			0		
4			0	Moist, No Odor	
5			0		
6			0	5-8 Fill material (asphalt, brick, concrete, ash)	4' of recovery
7			0		
8	SM		0	8-10 ' Brown M-F SAND with some silt and a trace of clay	
					Sample SB-70B collected at 8-8.5'
9			0		
10			0	Moist, No Odor	
6			0	10-15' Brown M-F SAND with some silt and a trace of clay	3.5' of recovery
7			0		
8			0		
9			0		
10			0	Moist, No Odor	

Notes:Backfilled on Completion. Fill material extended up to 10' therefore SB-70C was not collected

ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.
5 Marine View Plaza-Suite 401
Hoboken, NJ 07030

LOG OF: SB-70

BORING SB-71

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue
CLIENT: Hunters Point SG, LLC
DATE STARTED/COMPLETED: 11/14/2018
CONTRACTOR: Eastern Environmental Solutions

SATURATED SOIL AT: NA
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Rebeca Garofalo

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
	Fill			0-3" Asphalt and Concrete	
1			0		2.5' of recovery
2			0	3"-5' Fill material (asphalt, brick, concrete, ash)	Sample SB-71A collected at 2-2.5'
3			0		
4			0	Moist, No Odor	
5			0		
6			0	5-10' Fill material (asphalt, brick, concrete, ash)	4' of recovery
7			0		
8			0		
				7.5-10 ' Fill material (asphalt, brick, concrete, ash) with some clay	Sample SB-71B collected at 8-8.5'
9			0		
10			0	Moist, No Odor	

Notes:Backfilled on Completion. Fill material extended up to 10' therefore SB-71C was not collected

ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.
5 Marine View Plaza-Suite 401
Hoboken, NJ 07030

LOG OF: **SB-71**

BORING SB-72

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue
CLIENT: Hunters Point SG, LLC
DATE STARTED/COMPLETED: 11/14/2018
CONTRACTOR: Eastern Environmental Solutions

SATURATED SOIL AT: NA
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Rebeca Garofalo

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
				0-3" Asphalt and Concrete	
1			0		2.5' of recovery
2			0.3	3"-5' Fill material (asphalt, brick, concrete, ash)	Sample SB-72A collected at 2-2.5'
3			0.4		
4			0	Moist, No Odor	Sample SB-72B collected at 4-4.5'
5			0		
6			0	5-7.5' Fill material (asphalt, brick, concrete, ash)	4' of recovery
7			0		
8	SM		0		
				7.5-10 ' Brown M-F Sand with a trace of silt	Sample SB-72C collected at 8-8.5'
9			0		
10			0	Moist, No Odor	
6			0	10-13' Brown M-F Sand with a trace of silt	4' of recovery
7			0		
8	SM		0		
				13-15' Organic Material	
9			0		
10			0	Moist, No Odor	

Notes:Backfilled on Completion.

ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.
5 Marine View Plaza-Suite 401
Hoboken, NJ 07030

LOG OF: **SB-72**

BORING SB-73

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue
CLIENT: Hunters Point SG, LLC
DATE STARTED/COMPLETED: 11/14/2018
CONTRACTOR: Eastern Environmental Solutions

SATURATED SOIL AT: 13
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Rebeca Garofalo

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
	SM			0-3" Asphalt and Concrete	
1			0	3"-1' Brown Coarse M SAND with a trace of silt	2.5' of recovery
2			0.3	1-5' Black M-F SAND with some silt and fill material (asphalt, brick, concrete, ash)	Sample SB-73A collected at 2-2.5'
3	Fill		0.4		
4			0	Moist, No Odor	Sample SB-73B collected at 4-4.5'
5			0		
6			0	5-10' Black M-F SAND with some silt	3' of recovery
7			0		
8	SM		0		
					Sample SB-73C collected at 8-8.5'
9			0		
10			0	Moist, No Odor	

Notes:Backfilled on Completion.

ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.
5 Marine View Plaza-Suite 401
Hoboken, NJ 07030

LOG OF: **SB-73**

BORING SB-74

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue
CLIENT: Hunters Point SG, LLC
DATE STARTED/COMPLETED: 11/15/2018
CONTRACTOR: Eastern Environmental Solutions

SATURATED SOIL AT: NA
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Rebeca Garofalo

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
	SW			0-3" Asphalt and Concrete	
1			0	3"-2' Brown M-F SAND with some pebbles and a trace of silt	1.5' of recovery
2			0.3		Sample SB-74A collected at 2-2.5'
				2-3' Black Coarse M SAND with fill material (asphalt, brick, concrete, ash)	
3			0.4	Moist, No Odor	
				3-6' Black Coarse M SAND with fill material (asphalt, brick, concrete, ash)	2.5' of recovery
4			0		
5			0		
6			0	Moist, No Odor	
					2' of recovery
7			0	6-9' Black Coarse M SAND with fill material (asphalt, brick, concrete, ash)	
8	Fill		0		
				Moist, No Odor	Sample SB-74B collected at 8-8.5'
9			0		Saturated Soil at 9'

Notes:Backfilled on Completion. Fill material extended up to 10' therefore SB-74C was not collected

ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.
5 Marine View Plaza-Suite 401
Hoboken, NJ 07030

LOG OF: SB-74

BORING SB-75

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue
CLIENT: Hunters Point SG, LLC
DATE STARTED/COMPLETED: 11/15/2018
CONTRACTOR: Eastern Environmental Solutions

SATURATED SOIL AT: NA
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Rebeca Garofalo

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
	SW			0-3" Asphalt and Concrete	
1			0	3"-2' Brown M-F SAND with some pebbles and a trace of silt	1.5' of recovery
2			0.3		Sample SB-75A collected at 2-2.5'
				2-3' Black Coarse M SAND with fill material (asphalt, brick, concrete, ash)	
3			0.4	Moist, No Odor	
				3-6' Black Coarse M SAND with fill material (asphalt, brick, concrete, ash)	2.5' of recovery
4			0		
5			0		
6			0	Moist, No Odor	
					2' of recovery
7			0	6-9' Black Coarse M SAND with fill material (asphalt, brick, concrete, ash)	
8	Fill		0		
				Moist, No Odor	Sample SB-75B collected at 8-8.5'
9			0		

Notes:Backfilled on Completion. Fill material extended up to 10' therefore SB-75C was not collected

ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.
5 Marine View Plaza-Suite 401
Hoboken, NJ 07030

LOG OF: **SB-75**

BORING SB-76

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue
CLIENT: Hunters Point SG, LLC
DATE STARTED/COMPLETED: 11/15/2018
CONTRACTOR: Eastern Environmental Solutions

SATURATED SOIL AT: NA
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Rebeca Garofalo

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
	SW			0-3" Asphalt and Concrete	
1			0	3"-1' Brown M-F SAND with s a trace of silt	1.8' of recovery
2			0	1-3' Black Coarse M SAND with fill material (asphalt, brick, concrete, ash)	Sample SB-76A collected at 2-2.5'
3			0	Moist, No Odor	
				3-6' Black Coarse M SAND with fill material (asphalt, brick, concrete, ash)	2.5' of recovery
4	Fill		0		
5			0		
6			0	Moist, No Odor	
					2' of recovery
7			0	6-9' Black Coarse M SAND with fill material (asphalt, brick, concrete, ash)	
8			0		
					Sample SB-76B collected at 8-8.5'
9			0		

Notes:Backfilled on Completion. Fill material extended up to 10' therefore SB-76C was not collected

ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.
5 Marine View Plaza-Suite 401
Hoboken, NJ 07030

LOG OF: **SB-76**

BORING SB-77

PROJECT NUMBER: 37321
PROJECT CODE: STX
LOCATION: 27-10 49th Avenue
CLIENT: Hunters Point SG, LLC
DATE STARTED/COMPLETED: 11/15/2018
CONTRACTOR: Eastern Environmental Solutions

SATURATED SOIL AT: NA
GROUND SURFACE ELEVATION: NA
CHECKED BY: Seamus Kelly
LOGGED BY: Rebeca Garofalo

Depth (FT BGS)	USCS	Graphic Symbol	PID (ppm)	DESCRIPTION	REMARKS
				0-3" Asphalt and Concrete	
1			0		1.8' of recovery
2			0	3"-3' Black Coarse M SAND with fill material (asphalt, brick, concrete, ash)	Sample SB-77A collected at 2-2.5'
3	Fill		0	Moist, No Odor	
				3-6' Black Coarse M SAND with fill material (asphalt, brick, concrete, ash)	2.5' of recovery
4			0		
5			0	5-6' Brown M-F SAND with some silt and a trace of clay	Sample SB-77B collected at 5-5.5'
	SW				
6			0	Moist, No Odor	
				6-9' Black Coarse M SAND with fill material (asphalt, brick, concrete, ash)	2' of recovery
7			0		
8	Fill		0		
				Moist, No Odor	Sample SB-77C collected at 8-8.5'
9			0		

Notes:Backfilled on Completion.

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Hoboken, NJ 07030

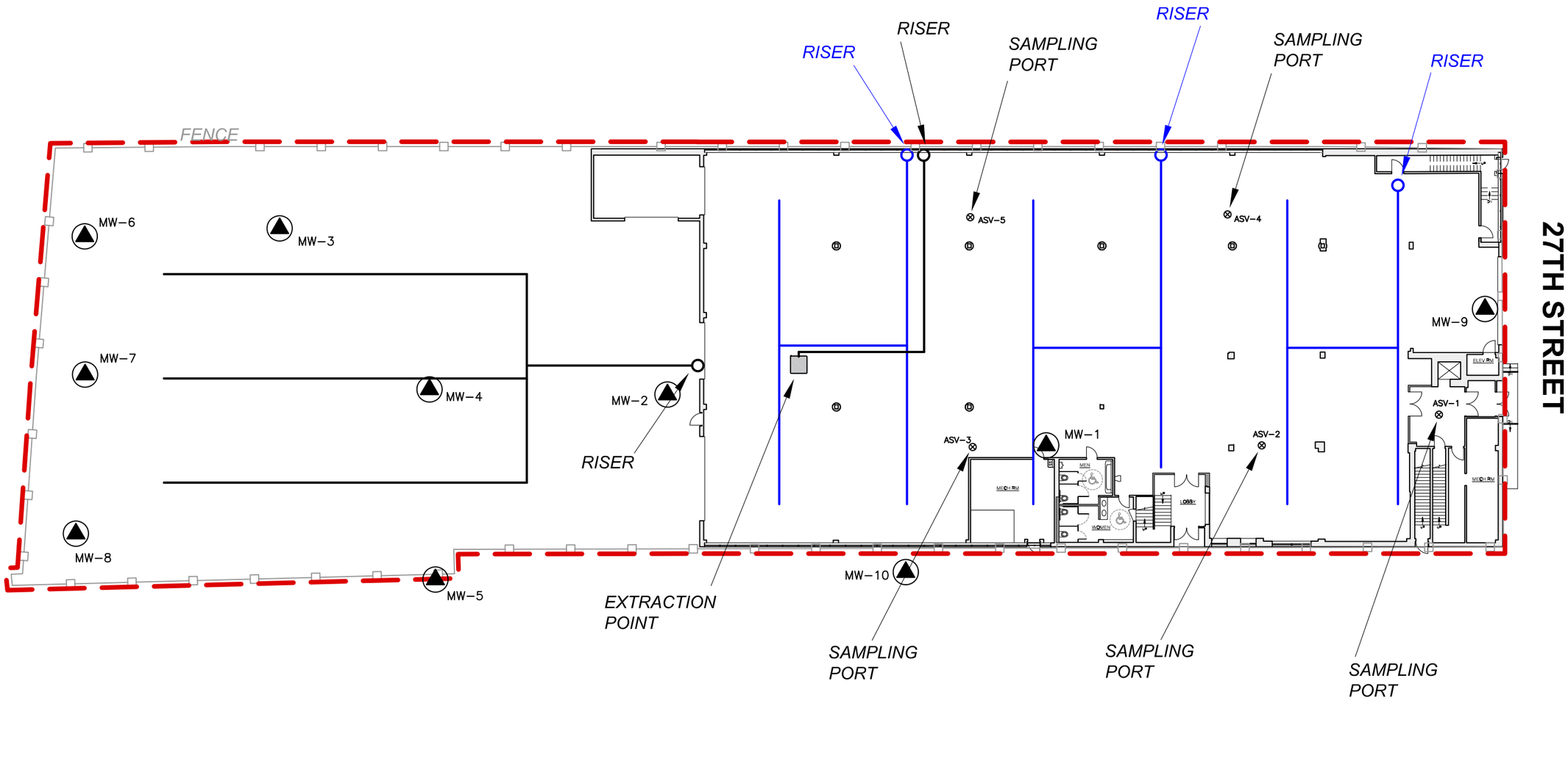
LOG OF: SB-77

APPENDIX D

SSDS/SVES and Expanded SVES
As-Builts and Component Manuals

APPENDIX D1

SSDS/SVES As-Built and Component Manual



* SSDS = SUB-SLAB DEPRESSURIZATION SYSTEM
* SVES = SOIL-VAPOR EXTRACTION SYSTEM

LEGEND

- SITE BOUNDARY
- FENCE
- ⊗ AESI INSTALLED MONITORING POINT
- MW-9 GROUNDWATER MONITORING WELLS

ROUX NOTES

1. FIGURE ADAPTED FROM DRAWINGS BY ATLANTIC ENVIRONMENTAL SOLUTIONS INC.
2. ROUX FIELD VERIFIED THE SYSTEM TO THE EXTENT POSSIBLE, HOWEVER, THE CONFIGURATION OF SUBGRADE COMPONENTS COULD NOT BE VERIFIED.

0' 40' 80'
SCALE: 1" = 40'

Title:

SITE SSDS AND SVES PLAN

27-10 49TH AVENUE
LONG ISLAND CITY, NY

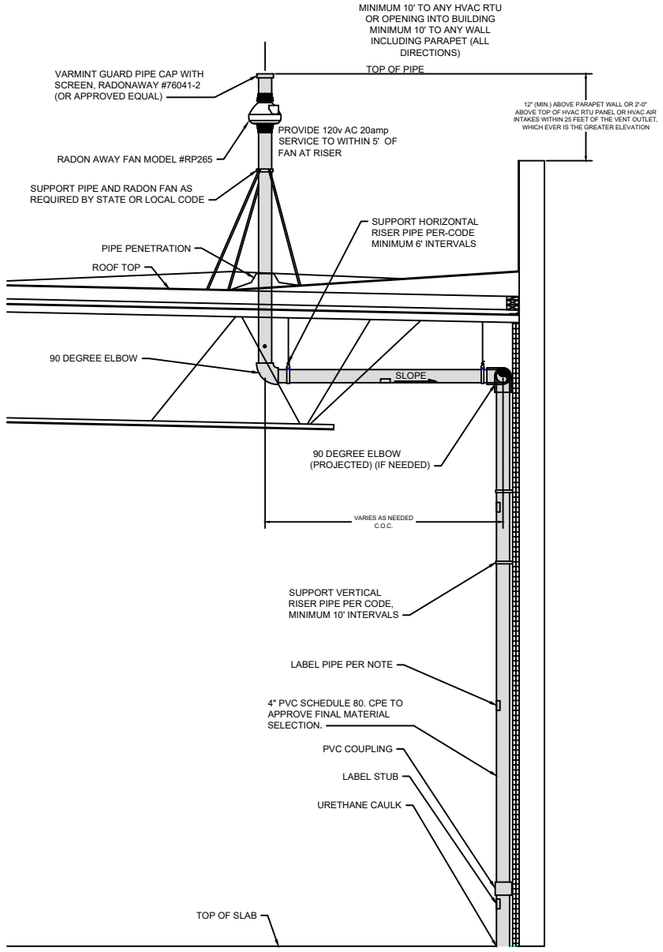
Prepared for:
HUNTERS POINT SG, LLC

ROUX

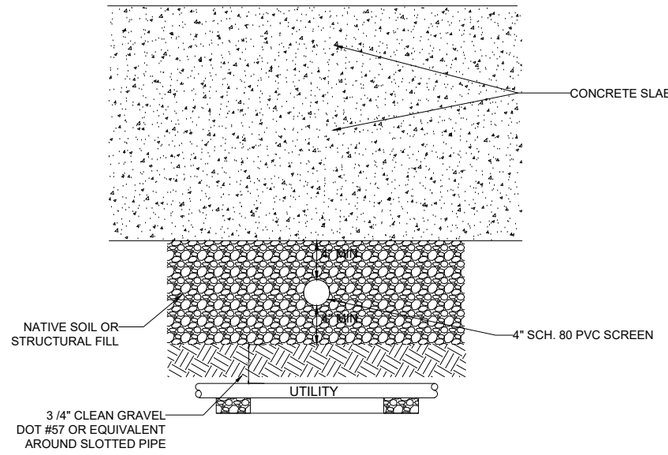
Compiled by: DEK	Date: 1/21/2022
Prepared by: DEK	Scale: AS SHOWN
Project Mgr: CP	Project: 3446.0008Y000
File: 3446.0008Y101.DWG	

FIGURE 8

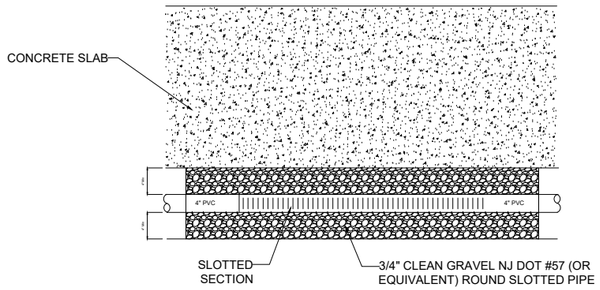
V:\CAD\PROJECTS\3446Y\0008Y\101\3446.0008Y101.DWG



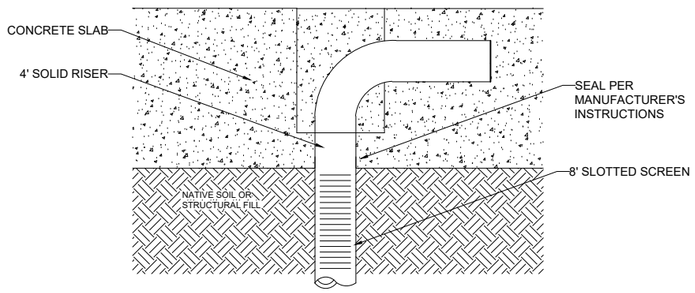
CONSTRUCTION AND INSTALLATION OF SSDS PIPING



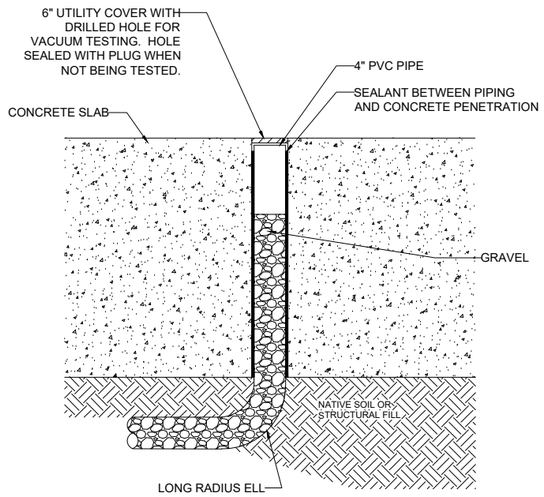
TYP. SSDS INSTALLATION



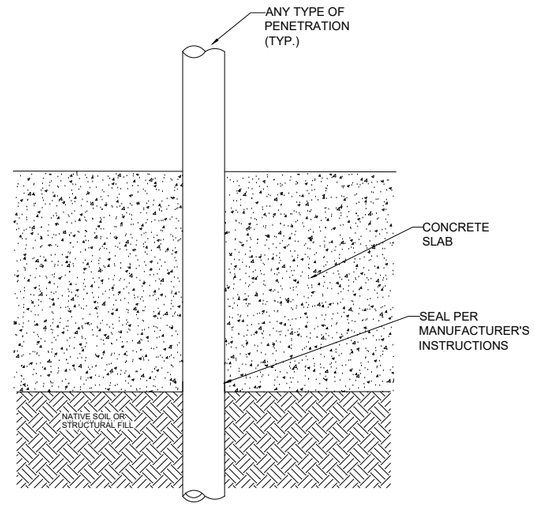
SOIL VAPOR EXTRACTION POINT



SAMPLING PORT



SLAB PENETRATION DETAIL



ROUX NOTES
1. FIGURE ADAPTED FROM DRAWINGS BY ATLANTIC ENVIRONMENTAL SOLUTIONS INC.
2. ROUX FIELD VERIFIED THE SYSTEM TO THE EXTENT POSSIBLE, HOWEVER, THE CONFIGURATION OF SUBGRADE COMPONENTS COULD NOT BE VERIFIED.

Title:

SITE SSDS AND SVES DETAILS

27-10 49TH AVENUE
LONG ISLAND CITY, NY

Prepared for:

HUNTERS POINT SG, LLC

ROUX	Compiled by: DEK	Date: 1/21/2022	FIGURE
	Prepared by: DEK	Scale: AS SHOWN	9
	Project Mgr: CP	Project: 3446.0008Y000	
	File: 3446.0008Y101.DWG		

V:\CAD\PROJECTS\3446Y\0008Y\101\3446.0008Y101.DWG

RadonAway

RP PRO SERIES

Installs white, stays white

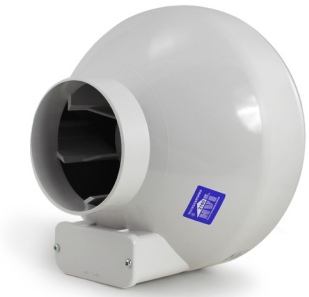


Radon Mitigation Fan

All RadonAway® fans are specifically designed for radon mitigation. RP Series Fans provide superb performance, run ultra-quiet and are attractive. They are ideal for most sub-slab radon mitigation systems.

Features

- Eternalast™ polycarbonate plastic housing
- Energy efficient
- Ultra-quiet operation
- Meets all electrical code requirements
- Water-hardened motorized impeller
- Seams sealed to inhibit radon leakage (RP140 & RP145 double snap sealed)
- ETL Listed - for indoor or outdoor use
- Thermally protected motor
- Rated for commercial and residential use
- HVI certified fan performance





Model	A	B	C
RP140	4.5”	9.7”	8.5”
RP145	4.5”	9.7”	8.5”
RP260	6”	11.75”	8.6”
RP265	6”	11.75”	8.6”
RP380	8”	13.41”	10.53”

MODEL	P/N	FAN DUCT DIAMETER	WATTS	RECOM. MAX. OP. PRESSURE “WC	TYPICAL CFM vs. STATIC PRESSURE WC					
					0”	.2”	.5”	1.0”	1.5”	2.0”
RP140†	28460	4”	17-21	0.7	138	110*	66*	-	-	-
RP145	28461	4”	34-66	1.7	169	150*	124*	81*	42	4
RP260	28462	6”	47-65	1.3	251	210*	157	70	-	-
RP265	28463	6”	96-136	2.3	375	340*	282*	204*	140	70
RP380	28464	8”	96-138	2.0	531	490*	415*	268*	139	41

*HVI Certified Values. †Energy Star® Rated.

MADE IN USA

ETL Listed

5 YEAR WARRANTY

All RadonAway® inline radon fans are covered by our 5-year, hassle-free warranty.

ENERGY STAR RP140 Only

© 2023 RadonAway

Rev J 0322
P/N 02047





RP and XP Pro Series Installation Instructions

DO NOT CONNECT POWER SUPPLY UNTIL FAN IS COMPLETELY INSTALLED. MAKE SURE ELECTRICAL SERVICE TO FAN IS LOCKED IN "OFF" POSITION. DISCONNECT POWER BEFORE SERVICING FAN.

1. **WARNING!** For General Ventilating Use Only. Do Not Use to Exhaust Hazardous, Corrosive or Explosive Materials, Gases or Vapors. See Vapor Intrusion Application Note #AN001 for important information on VI Applications. RadonAway.com/vapor-intrusion

2. **NOTE:** Fan is suitable for use with solid state speed controls; however, use of speed controls is not generally recommended.

3. **WARNING!** Check voltage at the fan to ensure it corresponds with nameplate.

4. **WARNING!** Normal operation of this device may affect the combustion airflow needed for safe operation of fuel burning equipment. Check for possible backdraft conditions on all combustion devices after installation.

5. **NOTICE!** There are no user serviceable parts located inside the fan unit.
   Do NOT attempt to open. Return unit to the factory. (See Warranty, p. 8, for details.)

6. **WARNING!** Do not leave fan unit installed on system piping without electrical power for more than 48 hours. Fan failure could result from this non-operational storage.

7. **WARNING!** TO REDUCE THE RISK OF FIRE, ELECTRIC SHOCK, OR INJURY TO PERSONS, OBSERVE THE FOLLOWING:

   a) Use this unit only in the manner intended by the manufacturer. If you have questions, contact the manufacturer. (See p. 8.)

   b) Before servicing or cleaning unit, switch power off at service panel and lock the service disconnecting means to prevent power from being switched on accidentally. When the service disconnecting means cannot be locked, securely fasten a prominent warning device, such as a tag, to the service panel.

   c) Installation work and electrical wiring must be done by qualified person(s) in accordance with all applicable codes and standards, including fire rated construction.

   d) Sufficient air is needed for proper combustion and exhausting of gases through the flue (chimney) of fuel burning equipment to prevent backdrafting. Follow the heating equipment manufacturers' guidelines and safety standards such as those published by any National Fire Protection Association, and the American Society for Heating, Refrigerating and Air Conditioning Engineers (ASHRAE), and the local code authorities.

   e) When cutting or drilling into a wall or ceiling, do not damage electrical wiring and other hidden utilities.

   f) Ducted fans must always be vented to outdoors.

   g) If this unit is to be installed over a tub or shower, it must be marked as appropriate for the application and be connected to a GFCI (Ground Fault Circuit Interrupter) protected branch circuit.

1.0 SYSTEM DESIGN CONSIDERATIONS

1.1 INTRODUCTION

The RP and XP Pro Series Radon and Vapor Intrusion (VI) Fans are intended for use by trained, professional, certified/licensed radon mitigators. The purpose of these instructions is to provide additional guidance for the most effective use of RP and XP Series Fans. These instructions should be considered supplemental to EPA/radon industry standard practices, state and local building codes and regulations. In the event of a conflict, those codes, practices and regulations take precedence over these instructions.

1.2 FAN SEALING

The RP and XP Pro Series Radon and VI Fans are factory sealed; no additional caulk or other materials are required to inhibit air leakage.

1.3 ENVIRONMENTALS

The RP and XP Pro Series Radon and VI Fans are designed to perform year-round in all but the harshest climates without additional concern for temperature or weather. For installations in an area of severe cold weather, please contact RadonAway for assistance. When not in operation, the fan should be stored in an area where the temperature is never less than 32 degrees F or more than 100 degrees F.

1.4 ACOUSTICS

The RP and XP Pro Series Radon and VI Fans, when installed properly, operate with little or no noticeable noise to the building occupants. The velocity of the outgoing air should be considered in the overall system design. In some cases the “rushing” sound of the outlet air may be disturbing. In these instances, the use of a RadonAway Exhaust Muffler is recommended.

(To ensure quiet operation of inline and remote fans, each fan shall be installed using sound attenuation techniques appropriate for the installation. For bathroom and general ventilation applications, at least 8 feet of insulated flexible duct shall be installed between the exhaust or supply grille(s) and the fan(s). The RP and XP Pro Series Radon Fans are not suitable for kitchen range hood remote ventilation applications.)

1.5 GROUND WATER

In the event that a temporary high water table results in water at or above slab level, water may be drawn into the riser pipes, thus blocking air flow to the RP and XP Pro Series Radon and VI Fan. The lack of cooling air may result in the fan cycling on and off as the internal temperature rises above the thermal cutoff. Should this condition arise, it is recommended that the fan be turned off until the water recedes, allowing for return to normal operation.

1.6 SLAB COVERAGE

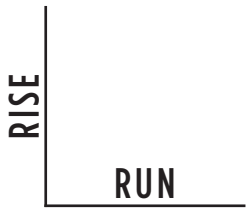
The RP and XP Pro Series Radon and VI Fans can provide coverage up to 2000+ sq. ft. per slab penetration. This will primarily depend on the sub-slab material in any particular installation. In general, the tighter the material, the smaller the area covered per penetration. Appropriate selection of the RP and XP Pro Series Radon and VI Fan best suited for the sub-slab material can improve the slab coverage. The RP and XP Pro Series Radon and VI Fans have a wide range of models to choose from to cover a wide range of sub-slab materials. The RP140 and 145 are best suited for general purpose use. The RP260 can be used where additional airflow is required, and the RP265 and RP380 are best suited for large slab, high airflow applications. Additional suction points can be added as required. It is recommended that a small pit (5 to 10 gallons in size) be created below the slab at each suction hole.

1.7 CONDENSATION & DRAINAGE

Condensation is formed in the piping of a mitigation system when the air in the piping is chilled below its dew point. This can occur at points where the system piping goes through unheated space such as an attic, garage or outside. The system design must provide a means for water to drain back to a slab hole to remove the condensation. The RP and XP Pro Series Radon and VI Fan MUST be mounted vertically plumb and level, with the outlet pointing up for proper drainage through the fan. Avoid mounting the fan in any orientation that will allow water to accumulate inside the fan housing. The RP and XP Pro Series Radon and VI Fans are NOT suitable for underground burial.

For RP and XP Pro Series Fan piping, the following table provides the minimum recommended pipe diameter and pitch under several system conditions.

Pipe Diameter	Minimum Rise per Ft of Run*		
	@25 CFM	@50 CFM	@100 CFM
4”	1/8”	1/4”	3/8”
3”	1/4”	3/8”	1 1/2”



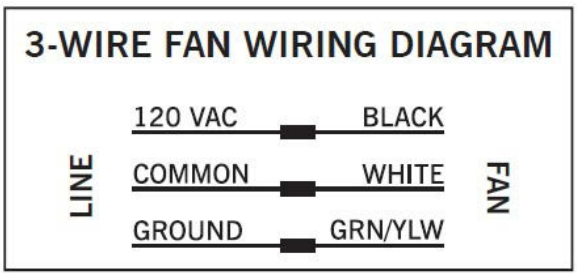
*See p. 7 for detailed specifications.

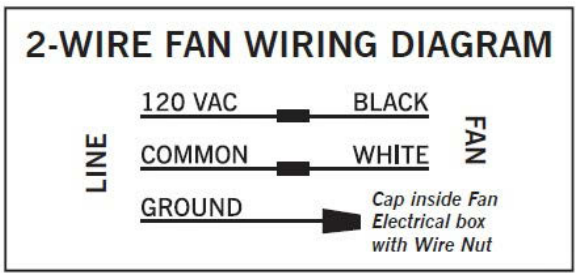
1.8 SYSTEM MONITOR & LABEL

A System Monitor, such as a manometer (P/N 50017) or audible alarm (P/N 28535, 28001-2, 28001-4 or 28421), is required to notify the occupants of a fan system malfunction. A System Label (provided with Manometer P/N 50017) with instructions for contacting the installing contractor for service and identifying the necessity for regular radon tests to be conducted by the building occupants must be conspicuously placed in a location where the occupants frequent and can see the label.

1.9 ELECTRICAL WIRING

The RP and XP Pro Series Radon and VI Fans operate on standard 120V, 60Hz AC. All wiring must be performed in accordance with National Fire Protection (NFPA) National Electrical Code, Standard #70, current edition, for all commercial and industrial work, and state and local building codes. All wiring must be performed by a qualified and licensed electrician. Outdoor installations require the use of a UL Listed watertight conduit. Ensure that all exterior electrical boxes are outdoor rated and properly sealed to prevent water penetration into the box. A means, such as a weep hole, is recommended to drain the box.





Note: Some of our fan models use motors that do not utilize a ground wire. This wire configuration is safe and allowable under our ETL safety listing. If the fan being installed was constructed with the 2-wire configuration (no ground), the ground wire from the Line supply should be capped with a wire nut inside the electrical box at the fan.

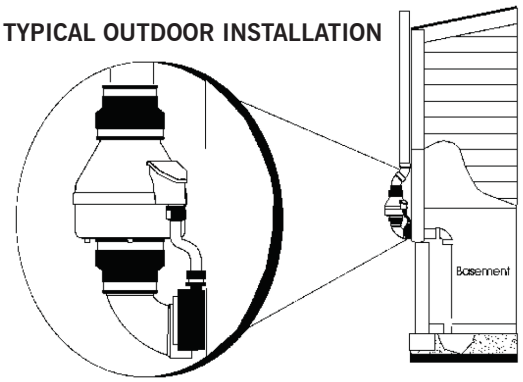
1.10 SPEED CONTROLS

The RP and XP Pro Series Radon and VI Fans are rated for use with electronic speed controls; however, speed controls are generally not recommended. If used, the recommended speed control is Pass & Seymour Solid State Speed Control (Cat. No. 94601-1).

2.0 INSTALLATION

The RP and XP Pro Series Radon Fans can be mounted indoors or outdoors. (It is suggested that EPA and radon mitigation standards recommendations be followed in choosing the fan location.) The RP and XP Pro Series Radon and VI Fans may be mounted directly on the system piping or fastened to a supporting structure by means of an optional mounting bracket. The ducting from the fan to the outside of the building has a strong effect on noise and fan energy use. Use the shortest, straightest duct routing possible for best performance, and avoid installing the fan with smaller ducts than recommended. Insulation around the ducts can reduce energy loss and inhibit mold growth. Fans installed with existing ducts may not achieve their rated airflow.

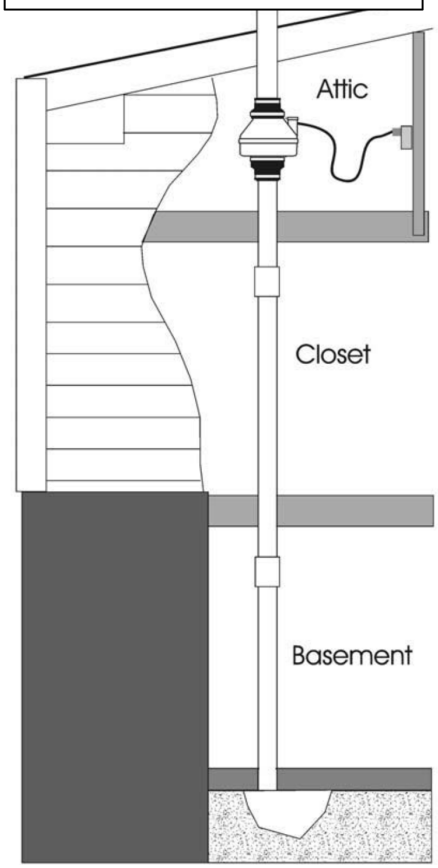
TYPICAL OUTDOOR INSTALLATION



2.1 MOUNTING

Mount the RP and XP Pro Series Radon and VI Fan vertically with outlet up. Ensure the unit is plumb and level. When mounting directly on the system piping assure that the fan does not contact any building surface to avoid vibration noise.

TYPICAL INDOOR INSTALLATION



2.2 MOUNTING BRACKET (optional)

The RP and XP Pro Series Radon and VI Fans may be optionally secured with the RadonAway Fan Mounting Bracket (P/N 25007). Foam or rubber grommets may also be used between the bracket and mounting surface for vibration isolation.

2.3 SYSTEM PIPING

Complete piping run, using flexible couplings as a means of disconnect for servicing the unit and for vibration isolation. As the fan is typically outside of the building thermal boundary and is venting to the outside, installation of insulation around the fan is not required.

2.4 ELECTRICAL CONNECTION

Connect wiring with wire nuts provided, observing proper connections (See Section 1.9). Note that the fan is not intended for connection to rigid metal conduit.

2.5 VENT MUFFLER (optional)

Install the muffler assembly in the selected location in the outlet ducting. Solvent weld all connections. The muffler is normally installed at the end of the vent pipe.

2.6 OPERATION CHECKS & ANNUAL SYSTEM MAINTENANCE

_____ **Verify** all connections are tight and **leak-free**.

_____ **Ensure** the RP and XP Pro Series Radon and VI Fan and all ducting are **secure and vibration-free**.

_____ **Verify system vacuum pressure** with manometer. **Ensure** vacuum pressure is within normal operating range and **less than** the maximum recommended operating pressure.

(Based on sea-level operation, at higher altitudes reduce by about 4% per 1000 feet)
(Further reduce Maximum Operating Pressure by 10% for High Temperature environments.)
See Product Specifications. If this is exceeded, increase the number of suction points.

_____ **Verify Radon levels** by testing to EPA Protocol and applicable testing standards.

THE FOLLOWING CHARTS SHOW THE PERFORMANCE OF THE RP AND XP PRO SERIES RADON AND VI FANS

RP Pro Series Product Specifications

Typical CFM Vs. Static Pressure "WC									
Model	**0"**	**.2"**	**.5"**	**.75"**	**1.0"**	**1.25"**	**1.5"**	**1.75"**	**2.0"**
RP140†◆	138	110*	66*	-	-	-	-	-	
RP145◆	169	150*	124*	101	81*	61	42	22	4
RP260	251	210*	157	117	70	26	-	-	-
RP265	375	340*	282*	238	204*	170	140	108	70
RP380	541	510*	461*	409	347*	292	235	171	107

**Denotes HVI certified values. †Energy Star® Rated. ◆Vapor Tite™ fans.*

Model	Power Consumption 120VAC, 60Hz, 1.5 Amp Maximum	Maximum Recommended Operation Pressure* (Sea Level Operation)**
RP140†	17 - 21 watts	0.7" WC
RP145◆	34 - 66 watts	1.7" WC
RP260	47-65 watts	1.3" WC
RP265	96 - 136 watts	2.3" WC
RP380	90 - 145 watts	2.0" WC

**Reduce by 10% for High Temperature Operation. **Reduce by 4% per 1000 ft. of altitude.*

Model	Size	Weight	Inlet/Outlet	L.2
RP140†	8.5"H x 9.7" Dia.	5.5 lbs	4.5"OD (4.0" PVC Sched 40 size compatible)	25
RP145◆	8.5"H x 9.7" Dia.	5.5 lbs	4.5" OD	15
RP260	8.6"H x 11.75" Dia.	5.5 lbs	6.0" OD	48
RP265	8.6"H x 11.75" Dia.	6.5 lbs	6.0" OD	30
RP380	10.53"H x 13.41" Dia.	11.5 lbs	8.0" OD	57

L.2 = Estimated Equivalent Length of Rigid Metal Ducting resulting in .2" WC pressure loss for Duct Size listed. Longer Equivalent Lengths can be accommodated at Flows Lower than that at .2" WC pressure loss (see CFM Vs Static Pressure "WC Table).

XP Pro Series Product Specifications

Typical CFM Vs. Static Pressure "WC						
	0"	**.5"**	**1.0"**	**1.5"**	**1.75"**	**2.0"**
XP151	167	127	77	-	-	-
XP201	126	98	66	26	-	-

Model	**Power Consumption 120VAC, 60Hz, 1.5 Amp Maximum**	**Maximum Recommended Operation Pressure* (Sea Level Operation)****
XP151	53-70 watts	1.4" WC
XP201	38-74 watts	1.6" WC

**Reduce by 10% for High Temperature Operation **Reduce by 4% per 1000 ft. of altitude.*

Model	**Size**	**Weight**	**Inlet/Outlet**
XP151	9.5"H x 8.5" Dia.	6 lbs	4.5"OD (4.0" PVC Sched 40 size compatible)
XP201	9.5"H x 8.5" Dia.	6 lbs	4.5" OD

RP and XP Pro Series Additional Specifications

Model	**Recommended Duct**	**PVC Pipe Mounting**	**Thermal Cutout**	**Insulation Class**
RP140†◆	3" or 4" Schedule 20/40 PVC	Mount on the duct pipe or with optional mounting bracket. For Ventilation: 4", 6" or 8" Rigid or Flexible Ducting.	130°C/266°F	Class B/F Insulation
RP145◆			130°C/266°F	Class F Insulation
RP260			150°C/302°F	
RP265			150°C/302°F	
RP380	6" Schedule 20/40 PVC Pipe		150°C/302°F	
XP151	3" or 4" Schedule 20/40 PVC	Fan may be mounted on the duct pipe or with integral flanges.	120°C/248°F	Class B Insulation
XP201				

Continuous Duty
3000 RPM
Thermally Protected
RP Residential and Commercial
XP Residential Only
Rated for Indoor or Outdoor Use

ENERGY STAR
RP140 Only

LISTED
Electric Fan

Intertek
77728

Conforms to UL STD. 507
Certified to CAN/CSA STD. C22.2 No.113

IMPORTANT INSTRUCTIONS TO INSTALLER

Inspect the RP and XP Pro Series Radon and VI Fan for shipping damage within 15 days of receipt. **Notify RadonAway of any damages immediately.** RadonAway is not responsible for damages incurred during shipping. However, for your benefit, RadonAway does insure shipments.

There are no user serviceable parts inside the fan. **Do not attempt to open the housing.** Return unit to factory. (See Warranty below).

Install the RP and XP Pro Series Radon and VI Fan in accordance with all EPA, ANSI/AARST standard practices, and state and local building codes and regulations.

Provide a copy of this instruction or comparable radon system and testing information to the building occupants after completing system installation.

Warranty

RadonAway® warrants that the RP and XP Pro Series Radon Fan (the "Fan") will be free from defects in materials and workmanship for a period of 12 months from the date of purchase or 18 months from the date of manufacture, whichever is sooner (the "Warranty Term").

RadonAway® will replace any fan which fails due to defects in materials or workmanship during the Warranty Term. This Warranty is contingent on installation of the Fan in accordance with the instructions provided. This Warranty does not apply where any repairs or alterations have been made or attempted by others, or if the unit has been abused or misused. Warranty does not cover damage in shipment unless the damage is due to the negligence of RadonAway®.

The Fan must be returned (at Owner's cost) to the RadonAway® factory. Any Fan returned to the factory will be discarded unless the Owner provides specific instructions along with the Fan when it is returned regardless of whether or not the Fan is actually replaced under this warranty. Proof of purchase must be supplied upon request for service under this Warranty.

5-YEAR EXTENDED WARRANTY WITH PROFESSIONAL INSTALLATION.

RadonAway® will extend the Warranty Term of the fan to 60 months (5 years) from date of purchase or 66 months from date of manufacture, whichever is sooner, provided that the fan is installed by a professional radon mitigation contractor. Proof of purchase and/or proof of professional installation may be required for service under this warranty. No extended warranty is offered outside the Continental United States and Canada beyond the standard 12 months from the date of purchase or 18 months from the date of manufacture, whichever is sooner.

RadonAway® is not responsible for installation, removal or delivery costs associated with this Warranty.

LIMITATION OF WARRANTY

EXCEPT AS STATED ABOVE, THE RP AND XP PRO SERIES RADON AND VI FANS ARE PROVIDED WITHOUT WARRANTY OF ANY KIND, EITHER EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE.

IN NO EVENT SHALL RADONAWAY BE LIABLE FOR ANY DIRECT, INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES ARISING OUT OF, OR RELATING TO, THE FAN OR THE PERFORMANCE THEREOF. RADONAWAY'S AGGREGATE LIABILITY HEREUNDER SHALL NOT IN ANY EVENT EXCEED THE AMOUNT OF THE PURCHASE PRICE OF SAID PRODUCT. THE SOLE AND EXCLUSIVE REMEDY UNDER THIS WARRANTY SHALL BE THE REPAIR OR REPLACEMENT OF THE PRODUCT, TO THE EXTENT THE SAME DOES NOT MEET WITH RADONAWAY'S WARRANTY AS PROVIDED ABOVE.

For service under this Warranty, contact RadonAway for a Return Material Authorization (RMA) number and shipping information. No returns can be accepted without an RMA. If factory return is required, the customer assumes all shipping costs, including insurance, to and from factory.

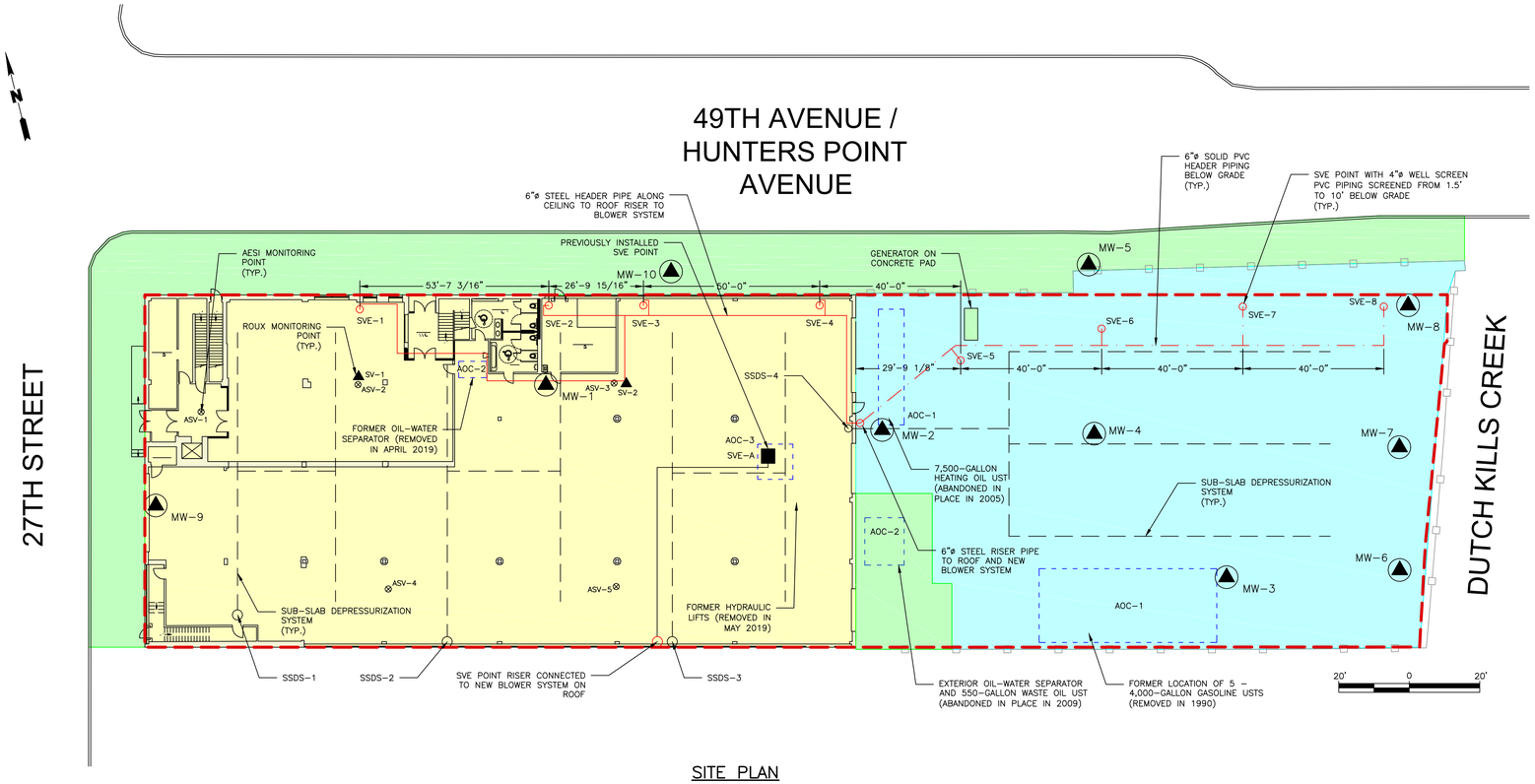
RadonAway® 3 Saber Way
Ward Hill, MA 01835 USA TEL (978) 521-3703
FAX (978) 521-3964
Email to: Returns@RadonAway.com

Record the following information for your records:

Serial Number: _____ Purchase Date: _____

APPENDIX D2

Expanded SVES As-Built and Component Manual



SITE PLAN

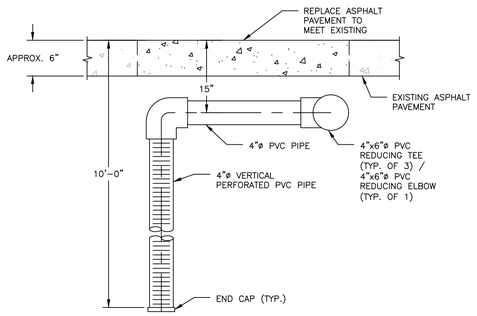
SCALE: 1" = 20'

LEGEND

- BUILDING FOUNDATION
- ASPHALT PARKING LOT
- CONCRETE PAVED AREA
- SITE BOUNDARY
- FENCE
- APPROXIMATE TANK AREAS (AS PER ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.)
- SVES EXPANSION COMPONENTS
- AESI INSTALLED MONITORING POINT
- SV-1 ROUX INSTALLED MONITORING POINT
- MW-8 GROUNDWATER MONITORING WELL
- BUILDING COLUMN

SUB-SLAB DEPRESSURIZATION SYSTEM NOTES

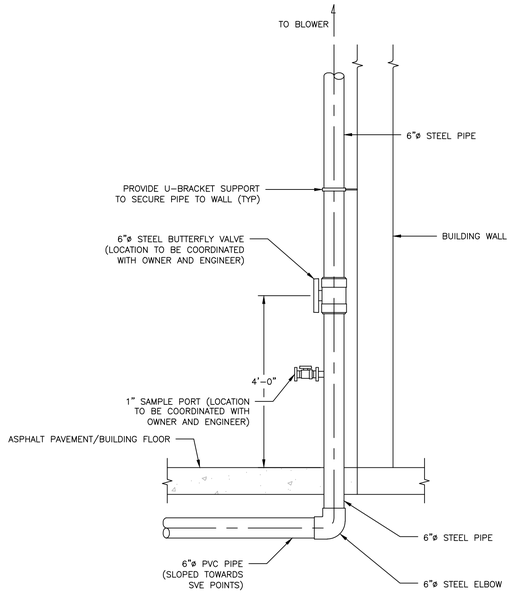
1. CONTRACTOR SHALL COORDINATE WITH PLUMBING, MECHANICAL, CIVIL AND ELECTRICAL CONTRACTORS FOR ALL UTILITY CROSSINGS.
2. THIS SOIL VAPOR EXTRACTION SYSTEM WAS DESIGNED TO MINIMIZE CROSSINGS OF ONSITE FEATURES AND STRUCTURAL FEATURES. FIELD VERIFICATION OF LOCATIONS SHOULD BE MADE TO ENSURE CROSSINGS ARE MINIMIZED.



PROFILE VIEW

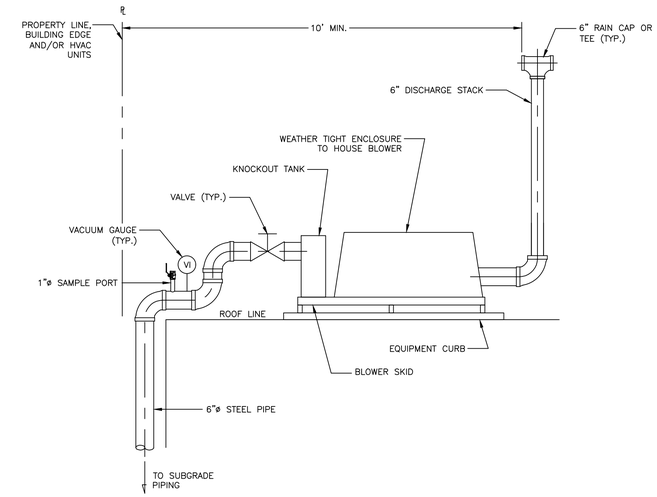
1 SOIL VAPOR EXTRACTION POINT DETAIL

SCALE: NOT TO SCALE



2 RISER DETAIL

SCALE: NOT TO SCALE



BLOWER NOTES

1. PROVIDE ELECTRICAL/CONTROL CONDUIT TO BLOWERS. COORDINATE WITH ELECTRICAL CONTRACTOR.
2. ELECTRICAL CONDUIT SHALL BE SIZED FOR 230/460 VOLT, THREE PHASE, 60 HZ, FOR THE BLOWER MOTOR.
3. SVES VENT EXHAUST SHALL BE OFFSET A MINIMUM OF 10 FEET FROM PROPERTY LINES, BUILDING EDGES, HVAC/AIR INTAKES, OPERABLE OPENINGS AND ANY OUTDOOR RECREATIONAL SPACES IN ACCORDANCE WITH NYC PLUMBING CODE CHAPTER 9 VENTS.
4. THE BLOWER SHALL BE A 10.0 HP, ATLANTIC BLOWERS AB-850 OR APPROVED EQUAL.
5. THE BLOWER SHALL BE PROVIDED WITH A WEATHER TIGHT ALUMINUM CUSTOM ENCLOSURE OR APPROVED EQUAL.
6. THE BLOWER SKID SHALL INCLUDE A WEATHER TIGHT ENCLOSURE, KNOCKOUT TANK (WITH HIGH LEVEL ALARM), VACUUM RELIEF VALVE, LOW VACUUM SWITCH, GAUGES, AND INTERCONNECTING PIPING/FITTINGS.
7. A CONTROL PANEL SHALL BE PROVIDED WITH THE BLOWER SKID. THE CONTROL PANEL SHALL HAVE GREEN OPERATING LIGHTS AND RED ALARM LIGHTS. THE CONTROL PANEL SHALL HAVE AN ALARM FOR WATER LEVEL IN KNOCKOUT TANK, LOW VACUUM AND NO POWER. THE ALARM SIGNAL SHALL BE SENT TO AN APPROPRIATE LOCATION IN THE PROPOSED BUILDING (I.E., SUPERINTENDENT'S OFFICE) AND SHALL ALSO BE AUDIBLE. THE ALARM SHALL BE A MCMASTER-CARR SIGNAL LIGHT WITH AUDIBLE ALARM (PART NO. 5753T71) OR APPROVED EQUAL.
8. PROVIDE ALL NECESSARY PIPE SUPPORTS FOR RISERS FROM THE ASPHALT PAVEMENT AND INSIDE THE BUILDING TO THE BLOWER ON THE ROOF.

3 TYPICAL BLOWER DETAIL

SCALE: NOT TO SCALE

NO.	DATE	REVISION DESCRIPTION	INT.

STATE OF NEW YORK — DAVID ERIC KAISER — 097317 — LICENSED PROFESSIONAL ENGINEER

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THESE DOCUMENTS (OR COPIES OF ANY THEREOF) PREPARED BY OR BEARING THE SEAL OF THE ENGINEER, SHALL NOT BE REUSED FOR ANY EXTENSIONS OF THE PROJECT OR ANY OTHER PROJECT WITHOUT THE WRITTEN CONSENT OF THE ENGINEER.

PROJ. ENGINEER: D.E.K.		DRAWN BY: D.E.K.	
DESIGNED BY: D.E.K.		CHECKED BY: N.C.	
DRAWING SCALE: AS SHOWN		PLOT SCALE: 1:1	
DRAWING DATE: 12SEPT25		PRINT TYPE: COLOR	
OFFICE: NY		PAPER SIZE: ARCH D	
PROJECT NO.: 3446.0008Y000			
DRAWING FILE: 3446.0008Y125.05-REV 1.DWG			

ROUX
Roux Environmental Engineering and Geology, D.P.C.
209 SHAFTER STREET ISLANDIA NEW YORK 11749
(631) 232-2600

PROJECT NAME:
27-10 49TH AVENUE, QUEENS, NY
NYSDEC BCP SITE NO. C241219

PROJECT FOR:
HUNTERS POINT SG, LLC
10 W FOREST AVENUE, ENGLEWOOD, NJ

TITLE:
AS-BUILT SUB-SLAB DEPRESSURIZATION SYSTEM/SOIL VAPOR EXTRACTION SYSTEM, EXPANDED SOIL VAPOR EXTRACTION SYSTEM AND SITE COVER PLAN AND DETAILS

DRAWING NO.
1
DRAWING 1 OF 1

V:\CAD\PROJECTS\3446Y\0008Y\125\3446.0008Y125.05-REV 1.DWG DKAISER

SVE-1

Client: Hunters Point SG, LLC	Site: 27-10 49th Ave	Project Number: 3446.0008y000
Address: 27-10 49th Ave	City/State: Queens, New York	Logged By: S.Stern

Start to Finish Date:	Contractor: EnviroTrac	Drill Type: Hand Auger	Sampler Type/Method: 4" Hand Auger
Borehole Depth: 10 feet	Backfill: Sand	Borehole Diameter: 4-inches	DTW:
Area: Building Interior	Elevation: NM	Latitude: NM	Longitude: NM

Well Depth: 10 feet	Well Dia./Materials: 4-inch PVC	Screen Interval: 1.5-10 feet	Screen Slot Size: 20-Slot	Sand/Filter Pack Size: Morie #2	Annular Seal:

Depth (ft)	Well Diagram	USCS	USCS Graphic	Visual Description	Sample Interval	Recovery (ft)	PID	Notes
5	Sch 40 PVC, 20-Slot	MIXD		FILL.				

Bottom of borehole at 10 feet

ROUX STANDARD LOG_ - 7/7/25 13:23 - C:\USERS\PUBLIC\DOCUMENTS\BENTLEY\GINTCL\PROJECTS\3446.0008Y000.GPJ

SVE-2

Client: Hunters Point SG, LLC	Site: 27-10 49th Ave	Project Number: 3446.0008y000
Address: 27-10 49th Ave	City/State: Queens, New York	Logged By: S.Stern

Start to Finish Date:	Contractor: EnviroTrac	Drill Type: Hand Auger	Sampler Type/Method: 4" Hand Auger
Borehole Depth: 8 feet	Backfill: Sand	Borehole Diameter: 4-inches	DTW:
Area: Building Interior	Elevation: NM	Latitude: NM	Longitude: NM

Well Depth: 8 feet	Well Dia./Materials: 4-inch PVC	Screen Interval: 1.5-8 feet	Screen Slot Size: 20-Slot	Sand/Filter Pack Size: Morie #2	Annular Seal:

Depth (ft)	Well Diagram	USCS	USCS Graphic	Visual Description	Sample Interval	Recovery (ft)	PID	Notes
5	Sch 40 PVC, 20-Slot	MIXD		FILL.				

Bottom of borehole at 8 feet

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SVE-3

Client: Hunters Point SG, LLC	Site: 27-10 49th Ave	Project Number: 3446.0008y000
Address: 27-10 49th Ave	City/State: Queens, New York	Logged By: S.Stern

Start to Finish Date:	Contractor: EnviroTrac	Drill Type: Hand Auger	Sampler Type/Method: 4" Hand Auger
Borehole Depth: 10 feet	Backfill: Sand	Borehole Diameter: 4-inches	DTW:
Area: Building Interior	Elevation: NM	Latitude: NM	Longitude: NM

Well Depth: 10 feet	Well Dia./Materials: 4-inch PVC	Screen Interval: 1.5-10 feet	Screen Slot Size: 20-Slot	Sand/Filter Pack Size: Morie #2	Annular Seal:

Depth (ft)	Well Diagram	USCS	USCS Graphic	Visual Description	Sample Interval	Recovery (ft)	PID	Notes
5	Sch 40 PVC, 20-Slot	MIXD		FILL.				

Bottom of borehole at 10 feet

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SVE-4

Client: Hunters Point SG, LLC	Site: 27-10 49th Ave	Project Number: 3446.0008y000
Address: 27-10 49th Ave	City/State: Queens, New York	Logged By: S.Stern

Start to Finish Date:	Contractor: EnviroTrac	Drill Type: Hand Auger	Sampler Type/Method: 4" Hand Auger
Borehole Depth: 10 feet	Backfill: Sand	Borehole Diameter: 4-inches	DTW:
Area: Building Interior	Elevation: NM	Latitude: NM	Longitude: NM

Well Depth: 10 feet	Well Dia./Materials: 4-inch PVC	Screen Interval: 1.5-10 feet	Screen Slot Size: 20-Slot	Sand/Filter Pack Size: Morie #2	Annular Seal:

Depth (ft)	Well Diagram	USCS	USCS Graphic	Visual Description	Sample Interval	Recovery (ft)	PID	Notes
5	Sch 40 PVC, 20-Slot	MIXD		FILL.				

Bottom of borehole at 10 feet

ROUX STANDARD LOG_ - 7/7/25 13:23 - C:\USERS\PUBLIC\DOCUMENTS\BENTLEY\GINTG\PROJECTS\3446.0008Y000.GPJ

SVE-5

Client: Hunters Point SG, LLC	Site: 27-10 49th Ave	Project Number: 3446.0008y000
Address: 27-10 49th Ave	City/State: Queens, New York	Logged By: S.Stern

Start to Finish Date:	Contractor: EnviroTrac	Drill Type: Hand Auger	Sampler Type/Method: 4" Hand Auger
Borehole Depth: 10 feet	Backfill: Sand	Borehole Diameter: 4-inches	DTW:
Area: Building Interior	Elevation: NM	Latitude: NM	Longitude: NM

Well Depth: 10 feet	Well Dia./Materials: 4-inch PVC	Screen Interval: 1.5-10 feet	Screen Slot Size: 20-Slot	Sand/Filter Pack Size: Morie #2	Annular Seal:

Depth (ft)	Well Diagram	USCS	USCS Graphic	Visual Description	Sample Interval	Recovery (ft)	PID	Notes
5	Sch 40 PVC, 20-Slot	MIXD		FILL.				

Bottom of borehole at 10 feet

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SVE-6

Client: Hunters Point SG, LLC	Site: 27-10 49th Ave	Project Number: 3446.0008y000
Address: 27-10 49th Ave	City/State: Queens, New York	Logged By: S.Stern

Start to Finish Date:	Contractor: EnviroTrac	Drill Type: Hand Auger	Sampler Type/Method: 4" Hand Auger
Borehole Depth: 10 feet	Backfill: Sand	Borehole Diameter: 4-inches	DTW:
Area: Building Interior	Elevation: NM	Latitude: NM	Longitude: NM

Well Depth: 10 feet	Well Dia./Materials: 4-inch PVC	Screen Interval: 1.5-10 feet	Screen Slot Size: 20-Slot	Sand/Filter Pack Size: Morie #2	Annular Seal:

Depth (ft)	Well Diagram	USCS	USCS Graphic	Visual Description	Sample Interval	Recovery (ft)	PID	Notes
5	Sch 40 PVC, 20-Slot	MIXD		FILL.				

Bottom of borehole at 10 feet

ROUX STANDARD LOG_ - 7/7/25 13:23 - C:\USERS\PUBLIC\DOCUMENTS\BENTLEY\GINTG\PROJECTS\3446.0008Y000.GPJ

SVE-7

Client: Hunters Point SG, LLC	Site: 27-10 49th Ave	Project Number: 3446.0008y000
Address: 27-10 49th Ave	City/State: Queens, New York	Logged By: S.Stern

Start to Finish Date:	Contractor: EnviroTrac	Drill Type: Hand Auger	Sampler Type/Method: 4" Hand Auger
Borehole Depth: 7 feet	Backfill: Sand	Borehole Diameter: 4-inches	DTW:
Area: Building Interior	Elevation: NM	Latitude: NM	Longitude: NM

Well Depth: 7 feet	Well Dia./Materials: 4-inch PVC	Screen Interval: 1.5-7 feet	Screen Slot Size: 20-Slot	Sand/Filter Pack Size: Morie #2	Annular Seal:

Depth (ft)	Well Diagram	USCS	USCS Graphic	Visual Description	Sample Interval	Recovery (ft)	PID	Notes
0				FILL.				
		MIXD						
	Sch 40 PVC, 20-Slot							
5								

Bottom of borehole at 7 feet

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SVE-8

Client: Hunters Point SG, LLC	Site: 27-10 49th Ave	Project Number: 3446.0008y000
Address: 27-10 49th Ave	City/State: Queens, New York	Logged By: S.Stern

Start to Finish Date:	Contractor: EnviroTrac	Drill Type: Hand Auger	Sampler Type/Method: 4" Hand Auger
Borehole Depth: 10 feet	Backfill: Sand	Borehole Diameter: 4-inches	DTW:
Area: Building Interior	Elevation: NM	Latitude: NM	Longitude: NM

Well Depth: 10 feet	Well Dia./Materials: 4-inch PVC	Screen Interval: 1.5-10 feet	Screen Slot Size: 20-Slot	Sand/Filter Pack Size: Morie #2	Annular Seal:

Depth (ft)	Well Diagram	USCS	USCS Graphic	Visual Description	Sample Interval	Recovery (ft)	PID	Notes
5	Sch 40 PVC, 20-Slot	MIXD		FILL.				

Bottom of borehole at 10 feet

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SUBMITTAL/TRANSMITTAL FORM

FROM:	EnviroTrac Ltd. 5 Old Dock Road Yaphank, New York 11980 Phone: (631) 924-3001 Fax: (631) 924-5001	**DATE SENT: 12/06/23**
TO:	**Roux Inc.** 209 Shafter Street Islandia, NY 11749 Attn: David E. Kaiser, P.E.	***DATE RECEIVED:_____***

PROJECT:

Soil Vapor Extraction System
27-10 49th Avenue, Long Island City, New York

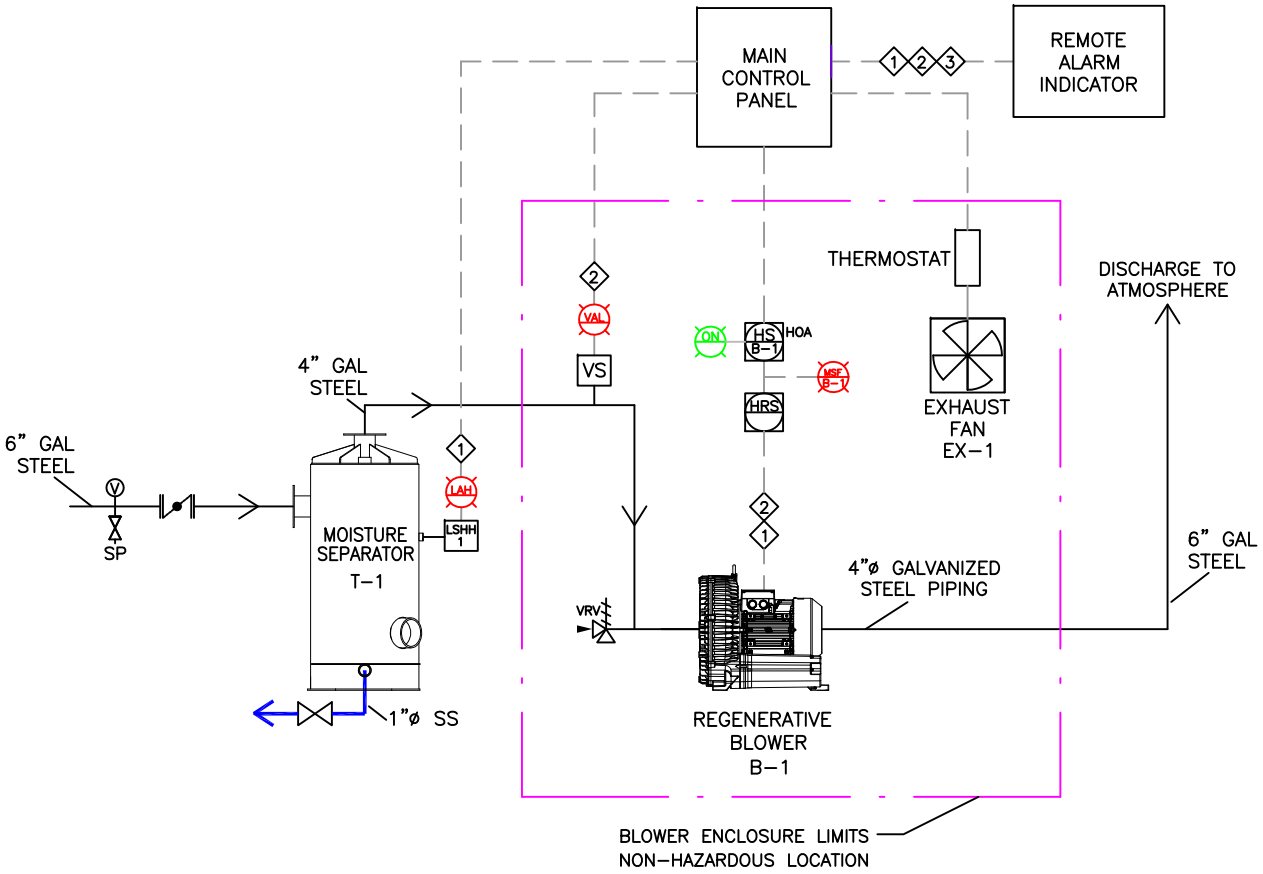
We are transmitting (Herewith ☒, Under separate cover ☐, Electronic ☒, Hard copy ☐), the following:

Item No.(s)	Submittal Description	Submittal No.	Revision to Previous Submittal:
1	Figure 1 – SVE System P&ID	01	☐ Yes ☒ No
2	SVE Blower Specifications	02	☐ Yes ☒ No
3	Blower Enclosure Specifications	03	☐ Yes ☒ No
4	Moisture Separator Specifications	04	☐ Yes ☒ No
5	Moisture Separator Level Switch Specifications	05	☐ Yes ☒ No
6	Vacuum Switch Specifications	06	☐ Yes ☒ No
7	Vacuum Gauge Specifications	07	☐ Yes ☒ No
8	Remote Alarm Indicator Specifications	08	☐ Yes ☒ No

Remarks:_____

Copy to: File

Signed: James W. Benson



SYSTEM LEGEND:

- VACUUM GAUGE
- LS — LEVEL SWITCH
- VS — VACUUM SWITCH
- BUTTERFLY VALVE
- BALL VALVE
- SP — SAMPLE PORT
- VRV — VACUUM RELIEF VALVE
- UNION
- HS — HAND SWITCH PANEL MOUNTED
- HRS — RUN TIME METER
- CONTROL PANEL INDICATOR LIGHT
- CONTROL PANEL INTERLOCK
- ELECTRIC LINE
- AIR FLOW DIRECTION
- CONDENSATE WATER FLOW DIRECTION
- ENCLOSURE LIMITS

INDICATOR LIGHT INDEX:

- LAH — LEVEL ALARM HIGH
- VAL — VACUUM ALARM LOW
- MSF B-1 — MOTOR STARTER FAILURE
- ON — MOTOR RUN INDICATOR

INTERLOCK SCHEDULE:

1. HIGH LEVEL IN T-1 – SHUT DOWN B-1, ACTIVATE REMOTE ALARM.
2. LOW VACUUM – ACTIVATE REMOTE ALARM.
3. MOTOR STARTER FAULT – SHUT DOWN B-1, ACTIVATE REMOTE ALARM.

NOTES:

BLOWER: ATLANTIC BLOWER MODEL NO: AB-850 (10 HP, 3 PH, TEFC)
MOISTURE SEPARATOR T-1: ESD/W2W MODEL NO: AWS80-6

DRAWN/REVISED BY: JW
REVISION DATE: DEC. 5, 2023

FIGURE: 1

DRAWING TITLE

PROPOSED SOIL VAPOR EXTRACTION SYSTEM PROCESS AND INSTRUMENTATION DIAGRAM

PREPARED FOR

27-10 49TH AVENUE
LONG ISLAND CITY, NEW YORK

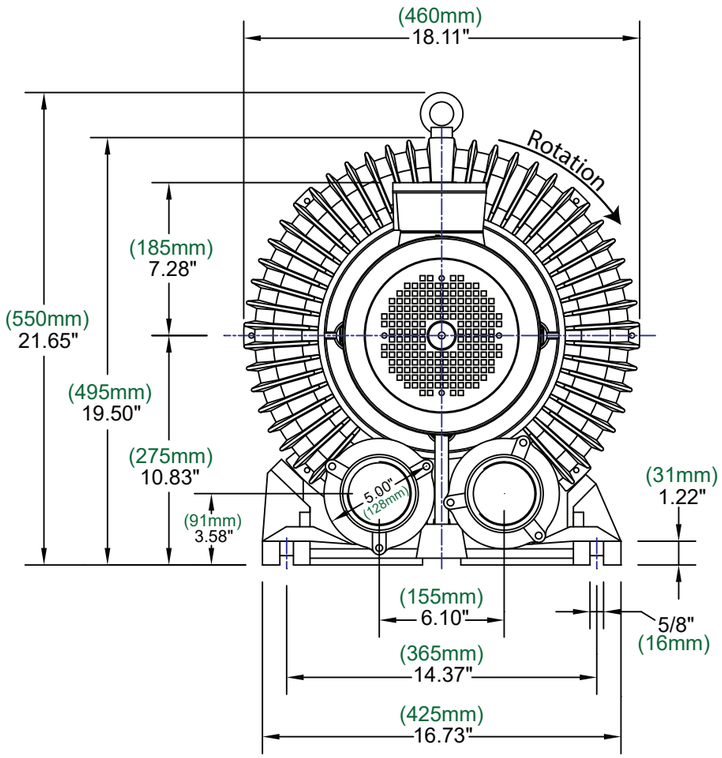
EnviroTrac
ENVIRONMENTAL SERVICES
5 OLD DOCK ROAD, YAPHANK, NEW YORK 11980
PHONE: (631)924-3001 FAX: (631)924-5001

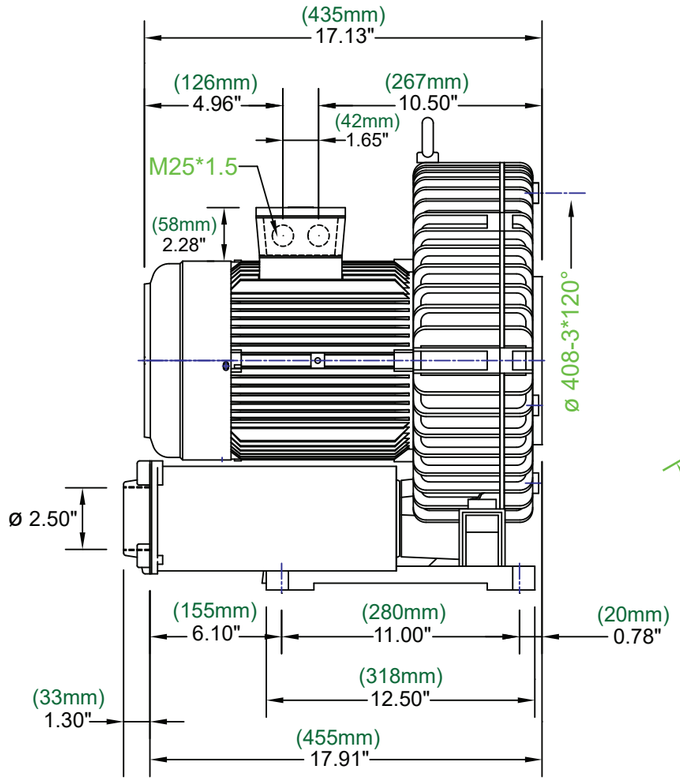
atlantic blowers

Phase	Model Number	Curve Number	Frequency (Hz)	KW	HP	Max Flow (SCFM)	Max Pressure ("H_2O)	Maximum Vacuum	Sound Level (db)	Inlet Diameter	Voltage	Current (A)	Weight (lbs)
3	AB-850	A21	60Hz	7.50	10.00	464	134	129	80	2.50"	220-275/380-480	36.5Δ/20.8Y	185
			50Hz	6.50	8.70	387	90	87	72		200-240/345-415	30.4Δ/17.3Y	

**Sound db measured at 3 ft.

MODEL NO. : AB-850 SINGLE STAGE



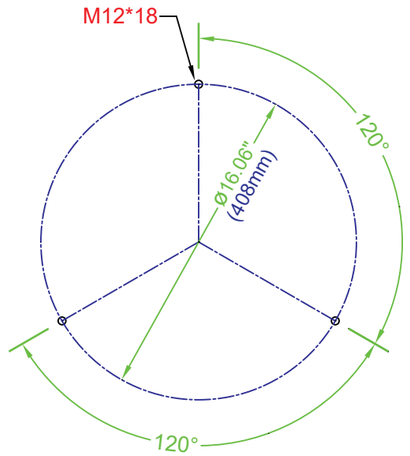


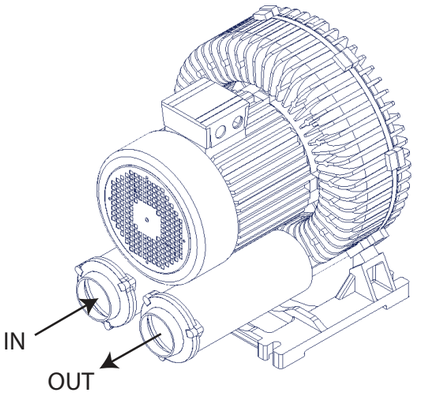
Key

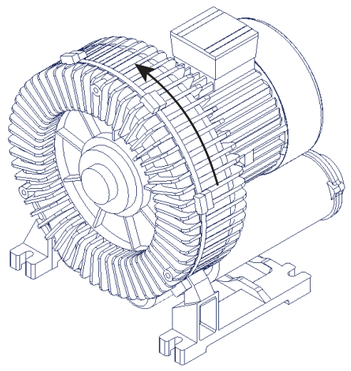
60Hz

50Hz

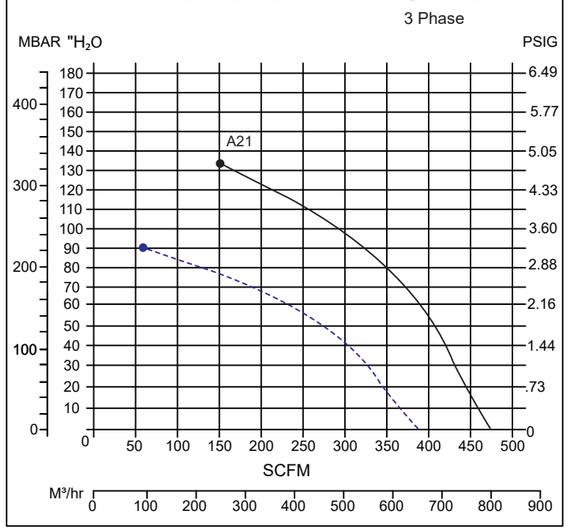
Standard Conditions
-Sea Level (14.69 PSI)
-60°F (15°C)
-0% Relative Humidity



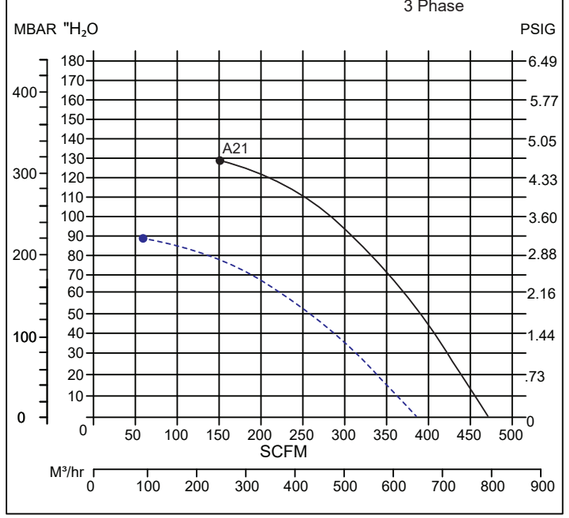




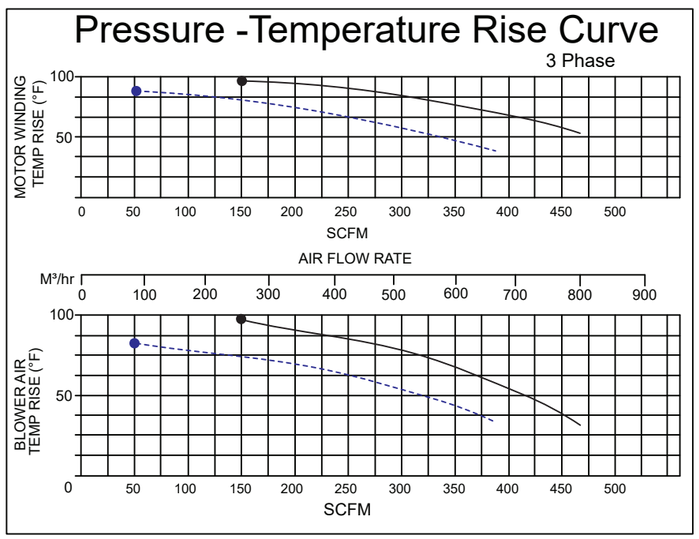
Pressure Performance Curve



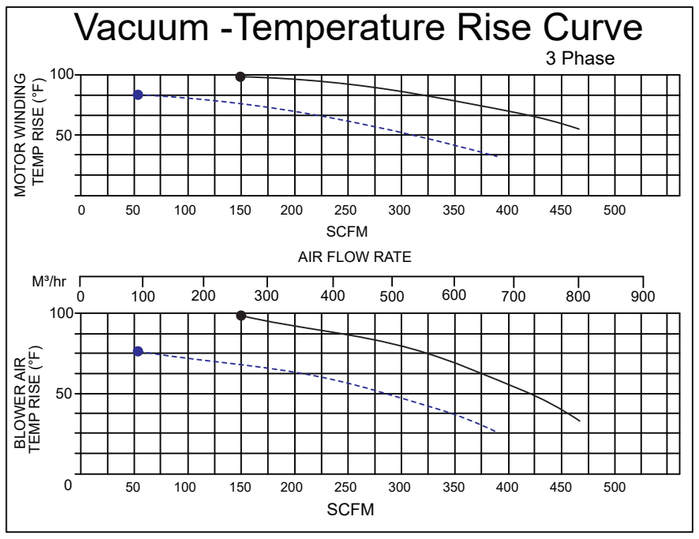
Vacuum Performance Curve



Pressure -Temperature Rise Curve



Vacuum -Temperature Rise Curve



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Blower Enclosure - Zombie Box Model-Peacemaker Medium

ALL-WEATHER, PORTABLE, SOUNDPROOF ENCLOSURES AND SYSTEMS

All of our products and components are engineered and manufactured in the USA

US Patent - 9,641,043

Others Pending





PEACEMAKER - PORTABLE NOISE ENCLOSURE

PeaceMaker enclosure offers up to a -20 dBA reduction in noise *about 99% quieter operation (equipment & environment conditional).

For extra noise reduction and longevity: The Black 'ArmorPlate' color option is an industrial rubberized coating that gives another 2-3 db noise reduction and helps prevent oxidation and tarnish of the galvanized steel.

Don't forget to add the ZPipe Exhaust system and Rubber base pad!

We strongly recommend adding the acoustic rubber base mat for **ALL enclosures! (Rubber Base pads are not included in price)

- Max allowable generator dimensions for MEDIUM: 26 x 20 x 20
- Max allowable generator dimensions for LARGE : 36 x 30 x 30

NOTE: **For proper ventilation** - generators over 10KW, or equipment with multiple cylinders, choose the **Extra Large enclosure**.

Size:

Medium

Color:

Metal

ZombieBox | Noise Control Systems

Patented & others Pending | US Patent 9,641,043

'Make Peace with Power'

ZombieBox International
127 W. Juanita Ave
Ste. 103
Mesa, AZ 85210
www.zombie-box.com
Phone: 623.670.8100
E-mail: info@zombie-box.com

The world's first and ONLY, patented, portable noise control system for generators and outdoor power equipment

ZombieBox | Noise Control Systems

Patented & others Pending | US Patent 9,641,043

'Make Peace with Power'

ZombieBox Noise Control Systems – Portable Soundproofing Enclosures
Our rugged and durable enclosures can be assembled in minutes and deployed easily to reduce the noise intensity and volume of almost ANY portable or standby generator by up to 4X!

Structural & Safety **-**

- Self-supporting, weatherproof against rain, snow and 110mph wind
- 22 gauge galvanized steel construction – 1/16" tolerance fit
- Fully guarded ventilation & penetrations – vermin & rodent proof
- Tamper & Theft resistant 3 point lockable lid – secures all panels
- 4 point internal removable brackets – for secure anchoring
- **No Tools** required for setup - **No Permits** required for installation



*All electrical components and materials meet **NFPA**, **ASTM** and **UL** certification requirements – ZombieBox assemblies & products do not require or hold separate manufacturer certificates or listings

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127 W. Juanita Ave
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ZombieBox | Noise Control Systems

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'Make Peace with Power'

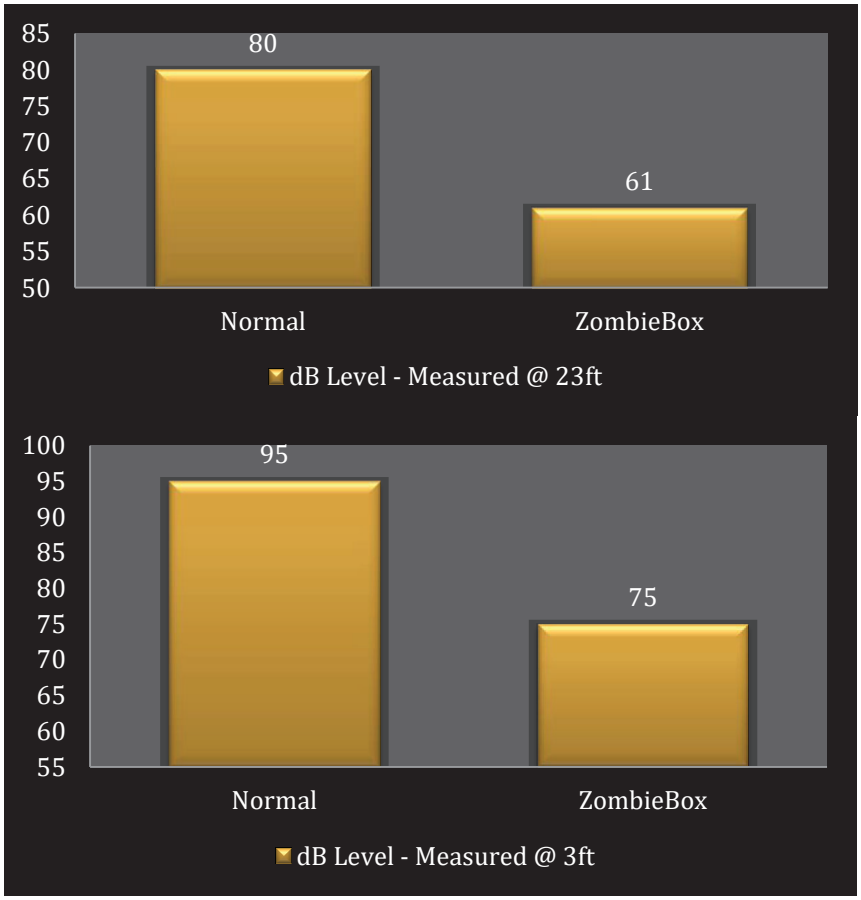
Acoustical Performance -

Sound Pressure Level (SPL) Decibel (dB) Reduction Testing:

- 125Hz to 8kHz | Weight: A | Range: 40-70 dB, 60-90 dB | 50% Load
- Source Unit: Generac 16 – 22kw portable & Standby generators
- Test conditions used: 3/4in rubber isolator pad and Armor Plate rubberized coating

**Independently replicated ASTM E596-96 procedures - actual dB varies with generator, configuration, load and environmental factors*

Noise Reduction				
Model/Color	**Without Z-Pipe**		**With Z-Pipe**	
	ZombieBox	*PeaceMaker*	*ZombieBox*	*PeaceMaker*
Metal	-15db	-20db	-18db	-23db
ArmorPlate	-17db	-22db	-20db	-25db



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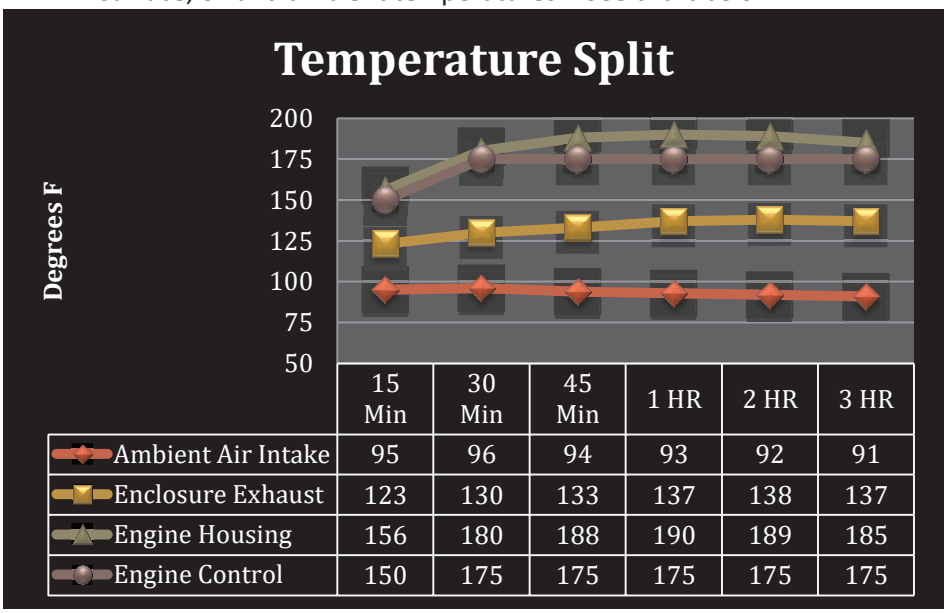
ZombieBox | Noise Control Systems

Patented & others Pending | US Patent 9,641,043

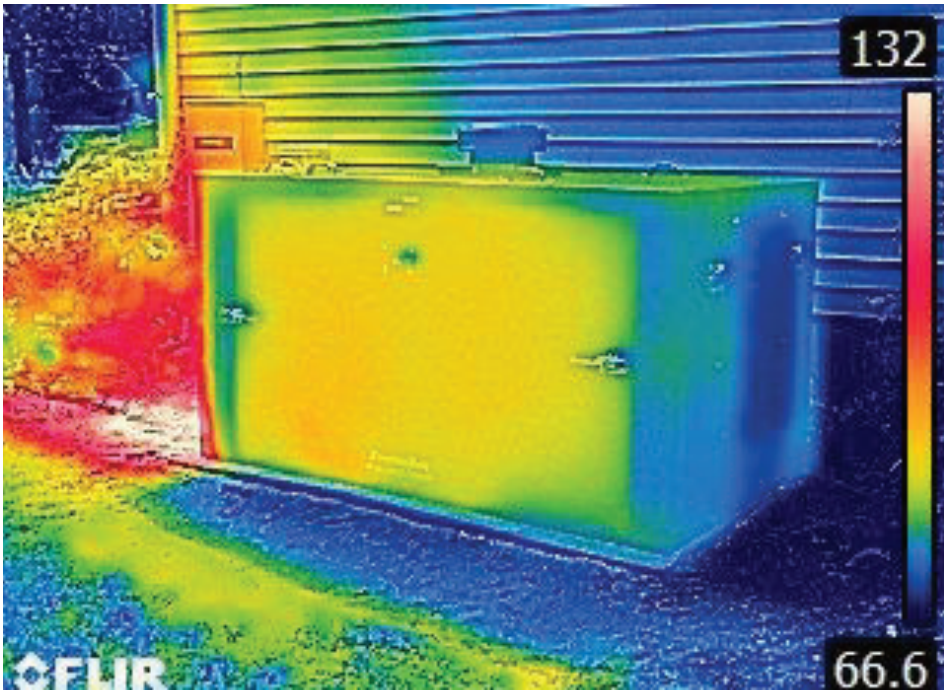
'Make Peace with Power'

Thermal Performance –

- Normal operating conditions: 50% Load, exhausted to exterior of box
- Dissipation rates consistent with standard operation ranges for surface, oil and ambient temperatures – See chart below



	15 Min	30 Min	45 Min	1 HR	2 HR	3 HR
Ambient Air Intake	95	96	94	93	92	91
Enclosure Exhaust	123	130	133	137	138	137
Engine Housing	156	180	188	190	189	185
Engine Control	150	175	175	175	175	175



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Moisture Separator #AWS80-6

ESD Waste2Water, Inc.
Partnership for a Cleaner Tomorrow

Air / Water Separators



ESD Waste2Water, Inc. ESD custom fabricates Air / Water Separators for Soil Vapor Extraction and Dual Phase Extraction applications. Made of structurally sound, light-weight marine grade 5052 aluminum, our separators can withstand full vacuum applications and are completely corrosion resistant. Unlike carbon steel based separators, ESD Separators resist both internal chemical corrosion and the harshest external environmental conditions. The aesthetic qualities of ESD Separators are never compromised by oxidation. ESD Separators never experience corrosive pitting leaks, because our designs render expensive internal/external epoxy mastic coatings entirely unnecessary.

ESD Separators are available in many standard sizes and can be custom designed with a wide variety of options, including pump out systems, level gauging, additional particulate filtration, and baffling for high entrained

UL® Certified to UL-508A Standards

Thank you for allowing ESD to provide a solution to your equipment needs.





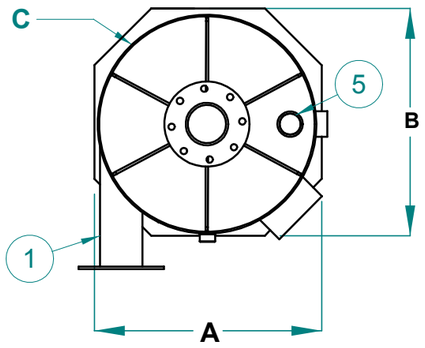
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Tel: 800.277.3279 Fax: 352.680.9278
www.waste2water.com

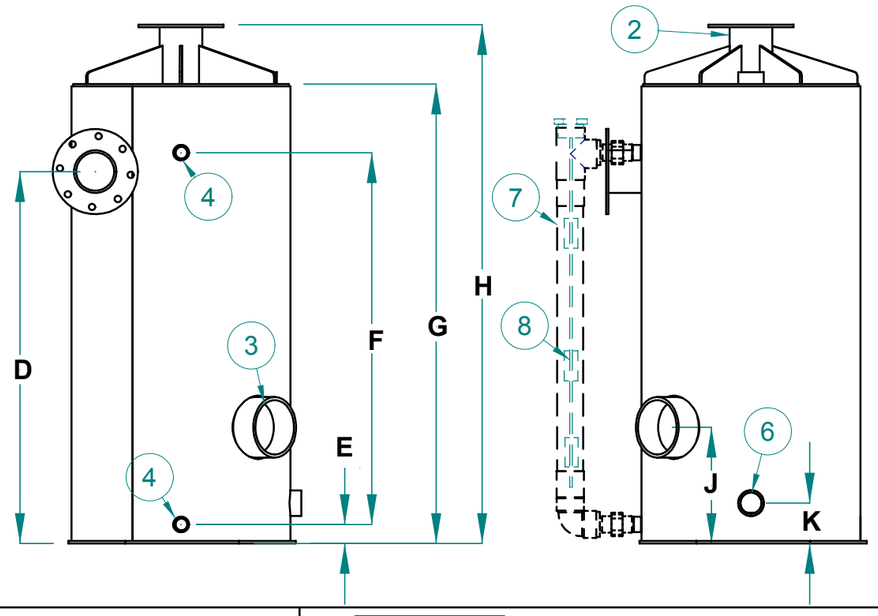


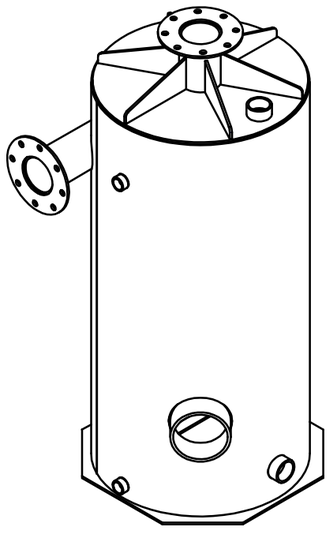
STANDARD AWS SPECIFCATION

TYPE	WORKING VOLUME @(LSH)	AVAILABLE CONNECTION TYPE																CLEAN OUT PIPE	A	B	C (DIA.)	D	E	F	G	H	J
		FLANGE						MNPT					FNPT														
		2"	3"	4"	6"	8"	10"	2"	3"	4"	6"	8"	2"	3"	4"	6"	8"										
AWS30	12 GAL	X	X	X	-	-	-	X	X	X	-	-	X	X	X	-	-	6"	-	-	16 1/4"	25"	2"	19"	30"	33 1/2"	6"
AWS60	24 GAL	X	X	X	X	-	-	X	X	X	X	-	X	X	X	-	-	6"	24"	24"	23"	25"	2"	23"	30"	36 1/2"	6"
AWS80	47 GAL	X	X	X	X	-	-	X	X	X	X	-	X	X	X	-	-	8"	24"	24"	23"	39"	2"	39"	48"	54 3/4"	12"
AWS120	50 GAL	X	X	X	X	X	-	X	X	X	X	-	X	X	X	-	-	8"	24"	24"	23"	49"	2"	49"	60"	66 3/4"	12"
AWS220	107 GAL	-	X	X	X	X	X	X	X	X	X	-	X	X	X	-	-	8"	34"	34"	33 1/2"	49"	2"	49"	60"	66 3/4"	12"

RECOMMENED AIR FLOW (ACFM)						
	2"	3"	4"	6"	8"	10" *
ACFM	120	280	320	500	750	1000







ITEM #	DESCRIPTION
1	INLET PIPE (SEE TABLE FOR AVAILABLE SIZE AND CONNECTION TYPE)
2	OUTLET PIPE (SEE TABLE FOR AVAILABLE SIZE AND CONNECTION TYPE)
3	CLEAN OUT
4	1" FNPT (MULTI LEVEL PROBE)
5	2" FNPT
6	2" FNPT
7	SIGHT TUBE 2" CLEAR PVC
8	MULTI LEVEL PROBE

NOTES:
1.MATERIAL : 1/8" & 3/16" ALUMINUM SHT 5052
2. PROBE (SIGHT TUBE) : 2" CLEAR PVC
3. CUSTOM SIZES AVAILABLE

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ESD Waste2Water, Inc.

495 Oak Road
Ocala, FL 34472
Phone (800) 277-3279
Fax (352) 680-0059

SCALE VERIFCATION

THIS BAR REPRESENTS ONE INCH ON ORIGNAL DRAWING

1"

USE TO VERIFY DRAWING

SIZE: B **SHEET #:** 1 OF 1

SCALE: NTS

UPDATED BY:

DRAWN BY: J.ANDREWS

APPROVED BY: N/A

COMPLETED: 06/15/10

UPDATED:

AWS SPECIFICATIONS
GENERAL LAYOUT

JOB NUMBER:

PRODUCT NUMBER: **AWS**

FILE NAME: "AWS SPEC.dft"

Moisture Separator Float Switch #L6-EPB-BS3A

Model L6 FLOTECT® Float Switch

Specifications - Installation and Operating Instructions

Explosion-Proof; UL and CSA Listed -
Class I, Groups *A, B, C, & D
Class II, Groups E, F & G
Directive 94/9/EC (ATEX) Compliant for
II 2 G EEx d IIC T6 Process Temp≤75°C CE Ex
*(Group A, stainless steel body only)





SPECIFICATIONS

Service: Liquids compatible with wetted materials.
Wetted Materials:
Float: Solid polypropylene or 304 SS.
Lower Body: Brass or 303 SS.
Magnet: Ceramic.
External Float Chamber (Tee): Matches lower body choice of brass or 303 SS.
Other: Lever Arm, Spring, Pin, etc.: 301 SS.
Temperature Limit: -4 to 220°F (-20 to 105°C) Standard, MT high temperature option 400°F (205°C)(MT not UL, CSA or ATEX). ATEX compliant AT option ambient temperature -4 to 167°F (-20 to 75°C) process temperature: -4 to 220°F (-20 to 105°C).
Pressure Limits: See next page.
Enclosure Rating: Weatherproof and Explosion-proof. Listed with UL and CSA for Class I, Groups A, B, C and D; Class II, Groups E, F, and G. (Group A on stainless steel body models only). CE 0344 Ex II 2 G EEx d IIC T6 Process Temp≤75°C.
EC-Type Certificate No.: KEMA 04ATEX2128
Switch Type: SPDT snap switch standard, DPDT snap switch optional.
Electrical Rating: UL models: 5A @ 125/250 VAC (V~). CSA and ATEX models: 5A @ 125/250 VAC (V~); 5A res., 3A ind. @ 30 VDC (V⎓). MV option: .1A @ 125 VAC (V~). MT option: 5A @125/250 VAC (V~). [MT option not UL, CSA or ATEX].
Electrical Connections: UL models: 18 AWG, 18″ (460 mm) long. ATEX/CSA models: terminal block.
Upper Body: Brass or 303 SS.
Conduit Connection: 3/4″ male NPT standard, 3/4″ female NPT on junction box models.
Process Connection: 1″ male NPT on models without external float chamber, 1″ female NPT on models with external float chamber.
Mounting Orientation: Horizontal with index arrow pointing down.
Weight: Approximately 1 lb (.5 kg) without external float chamber, 1.75 lb (.8 kg) with external float chamber.
Specific Gravity: See next page.

Example	L6	EP	B	B	S	3	B	MT		L6EPB-B-S-3-B-MT level switch; brass upper housing, brass lower housing, brass tee with Polypropylene spherical float, SPDT snap switch, and high temperature option
Series	L6									Series L6 level switch
Construction		EP								Explosion proof and weatherproof
Upper Body Material			B S							Brass 303 Stainless Steel
Lower Body Material				B S						Brass 303 Stainless Steel
Circuit (Switch) Type					S D					SPDT DPDT
Line Size						3 4 5 6				1″ NPT 1-1/4″ NPT (No tee models only) 1-1/2″ NPT (No tee models only) 2″ NPT
Tee and Float Options							0 A B C H L S			No Tee, Solid Polypropylene Spherical Float* No Tee, 304 SS Cylindrical Float Brass Tee, Solid Polypropylene Spherical Float* No Tee, 304 SS Spherical Float Brass Tee, 304 SS Spherical Float 303 SS Tee, 304 SS Spherical Float 303 SS Tee, Solid Polypropylene Spherical Float*
Switch Options								MV MT		Gold Contacts on snap switch for dry circuits (see specifications for ratings) High Temperature switch rated 400°F (205°C) (see specifications for ratings)*
Options									AT CSA GL ID JCT TBC TOP	ATEX approved construction (with JCT option standard) CSA approved construction (with JCT option standard)* Ground Lead* Customer Information on standard nameplate Weatherproof and explosion-proof junction box* Terminal Block Connector* Top Mounted (No tee models only)*

* Options that do not have ATEX

Attention: Units without the "AT" suffix are not Directive 94/9/EC (ATEX) compliant. These units are not intended for use in potentially hazardous atmospheres in the EU. These units may be CE marked for other Directives of the EU.

W.E. ANDERSON DIV., DWYER INSTRUMENTS, INC.
P.O. BOX 358 • MICHIGAN CITY, INDIANA 46361 U.S.A.
Phone: 219/879-8000
Fax: 219/872-9057
www.dwyer-inst.com
e-mail: info@dwyer-inst.com

MAXIMUM PRESSURE CHART

Model Number	Float	Minimum Sp. Gr.	Pressure Rating psig (bar)
L6EPB-B-S-3-A	Cylindrical SS	0.5	200 (13.8)
L6EPB-B-S-3-B	Polypropylene	0.9	250 (17.2)
L6EPB-B-S-3-C	Round SS	0.7	350 (24.1)
L6EPB-B-S-3-H	Round SS	0.7	250 (17.2)
L6EPB-B-S-3-O	Polypropylene	0.9	1000 (69.0)
L6EPB-S-S-3-A	Cylindrical SS	0.5	200 (13.8)
L6EPB-S-S-3-C	Round SS	0.7	350 (24.1)
L6EPB-S-S-3-L	Round SS	0.7	350 (24.1)
L6EPB-S-S-3-O	Polypropylene	0.9	2000 (138)
L6EPB-S-S-3-S	Polypropylene	0.9	2000 (138)

WETTED MATERIALS CHART

Model	Brass	Bronze	Ceramic	Polypropylene	301SS	303SS	304SS
B-S-3-A	X		X		X		X
B-S-3-B	X	X	X	X	X		
B-S-3-C	X		X		X		X
B-S-3-H	X	X	X		X		X
B-S-3-O	X	X	X	X	X		
S-S-3-A			X	X	X		X
S-S-3-C			X		X	X	X
S-S-3-L			X		X	X	X
S-S-3-O			X	X	X	X	
S-S-3-S			X	X	X	X	

INSTALLATION

Unpack switch and remove any packing material found inside lower housing or float chamber.

Switch must be installed with body in a horizontal plane and arrow on side pointing down.

If switch has an external float chamber (tee), connect it to vertical sections of 1″ NPT pipe installed outside vessel walls at appropriate levels. If unit has no external float chamber, it must be mounted in a 1″ NPT half coupling welded to the vessel wall. The coupling must extend through the wall.

Inspect and clean wetted parts at regular intervals.

ELECTRICAL CONNECTIONS

Connect wire leads in accordance with local electrical codes and switch action required. N.O. contacts will close and N.C. contacts will open when liquid level causes float to rise. They will return to “normal” condition on decreasing liquid level. Black = common, Blue = N.O. and Red = N.C.

For units supplied with both internal and external grounds the ground screw inside the housing must be used to ground the control. The external ground screw is for supplementary bonding when allowed or required by local code. Some CSA listed models are furnished with a separate green ground wire. Such units must be equipped with a junction box, no supplied but available on special order.

EC-Type Certificate Installation Instructions:

Cable Connection

The cable entry device shall be certified in type of explosion protection flameproof enclosure “d”, suitable for conditions of use and correctly installed. For ambient temperatures over 70°C, cable and cable glands suitable for at least 90°C shall be used.

Conduit Connection

An EEx d certified sealing device such as a conduit seal with setting compound shall be provided immediately to the entrance of the valve housing. For ambient temperatures over 70°C, the wiring and setting compound in the conduit seal shall be suitable for at least 90°C.

Note: ATEX units only: The temperature class is determined by the maximum ambient and or process temperature. Units are intended to be used in ambient of -20°C≤ Tamb ≤75°C. Units may be used in process temperatures up to 105°C providing the enclosure and switch body temperatures do not exceed 75°C. The standard Temperature Class is T6 Process Temp ≤75°C.

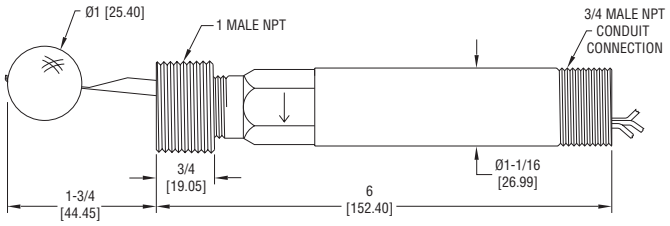
All wiring, conduit and enclosures must meet applicable codes for hazardous areas. Conduits and enclosures must be properly sealed. For outdoor or other locations where temperatures vary widely, precautions should be taken to prevent condensation inside switch or enclosure. Electrical components must be kept dry at all times.

CAUTION: To prevent ignition of hazardous atmospheres, disconnect the device from the supply circuit before opening. Keep assembly tightly closed when in use.

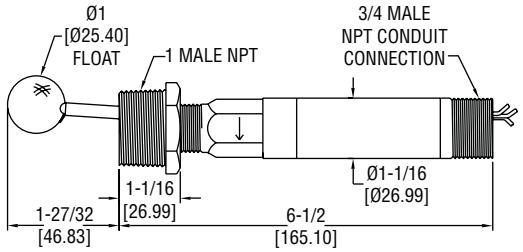
MAINTENANCE

Inspect and clean wetted parts at regular intervals. The cover should be in place at all times to protect, the internal components from dirt, dust and weather and to maintain hazardous location ratings. Disconnect device from the supply circuit before opening to prevent ignition of hazardous atmosphere.

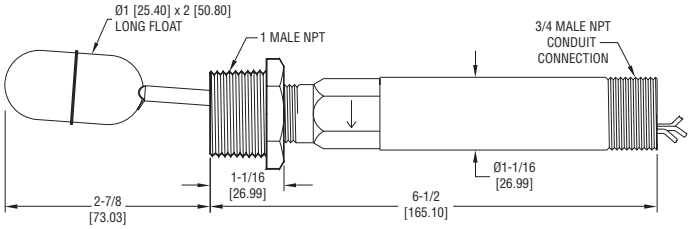
FLOTECT® MODEL L-6 FLOAT SWITCH — DIMENSION DRAWINGS



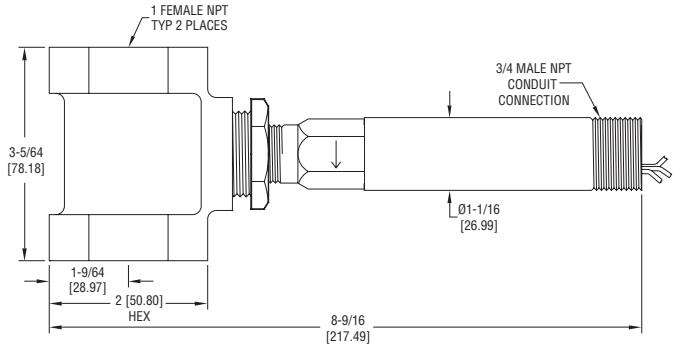
Polypropylene Float



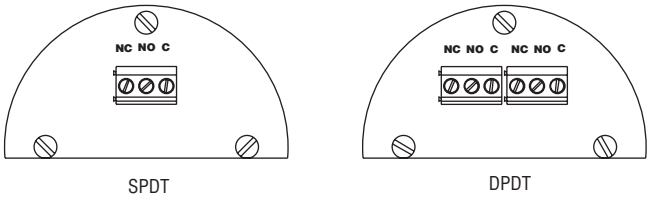
Round Stainless Steel Float



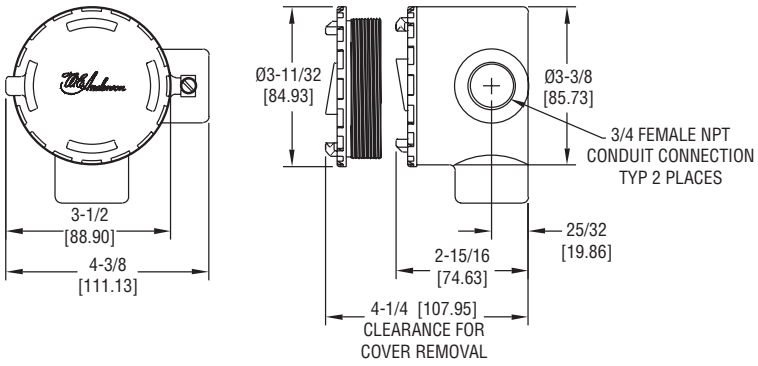
Cylindrical Stainless Steel Float



With External Chamber (Tee)



Terminal Connections CSA, ATEX Enclosures



CSA, ATEX Conduit Enclosure

Limited Warranty: The Seller warrants all Dwyer instruments and equipment to be free from defects in workmanship or material under normal use and service for a period of one year from date of shipment. Liability under this warranty is limited to repair or replacement F.O.B. factory of any parts which prove to be defective within that time or repayment of the purchase price at the Seller's option provided the instruments have been returned, transportation prepaid, within one year from the date of purchase. All technical advice, recommendations and services are based on technical data and information which the Seller believes to be reliable and are intended for use by persons having skill and knowledge of the business, at their own discretion. In no case is Seller liable beyond replacement of equipment F.O.B. factory or the full purchase price. This warranty does not apply if the maximum ratings label is removed or if the instrument or equipment is abused, altered, used at ratings above the maximum specified, or otherwise misused in any way.

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W.E. ANDERSON DIV., DWYER INSTRUMENTS, INC.
P.O. BOX 358 • MICHIGAN CITY, INDIANA 46361 U.S.A.

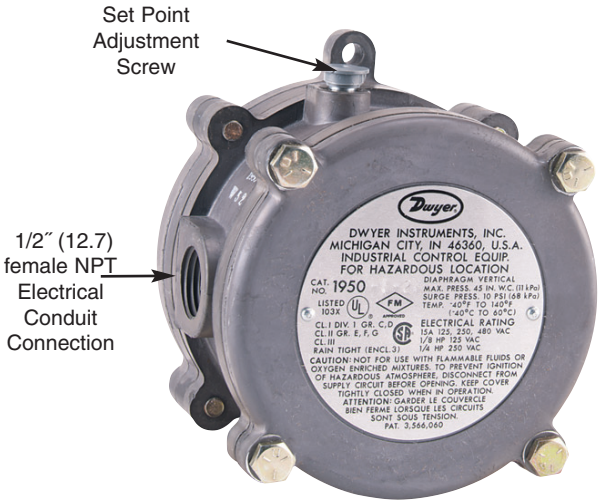
Phone: 219/879-8000
Fax: 219/872-9057

www.dwyer-inst.com
e-mail: info@dwyer-inst.com

SVE Vacuum Switch #1950-20-2F

Series 1950 Explosion-Proof Differential Pressure Switches

Specifications - Installation and Operating Instructions



Series 1950 Explosion-Proof Differential Pressure Switches combine the best features of the Dwyer Series 1900 Pressure Switch with an integral explosion-proof and weather-proof housing. Each unit is UL & CSA listed; FM approved for use in Class I, Groups C & D; Class II, Groups E, F, & G; and Class III atmospheres (NEMA 7 & 9). They are totally rain-tight for outdoor installations. Twelve models allow set-points from .03 to 20 inches w.c. and from .5 to 50 psi (3.4 to 345 kPa).

Easy access to the SPDT switch for electrical hook-up is provided by removing the top plate of the three-part aluminum housing. Adjustment to the set point of the switch can be made without disassembling the housing. The unit is very compact, about half the weight and bulk of equivalent conventional explosion-proof switches.

CAUTION

For use only with air or compatible gases. Use of the Model 1950 switch with explosive media connected to the Low pressure port (including differential pressure applications in such media) is not recommended. Switch contact arcing can cause an explosion inside the switch housing which, while contained, may render the switch inoperative. If switch is being used to sense a single positive pressure relative to atmosphere, run a line from the low pressure port to a non-hazardous area free of combustible gases. This may increase response time on -0 and -00 models.

NOTE: The last number-letter combination in the model number identifies the switch's electrical rating (number) and diaphragm material (letter). The 2F combination is standard as described in the physical data above. In case of special models, a number 1 rating is the same as 2; a number 3 or 4 rating is 10A 125, 250, 480 VAC; 1/8 H.P. 125 VAC; 1/4 H.P. 250 VAC; a number 5 or 6 rating is 1A 125 VAC. Letter B indicates a Buna-N diaphragm; N = Neoprene; S = Silicone; and V = Viton®.

UL and CSA Listed, FM Approved For

CL. I GR. C, D - CL. II GR. E, F, G - CL. III

Series 1950 Switches

Operating ranges and deadbands

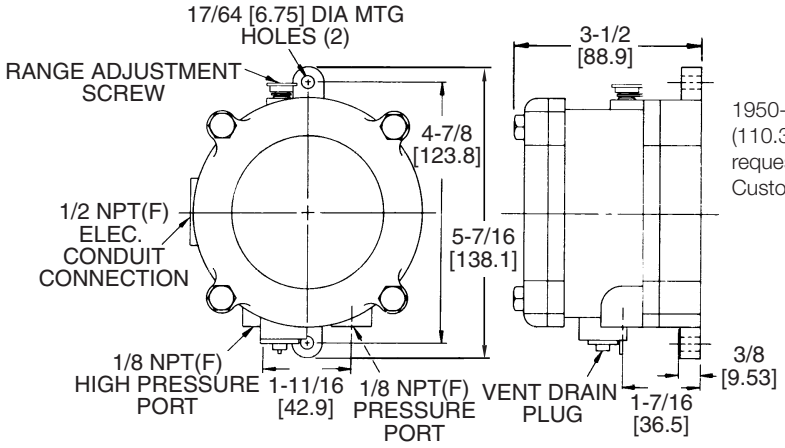
To order specify Model Number	Operating Range: Inches, W.C.	Approximate Dead Band	
		At Min. Set Point	At Max. Set Point
1950-02-2S	0.03 to 0.10	0.025	0.05
1950-00-2F	0.07 to 0.15	0.04	0.05
1950-0-2F	0.15 to 0.5	0.10	0.15
1950-1-2F	0.4 to 1.6	0.15	0.20
1950-5-2F	1.4 to 5.5	0.3	0.4
1950-10-2F	3.0 to 11.0	0.4	0.5
1950-20-2F	4.0 to 20.0	0.4	0.6
Model Number	**Operating Range: PSI**	**Approximate Dead Band**	
		Min. Set Point	Max. Set Point
1950P-2-2F	0.5 to 2.0	0.3 psi	0.3 psi
1950P-8-2F	1.5 to 8.0	1.0 psi	1.0 psi
1950P-15-2F	3.0 to 15.0	0.9 psi	0.9 psi
1950P-25-2F	4.0 to 25.0	0.7 psi	0.7 psi
1950P-50-2F	15.0 to 50	1.0 psi	1.5 psi

SPECIFICATIONS

Service: Air and non-combustible, compatible gases.
Wetted Materials: Consult factory.
Temperature Limits: -40 to 140°F (-40 to 60°C); 0 to 140°F (-17.8 to 60°C) for 1950P-8, 15, 25, and 50. -30 to 130°F (-34.4 to 54.4°C) for 1950-02.
Pressure Limits:
Continuous: 1950's - 45″ w.c. (0.11 bar);
1950P's - 35 psi (2.41 bar); 1950P-50 only - 70 psi (4.83 bar).
Surge: 1950's - 10 psi (0.69 bar), 1950P's - 50 psi (3.45 bar), 1950P-50 only - 90 psi (6.21 bar).
Enclosure Rating: IP64, NEMA 3, 7 and 9.
Switch Type: Single-pole double-throw (SPDT).
Electrical Rating: 15 A @, 125, 250, 480 VAC, 60 Hz. Resistive 1/8 HP @ 125 VAC, 1/4 HP @ 250 VAC, 60 Hz.
Electrical Connections: 3 screw type, common, normally open and normally closed.
Process Connections: 1/8″ female NPT.
Mounting Orientation: Diaphragm in vertical position. Consult factory for other position orientations.
Set Point Adjustment: Screw type on top of housing.
Weight: 3.25 lb (1.5 kg); 1950-02 model, 4.4 lb (2 kg).
Agency Approvals: CE, UL, CSA, FM.

RESPONSE TIME: Because of restrictive effect of flame arrestors, switch response time may be as much as 10-25 seconds where applied pressures are near set point.

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1950-02: 7-3/4″ (196.9) dia. x 4-11/32″ (110.3) depth. For complete dimensions request drawing 28-700175-00 from our Customer Service Department

1950 Switch Outline Dimensions

INSTALLATION

1. Select a location free from excess vibration and corrosive atmospheres where temperatures will be within the limits noted under Specifications on reverse. Switch may be installed outdoors or in areas where the hazard of explosion exists. See reverse for specific types of hazardous service.

2. Mount standard switches with the diaphragm in a vertical plane and with switch lettering and Dwyer nameplate in an upright position. Some switches are position sensitive and may not reset properly unless they are mounted with the diaphragm vertical.

3. Connect switch to source of pressure, vacuum or differential pressure. Metal tubing with 1/4″ O.D. is recommended, but any tubing which will not restrict the air flow can be used. Connect to the two 1/8″ female NPT pressure ports as noted below:

A. Differential pressures - connect pipes or tubes from source of greater pressure to high pressure port marked HIGH PRESS, and from source of lower pressure to low pressure port marked LOW PRESS.

B. Pressure only (above atmospheric pressure) - connect tube from source of pressure to high pressure port. The low pressure port is left open to atmosphere.

C. Vacuum only (below atmospheric pressure) - connect tube from source of vacuum to low pressure port. The high pressure port is left open to atmosphere.

4. To make electrical connections, remove the three hex head screws from the cover and after loosening the fourth captive screw, swing the cover aside. Electrical connections to the standard single pole, double throw snap switch are provided by means of terminals marked “COM” (common), “NO” (norm open), “NC” (norm closed). The normally open contacts close and the normally closed contacts open when pressure increases beyond the set point. Switch loads for standard models should not exceed the maximum specified current rating of 15 amps resistive. Switch capabilities decrease with an increase in ambient temperature, load inductance, or cycling rate. Whenever an application involves one or more of these factors, the user may find it desirable to limit the switched current to 10 amps or less in the interest of prolonging switch life.

ADJUSTMENT: To Change the Set point

1. Remove the plastic cap and turn the slotted Adjust-ment Screw at the top of the housing clockwise to raise the set point pressure and counter-clockwise to lower the set point. After calibration, replace the plastic cap and re-check the set point.

2. The recommended procedure for calibrating or checking calibration is to use a “T” assembly with three rubber tubing leads, all as short as possible and the entire assembly offering minimum flow restriction. Run one lead to the pressure switch, another to a manometer of known accuracy and appropriate range, and apply pressure through the third tube. Make final approach to the set point very slowly. Note that manometer and pressure switch will have different response times due to different internal volumes, lengths of tubing, fluid drainage, etc. Be certain the switch is checked in the position it will assume in use, i.e. with diaphragm in a vertical plane and switch lettering and Dwyer nameplate in an upright position.

3. For highly critical applications check the set point adjustment and if necessary, reset it as noted in step A.

MAINTENANCE

The moving parts of these switches need no maintenance or lubrication. The only adjustment is that of the set point. Care should be taken to keep the switch reasonably clean. Periodically the vent drain plug should be rotated, then returned to its original position. This will dislodge deposits which could accumulate in applications where there is excessive condensation within the switch. The Series 1950 Explosion-Proof Differential Pressure Switch is not field serviceable and should be returned if repair is needed (field repair should not be attempted and may void warranty). Be sure to include a brief description of the problem plus any relevant application notes. Contact customer service to receive a return goods authorization number before shipping.

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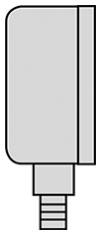
McMASTER-CARR®

Ultra-Low Vacuum Gauge with 1/4 NPT Male Bottom Connection

4" Dial Diameter, 304 Stainless Steel Case

4106K2





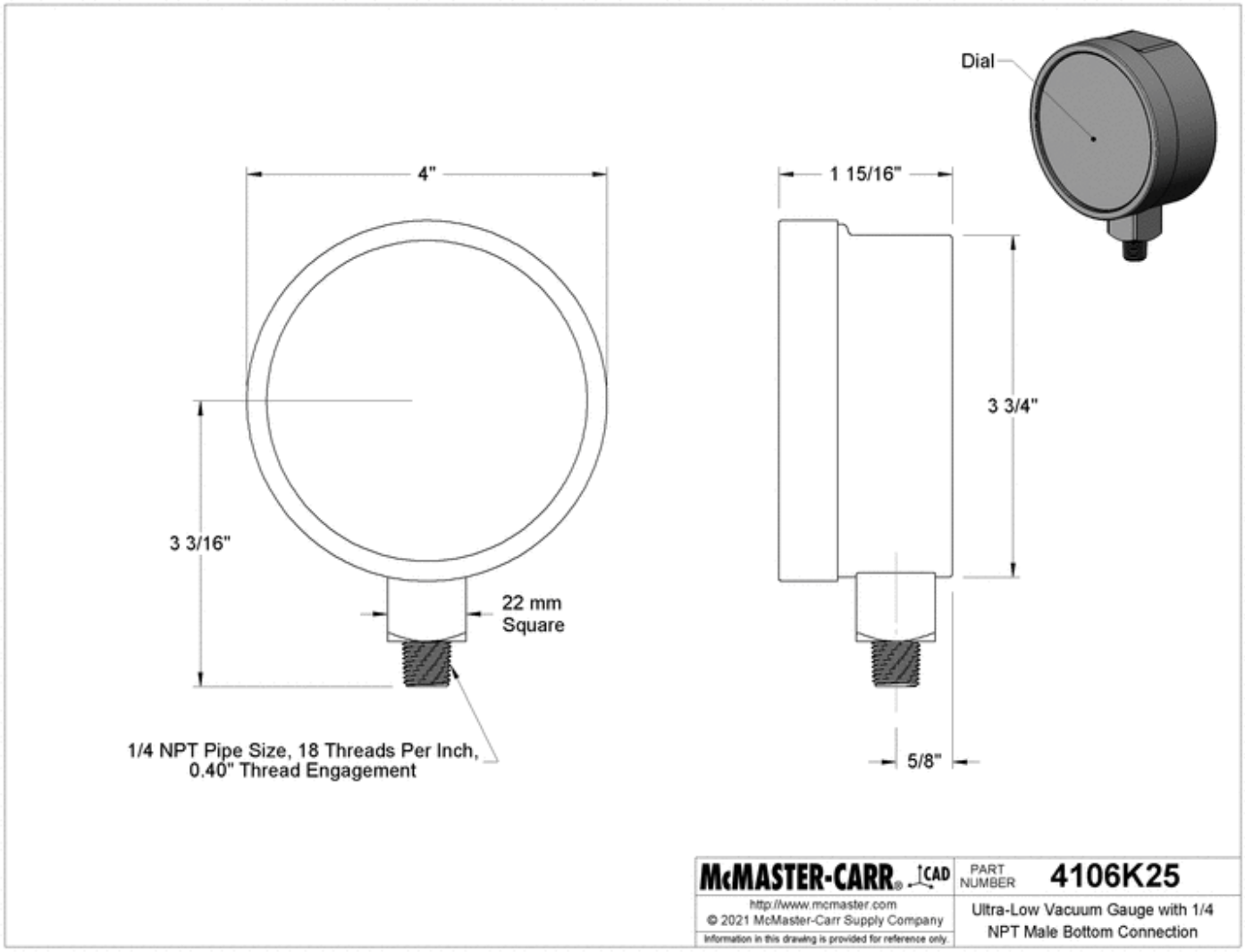
Bottom Connection

Measures	Vacuum
For Use With	Air
Display Type	Dial
Dial Type	Dry
Dial Diameter	4"
Pipe Size	1/4
Scale Type	Single
Scale	in. of H_2O
Environment Temperature Range	0° to 140° F
Process Temperature Range	0° to 175° F
Connection Type	Pipe
Pipe Connection Type	Threaded
Thread Type	NPT
Gender	Male
Case Material	304 Stainless Steel
Connection Material	Brass
Lens Material	Glass
Accuracy	±1%
Accuracy Scale	Full Scale
Accuracy Grade	Not Graded
Connection Location	Bottom
Graduation Marks	2 in. of h_2o
Numeric Increments	20 in. of h_2o
Vacuum Range	-100 to 0 in. of h_2o
RoHS	RoHS 3 (2015/863/EU) compliant with exemption 6(c) - Lead in copper alloy
REACH	REACH (EC 1907/2006) (01/17/2022, 223 SVHC) Compliant
DFARS	Specialty Metals COTS-Exempt
Country of Origin	Switzerland
Schedule B	902620.0000
ECCN	EAR99

Accommodate applications with very low vacuum with these gauges. Use them with vacuum pumps, packaging equipment, and in suction lines to measure and display vacuum.

Gauges with 304 stainless steel case have better corrosion resistance than gauges with steel case.

Vacuum Range, in. of H_2O: -100 to 0



The information in this 3-D model is provided for reference only.

KELE ALARM INDICATION STATION

AIS

DESCRIPTION

The **Kele Model AIS Alarm Indication Station** features an indication light, alarm horn and an alarm horn silence switch. Upon an alarm contact closure, the LED indicator will light and the horn will sound. The horn can be silenced through the alarm silence switch, while the visual indication will continue to be lighted until the alarm condition has been corrected.

SEQUENCE OF OPERATION

Upon an alarm contact closure, the LED indicator will light, and the horn will sound. The horn can be silenced through the alarm silence switch, while the visual indication will continue to be lighted until the alarm condition has been corrected. A power interruption or open alarm contact will reset the AIS.

FEATURES

- ***Long lasting, red LED indication***
- ***Distinct continuous audible tone***
- ***Horn silence switch***
- ***Compact and rugged design***
- ***Available in 24 VDC, 24 VAC, or 120 VAC***
- ***Bright yellow panel face***



AIS Series

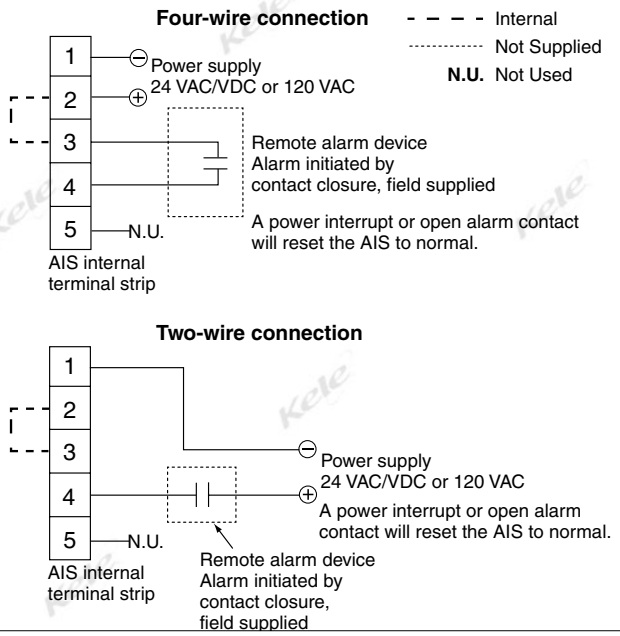
APPLICATION

- ***Refrigerant leak alarm indication***
- ***Water level alarm indication***
- ***Pressure alarm indication***
- ***High/Low temperature limits***
- ***Gas leak indication***
- ***Humidity limit alarm indication***
- ***Vibration limit***
- ***Voltage/Current level limit***
- ***Any contact closure alarm application***

SPECIFICATIONS

Supply Voltage	24 VAC @ 2.4 VA, 24 VDC @ 100 mA max., 120 VAC
Relay Output	
AIS-24D	24 VDC, 50 mA min
AIS-24A	24 VAC, 90 mA min
AIS-120A	120 VAC, 70 mA min
Alarm Horn	80 db
Mounting	Four screws through back
Dimensions	7.09"H x 4.33"W x 4.52"D (18.0 x 11.0 x 11.47 cm)
Enclosure Rating	NEMA 4, Polystyrene, impact resistant, knock-outs
Weight	1.1 lb (0.5 Kg)
Approvals	RoHS
Warranty	1 year

WIRING



ORDERING INFORMATION

MODEL	DESCRIPTION	
AIS	Alarm indication station	
	12VD	12 VDC powered
	24D	24 VDC powered
	24A	24 VAC powered
	120A	120 VAC powered

AIS – **120A**

Example: **AIS-24A** 24 VAC powered alarm indication station

Soil Vapor Extraction System O&M Manual

27-10 49th Avenue,
Long Island City, NY

Prepared for:

Roux
209 Shafter Street
Islandia, NY 11749

Prepared by:

EnviroTrac Ltd.
5 Old Dock Road
Yaphank, NY 11980

June 2024

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- Zombie Box Blower Sound Enclosure Specifications
- Fuji **#VV8** Vacuum, Relief Valve Specifications

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- Dwyer Instruments **#F6-MHS2** Moisture Separator Level Switch Specifications – Installation and Operating Instructions
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Section 4 – Control Panel

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- WEG Motor Contactor Specifications
- WEG Motor Overload Specifications
- Finder Slim Control Relays **#34.51.7.024.0010** Specifications
- Meanwell DC Power Supply **#HDR-30** Specifications
- Weidmuller 6mm Terminal Block Specifications
- Iboco Wire Channel Specifications

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- FIG-1-SVE System Process and Instrumentation Diagram
- FIG-2-SVE Equipment Layout

1. SSD EQUIPMENT

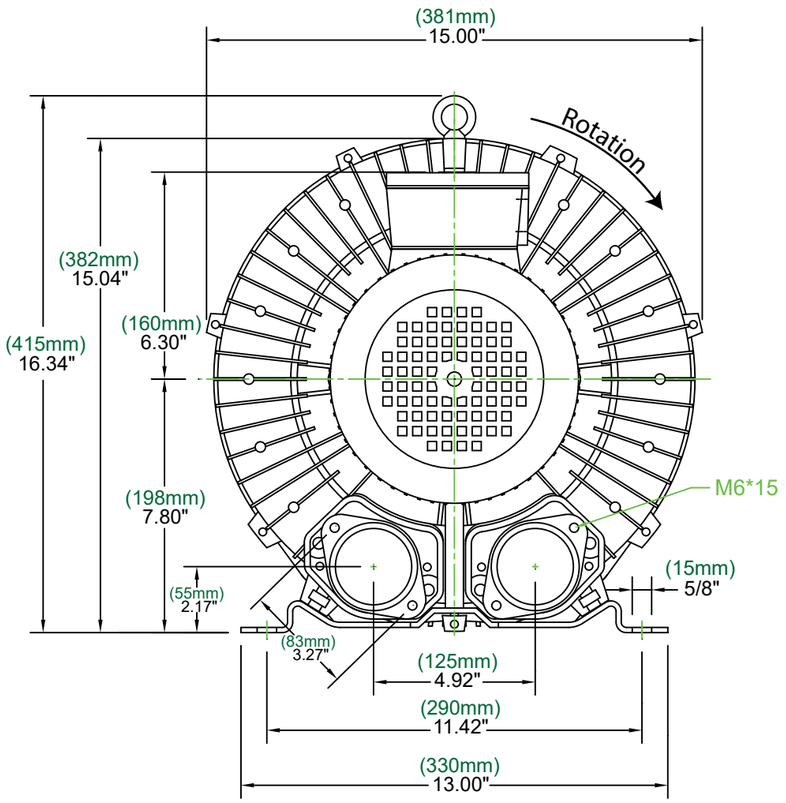
North and Central Systems

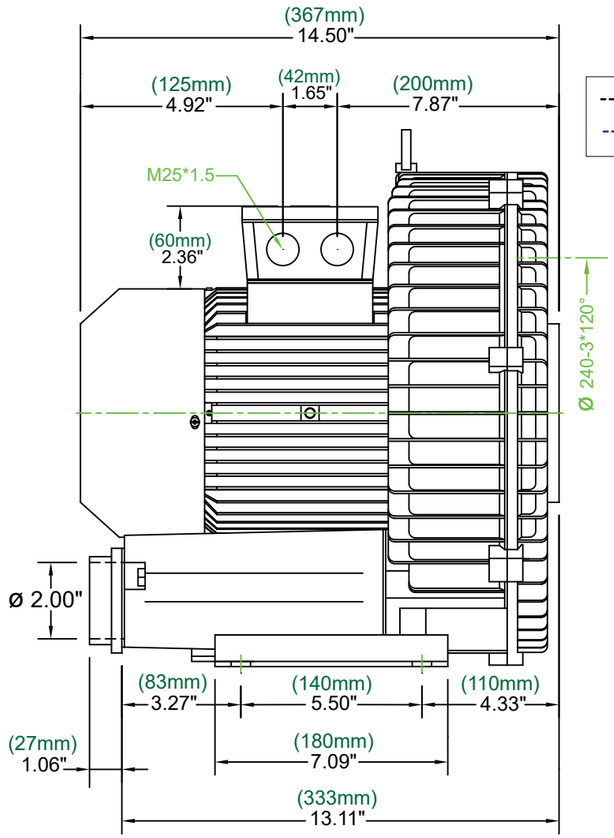
atlantic blowers

Phase	Model Number	Curve Number	Frequency (Hz)	KW	HP	Max Flow (SCFM)	Max Pressure ("H_2O)	Maximum Vacuum	Sound Level (db)	Inlet Diameter	Voltage	Current (A)	Weight (lbs)
3	AB-700	A19	60Hz	4.60	6.00	230	134	133	72	2.00"	220-275/380-480	16.2Δ/9.3Y	95
			50Hz	4.00	5.40	192	93	92	69		200-240/345-415	14.3Δ/8.2Y	

**Sound db measured at 3 ft.

MODEL NO. : AB-700 SINGLE STAGE





Key

--------60Hz

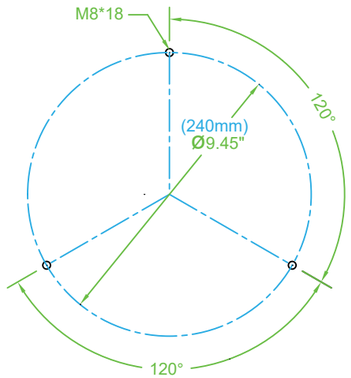
--------50Hz

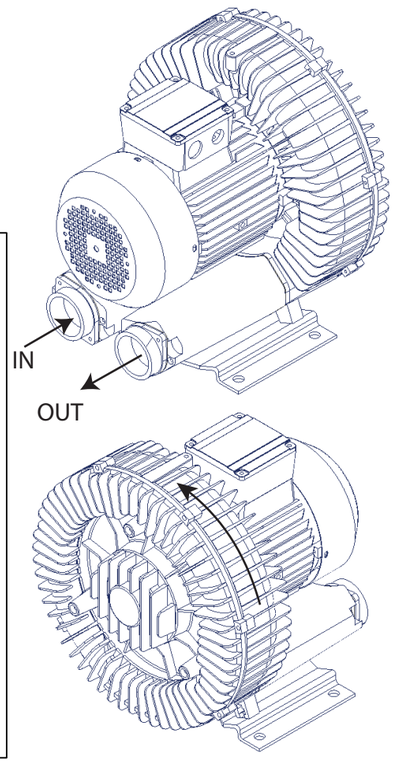
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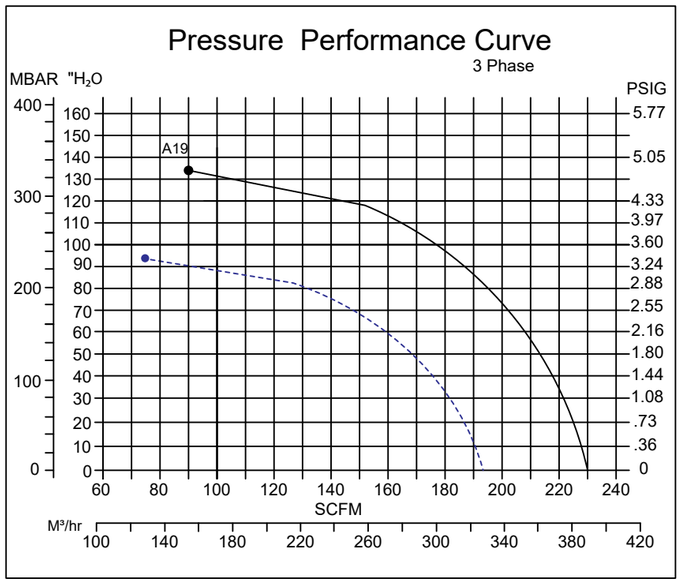
-Sea Level (14.69 PSI)

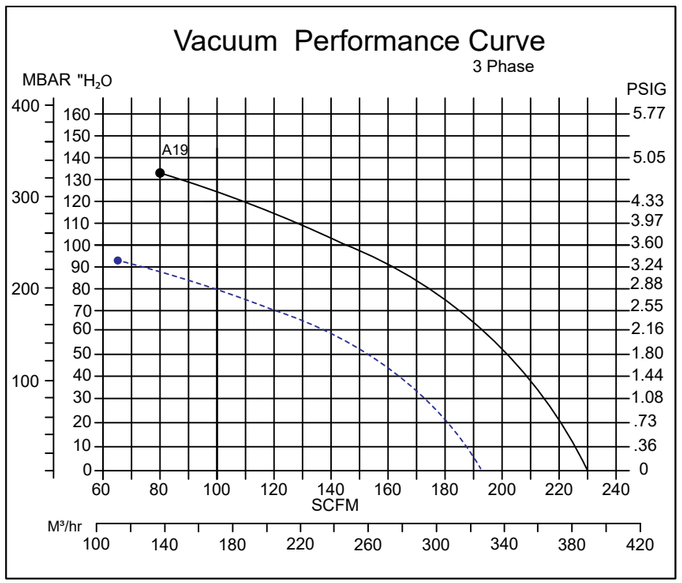
-60°F (15°C)

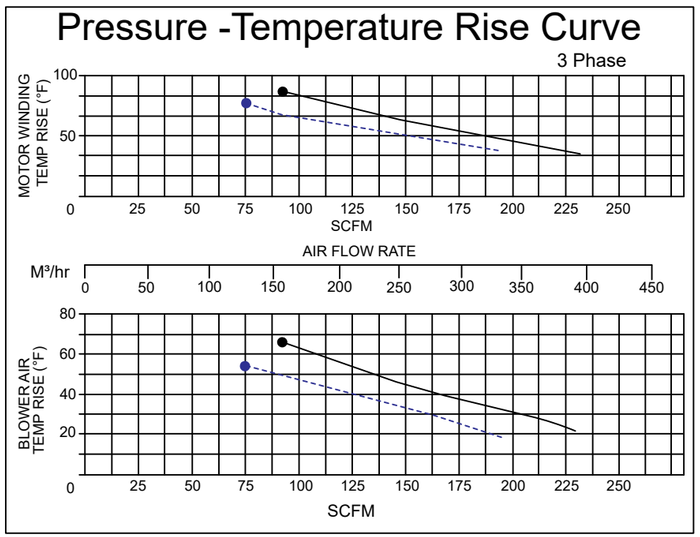
-0% Relative Humidity

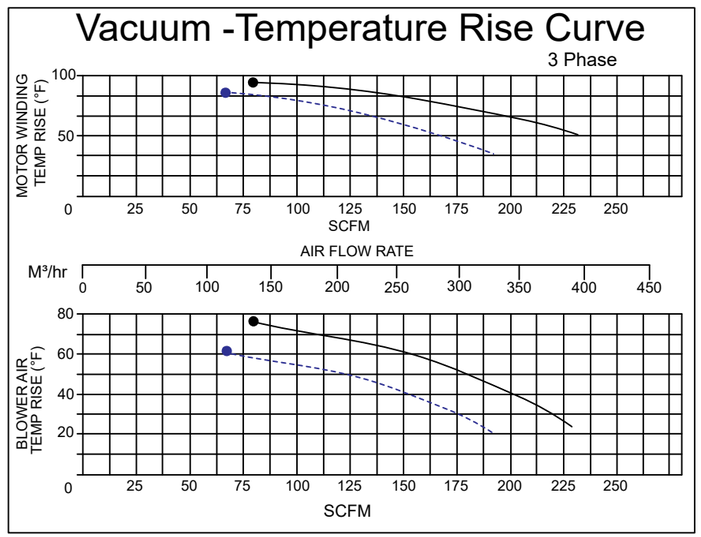












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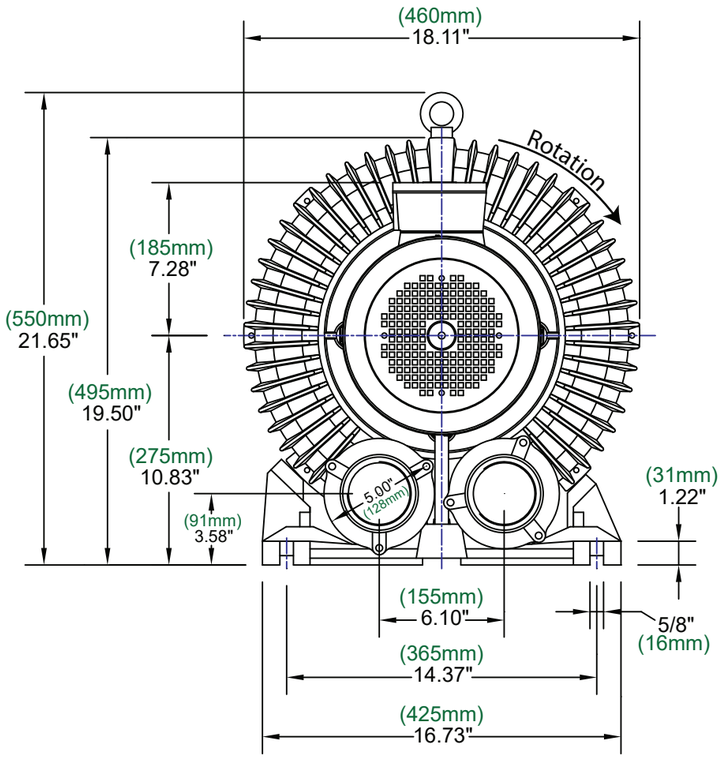
South System Blower

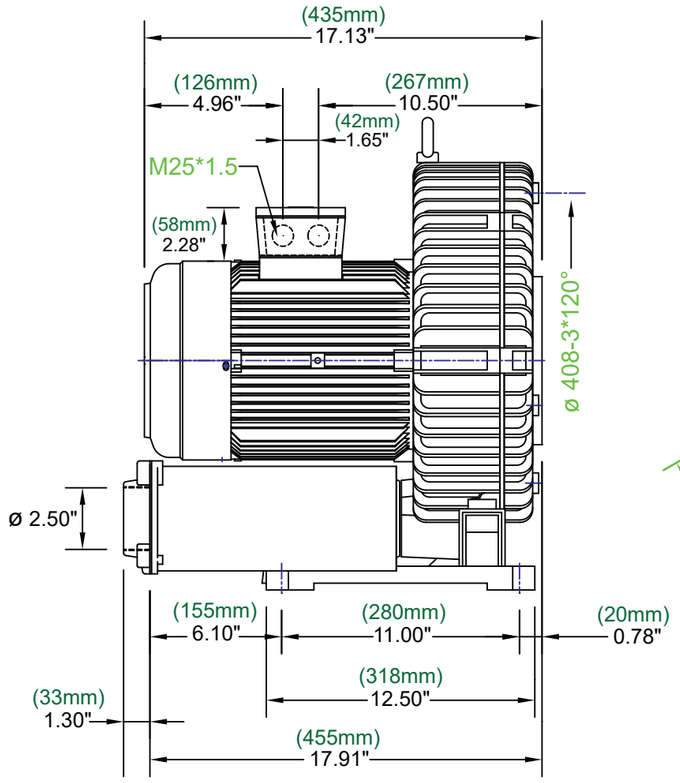
atlantic blowers

Phase	Model Number	Curve Number	Frequency (Hz)	KW	HP	Max Flow (SCFM)	Max Pressure ("H_2O)	Maximum Vacuum	Sound Level (db)	Inlet Diameter	Voltage	Current (A)	Weight (lbs)
3	AB-850	A21	60Hz	7.50	10.00	464	134	129	80	2.50"	220-275/380-480	36.5Δ/20.8Y	185
			50Hz	6.50	8.70	387	90	87	72		200-240/345-415	30.4Δ/17.3Y	

**Sound db measured at 3 ft.

MODEL NO. : AB-850 SINGLE STAGE



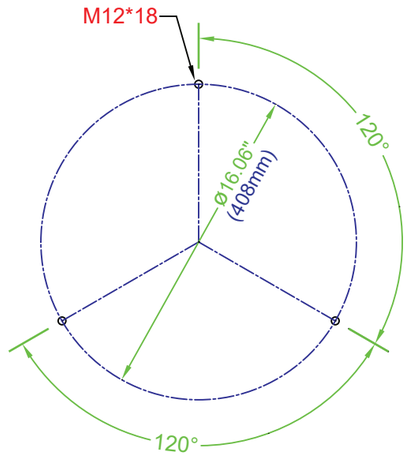


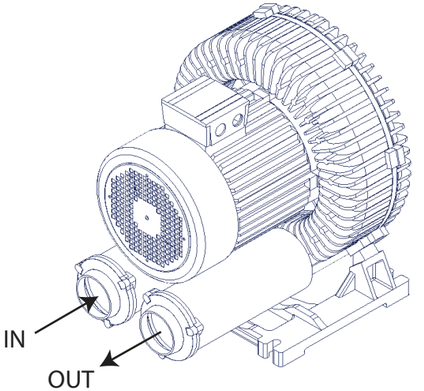
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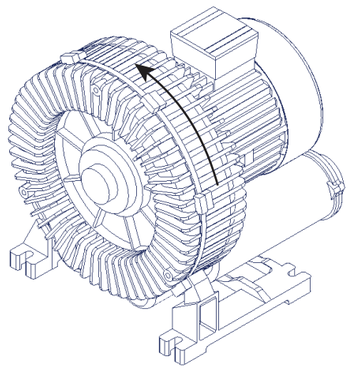
60Hz

50Hz

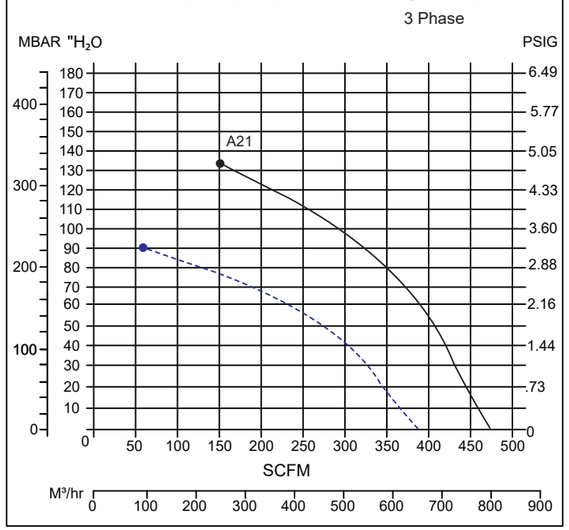
Standard Conditions
-Sea Level (14.69 PSI)
-60°F (15°C)
-0% Relative Humidity



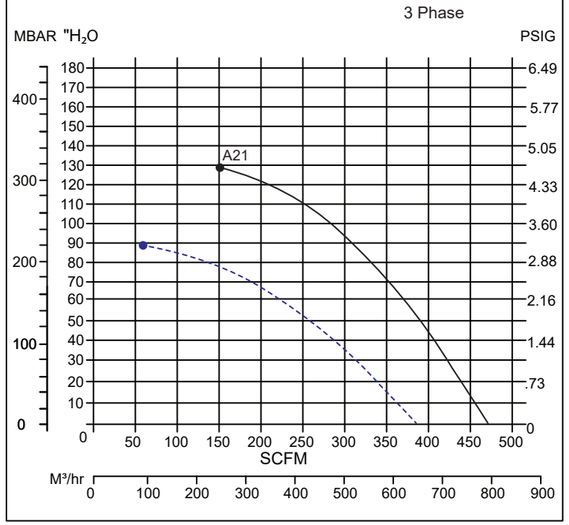




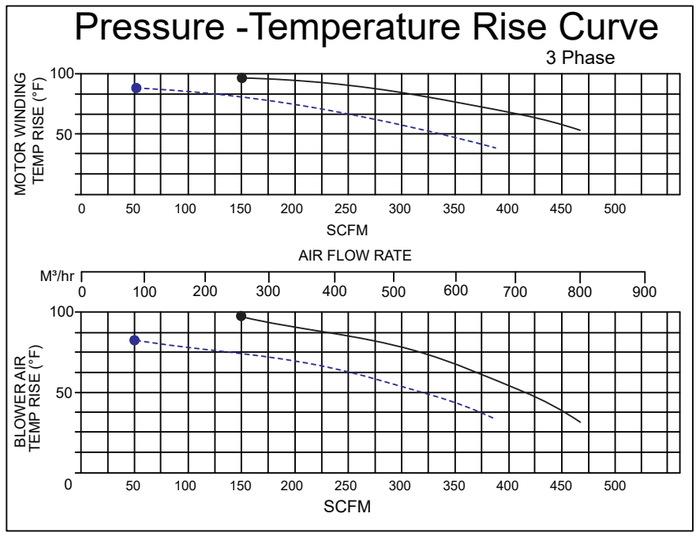
Pressure Performance Curve



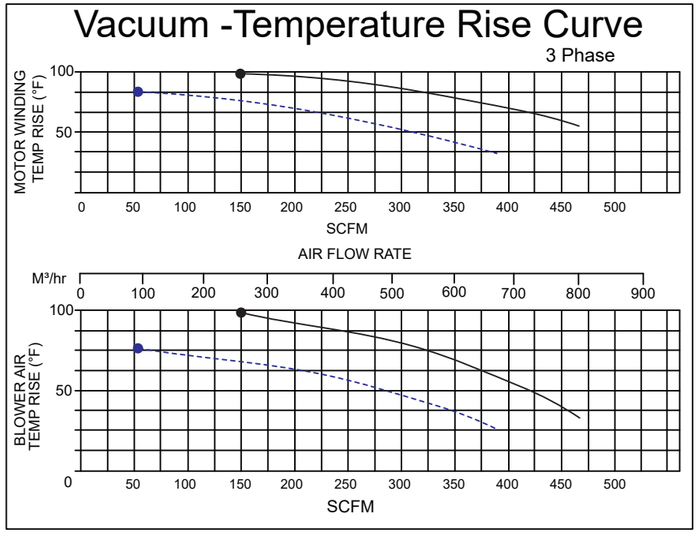
Vacuum Performance Curve



Pressure -Temperature Rise Curve



Vacuum -Temperature Rise Curve

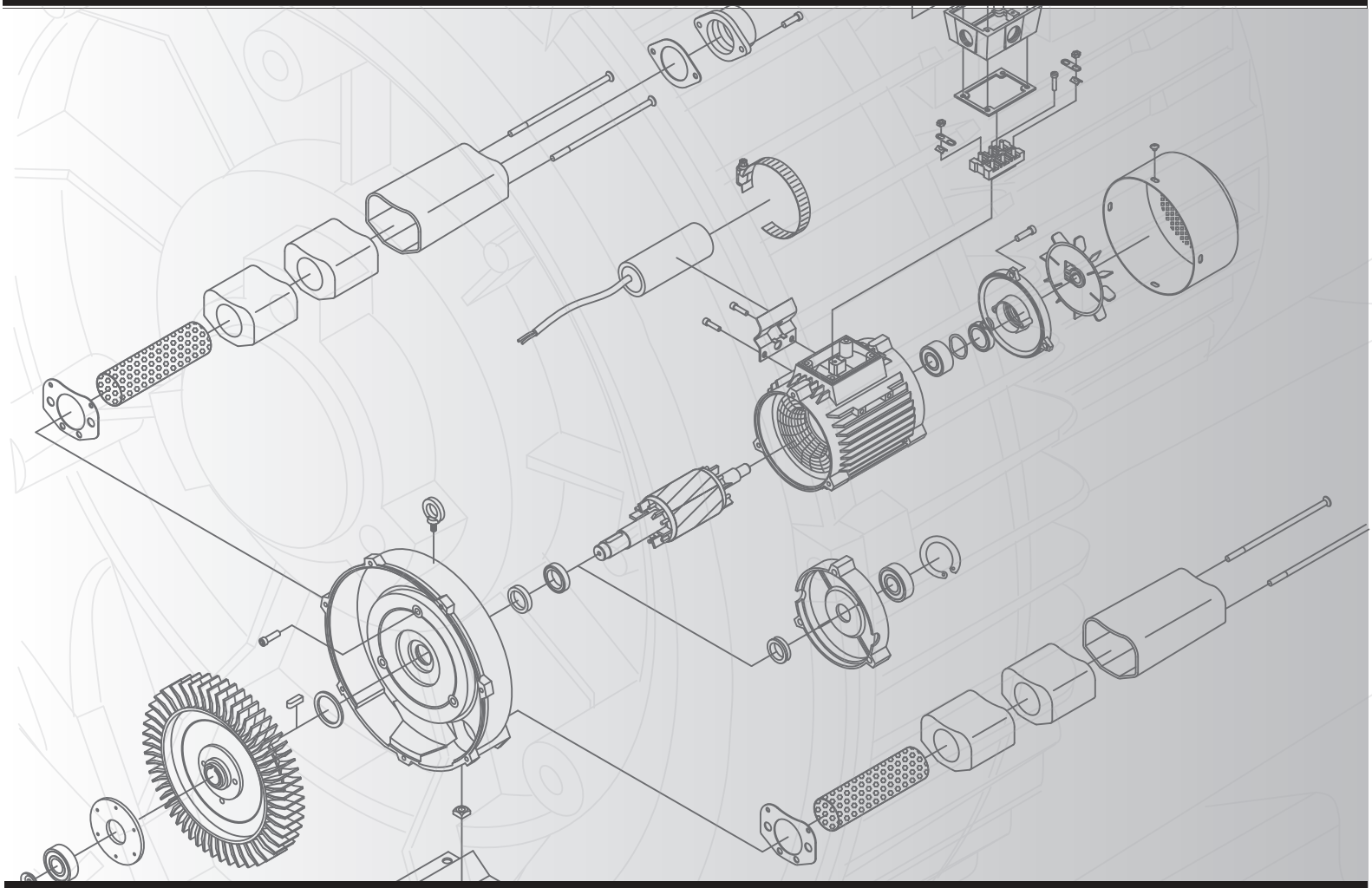


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Atlantic Blowers



Regenerative Blower Owner's Manual

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General Use

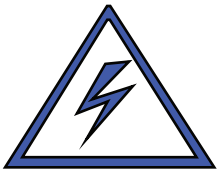
Safety Notice

To ensure safe operation, we have provided many important safety guidelines in this manual for our blowers and fans. Please read this instruction manual carefully, and pay attention to instructions with the following symbols:



WARNING

WARNING: Indicates an imminently hazardous situation which, if not avoided, may result in serious injury.



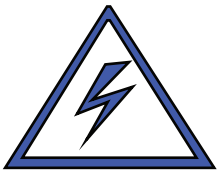
SHOCK HAZARD

SHOCK HAZARD: Indicates a potential electrical hazard which, if not handled carefully, will result in serious injury or death.

General Safety Criteria

1. Correct installation is the customer's responsibility.
2. Do not use flammable, explosive gases or atmosphere that contains such gases with standard motors/blowers. **It is required that you consult Atlantic Blowers for explosion proof motors/blowers.**
3. Ambient temperatures must be between 0°C – 40°C (32° F – 104°F). **For higher temperatures please consult Atlantic Blowers.**
4. Protect unit from contaminants and moisture.
5. Protect all surrounding items from exhausted air, as it can be very hot.
6. Air particles, water vapor, oil based contaminants or other liquids, can be harmful to the blower and may cause over-heating. **The use of an air-filter, relief valve, and pressure gauge are highly recommended in conjunction with our blowers.**
7. When using the blower at a high altitude or high temperatures, please consult with Atlantic Blowers prior to use.
8. Use only clean, dry air. If moisture is present please use a liquid separator.
9. Recommended piping should be, at minimum, the same size as the inlet and outlet ports
10. Elbows increase friction. Minimizing the amount of elbows in the piping run will decrease friction loss
11. Relief valves should be installed in a "Tee" fitting and should be the same diameter as the inlet and outlet of the blower.
12. Exhaust air temperature increases significantly above 65" of water column. Discharged air is typically too hot for most plastic piping. **Therefore, metal piping is recommended for at least the first five (5´) to eight (8´) feet from the blower on the discharge side.** In addition, this piping MUST be guarded and marked "DANGER-HOT-DO NOT TOUCH."
13. If a blower is exposed to the elements (rain, dust, hot and cold temperatures...etc.) it must be protected using a weather hood, or enclosure

Initial Startup



SHOCK HAZARD

Most problems arise at the point of the initial setup. After unboxing the blower, please follow the startup checklist before operation.

1. Inspect the blower for any visable damage..... ☐
2. Remove the plastic endcaps covering the blower's inlet and outlet..... ☐
3. Inspect both the inlet and outlet for any debris (Packing material, dirt,...etc.)..... ☐
4. Remove the motor fan cover (Part# 007-02). Spin the motor fan. The fan should spin freely without any resistance. Rotate the fan in both directions to confirm there is no blockage in the housing..... ☐
5. Mount the blower securely following the blower orientation on page 10..... ☐
6. SHOCK HAZARD: Use a multimeter to confirm the incoming voltage is correct..... ☐
7. Remove the terminal box cover (Part# 007-07). SHOCK HAZARD: Follow the wiring diagram on page 15 to complete the electircal hook up..... ☐
8. **Upon starting the blower, use your multimeter to confirm the blower is running below the FLA rating listed on the motor tag**..... ☐
9. When facing the inlet and outlet, check to see that air is coming from the right side of the blower (outlet). If air is coming from the left side the blower is wired incorrectly..... ☐

General Plumbing

1. Remove any foreign material (burrs, chips, welding drops, slag, pipe cuttings, excess sealant, sand, lime, etc...) from plumbing.
2. **Only Install piping +/- 1/2" diameter as the inlet and outlet.** If reduction is necessary please contact Atlantic Blowers for appropriate recommendations.
3. If plumbing entering or exiting the blower must be split (tee, header, Y branch), the sum area of the additional lines must be equal or approximated (< 1.5 in²) to the area of the blower inlet/outlet. For example: A 2" inlet/outlet with an overall area of 3.14 in² can be split into 4, 1" lines with an overall total area of 3.14 in².
4. **Use only metal piping for the first 5ft entering or exiting the blower.** If this is not possible, use materials with a high heat tolerance between 175º F and 250º F.
5. As a safety precaution, always install a filter and relief valve to any regenerative blower.
6. Install any elbow or tee at least 3 ft from the blower's inlet or outlet.
7. Attenuation occurs after 100 ft of piping.

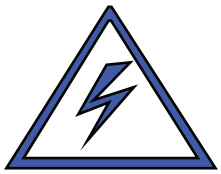
Rotation

From the motor side of the blower, verify the blower is rotating in the direction indicated by the arrow on the motor. (The motor side is marked with an arrow indicating a clock-wise motion). Proper rotation can also be checked by the air flow at the inlet and outlet ports. On blowers powered by a 3-phase motor, change the connection of any two (2) incoming wires to reverse blower rotation.

Motor Control

It is the customer's responsibility to contact a qualified electrician to ensure that the electrical installation is adequate and in compliance with all national and local electrical codes.

Select fuses, motor protective switches, or thermal protective switches to provide appropriate protection. Fuses act as short circuit protectors for the motor, not as protection against overloading. Incoming line fuses must be able to withstand the motor's starting current. Motor starters with thermal magnetic overload or circuit breakers protect motor from overload or reduced voltage conditions. Motors without automatic restart require thermal protection, magnetic or over-current cutout to prevent motor overloading from single phasing in a 3-phase circuit, high starting frequency, or locked blower.



SHOCK HAZARD

Wiring / Electrical Connection

1. All wiring and electrical work should be handled by a qualified electrician.
2. Check to see that the incoming power is off before installing power to the motor.
3. **Make sure that the jumper terminals are configured in the correct orientation on the wiring block that corresponds to your incoming voltage.**
4. When fastening the incoming wires to the wiring block, be sure that the wires are not touching one another.
5. Always ground the incoming power.
6. Do not permanently connect this product to wiring that is in poor condition or that is inadequately sized for the requirement of this blower.
7. Monitor the amp draw while the blower is starting up. The starting amp draw should be more than double the FLA on the motor tag. The amperage should reduce below the FLA within 15-20 seconds. If not, turn off the incoming power.



WARNING

Injury Hazard

Install proper safety guards as needed to prevent any close contact with blower suction area. Keep fingers and objects away from openings and rotating parts. Blower surfaces becomes very hot during operation. **Allow these surfaces to cool before handling**. Wear proper eye protection. Air stream from product may contain solid or liquid material that can result in eye or skin damage. Wear hearing protection. Sound level from some models may exceed 81 dBA. It is your responsibility to operate this product at the recommended pressures, or vacuum duties and ambient temperatures. Do not throttle discharge or suction pipes to reduce capacity. Throttling will increase differential pressure causing an increase in power absorption and working temperatures.

Common Issues

Below is a chart to diagnose common issues. If you are having an issue that does not appear on this chart please call us for assistance.

Problem	Reason	Solution
Increased Sound	-Damage to noise absorbing foam -Damage to bearing -unbalanced impeller	-Replace foam -Replace bearing(s) -Send to Atlantic Blowers for inspection
Excessive Vibration	-Damage to bearing -Unbalanced impeller -Excessive load	-Replace bearing(s) -Send to Atlantic Blowers for inspection -Check amp draw
Motor Overload	-Excessive load -Incorrect wiring -Incoming voltage spike	-Check amp draw -Follow wiring diagram -Contact an Electrician
Increase in Temperature	-Excessive load -Damaged motor -Damaged bearing -Excessive dust on blower -Incorrect wiring	-Check amp draw -Check motor winding for damage -Change bearings -Clean blower -Follow wiring diagram
Unit Does Not Start	-Incorrect electrical connection -Impeller is damaged or jammed Bearings damaged	-Follow wiring diagram -Check airway for debris
Decrease in Performance	-Excessive load -Damaged motor -Damaged bearing -Dirty filter	-Check amp draw -Check motor winding for damage -Change bearings -Clean Filter

Blower Maintenance Schedule

Schedule

The following is a guideline for the maintenance of a blower. Your company many need to adjust the process based on the application the blower will be operating under.

Service Timeline	Recommendation Process
Before and After Installation	Read "Owner's Manual" thoroughly for proper guidelines, and to familiarize yourself with your blower.
6 Months	Clean filters Check for bearings noise, change if needed.
1 Year	Clean filters and wipe down blower. Possibly change bearings, if noisy. Change inlet and outlet silencer sponge Change silencer wire mesh Change any Gaskets that may leak or are torn.
3 Years	Replace bearings Change Inlet and Outlet Silencer Sponge Change Silencer Wire Mesh Change any Gaskets that may leak or are torn.

Bearing Types

A variety of bearings and lubricants are used in all Atlantic Blowers' Regenerative Blowers. A summary of data is included in the Bearing Specification Table. Greasable bearings are supplied with a sufficient amount of lubricant from our factory to permit initial operation. The frequency of replacing the grease depends greatly upon the conditions, application and amount of use.

Grease Types

Atlantic Blowers' Regenerative Blowers utilize proprietary lubricants. These lubricants are available from Esso or Exxon. You can check with your local supplier for a recommended equivalent. (High temperature resistance and high speed: NLGI N3 Grade). Lubricants of different manufacturers should not be mixed. If changing lubricant types, the bearing and housing should be thoroughly cleaned to remove all previous lubricants before adding grease from a new supplier.

Order your "Maintenance Kit" specifically designed for Your blower which includes:

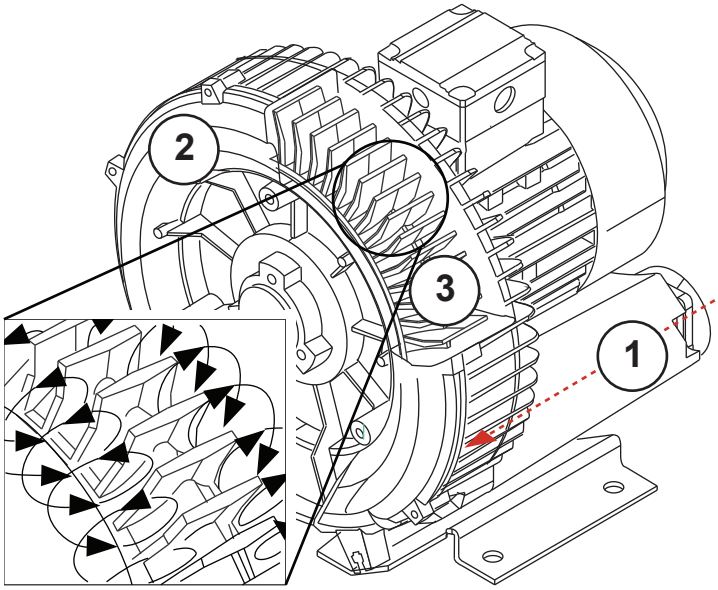
- **Bearings**
- **Inlet/Outlet Silencer Sponge**
- **Inlet/Outlet Wire Mesh**
- **Gaskets**
- **Shaft Seal**
- **Replacement Filter Element**

Regenerative Blowers

Regenerative Blower Operation

Operating Principle

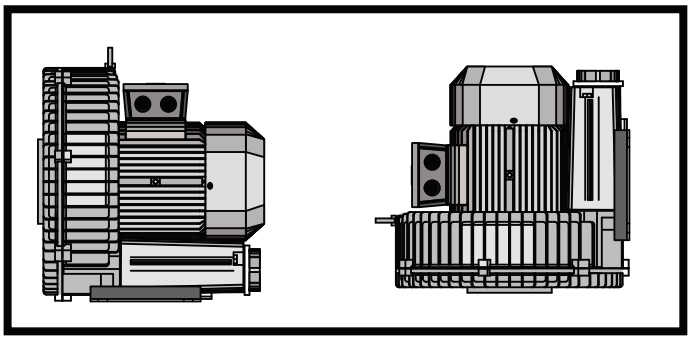
The impellers in the Atlantic Blowers Regenerative Blowers are mounted directly on the motor shaft for non contact compression without any friction. Maximum operational reliability, even at high pressure differentials, is ensured by the arrangement of the bearings outside the air channel. (1) The air is taken in through the inlet, then (2) enters through the side channel. (3) Then the rotating impeller imparts velocity to the air in the direction of rotation. The centrifugal force of the impeller blades accelerates the air outward and the pressure increases. Every rotation adds kinetic energy, resulting in the further increase of pressure and velocity along the side channel. The pressurized air is then forced to the outlet, discharging it through the muffler where it exits the blower.



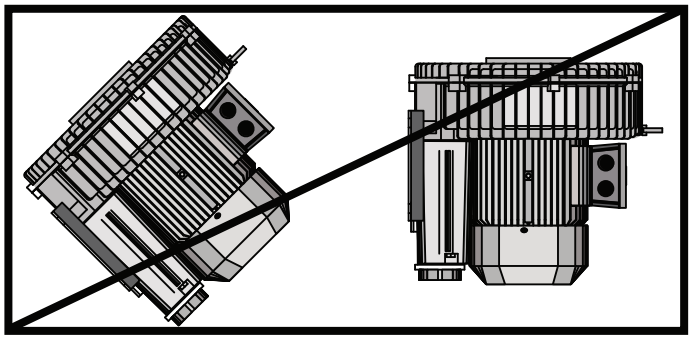
Blower Orientation

Blower orientation is crucial for longevity. Regenerative blowers can only be mounted in two ways: Horizontally, or vertically with the inlet and outlet facing upward. Below are examples of correct and incorrect blower orientation.

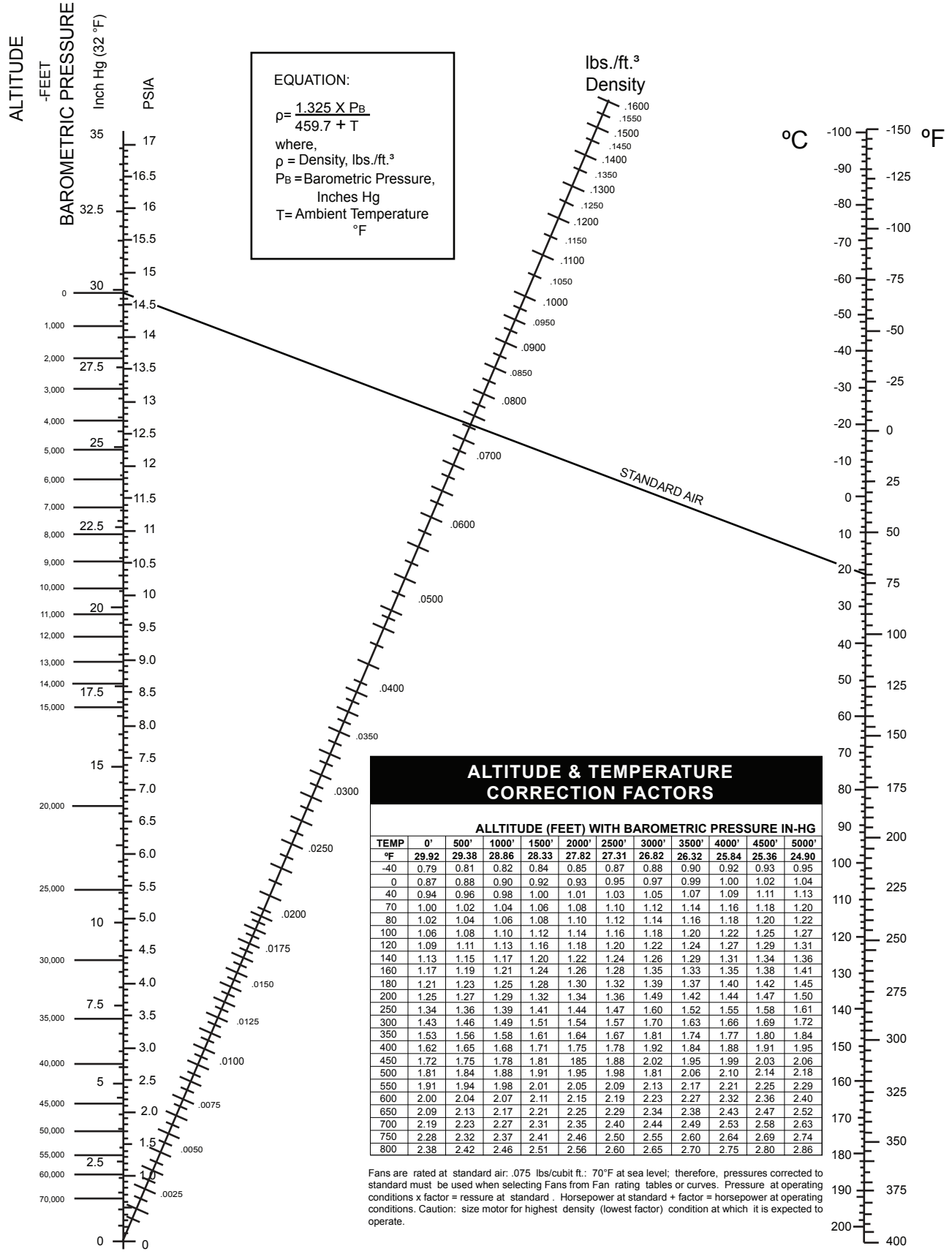
Correct Orientation



Incorrect Orientation



Density Correction Chart



ALTITUDE & TEMPERATURE CORRECTION FACTORS

	ALLTITUDE (FEET) WITH BAROMETRIC PRESSURE IN-HG										
TEMP	0'	500'	1000'	1500'	2000'	2500'	3000'	3500'	4000'	4500'	5000'
°F	29.92	29.38	28.86	28.33	27.82	27.31	26.82	26.32	25.84	25.36	24.90
-40	0.79	0.81	0.82	0.84	0.85	0.87	0.88	0.90	0.92	0.93	0.95
0	0.87	0.88	0.90	0.92	0.93	0.95	0.97	0.99	1.00	1.02	1.04
40	0.94	0.96	0.98	1.00	1.01	1.03	1.05	1.07	1.09	1.11	1.13
70	1.00	1.02	1.04	1.06	1.08	1.10	1.12	1.14	1.16	1.18	1.20
80	1.02	1.04	1.06	1.08	1.10	1.12	1.14	1.16	1.18	1.20	1.22
100	1.06	1.08	1.10	1.12	1.14	1.16	1.18	1.20	1.22	1.25	1.27
120	1.09	1.11	1.13	1.16	1.18	1.20	1.22	1.24	1.27	1.29	1.31
140	1.13	1.15	1.17	1.20	1.22	1.24	1.26	1.29	1.31	1.34	1.36
160	1.17	1.19	1.21	1.24	1.26	1.28	1.35	1.33	1.35	1.38	1.41
180	1.21	1.23	1.25	1.28	1.30	1.32	1.39	1.37	1.40	1.42	1.45
200	1.25	1.27	1.29	1.32	1.34	1.36	1.49	1.42	1.44	1.47	1.50
250	1.34	1.36	1.39	1.41	1.44	1.47	1.60	1.52	1.55	1.58	1.61
300	1.43	1.46	1.49	1.51	1.54	1.57	1.70	1.63	1.66	1.69	1.72
350	1.53	1.56	1.58	1.61	1.64	1.67	1.81	1.74	1.77	1.80	1.84
400	1.62	1.65	1.68	1.71	1.75	1.78	1.92	1.84	1.88	1.91	1.95
450	1.72	1.75	1.78	1.81	185	1.88	2.02	1.95	1.99	2.03	2.06
500	1.81	1.84	1.88	1.91	1.95	1.98	1.81	2.06	2.10	2.14	2.18
550	1.91	1.94	1.98	2.01	2.05	2.09	2.13	2.17	2.21	2.25	2.29
600	2.00	2.04	2.07	2.11	2.15	2.19	2.23	2.27	2.32	2.36	2.40
650	2.09	2.13	2.17	2.21	2.25	2.29	2.34	2.38	2.43	2.47	2.52
700	2.19	2.23	2.27	2.31	2.35	2.40	2.44	2.49	2.53	2.58	2.63
750	2.28	2.32	2.37	2.41	2.46	2.50	2.55	2.60	2.64	2.69	2.74
800	2.38	2.42	2.46	2.51	2.56	2.60	2.65	2.70	2.75	2.80	2.86

Fans are rated at standard air: .075 lbs/cubit ft.: 70°F at sea level; therefore, pressures corrected to standard must be used when selecting Fans from Fan rating tables or curves. Pressure at operating conditions x factor = ressure at standard . Horsepower at standard + factor = horsepower at operating conditions. Caution: size motor for highest density (lowest factor) condition at which it is expected to operate.

Formula Reference

Blower Performance Quick Reference

Calculating blower performance requires the use of a manometer. Be sure that your manometer is calibrated to handle your blower's rated air flow and pressure capacity. Please call Atlantic Blowers if any assistance is needed.

Volumetric Flow Rate and Air Velocity

Volumetric Flow Rate

$$CFM = \sqrt{P_V} \times 4005 \times A$$

P_V = Dynamic/Velocity Pressure (in W.C.)
A = Total Piping Area (Ft^2)
CFM = Volumetric Air Flow Rate (Ft^3/min)

$$CFM = FPM \times A$$

FPM = Air Velocity (Ft/min)
A = Total Piping Area (Ft^2)
CFM = Volumetric Air Flow Rate (Ft^3/min)

Air Velocity

$$FPM = 4005\sqrt{P_V}$$

P_V = Dynamic/Velocity Pressure (in W.C.)
FPM = Air Velocity (Ft/min)

$$FPM = \frac{CFM}{A}$$

FPM = Air Velocity (Ft/min)
A = Total Piping Area (Ft^2)
CFM = Volumetric Air Flow Rate (Ft^3/min)

Pipe Reduction/ Splits and Manifolds

$$\Delta P = \left(\frac{\rho}{144}\right) \cdot \left(\frac{V_2^2 - V_1^2}{2(T)}\right)$$

ΔP = Pressure Differential (in PSI)
ρ = Air Density(lbs/Ft^3)
V_1 = Air Velocity Before Reduction(Ft/sec)
V_2 = Air Velocity After Reduction(Ft/sec)
T = Ambient Air Temperature(°C)

$$A_B = A_T \pm 5\%$$

A_B = Blower Inlet/Outlet Area (in^2)
A_T = Total Sum Area of All Pipe Branches (in^2)

Air Pressure

Total Pressure

$$P_T = P_V + P_S$$

P_T = Total Pressure (in W.C.)
P_V = Velocity Pressure (in W.C.)
P_S = Static Pressure (in W.C.)

Static Pressure

$$P_S = P_T - P_V$$

P_T = Total Pressure (in W.C.)
P_V = Velocity Pressure (in W.C.)
P_S = Static Pressure (in W.C.)

Velocity Pressure

$$P_V = P_T - P_S$$

P_T = Total Pressure (in W.C.)
P_V = Velocity Pressure (in W.C.)
P_S = Static Pressure (in W.C.)

Fan Affinity Formulas

CFM at Variable Speed

$$CFM_2 = CFM_1\left(\frac{RPM_2}{RPM_1}\right)$$

CFM_1 = Orignal Flow Rate (Ft^3/min)
CFM_2 = Expected Flow Rate (Ft^3/min)
RPM_1 = Orignal Speed (RPM)
RPM_2 = Expected Speed (RPM)

Pressure at Variable Speed

$$P_2 = P_1\left(\frac{RPM_2}{RPM_1}\right)^2$$

P_1 = Orignal Pressure (in W.C.)
P_2 = Expected Pressure (in W.C.)
RPM_1 = Orignal Speed (RPM)
RPM_2 = Expected Speed (RPM)

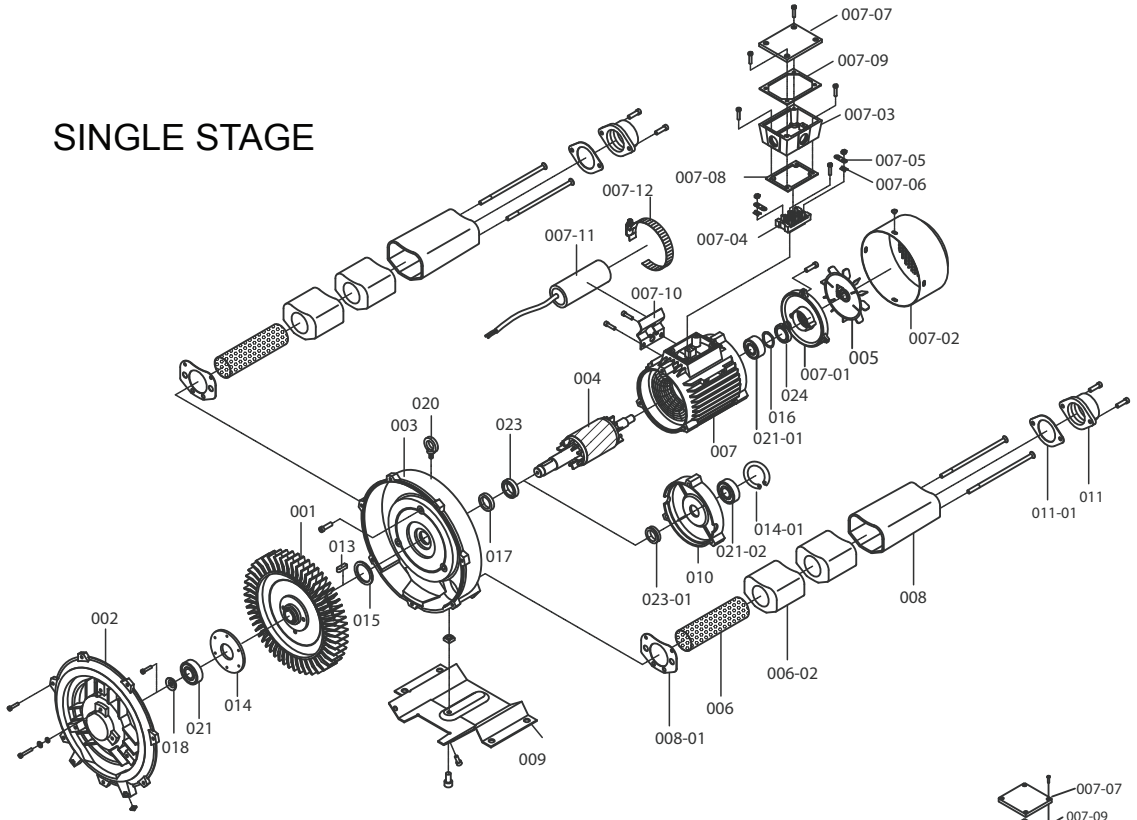
Horsepower at Variable Speed

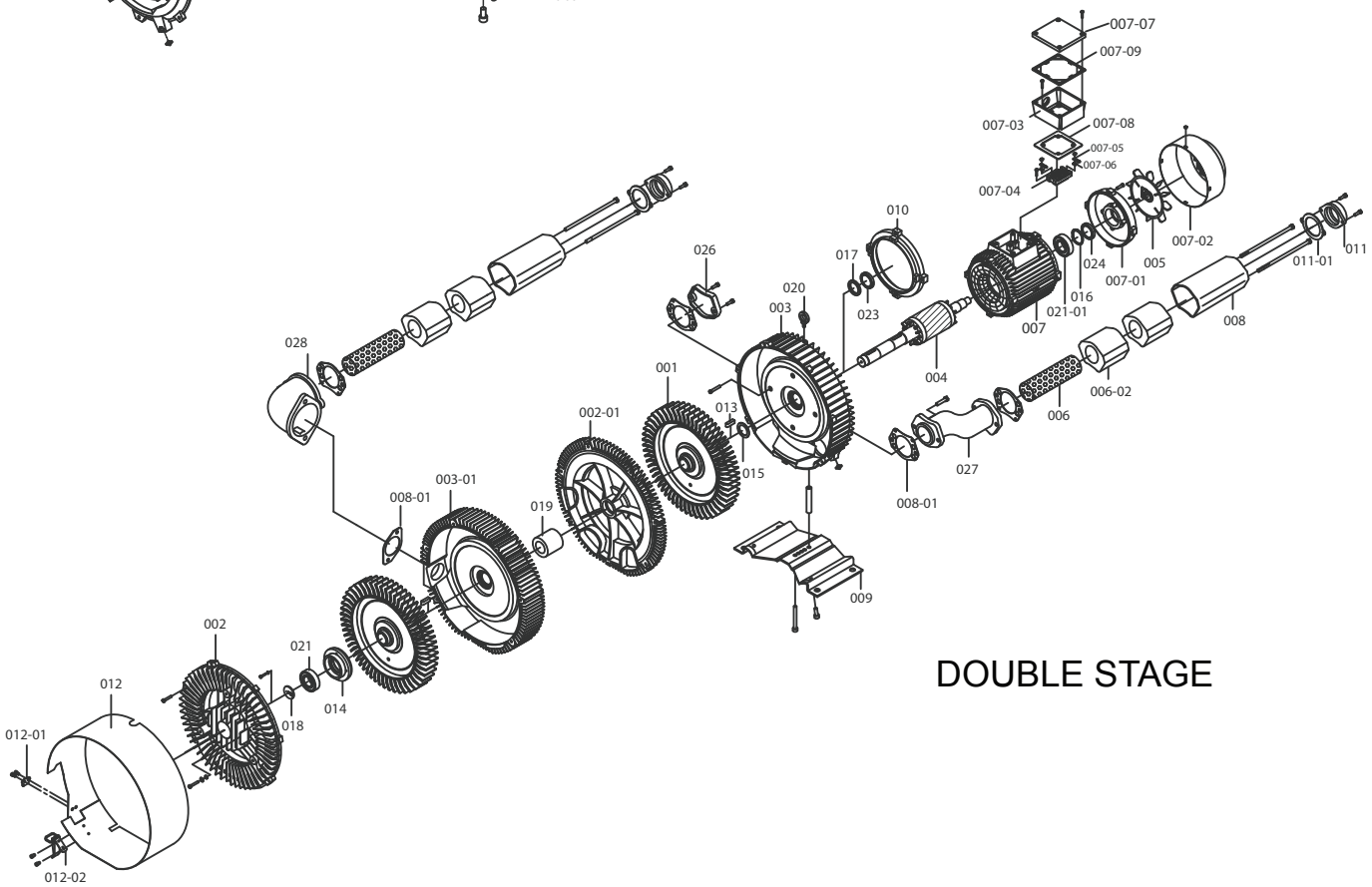
$$HP_2 = HP_1\left(\frac{RPM_2}{RPM_1}\right)^3$$

HP_1 = Orignal Horsepower
HP_2 = Expected Horsepower
RPM_1 = Orignal Speed (RPM)
RPM_2 = Expected Speed (RPM)

Regenerative Blower Exploded View

SINGLE STAGE





DOUBLE STAGE

Regenerative Blower Parts List

General Parts

Part No.	Part Name
001	Impeller
002	Blower Housing Cover
003	Blower Housing
004	Rotor
005	Fan
006	Silencer Mesh Pipe
006-02	Silencer Sponge
007	Motor
007-01	Motor Cover
007-02	Fan Cover
007-03	Terminal Box
007-04	Wire Mounting Block
007-05	Wire Connector / Jumper
007-06	Fixed Terminal
007-07	Terminal Box Cover
007-08	Terminal Box Gasket
007-09	Terminal Cover Gasket

Part No.	Part Name
008	Silencer Housing
008-01	Silencer Gasket
009	Mounting Baseplate
011	Inlet/Outlet Flange
011-01	Inlet/Outlet Gasket
013	Rotor Pin
014	Bearing Washer
015	Washer
016	Wear Washer
017	Seal
018	Washer
020	Hoist Ring
021	Front Bearing
021-01	Rear Bearing
023	Oil Seal

Single Phase Parts Only

Part No.	Part Name
007-10	Capacitor Mounting Bracket
007-11	Capacitor
007-12	Steel Clamp

Double Stage Parts Only

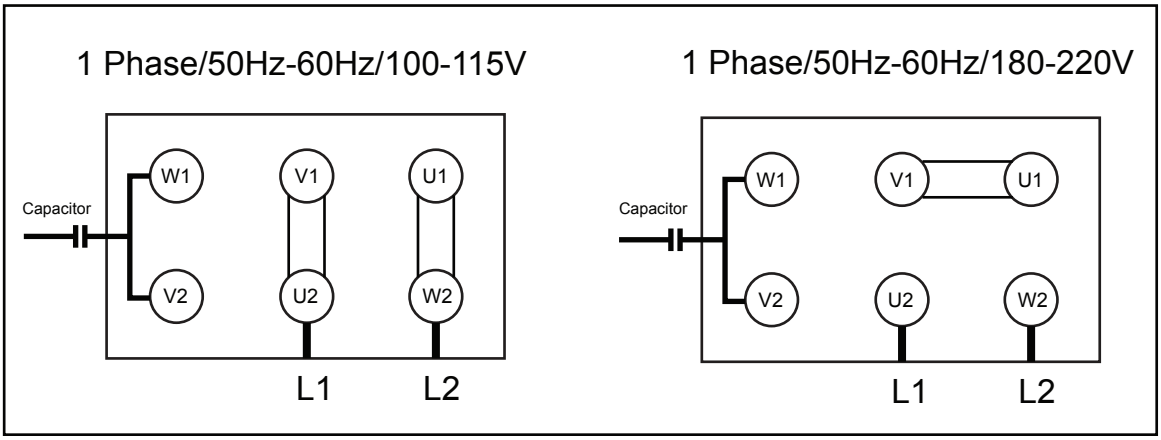
Part No.	Part Name
025	Muffler Mounting Bracket
026	Muffler Mounting Bracket Gasket w/ Screws
026-01	Muffler Mounting Bracket Gasket w/ Screws
027	Lateral Pipe
027-01	Middle Motor Cover
028	90 Degree Elbow

Regenerative Blower Wiring Diagram

SHOCK HAZARD

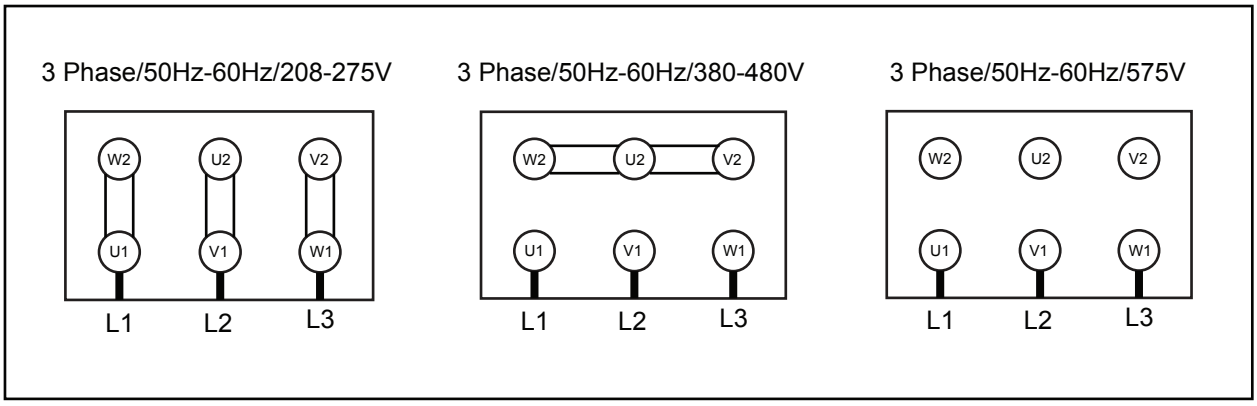
Single Phase Wiring

Below are digrams showing the wiring configuration for single phase power installation. Atlantic Blowers' regenerative blowers can be wired for both low and high voltage single phase power at either 50, or 60 Hz.



Three Phase Wiring

The following is a guideline for the maintenance of a blower. Your company many need to adjust the process based on the application the blower will be operating under.



Thermal Protection

All 3 phase blower motors have two PTC-Type A thermistors (small black wires) coming from the motor that are not connected to the terminal blocks. These wires are used with motor overload temperature protection features sometimes used in control panels. If a control panel without this feature is used, simply cap off the wires and do not use them.

Incoming Power Requirements

Voltage Requirements

Incoming voltage must correspond to the rated voltage listed on the blower motor tag. When using 3 phase power, it is acceptable to use an incoming voltage of 208V for motor voltage ratings of 230V. This falls within the blower service factor of 1.10. Before installing the incoming power to the blower motor, double check that the motor terminal is configured for the correct voltage.

Breaker and Wire Gauge Requirements

Fuses should be selected based on the blowers rated FLA (full load amps). The fuse rating should be no more than 2 amps above or below the motor FLA. Wire gauge is determined by the motor power and current. Please see the chart below to select the appropriate wire size.

HP		Amperage		Wire Gauge
230V	**460V**	**230V**	**460V**	**AWG**
1	0.75	3.3	1.7	14
1.5	1.1	4.7	2.4	14
2	1.5	6	3	14
3	2.3	9	4.5	14
5	3.8	15	7.5	12
7.5	5.6	22	11	8
10	7.5	27	14	8
15	11	38	19	6
20	15	52	26	4
25	19	64	32	3
30	23	77	39	1
40	30	101	51	00
50	38	125	63	000
60	45	149	75	200M
75	56	180	90	0000
100	75	245	123	500M
125	94	310	155	750M
150	113	360	180	1000M

Temperature Codes and Insulation Classification

Please see the charts listed below to find information regarding temperature codes and insulation classes.

Insulation Class	Maximum Operation Temperature Allowed		Allowable Temperature Rise at full load 1.10 service factor motor
	°C	°F	°C
A	105	221	65
B	130	266	85
F	155	311	110
H	180	356	120

Temperature Codes	°C	°F
T1	450	842
T2	300	572
T2A	280	536
T2B	260	500
T2C	230	446
T2D	215	419
T3	200	392
T3A	180	356
T3B	165	329
T3C	160	320
T4	135	275
T4A	120	248
T5	100	212
T6	85	185

Blower Storage and Environmental Conditions

Blower Storage Conditions

Blowers should be stored in covered environments free from any moisture and floating debris. Furthermore, ambient temperatures in the storage area should be between 0 °C - 40 °C (32 °F - 104 °F). If blower is not in operation, the inlet and outlet must be covered to protect from debris entering the blower.

Environmental Conditions

Use only clean, dry air. Do not use our standard blowers with explosive gases or in an atmosphere that has a hazardous area classification. Ambient temperatures should be between 0 °C - 40 °C (32 °F - 104 °F). If the blower is being used for aeration, always install either a check valve or Hartford loop to protect the blower from any water damage.

Spacial Requirements

Allow for at least 2” of clearance around the blower in any direction. Allow for at least 3” of clearance for the motor fan. Please see individual blower spec sheets for dimensional details.

Foreseeable Misuse

It is prohibited:

1.) To use any blower outside of its listed performance (see spec sheet).
2.) To use any standard blower in a hazardous area (exposure to flammable gases or dust). Please contact Atlantic Blowers for assistance.
3.) To reduce or restrict the blower with inadequate plumbing (varying pipe diameters, excessive elbows or splits...etc.).
4.) To operate the blower without any filtration method.
5.) To operate the blower in period intervals (time intervals less than 2 hours).
6.) To use a butterfly or gate valve to reduce the blowers performance.
7.) To allow liquids or viscous gas to pass through the blower housing chamber.

Best Practices

To ensure longevity:

1.) Follow the instruction on pages 6-10.
2.) Operate the blower in the middle of its performance range (refer to spec sheet).
3.) Operate the blower continuously.
4.) Use a motor starter or any other overload prevention method.
5.) Always use the recommended accessories
6.) Only convey dry air in the blower.
7.) Follow the maintenance schedule.
8.) Change filter element regularly.

Regenerative Blower Bearing Chart

Bearing Types

A variety of bearings and lubricants are used in all Atlantic Blowers' Regenerative Blowers. A summary of data is included in the Bearing Specification Table. Greasable bearings are supplied with a sufficient amount of lubricant from our factory to permit initial operation. The frequency of replacing the grease depends greatly upon the conditions, application, and amount of use.

Grease Types

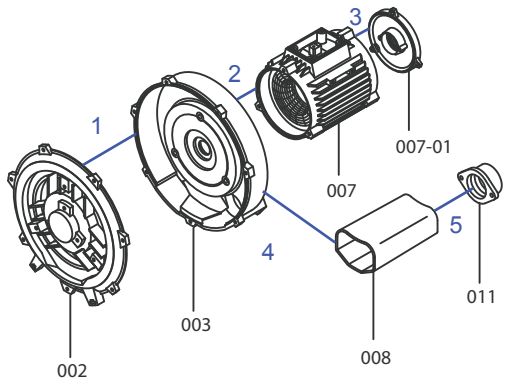
Atlantic Blowers' Regenerative Blowers utilize proprietary lubricants. These lubricants are available from Esso or Exxon. You can check with your local supplier for a recommended equivalent. (High temperature resistance and high speed: NLGI N3 Grade). Lubricants of different manufacturers should not be inter-mixed. If changing lubricant types, the bearing and housing should be thoroughly cleaned to remove all previous lubricants before adding grease from a new supplier. Bearing Specification (Recommended Bearing: SKF)

<table>
<tr><th colspan="3">Single Stage</th><th colspan="3">Double Stage</th></tr>
<tr><th>Model No.</th><th>Front Bearing</th><th>Rear Bearing</th><th>Model No.</th><th>Front Bearing</th><th>Rear Bearing</th></tr>
<tr><td>AB-70/AB-71</td><td rowspan="2">6201ZZ</td><td rowspan="2">6201ZZ</td><td>AB-102/AB-102/1</td><td rowspan="2">6203ZZ</td><td rowspan="2">6202ZZ</td></tr>
<tr><td>AB-80/AB-81</td><td>AB-202/AB-202/1</td></tr>
<tr><td>AB-90/AB-91</td><td rowspan="2">6203ZZ</td><td rowspan="2">6202ZZ</td><td>AB-302/AB-302/1</td><td rowspan="3">6204ZZ</td><td rowspan="3">6204ZZ</td></tr>
<tr><td>AB-100/AB-101</td><td>AB-402/AB-402/1</td></tr>
<tr><td>AB-200/AB-201</td><td>6204ZZ</td><td>6204ZZ</td><td>AB-502</td></tr>
<tr><td>AB-300/AB-301</td><td rowspan="2">6205ZZ</td><td rowspan="2">6204ZZ</td><td>AB-602</td><td rowspan="2">6205ZZ</td><td rowspan="3">6205ZZ</td></tr>
<tr><td>AB-400/AB-401</td><td>AB-702</td></tr>
<tr><td>AB-500</td><td rowspan="3">6206ZZ</td><td rowspan="3">6205ZZ</td><td>AB-802</td><td rowspan="3">6206ZZ</td></tr>
<tr><td>AB-600</td><td>AB-902</td><td rowspan="2">6207ZZ</td></tr>
<tr><td>AB-700</td><td>AB-1002</td></tr>
<tr><td>AB-800</td><td rowspan="4">6207ZZ</td><td rowspan="4">6207ZZ</td><td>AB-1102</td><td rowspan="6">6207ZZ</td><td rowspan="6">6209ZZ</td></tr>
<tr><td>AB-850</td><td>AB-1202</td></tr>
<tr><td>AB-900</td><td>AB-1302</td></tr>
<tr><td>AB-1000</td><td>AB-1402</td></tr>
<tr><td>AB-1100</td><td rowspan="3">6308ZZ</td><td rowspan="3">6209ZZ</td><td>AB-1502</td></tr>
<tr><td>AB-1200</td><td>AB-1602</td></tr>
<tr><td>AB-1300</td><td>AB-1702</td><td rowspan="3">6308ZZ</td><td rowspan="3">6209ZZ</td></tr>
<tr><td colspan="3" rowspan="3"></td><td>AB-1802</td></tr>
<tr><td>AB-1902</td></tr>
<tr><td colspan="3" rowspan="3"></td><td>AB-2002</td><td rowspan="3">6209ZZ</td><td rowspan="3">6308ZZ</td></tr>
<tr><td>AB-2102</td></tr>
<tr><td>AB-2202</td></tr>
</table>

Leak Seal

Atlantic Blowers provides a leak reduction treatment for each of our regenerative blowers. This is done by applying a high temperature liquid silicone gasket to the seam of the blower housing and blower housing cover. In some cases, when more leak resistance is needed, the blower is sealed further at strategic areas such as the muffler seams, flange seams, and motor seams. When all seams are sealed the leak rate is roughly 1100 cc/min. Below is a diagram of the seal points:

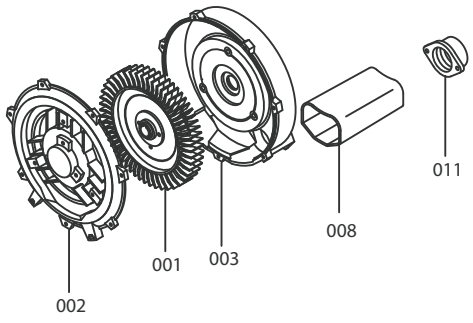
Seal Area Legend	
1	Blower Housing Seam
2	Blower Motor Seam
3	Motor Cover Seam
4	Muffler Seam
5	Flange Seam



Chemical Coating

Atlantic Blowers offers chemical coating for applications handling corrosive material. We apply a heavy duty polymer to any portion of the blower that has contact with the corrosive material. To receive a copy of the material safety data sheet please contact Atlantic Blowers.

Chemical Coating Parts List	
001	Impeller
002	Blower Housing Cover
003	Blower Housing
008	Muffler
011	Flange



Accessories

Kit Overview

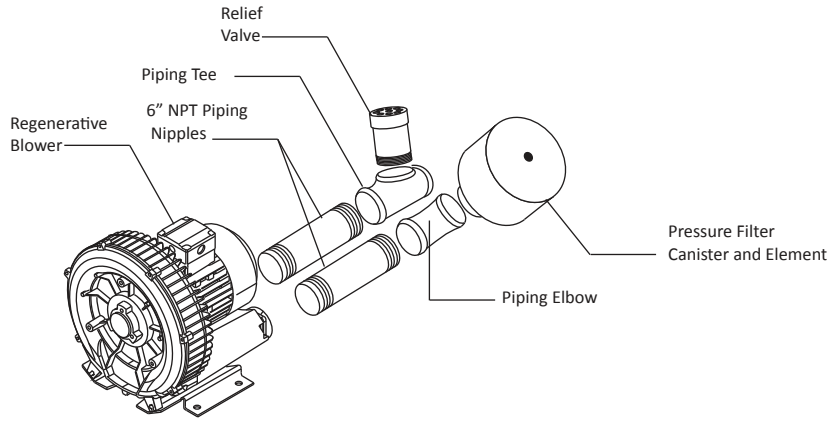
Regenerative Blower pressure and vacuum kits are available as a pre-packaged unit from Atlantic Blowers. The blower kit ensures that the blower is always conveying clean, dry air; releasing excess back pressure or vacuum thereby maximizing the longevity and performance of the blower. A kit comes with the regenerative blower, a pressure or vacuum filter canister and element, relief valve, and piping to connect these components to the blower. Also, purchasing a kit extends the warranty from 12 to 18 months.

Installation

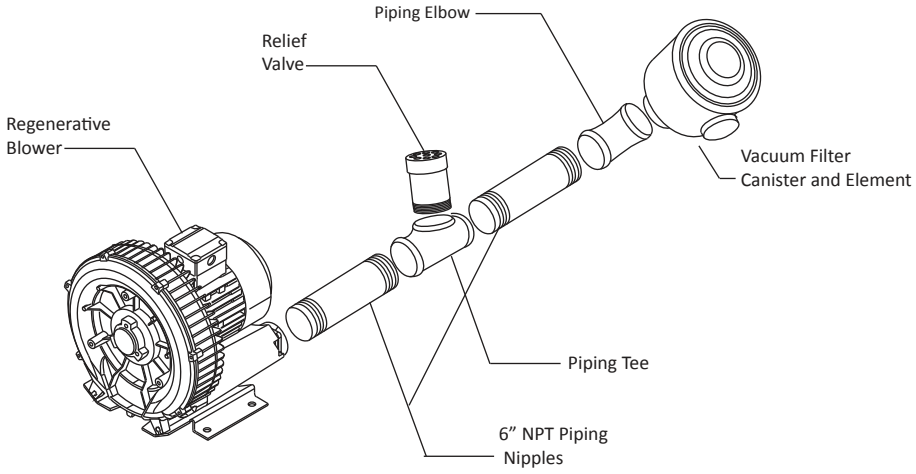
Begin by wrapping Teflon tape to the male thread of each component. With a pipe wrench, secure both piping nipples first followed by the elbow, then finally the tee fitting. Once the piping is installed, insert the relief valve, and then finally the filter canister. The filter canister may need to be installed at an angle depending on the blower size.

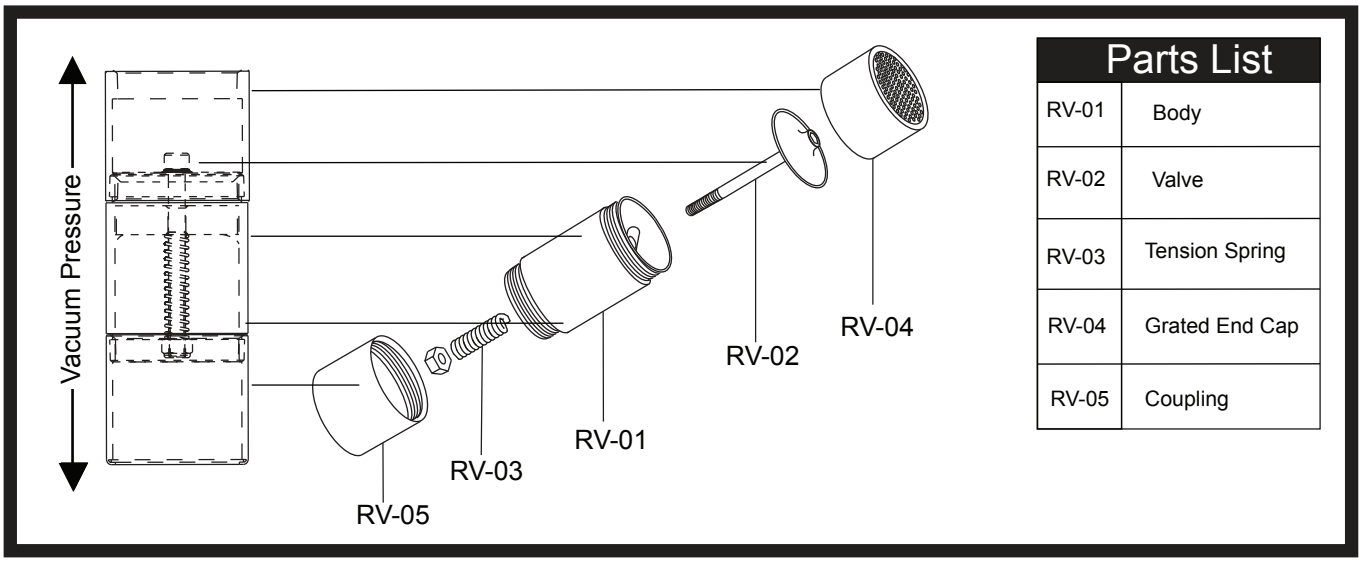
Regenerative Blower Kit Diagram

Regenerative Blower Pressure Kit



Regenerative Blower Vacuum Kit





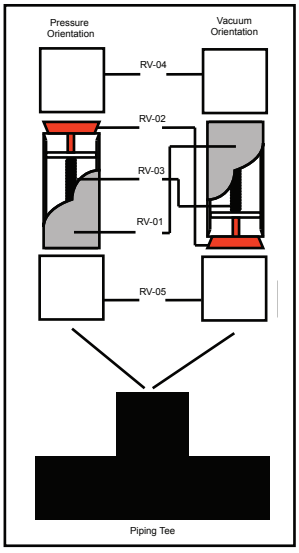
Parts List	
RV-01	Body
RV-02	Valve
RV-03	Tension Spring
RV-04	Grated End Cap
RV-05	Coupling

Description

Atlantic Blowers' relief valves are adjustable and reversable; made for both pressure and vacuum applications. In the event that a blower exceeds its maximum pressure or vacuum capicity, the relief valve will automatically open to its adjusted tolerance to relieve the system of any harmful back pressure. Relieving this back pressure is important due to the stress it adds to a blower's motor. Operating beyond a blower's maximum pressure/vacuum limit without a relief valve WILL Result in motor failure.

Installation

The relief valve can be used in either a pressure or vacuum application. The valve mechanism (Part # RV-02) will help to indicate the correct orientation. In a pressure application this part faces upward, and for a vacuum application this part faces downward (Ex. 1.1). The relief valve should always be installed in a piping tee no more than a foot from the blower inlet or outlet. During installation the tension spring (Part # RV-03) should be adjusted to meet the blower's maximum pressure range. Below you will find a guide to setting the relief valve:



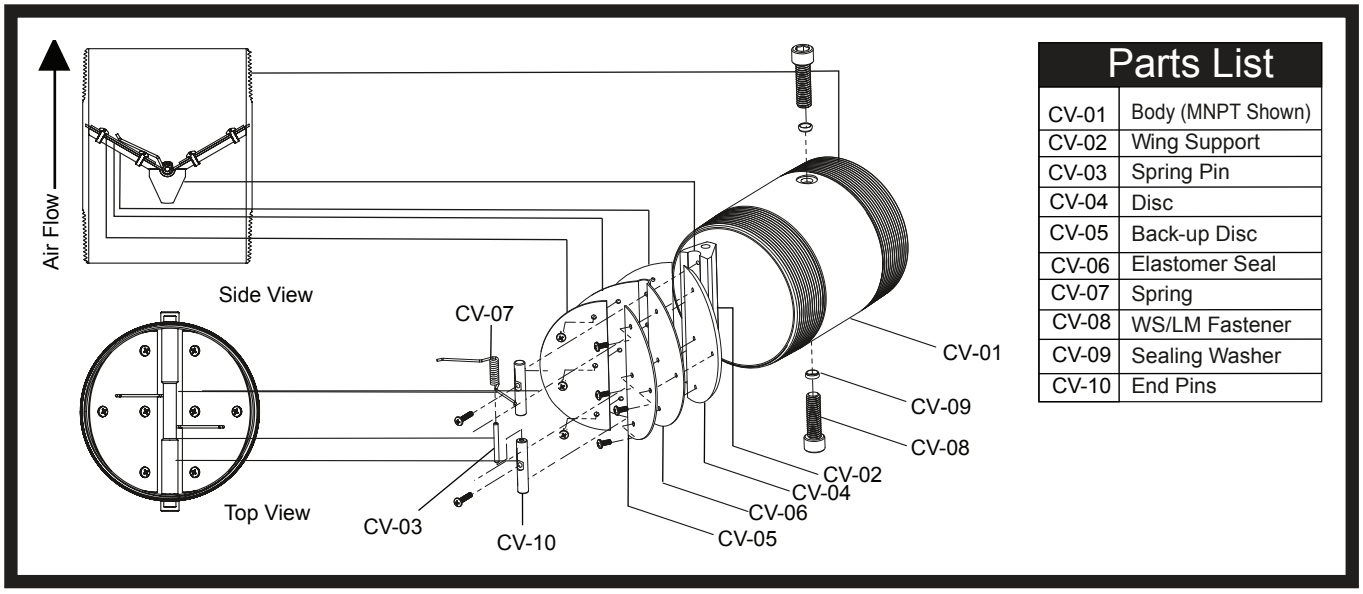
Ex.1.1- Relief Valve Orientation

Setting Your Relief Valve

To begin, you will need an amp meter and a gate valve to throttle the blower. Tighten the nut of the relief valve completely. Install both the relief valve and gate valve (down stream of the relief valve). As the blower is running, close the gate valve (no more than 3 seconds) to bring the motor to it's rated full load amps (FLA). IMPORTANT: The gate valve must be opened after 3 seconds. Exceeding this time frame may cause damage to the motor. After the gate valve is opened, remove the relief valve and loosen the nut by 2 full turns. Reinstall the relief valve and repeat this process until the amp rating is 1 amp below the FLA while the gate valve is fully closed.

Caution

A relief valve is a safety mechanism that is only intended as a temporary preventative measure. If your relief valve is constantly open this is either a sign that it is not properly installed, or your blower is constantly being subjected to harmful back pressure. Double check the relief valve installation and if it is found to be correct then you must re-evaluate your application to determine if you have chosen the right blower.



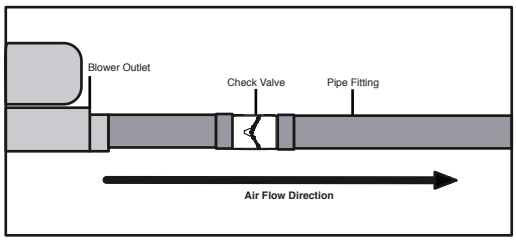
Parts List	
CV-01	Body (MNPT Shown)
CV-02	Wing Support
CV-03	Spring Pin
CV-04	Disc
CV-05	Back-up Disc
CV-06	Elastomer Seal
CV-07	Spring
CV-08	WS/LM Fastener
CV-09	Sealing Washer
CV-10	End Pins

Description

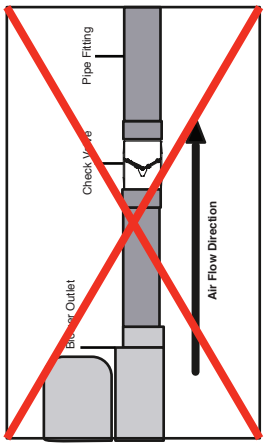
Atlantic Blowers' Check Valves are used to prevent the back flow of liquid and debris. This provides a one way flow path that keeps the blower protected at all times. Check valves are strongly recommended for any applications involving liquid, gas, or dust.

Installation

Check valves should be installed in line with the double doors facing away from the blower (Example 2.1). All Atlantic Blowers' Check Valves are male NPT threaded and come in either a 1.25", 1.5", 2", 2.5", 3", 4", and 5" diameter size. Upon installation, operate the blower briefly with the check valve installed and test that the valve is installed correctly. While running the test, ALWAYS test the amp draw and confirm that it meets the FLA on the blower motor tag.



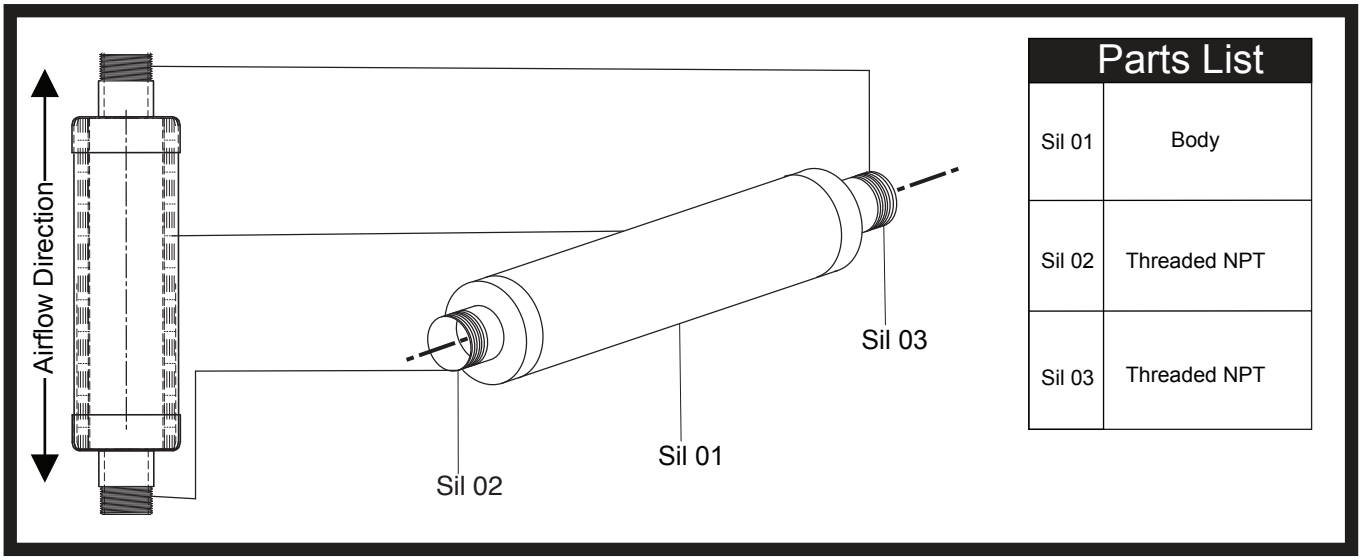
Ex. 2.1- Check Valve Installation



Ex. 2.2- Check Valve Installation

Caution

Excess back pressure will weaken the elasomter seal. For best results, do not plumb the check valve in an area where the fluid flow is bi-directional. DO NOT operate the blower with the check valve installed in the wrong direction. This will result in blower failure. If the blower is mounted vertically, do not install the check valve directly over the blower outlet. If the check valve fails, there will be a serious risk of debris falling into the blower housing.



Parts List	
Sil 01	Body
Sil 02	Threaded NPT
Sil 03	Threaded NPT

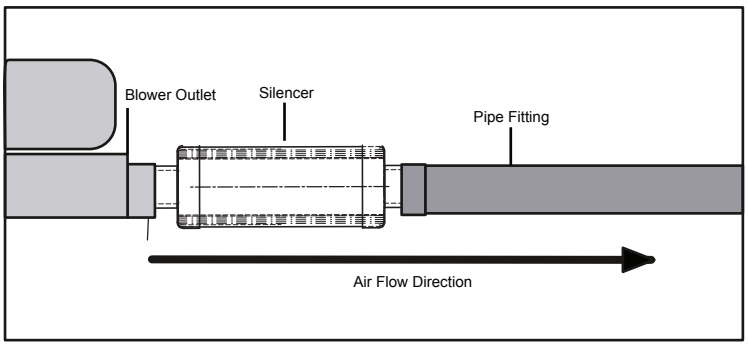
Description

Atlantic Blowers' external silencers are made of durable cast aluminum. External silencers are used to reduce the noise level of a blower by 10-15 dbA. Silencers can be used on either the inlet or outlet of the blower. For additional noise reduction, silencers can be fitted to both the inlet **and** outlet. All silencers are tested at a distance of 3 ft (1 meter).

Installation

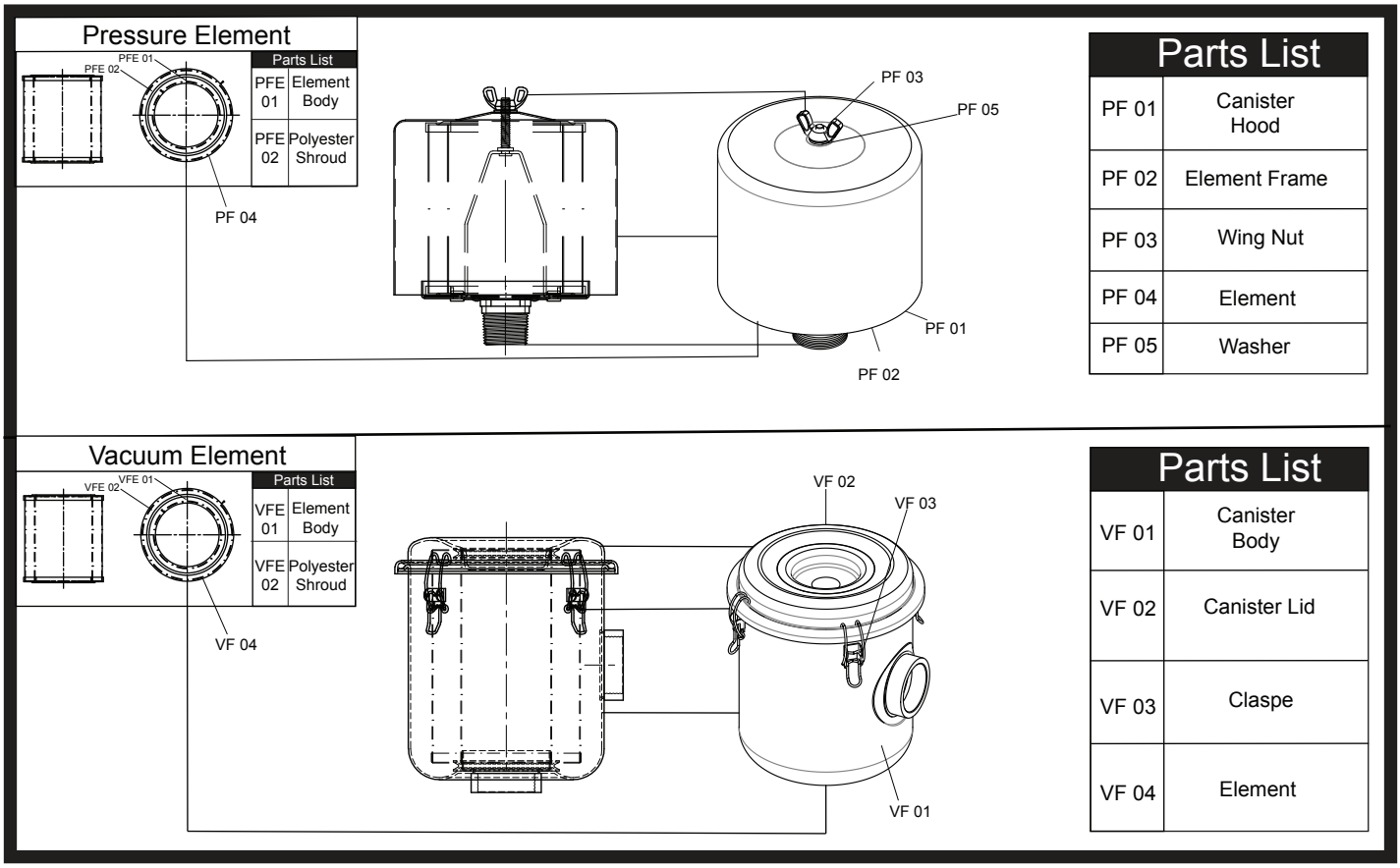
Silencers should be installed in-line directly in the inlet or outlet of the blower (Example 1.4). All Atlantic Blowers' Silencers are male NPT threaded and come in either a 1.25", 1.5", 2", 2.5", 3", 4", and 5" diameter size.
Upon installation, operate the blower briefly to test for any leakage in the silencer/blower connection point.

Ex. 1.4 - Silencer Installation



Caution

Always install a silencer with the same inlet/outlet diameter as its paired blower. DO NOT use a silencer with a different diameter.

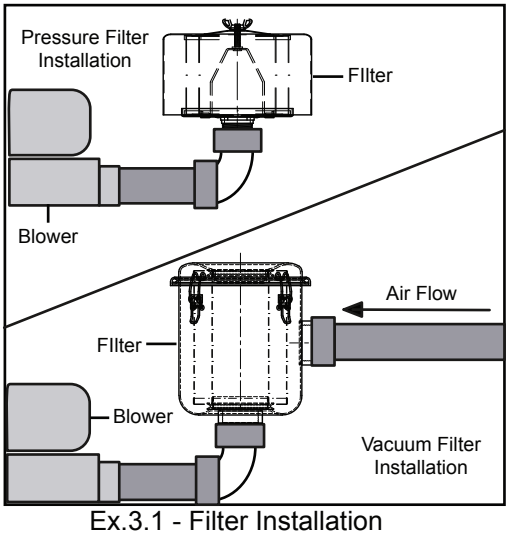


Description

Atlantic Blowers' pressure/vacuum filters keep debris from entering and damaging the blower. Filters are a required accessory for any regenerative blower. Our filters come standard with a 2 micron paper element and can be customized with a 0.3 micron HEPA filter element, or 5 micron polyester element. When choosing a filter, please be sure to only use vacuum filter canisters for vacuum applications, and pressure filter canisters for pressure applications.

Installation

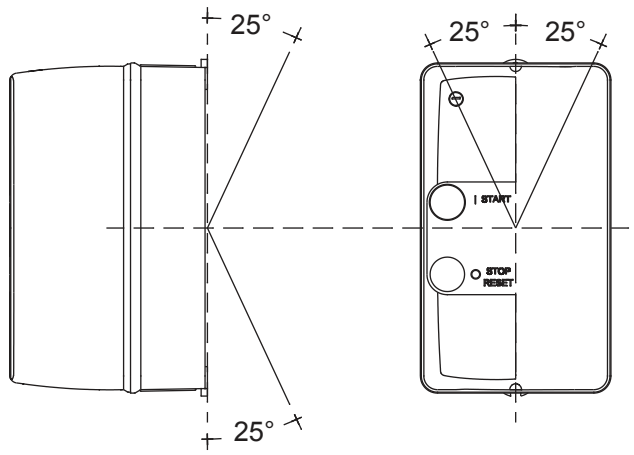
Pressure/vacuum filters are to be installed on the inlet of the blower only. Do not operate a regenerative blower without a filter. Use Teflon tape to provide a good seal before the filter is threaded on. Once installed use a filter monitor gauge (AB-12000) to check the health of the filter element.



Ex.3.1 - Filter Installation

Caution

For our vacuum filter canisters, be sure to use the provided seals on the lid and body to ensure a tight element fit. Again, DO NOT OPERATE a regenerative blower without a filter. This will result in failure of the motor. If the blower was found to be operating without a filter the warranty will be voided. For environments containing large amount of debris particles, the filter element will need to be changed more often. This frequency is ultimately at the discretion of the operator and will be dependent upon the amount of blockage the element has sustained. For best results use a filter monitor gauge.



Line Terminals		
IC330-09S...18S	14-10 awg	15 lb-in
IC330-25S	14-8 awg	16 lb-in
IC330-32S...40S	14-8 awg	22 lb-in
IC330-50S...80S	14-1/0 awg	40 lb-in
IC330-95S...105S	10-1/0 awg	60 lb-in

Load Terminals		
IOL-25S	14-6 awg	20 lb-in
IOL-40S...80S	14-2 awg	35 lb-in
IOL-105S	8-1/0 awg	53 lb-in

Description

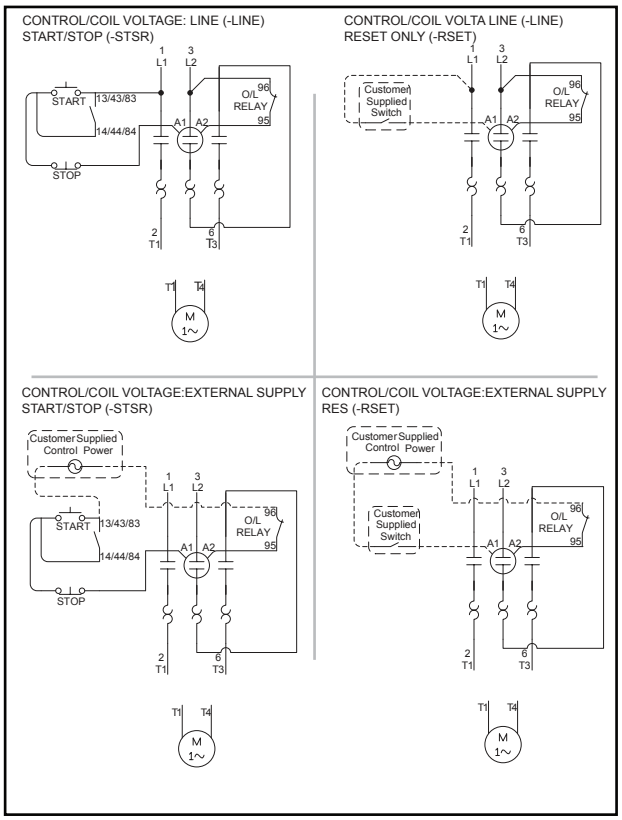
Motor starters are used to control the operation of a blower by providing a partition between the incoming power source and motor. Using an enclosed motor starter protects the motor from burnout and overload. These starters come standard with a start, stop, and reset button. Each starter is rated for NEMA 4X protection. Atlantic Blowers motor starters can be used with our entire blower line and are compatible with either single or three phase power.



SHOCK HAZARD

Installation

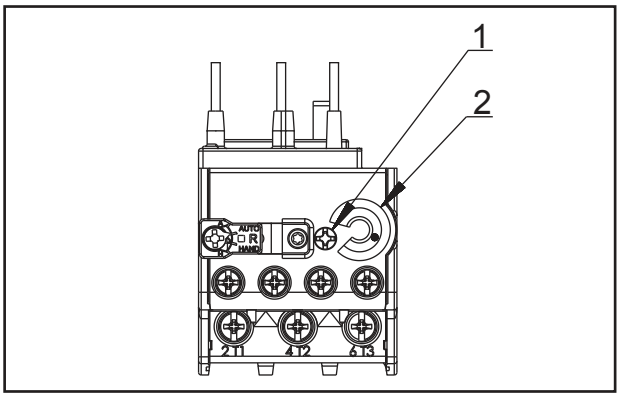
Please follow the diagram (EX. 4.1 - Motor Starter Schematic) for installation instructions. Before installation, check to see that all incoming power is disabled and that no incoming lines are connected.



Ex.4.1 - Motor Starter Schematic

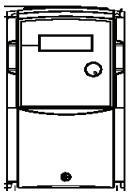
Caution

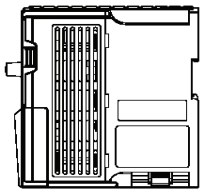
To provide continued protection against fire or shock hazard, the complete overload relay must be replaced if burnout of one or more of the heater elements occurs. **Setting the full load current:** (Ex.4.2 - Motor Starter FLA Dial) Set the overload relay to full load current by adjusting dial (1) so that the set marking (red point) aligns with the desired current (2).

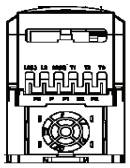


Ex.4.2 - Motor Starter FLA Dial

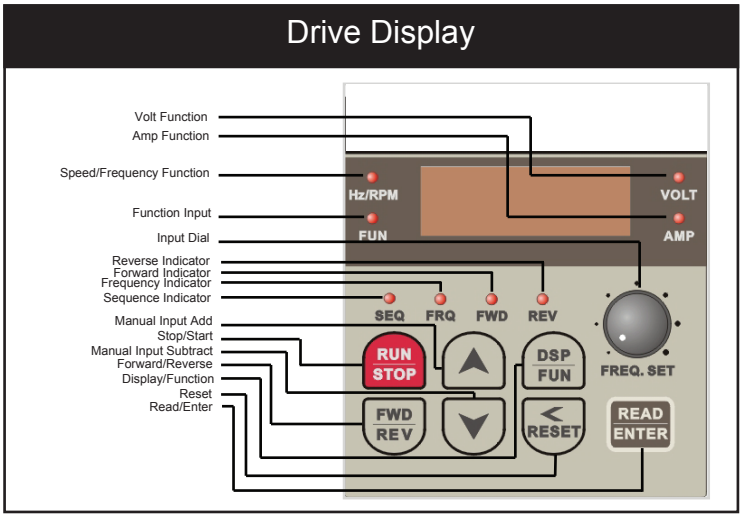
Variable Frequency Drives (VFD's)







Drive Display



Description

Variable Frequency Drives (VFD's) are used to control the speed and frequency of the blower motor. By lowering the speed of the motor, the blower flow rate (CFM) will decrease linearly, and pressure will decrease exponentially. Each VFD is rated for NEMA 4X protection. Atlantic Blowers variable frequency drives can be used with any 3 phase blower.

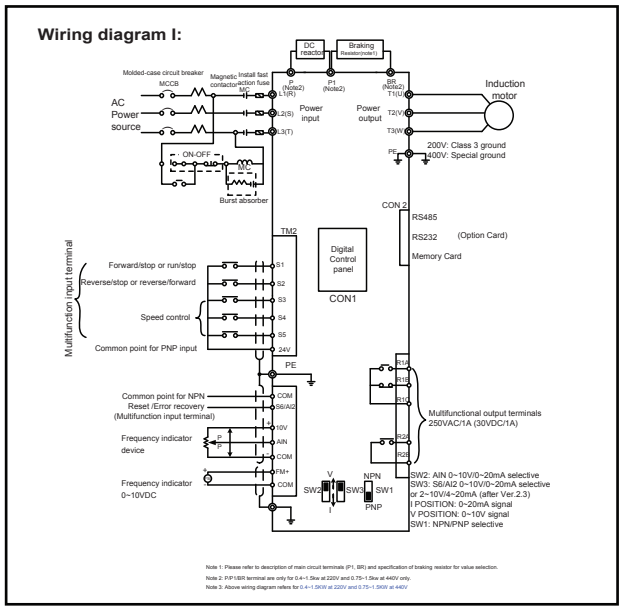
SHOCK HAZARD

Installation

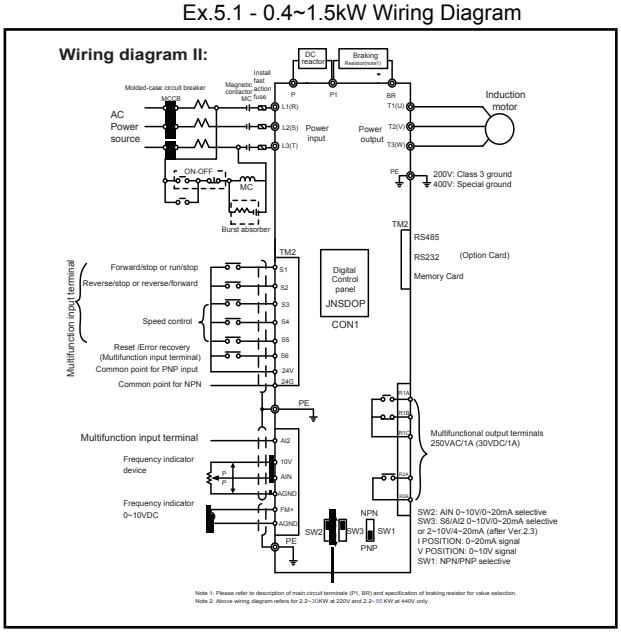
Please follow the diagram (Ex.5.1 - 0.4~1.5kW Wiring Diagram, Ex.5.2 - 2.2~30kW Wiring Diagram) for installation instructions. Before installation, check to see that all incoming power is disabled and that no incoming lines are connected.

Caution

To provide continued protection against motor failure, check to see that the VFD is compatible with your motor's HP, voltage and amperage range.

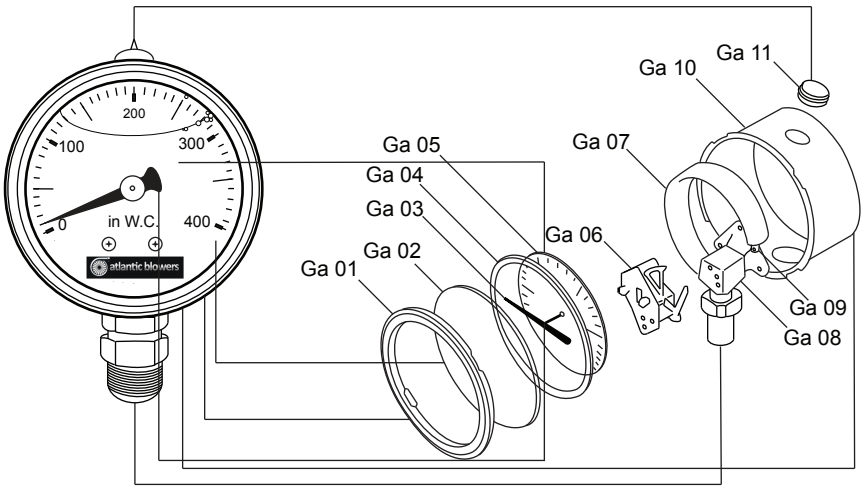


Ex.5.1 - 0.4~1.5kW Wiring Diagram



Ex.5.2- 2.2~30kW Wiring Diagram

Pressure/Vacuum Gauges



Parts List	
Ga 01	Flange
Ga 02	Window
Ga 03	Pointer
Ga 04	Gasket
Ga 05	Unit Diagram
Ga 06	Rack and Pinion
Ga 07	C Tube
Ga 08	Threaded Socket
Ga 09	Link
Ga 10	Body
Ga 11	Glycerin Plug

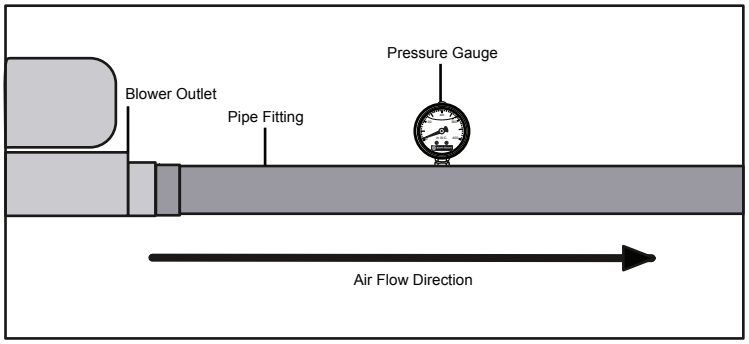
Description

Atlantic Blowers' pressure and vacuum gauges are made of durable steel components with a 1/4" (M) NPT connection. Gauges are used to measure static pressure exiting and entering the blower. All static pressure is measured above atmospheric pressure. Each gauge is filled with glycerin to dampen system pulsation to keep the pointer from vibrating.

Installation

To install a pressure/vacuum gauge begin by tapping a hole 12"- 36" from the inlet/outlet of the blower. Once the hole is tapped thread the hole to match the thread pattern and pitch of the NPT threads. Wrap the 1/4" NPT thread with Teflon tape. Line the gauge up to the hole to be perpendicular to the adjoining pipe before screwing in the gauge. Once installed, make sure that the gauge is seated firmly in the hole.

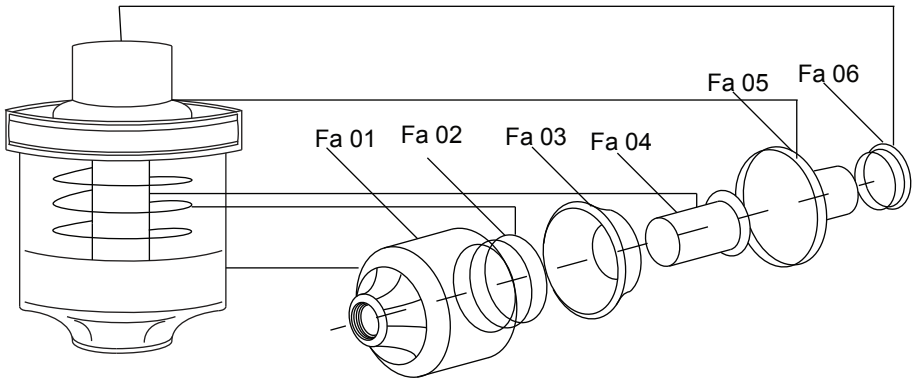
Ex. 6.1- Gauge Installation



Caution

For best results, do not install a gauge on a pipe with a diameter less than 1". If the pipe is metal, coat the threaded hole with oil before installing the gauge. DO NOT force the gauge into a tapped hole. This may lead to a stripped gauge. Always install the gauge perpendicular to the pipe as this will ensure a tighter seal.

Filter Monitor Gauges



Parts List	
Fa 01	Body
Fa 02	Spring
Fa 03	Diaphram
Fa 04	Pin
Fa 05	Cap
Fa 06	Reset Plug

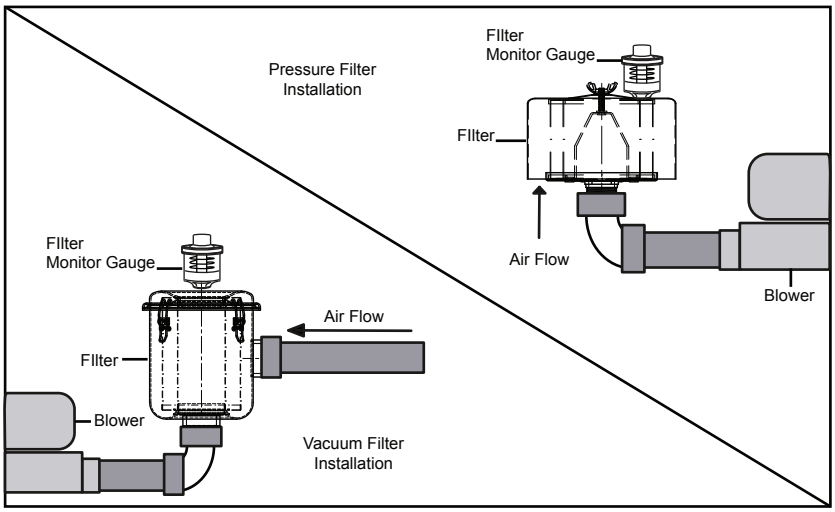
Description

A pressure monitor gauge allows the user to measure the pressure differential of a filter element. As the element collects dust and debris, there is a raise of differential pressure inside the filter. The filter monitor gauge measures this change, and visually indicates when an element should be changed.

Installation

To install a pressure monitor gauge begin by tapping a hole at the top of your pressure/vacuum filter. Be sure to tap the hole inside the inner diameter of the element space. Thread the the hole to match the 1/4” NPT fitting included with the gauge.

Ex. 7.1- Monitor Gauge Installation



Caution

Coat the threaded hole with oil before installing the gauge. DO NOT force the gauge into a tapped hole. This may lead to a stripped gauge. Always install the gauge parallel to the filter. Install the gauge at the inside point of the filter element.

Warranty

ATLANTIC BLOWERS (“Atlantic Blowers”)
warrants this product against defects in material
or workmanship, as follows:

A. Labor

For a period of twelve (12) months from the date of purchase, Atlantic Blowers will, at no charge, repair this Product if determined by Atlantic Blowers to be defective. After the warranty period, the Purchaser must pay all labor charges.

B. Parts

For a period of one (1) year from the date of purchase Atlantic Blowers will, at no charge, supply new or rebuilt replacements for parts determined by Atlantic Blowers to be defective. After the warranty period, the Purchaser must pay all parts charges.

C. Territory

During the labor warranty period, to repair the Product, Purchaser will either return the defective Product; freight prepaid, or deliver it to an Atlantic Blowers Service Center or to a service facility authorized by Atlantic Blowers. The Product to be repaired is to be returned in either its original carton or a similar package affording an equal degree of protection. Atlantic Blowers will return the repaired Product freight prepaid to Purchaser. All freight costs associated with replacement of warranty parts after expiration of the original labor warranty period are the responsibility of the Purchaser. Atlantic Blowers is not obligated to provide Purchaser with a substitute unit during the warranty period or at any time. For an additional fee, Atlantic Blowers field service and support at the Purchaser’s location is available to Purchaser at Atlantic Blower’s prevailing per incident billable rates for such service subject to availability.

The limited warranty stated on this card is subject to all of the following terms and conditions.

TERMS AND CONDITIONS

1.NOTIFICATION OF CLAIMS: WARRANTY SERVICE: If Purchaser believes that the Product is defective in material or workmanship, then written notice with an explanation of the claim shall be given promptly by Purchaser to Atlantic Blowers but all claims for warranty service must be made within the warranty period. If after investigation Atlantic Blowers determines that the reported problem was not covered by the warranty, Purchaser shall pay Atlantic Blowers for the cost of investigating the problem at it sthen prevailing per incident billable rate. No repair or replacement of any Product or part thereof shall extend the warranty period as to the entire Product. The specific warranty on the repaired part only shall be in effect for a period of ninety (90) days following the repair or replacement of that part or the remaining period of the Product parts warranty, whichever is greater.
2.EXCLUSIVE REMEDY: ACCEPTANCE: Purchaser’s exclusive remedy and Atlantic Blower’s sole obligation is to supply (or pay for) all labor necessary to repair any Product found to be defective within the warranty period and to supply, at no extra charge, new or rebuilt replacements for defective parts. If repair or replacement fails to remedy the defect, then, and only in such event, shall Atlantic Blowers refund to Purchaser the purchase price for such Product. Purchaser’s failure to make a claim as provided in paragraph 1 above or continued use of the Product shall constitute an unqualified acceptance of such Product and a waiver by Purchaser of all claims thereto.
3.EXCEPTIONS TO LIMITED WARRANTY: Atlantic Blowers shall have no liability or obligation to Purchaser with respect to any Product requiring service during the warranty period which is subjected to any of the following: abuse, improper use: negligence, accident, modification, failure of the end-user to follow the operating procedures outlined in the user’s manual, failure of the end-user to follow the maintenance procedures in the service manual for the Product where a schedule is specified for regular replacement or maintenance or cleaning of certain parts (based on usage) and the end-user has failed to follow such schedule; attempted repair by non-qualified personnel; operation of the Product outside of the published environmental and electrical parameters, or if such Product’s original identification (trademark, serial number) markings have been defaced, altered, or removed. Atlantic Blowers excludes from warranty coverage Products sold AS IS and/or WITH ALL FAULTS and excludes used Products which have not been sold by Atlantic Blowers to the Purchaser. Atlantic Blowers also excludes from warranty coverage consumable items such as filters and valves. All material and accompanying documentation furnished with, or as part of the Product is furnished “AS IS” (i.e., without any warranty of any kind), except where expressly provided otherwise in any documentation or license agreement furnished with the Product. Blower(s), coverage will be denied if a filter and relief valve were not used during normal operation. This warranty does not apply to electrical controls and gasoline engines not supplied by Atlantic and does not extend to any goods or parts which have been subjected to misuse, lack of maintenance, neglect, damage by accident or transit damage. Decomposition by chemical reaction and chemical precipitate, or wear caused by the presence of abrasive materials shall
4.Liability: Atlantic is not responsible or liable for indirect or consequential damages of any kind however, including but not limited to those for use of any products, loss of time, inconvenience, lost profit, labor charges, or other incidental or consequential damages with respect to persons, business, or property, whether as a result of breach of warranty, negligence or otherwise.
5.PROOF OF PURCHASE: The Purchaser’sdatedinvoicemustberetainedasevidenceofthedateofpurchaseandtoestablish warranty eligibility.
6.PRODUCT REGISTRATION: Registration of any Product or of this limited warranty is voluntary; failure to register will not diminish any rights available under this warranty.

DISCLAIMER OF WARRANTY
EXCEPT FOR THE FOREGOING WARRANTIES, ATLANTIC BLOWERS HEREBY DISCLAIMS AND EXCLUDES ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, BUT NOT LIMITED TO ANY AND/OR ALL IMPLIED WARRANTIES OF MERCHANTABIL ITY, FITNESS FOR A PARTICULAR PURPOSE AND/OR ANY WARRANTY WITH REGARD TO ANY CLAIM OF INFRINGEMENT THAT MAY BE PROVIDED IN SECTION 2-312(3) OF THE UNIFORM COMMERCIAL CODE AND/OR IN ANY OTHER COMPARABLE STATE STATUTE. ATLANTIC BLOWERS HEREBY DISCLAIMS ANY REPRESENTATIONS OR WARRANTY THAT THE PRODUCT IS COMPATIBLE WITH ANY COMBINATION OF NON-ATLANTIC BLOWERS PRODUCTS PURCHASER MAY CHOOSE TO CONNECT TO THE PRODUCT.

LIMITATION OF LIABILITY
THE LIABILITY OF ATLANTIC BLOWERS, IF ANY, AND PURCHASER’S SOLE AND EXCLUSIVE REMEDY FOR DAMAGES FOR ANY CLAIM OF ANY KIND WHATSOEVER, REGARDLESS OF THE LEGAL THEORY AND WHETHER ARISING IN TORT OR CONTRACT, SHALL NOT BE GREATER THAN THE ACTUAL PURCHASE PRICE OF THE PRODUCT WITH RESPECT TO WHICH SUCH CLAIM IS MAD E. IN NO EVENT SHALL ATLANTIC BLOWERS BE LIABLE TO PURCHASER FOR ANY SPECIAL, INDIRECT, INCIDENTAL, OR CONSEQUENTIAL DAMAGES OF ANY KIND INCLUDING, BUT NOT LIMITED TO, COMPENSATION, REIMBURSEMENT OR DAMAGES ON ACCOUNT OF THE LOSS OF PRESENT OR PROSPECTIVE PROFITS OR FOR ANY OTHER REASON WHATSOEVER.

For further information and the name of the nearest authorized Atlantic Blowers service facility contact: United States of America

Atlantic Blowers
Customer Services
1134 Longpoint Dr
Dallas, TX 75247
(214) 233-0280
www.atlanticblowers.com
sales@atlanticblowers.com

Condition of Sale

1. Warranties
Seller warrants to Buyer that products and any services furnished hereunder will be free from defects in material, workmanship and title and will be of the kind and quality specified in Seller's written quotation. The foregoing shall apply only to failures to meet said warranties (excluding any defects in title) which appear within 12 months from the date of shipment hereunder. The conditions of any tests shall be mutually agreed upon and Seller shall be notified of, and may be represented at, all tests that may be made. The warranties and remedies set forth herein are conditioned upon (a) proper storage, installation, use and maintenance, and conformance with any applicable recommendations of Seller and (b) Buyer promptly notifying Seller of any defects and, if required, promptly making the product available for correction. If any product or service fails to meet the foregoing warranties (except title), Seller shall thereupon correct any such failure either at its option, (i) by repairing any defective or damaged part or parts of the products, or (ii) by making available, F.O.B. Seller's plant or other point of shipment, any necessary repaired or replacement parts. Where a failure cannot be corrected by Seller's reasonable efforts, the parties will negotiate an equitable adjustment in price. The preceding paragraph sets forth the exclusive remedies for claims (except as to title) based on defect in or failure of products or services, whether the claim is in contract, indemnity, warranty, tort (including Seller's negligence), strict liability or otherwise and however instituted. Upon the expiration of the warranty period, all such liability shall terminate and Buyer shall have a reasonable time, within thirty days after the warranty period, to give written notice of any defects which appeared during the warranty period. Except as set forth in Article 2, "Patents", the foregoing warranties are exclusive and in lieu of all other warranties, whether written, oral, implied or statutory. NO IMPLIED STATUTORY WARRANTY OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE SHALL APPLY. Seller does not warrant any products or services of others which Buyer has designated.

2. Patents
(a) Subject to the provisions of this Article, Seller warrants that products furnished hereunder, and any part thereof, shall be delivered free of any rightful claim of any third party for infringement of any United States patent. If notified promptly in writing and given authority, information and assistance, and contingent upon Buyer not taking any position adverse to Seller in connection with such claim, Seller shall defend, or may settle, at its expense, any suit or proceeding against Buyer so far as based on a claimed infringement which would result in a breach of this warranty and Seller shall pay all damages and costs awarded therein against Buyer due to such breach. In case any product or part thereof is in such suit held to constitute such an infringement and the use for the purpose intended of said product or part is enjoined, Seller shall, at its expense and option, either procure for Buyer the right to continue using said product or part, or replace same with a noninfringing product or part, or modify same so it becomes noninfringing, or remove the product and refund the purchase price (less reasonable depreciation for any period of use) and any transportation costs separately paid by Buyer. The foregoing states the entire liability of Seller for patent infringement by said products or any part thereof. (b) The preceding paragraph shall not apply to any product or part specified by Buyer or manufactured to Buyer's design, or to the use of any product furnished hereunder in conjunction with any other product in a combination not furnished by Seller as a part of this transaction. As to any such product, part, or use in such combination, Seller assumes no liability whatsoever for patent infringement and Buyer will hold Seller harmless against any infringement claims arising therefrom.

3. Delivery, title and risk of loss
Delivery dates are approximate and are based upon prompt receipt of all necessary information from Buyer. Unless otherwise specified by Seller, delivery will be made and title will pass F.O.B. point of shipment to Buyer. Risks of loss or damage pass to Buyer on delivery. Further, buyer agrees to file a claim for shortage or damage with the carrier.

4. Excusable delays
Seller shall not be liable for delays in delivery or performance, or for failure to manufacture, deliver or perform, due to (i) a cause beyond its reasonable control, or (ii) an act of God, act of Buyer, act of civil or military authority, Governmental priority, strike or other labor disturbance, flood, epidemic, war, riot, delay in transportation or car shortage, or (iii) inability on account of a cause beyond the reasonable control of Seller to obtain necessary materials, components, services or facilities. Seller will notify Buyer promptly of any material delay excused by this Article and will specify the revised delivery date as soon as practicable. In the event of any such delay, there will be no termination and the date of delivery or of performance shall be extended for a period equal to the time lost by reason of the delay. In the event of an unexcused and material delay, the parties will mutually agree to an equitable solution.

5. Payments and financial condition
Except to the extent otherwise specified by Seller in its quotation, pro rata payments shall become due without setoff as shipments are made. If Seller consents to delay shipments after completion of any product, payment shall become due on the date when Seller is prepared to make shipment. In the event of any such delay, title shall pass and products shall be held at Buyer's risk and expense. Any order for products by Buyer shall constitute a representation that Buyer is solvent. In addition, upon Seller's request, Buyer will furnish a written representation concerning its solvency at any time prior to shipment. If Buyer's financial condition at any time does not justify continuance of the work to be performed by Seller hereunder on the agreed terms of payment, Seller may require full or partial payment in advance. In the event of Buyer's bankruptcy or insolvency or in the event any proceeding is brought against Buyer, voluntarily or involuntarily, under the bankruptcy or any insolvency laws, Seller shall be entitled to cancel any order then outstanding at any time during the period allowed for filing claims against the estate and shall receive reimbursement for its proper cancellation charges. Seller's rights under this Article are in addition to all rights available to it at law or in equity.

6. Cancellations
All orders are for firm delivery and not subject to change or cancellation, without written approval from Atlantic Blowers. In the event a cancellation or change is approved, buyer agrees to pay a re-stocking fee and any applicable freight costs:

25% re-stocking fee on all items returned
40% re-stocking fee on all items returned 31-60 days
50% re-stocking fee on all items returned 61-90 days
> 90 days No Returns Allowed

7. Disclosure of information
Any information, suggestions or ideas transmitted by Buyer to Seller in connection with performance hereunder are not to be regarded as secret or submitted in confidence except as may be otherwise provided in a writing signed by a duly authorized representative of Seller.

8. Taxes
In addition to any price specified herein, Buyer shall pay the gross amount of any present or future sales, use, excise, value-added, or other similar tax applicable to the price, sale or delivery of any products or services furnished hereunder or to their use by Seller or Buyer, or Buyer shall furnish Seller with evidence of exemption acceptable to the taxing authorities.

9. Limitations of liability and indemnities
(a) Subject to the other provisions of this Article, Seller agrees to indemnify and save harmless Buyer from and against any loss, expense or claim asserted by third parties for damage to third party tangible property, or for bodily injury, or both, arising out of the performance of this agreement, to the extent such damage or injury is attributable to the negligence of Seller; provided that Buyer gives Seller prompt notice of any such claim and all necessary information and assistance so that Seller, at its option, may defend or settle such claim and Buyer does not take any adverse position in connection with such claim. In the event that any such damage or injury is caused by the joint or concurrent negligence of Seller and Buyer, the loss, expense or claim shall be borne by Seller and Buyer in proportion to their negligence.

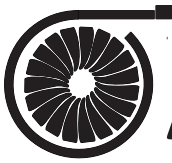
(b) Except as provided in Article 2, “Patents”, in no event, whether as a result of breach of contract, indemnity, warranty, tort (including Seller’s negligence), strict liability or otherwise, shall Seller’s liability to Buyer or its insurers for any loss or damage arising out of, or resulting from this agreement, or from its performance or breach, or from the products or services furnished hereunder, exceed the price of the specific product or service which gives rise to the claim, and except as to title, any such liability shall terminate upon the expiration of the warranty period specified in Article 1, “Warranties”. Any such claim of liability must be timely commenced in a court of competent jurisdiction in accordance with the applicable statute of limitations and/or of repose, but in no event later than one year from the termination of the warranty period.
(c) In no event, whether as a result of breach of contract, indemnity, warranty, tort (including Seller’s negligence), strict liability or otherwise, shall Seller be liable for any special, consequential, incidental or penal damages including, but not limited to, loss of profit or revenues, loss of use of the products or any associated equipment, damage to associated equipment, cost of capital, cost of substitute products, facilities, services or replacement power, downtime costs, or claims of Buyer’s customers for such damages. If the products or services being provided by Seller will be furnished by the Buyer to a third party by contract or otherwise or relate to a contract between the Buyer and a third party, the Buyer shall obtain from such third party a provision affording Seller the protection of this Article, except for paragraph (a).
(d) If Seller furnishes Buyer with advice or other assistance which concerns any product supplied hereunder or any system or equipment in which any such product may be installed and which is not required pursuant to this agreement, the furnishing of such advice or assistance will not subject Seller to any liability, whether in contract, indemnity, warranty, tort (including Seller’s negligence), strict liability or otherwise. For the purposes of paragraphs (b), (c) and (d) of this Article, the term Seller includes the Seller’s subcontractors and suppliers.
(e) Unless otherwise agreed in writing by a duly authorized representative of Seller, products sold hereunder are not intended for use in connection with any nuclear facility or activity. If so used, the provisions of the Rider For Nuclear Applications (below) will apply.

10. Application Guidance
Atlantic Blowers offers general application guidance; however suitability of the particular blower selection is ultimately the responsibility of the purchasee, not the manufacturer.

11. General
Any products delivered by Seller hereunder will be produced in compliance with the Fair Labor Standards Act of 1938, as amended and applicable. Seller will comply with applicable federal, state and local laws and regulations as of the date of any quotation which relate to (i) nonsegregated facilities and equal employment opportunity (including the seven paragraphs appearing in Section 202 of Executive Order 11246, as amended), (ii) workers’ compensation, and (iii) the production in Seller’s manufacturing facilities of products furnished hereunder. Price and, if necessary, delivery will be equitably adjusted to compensate Seller for the cost of compliance with any other laws or regulations.The delegation or assignment by Buyer of any or all of its duties or rights hereunder without Seller’s prior written consent shall be void. Any representation, warranty, course of dealing or trade usage not contained or referenced herein will not be binding on Seller. These Conditions of Sale contain the entire and only agreement between the Buyer and Seller respecting the terms and conditions and supersedes and cancels all previous negotiations, agreements, commitments, representations and writings in respect thereto. The Conditions of Sale may not be amended, supplemented, changed or modified in any manner, orally or otherwise, except by an instrument in writing of concurrent or subsequent date, signed by a duly authorized representative of each party. The validity, performance and all matters relating to the interpretation and effect of this agreement and any amendment hereto shall be governed by the law of the State of Texas, excluding its conflict of law rules. The invalidity, in whole or part, of any of the articles or paragraphs in this Conditions of Sale will not affect the remainder of such article or paragraph or any other article or paragraph. The provisions of this agreement are for the benefit of the parties hereto and not for any other person except as specifically provided herein.

12. Hazardous locations
Atlantic Blowers highly recommends the use of explosion proof motors in explosive environments. Sealed blowers are not a substitute for explosion proof motors. Standard blowers with standard TEFC motors should not be used in explosive environments or where local, state and federal laws require explosion proof motors and materials.

Rider for nuclear applications
If any products sold hereunder are used in connection with any nuclear facility or activity, Seller and its suppliers shall have no liability to Buyer or its insurers for any nuclear damage or contamination, and Buyer shall indemnify Seller against any such liability, whether as a result of breach of contract, indemnity, warranty, tort (including Seller’s negligence), strict liability or otherwise. The indemnity in Article 8(a) above shall not apply to any damages or bodily injury, or both, arising out of a “nuclear incident”, as that term is defined in the Atomic Energy Act of 1954, as amended (the “Act”). In addition, Buyer shall furnish financial protection as required by Section 170 of the Act, including an agreement of indemnification and/or nuclear liability insurance from ANI and MAELU, or both, pursuant to Section 170 of the Act, as applicable. Buyer shall not remove any items of equipment from the plant site or otherwise transfer any interest therein without first providing Seller with written assurance of limitation of and protection against liability (both nuclear and non-nuclear) following the proposed removal or transfer at least equivalent to that afforded to Seller and its suppliers under Article 8 above. Removal or transfer contrary to this provision shall, in addition to any other legal or equitable rights of Seller, make Buyer the indemnitor of Seller and its suppliers to the same extent that they would have been protected had no such removal or transfer taken place. Any Seller’s material or equipment which becomes radioactive at the work site, shall, at Seller’s option, be purchased by Buyer. Any nuclear decontamination necessary for Seller’s performance (including warranty) shall be performed by Buyer without cost to Seller.



Atlantic Blowers

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Moisture Separator #AWS80-4

ESD Waste2Water, Inc.
Partnership for a Cleaner Tomorrow

Air / Water Separators



ESD Waste2Water, Inc. ESD custom fabricates Air / Water Separators for Soil Vapor Extraction and Dual Phase Extraction applications. Made of structurally sound, light-weight marine grade 5052 aluminum, our separators can withstand full vacuum applications and are completely corrosion resistant. Unlike carbon steel based separators, ESD Separators resist both internal chemical corrosion and the harshest external environmental conditions. The aesthetic qualities of ESD Separators are never compromised by oxidation. ESD Separators never experience corrosive pitting leaks, because our designs render expensive internal/external epoxy mastic coatings entirely unnecessary.

ESD Separators are available in many standard sizes and can be custom designed with a wide variety of options, including pump out systems, level gauging, additional particulate filtration, and baffling for high entrained

UL® Certified to UL-508A Standards

Thank you for allowing ESD to provide a solution to your equipment needs.





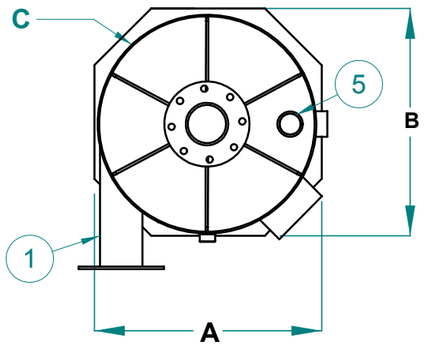
ESD Waste2Water, Inc.
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www.waste2water.com

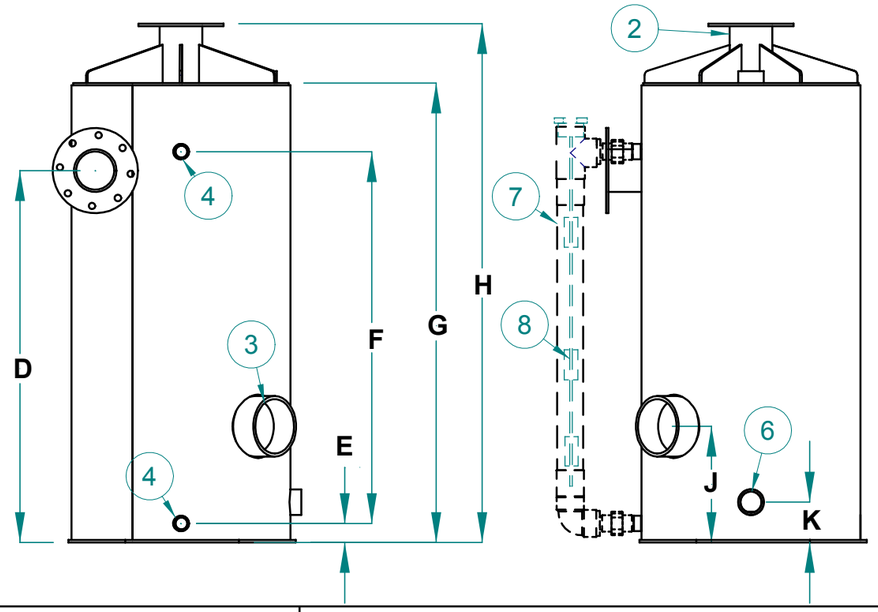


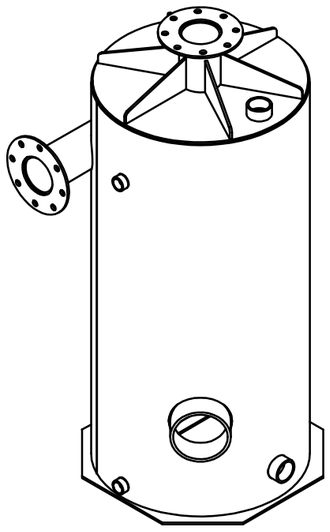
STANDARD AWS SPECIFCATION

TYPE	WORKING VOLUME @(LSH)	AVAILABLE CONNECTION TYPE																CLEAN OUT PIPE	A	B	C (DIA.)	D	E	F	G	H	J
		FLANGE						MNPT					FNPT														
		2"	3"	4"	6"	8"	10"	2"	3"	4"	6"	8"	2"	3"	4"	6"	8"										
AWS30	12 GAL	X	X	X	-	-	-	X	X	X	-	-	X	X	X	-	-	6"	-	-	16 1/4"	25"	2"	19"	30"	33 1/2"	6"
AWS60	24 GAL	X	X	X	X	-	-	X	X	X	X	-	X	X	X	-	-	6"	24"	24"	23"	25"	2"	23"	30"	36 1/2"	6"
AWS80	47 GAL	X	X	X	X	-	-	X	X	X	X	-	X	X	X	-	-	8"	24"	24"	23"	39"	2"	39"	48"	54 3/4"	12"
AWS120	50 GAL	X	X	X	X	X	-	X	X	X	X	-	X	X	X	-	-	8"	24"	24"	23"	49"	2"	49"	60"	66 3/4"	12"
AWS220	107 GAL	-	X	X	X	X	X	X	X	X	X	-	X	X	X	-	-	8"	34"	34"	33 1/2"	49"	2"	49"	60"	66 3/4"	12"

RECOMMENED AIR FLOW (ACFM)						
	2"	3"	4"	6"	8"	10" *
ACFM	120	280	320	500	750	1000







ITEM #	DESCRIPTION
1	INLET PIPE (SEE TABLE FOR AVAILABLE SIZE AND CONNECTION TYPE)
2	OUTLET PIPE (SEE TABLE FOR AVAILABLE SIZE AND CONNECTION TYPE)
3	CLEAN OUT
4	1" FNPT (MULTI LEVEL PROBE)
5	2" FNPT
6	2" FNPT
7	SIGHT TUBE 2" CLEAR PVC
8	MULTI LEVEL PROBE

NOTES:
1.MATERIAL : 1/8" & 3/16" ALUMINUM SHT 5052
2. PROBE (SIGHT TUBE) : 2" CLEAR PVC
3. CUSTOM SIZES AVAILABLE

ALL IDEAS,DESIGNS AND PLANS INDICATED OR REPRESENTED BY THIS DRAWING ARE OWNED BY AND THE PROPERTY OF ESD INC. AND WERE CREATED, EVOLVED AND DEVELOPED FOR USE ON AND IN CONJUCTION WITH THE SPECIFIED PROJECT. NONE OF THE IDEAS,DESIGNS OR PLANS SHALL BE USED OR DISCLOSED TO ANY PERSONS ,FIRM OR CORPORATION FOR ANY PURPOSE WHATSOEVER WITHOUT WRITTEN PERMISSION OF ESD WASTE2WATER, INC.

ESD Waste2Water, Inc.

495 Oak Road
Ocala, FL 34472
Phone (800) 277-3279
Fax (352) 680-0059

SCALE VERIFCATION

THIS BAR REPRESENTS ONE INCH ON ORIGNAL DRAWING

1"

USE TO VERIFY DRAWING

SIZE: B **SHEET #:** 1 OF 1

SCALE: NTS

UPDATED BY:

DRAWN BY: J.ANDREWS

APPROVED BY: N/A

COMPLETED: 06/15/10

UPDATED:

AWS SPECIFICATIONS
GENERAL LAYOUT

JOB NUMBER:

PRODUCT NUMBER: **AWS**

FILE NAME: "AWS SPEC.dft"

Blower Enclosure - Zombie Box Model-Peacemaker Medium

ALL-WEATHER, PORTABLE, SOUNDPROOF ENCLOSURES AND SYSTEMS

All of our products and components are engineered and manufactured in the USA

US Patent - 9,641,043

Others Pending





PEACEMAKER - PORTABLE NOISE ENCLOSURE

PeaceMaker enclosure offers up to a -20 dBA reduction in noise *about 99% quieter operation (equipment & environment conditional).

For extra noise reduction and longevity: The Black 'ArmorPlate' color option is an industrial rubberized coating that gives another 2-3 db noise reduction and helps prevent oxidation and tarnish of the galvanized steel.

Don't forget to add the ZPipe Exhaust system and Rubber base pad!

We strongly recommend adding the acoustic rubber base mat for **ALL enclosures! (Rubber Base pads are not included in price)

- Max allowable generator dimensions for MEDIUM: 26 x 20 x 20
- Max allowable generator dimensions for LARGE : 36 x 30 x 30

NOTE: **For proper ventilation** - generators over 10KW, or equipment with multiple cylinders, choose the **Extra Large enclosure**.

Size:

Medium

Color:

Metal

SIZES AND SPECIFICATIONS:

There are 2 styles of enclosures - Portable and Standby:

- For **PORTABLE** generators choose from the Medium, Large or Extra Large.
- For Standby generators: Choose the **STANDBY**.

The enclosures fit MOST common portable and stationary generators regardless of wattage, make or model. A detailed chart of the inside and outside dimensions is below.

NOTE: **For proper cooling & ventilation** - portable generators over 10KW, or equipment cylinders, need the **Extra Large** enclosure.

Size	Inside Dimensions			Outside Dimensions		
	Length	*Width*	*Height*	*Length*	*Width*	*Height*
Medium	36	30	32	38	38	40
Large	42	36	36	44	44	45
X-Large	57	40	44	60	48	54
Standby	56	36	34	68	40	36

ZombieBox | Noise Control Systems

Patented & others Pending | US Patent 9,641,043

'Make Peace with Power'

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127 W. Juanita Ave
Ste. 103
Mesa, AZ 85210
www.zombie-box.com
Phone: 623.670.8100
E-mail: info@zombie-box.com

The world's first and ONLY, patented, portable noise control system for generators and outdoor power equipment

ZombieBox | Noise Control Systems

Patented & others Pending | US Patent 9,641,043

'Make Peace with Power'

ZombieBox Noise Control Systems – Portable Soundproofing Enclosures
Our rugged and durable enclosures can be assembled in minutes and deployed easily to reduce the noise intensity and volume of almost ANY portable or standby generator by up to 4X!

Structural & Safety **-**

- Self-supporting, weatherproof against rain, snow and 110mph wind
- 22 gauge galvanized steel construction – 1/16" tolerance fit
- Fully guarded ventilation & penetrations – vermin & rodent proof
- Tamper & Theft resistant 3 point lockable lid – secures all panels
- 4 point internal removable brackets – for secure anchoring
- **No Tools** required for setup - **No Permits** required for installation



*All electrical components and materials meet **NFPA**, **ASTM** and **UL** certification requirements – ZombieBox assemblies & products do not require or hold separate manufacturer certificates or listings

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Patented & others Pending | US Patent 9,641,043

'Make Peace with Power'

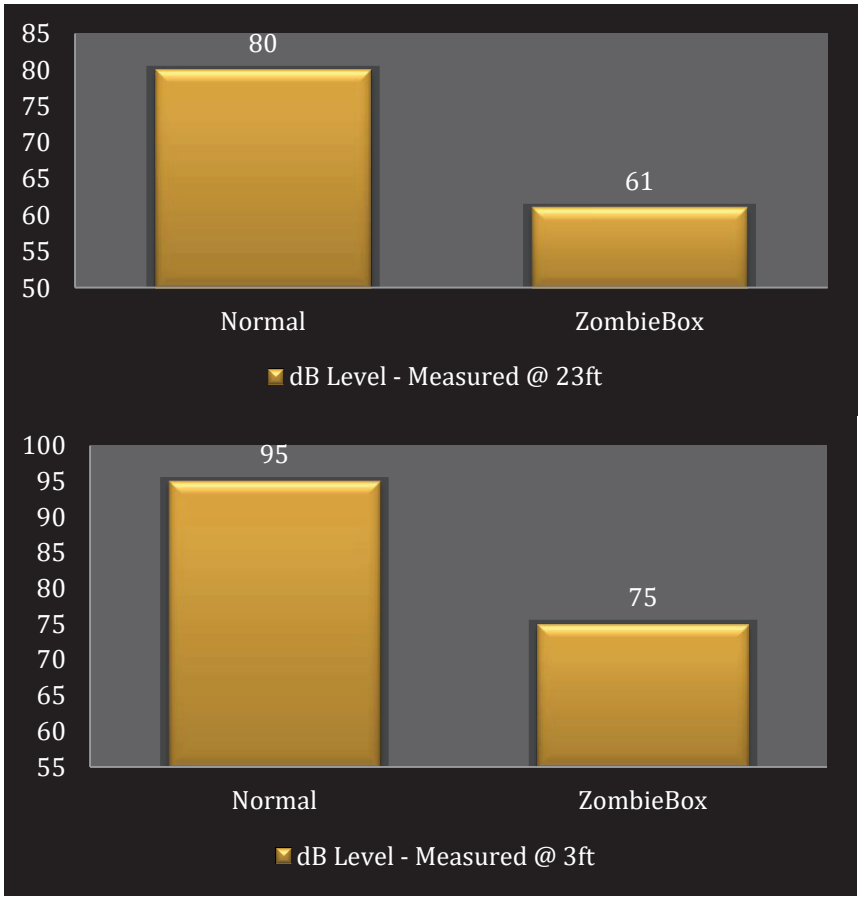
Acoustical Performance -

Sound Pressure Level (SPL) Decibel (dB) Reduction Testing:

- 125Hz to 8kHz | Weight: A | Range: 40-70 dB, 60-90 dB | 50% Load
- Source Unit: Generac 16 – 22kw portable & Standby generators
- Test conditions used: 3/4in rubber isolator pad and Armor Plate rubberized coating

**Independently replicated ASTM E596-96 procedures - actual dB varies with generator, configuration, load and environmental factors*

Noise Reduction				
Model/Color	**Without Z-Pipe**		**With Z-Pipe**	
	ZombieBox	*PeaceMaker*	*ZombieBox*	*PeaceMaker*
Metal	-15db	-20db	-18db	-23db
ArmorPlate	-17db	-22db	-20db	-25db



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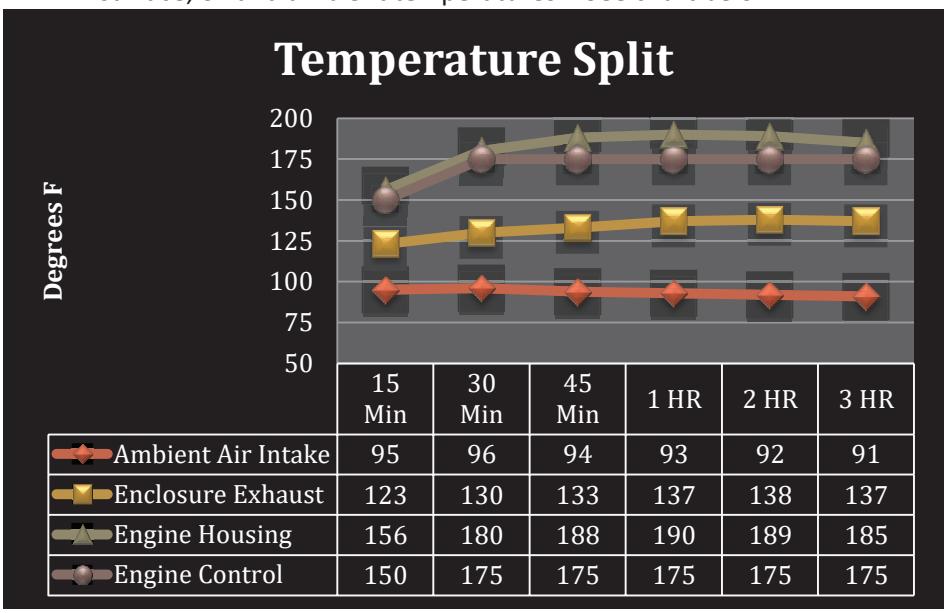
ZombieBox | Noise Control Systems

Patented & others Pending | US Patent 9,641,043

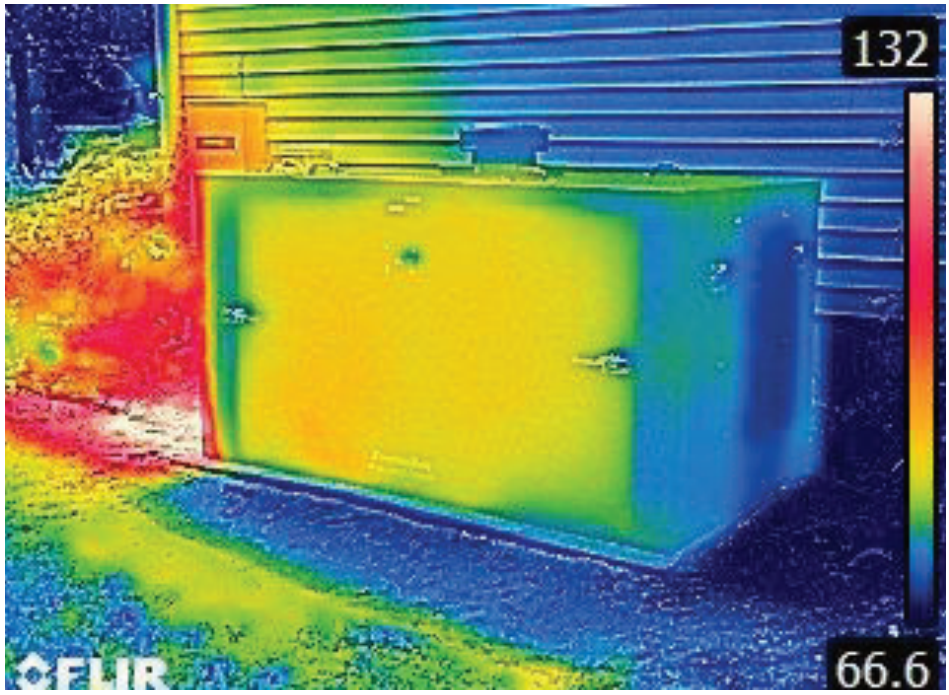
'Make Peace with Power'

Thermal Performance –

- Normal operating conditions: 50% Load, exhausted to exterior of box
- Dissipation rates consistent with standard operation ranges for surface, oil and ambient temperatures – See chart below



	15 Min	30 Min	45 Min	1 HR	2 HR	3 HR
Ambient Air Intake	95	96	94	93	92	91
Enclosure Exhaust	123	130	133	137	138	137
Engine Housing	156	180	188	190	189	185
Engine Control	150	175	175	175	175	175



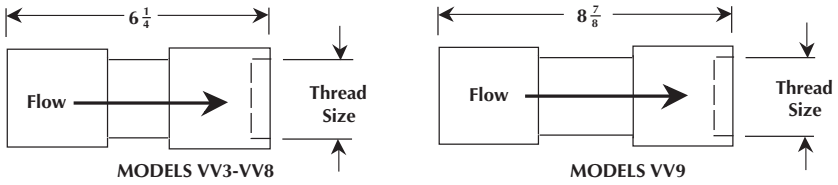
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ACCESSORIES

VACUUM RELIEF VALVES

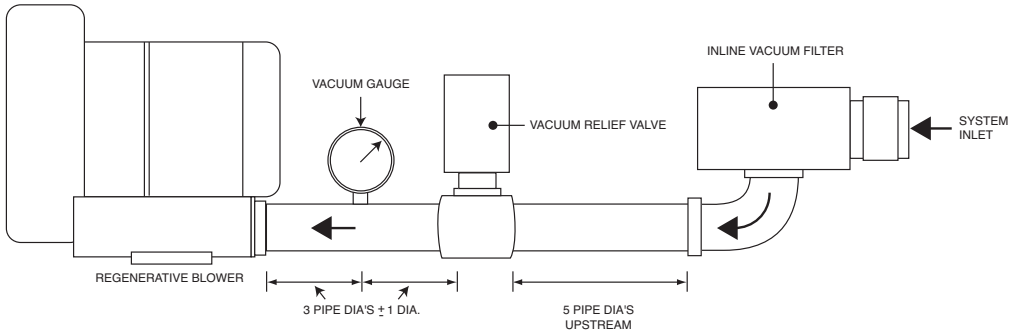
Most Fuji Ring Compressors should not be operated in a “dead-head” condition. These relief valves are designed to protect the blowers from overheating when operating dead-headed under vacuum.
The valves are preset to provide the proper protection for the appropriate model, which is approximately 90% of the dead-head vacuum and is adjustable to a lower setting.





VACUUM RELIEF VALVES			
Model No.	For Use With Blower Model	Factory Setting (“H_2O”)	Thread Size
VV3	VFC30	39	1 1/2″ FPT
VV4	VFC40	42	1 1/2″ FPT
VV5	VFC50	60	1 1/2″ FPT
VV6	VFC60	86	2″ FPT
VV7	VFC70	85	2″ FPT
VV8	VFC80	100	2″ FPT
VV9	VFC90	100	2 1/2″ FPT

Typical Vacuum System



2. SSD INSTRUMENTATION

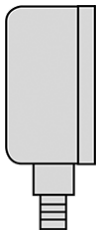
McMASTER-CARR®

Ultra-Low Vacuum Gauge with 1/4 NPT Male Bottom Connection

4" Dial Diameter, 304 Stainless Steel Case

4106K2





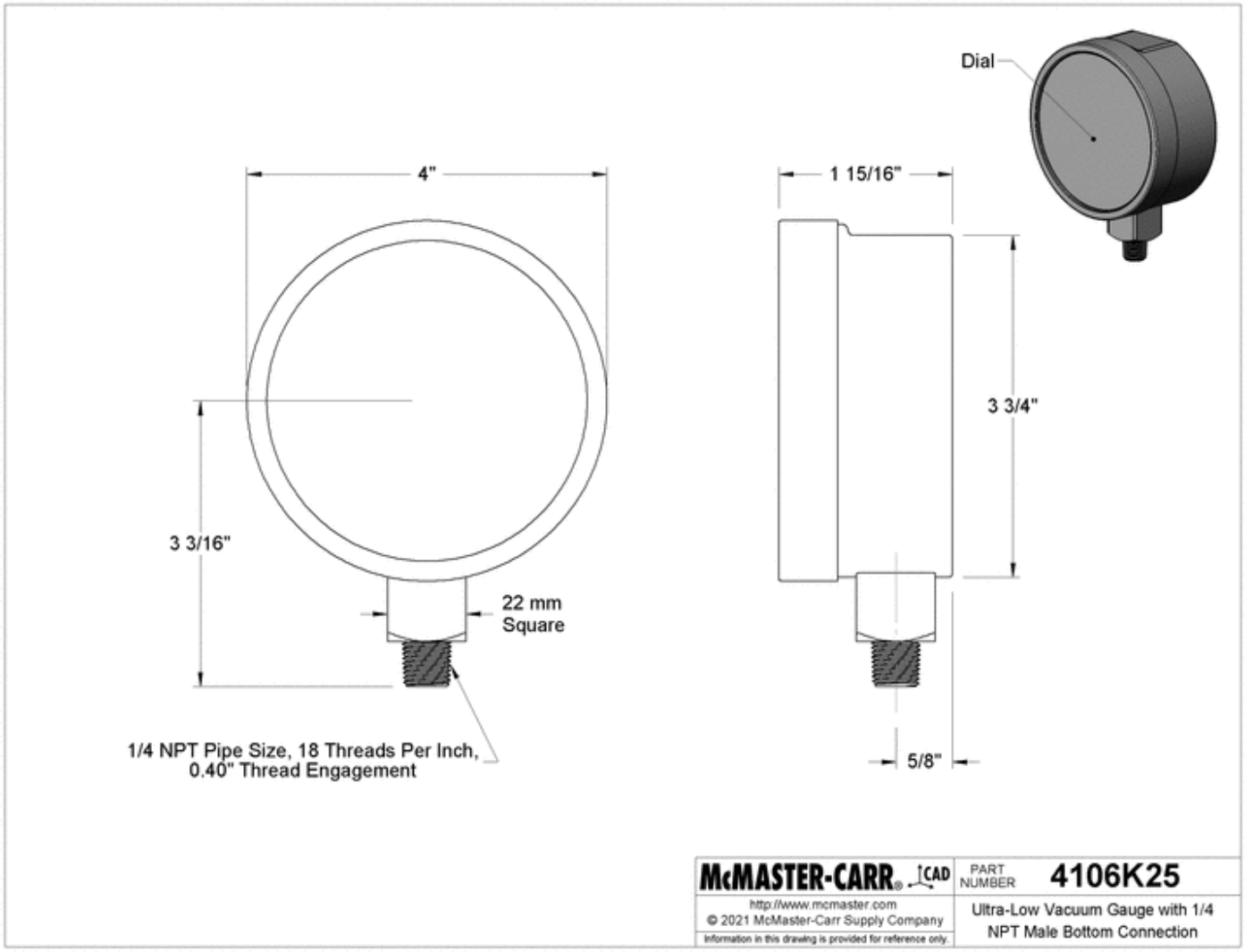
Bottom Connection

Measures	Vacuum
For Use With	Air
Display Type	Dial
Dial Type	Dry
Dial Diameter	4"
Pipe Size	1/4
Scale Type	Single
Scale	in. of H_2O
Environment Temperature Range	0° to 140° F
Process Temperature Range	0° to 175° F
Connection Type	Pipe
Pipe Connection Type	Threaded
Thread Type	NPT
Gender	Male
Case Material	304 Stainless Steel
Connection Material	Brass
Lens Material	Glass
Accuracy	±1%
Accuracy Scale	Full Scale
Accuracy Grade	Not Graded
Connection Location	Bottom
Graduation Marks	2 in. of h_2o
Numeric Increments	20 in. of h_2o
Vacuum Range	-100 to 0 in. of h_2o
RoHS	RoHS 3 (2015/863/EU) compliant with exemption 6(c) - Lead in copper alloy
REACH	REACH (EC 1907/2006) (01/17/2022, 223 SVHC) Compliant
DFARS	Specialty Metals COTS-Exempt
Country of Origin	Switzerland
Schedule B	902620.0000
ECCN	EAR99

Accommodate applications with very low vacuum with these gauges. Use them with vacuum pumps, packaging equipment, and in suction lines to measure and display vacuum.

Gauges with 304 stainless steel case have better corrosion resistance than gauges with steel case.

Vacuum Range, in. of H_2O: -100 to 0



The information in this 3-D model is provided for reference only.

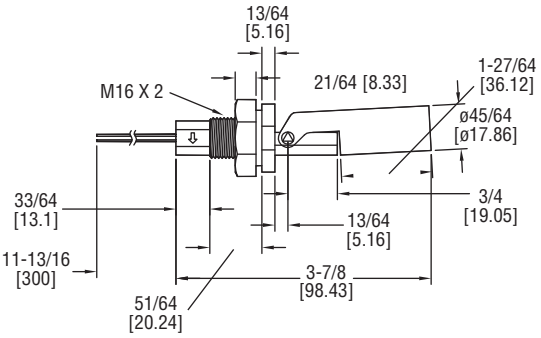
Bulletin E-100-F6

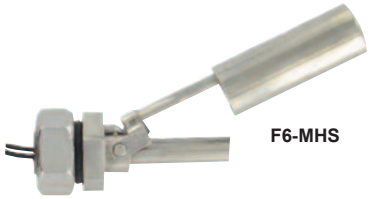
Series F6 Horizontal and Vertical Mount Level Switches

Specifications - Installation and Operating Instructions

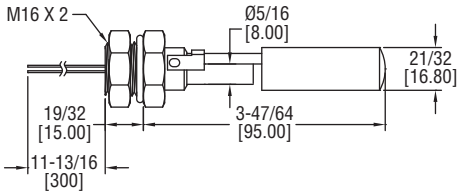


F6-HPS-11



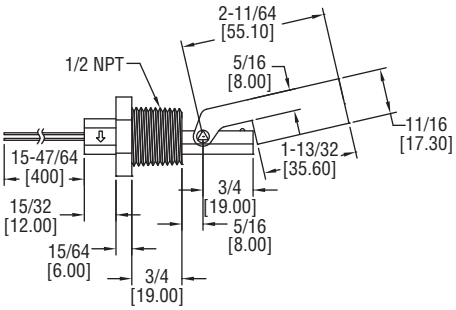


F6-MHS



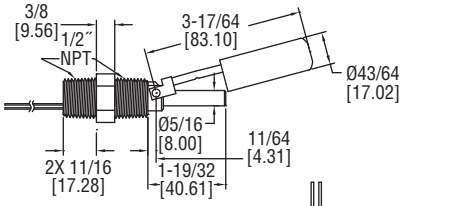


F6-HPS-21



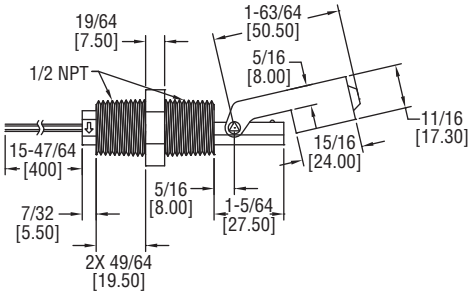


F6-MHS2



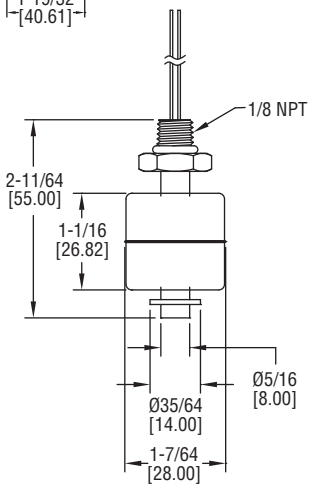


F6-HPS-31





F6-SS



Series F6 Level Switches provide a simple, inexpensive control of the liquid level within a tank. Switch ratings are suitable for many solid-state control systems and monitors or alarms. Simple relay interfaces can be used for higher current applications. Hermetically sealed reed switches are actuated by magnets permanently bonded inside the float and can be easily adapted to open or close a circuit on rising or falling levels.

SPECIFICATIONS

Service: Compatible liquids.
Wetted Materials: See model table.
Temperature Limit: F6-SS, F6-MHS & F6-MHS2: -4 to 257°F (-20 to 125°C); F6-HPS-11, 21, 31: 14 to 176°F (-10 to 80°C).
Pressure Limit: F6-SS & F6-MHS: 218 psi (15 bar); F6-HPS-11, 21, 31: 116 psi (8 bar); FS-MHS2: 363 psi (25 bar).
Enclosure Rating: General purpose.
Switch Type: SPST Hermetically sealed reed switch, reversible for N.O. or N.C.
Electrical Rating: 20VA: 0.17A @ 120VAC, 0.08A @ 240 VAC.
Electrical Connections: 22 AWG, 11.811″ (300mm) long.
Process Connection: F6-SS: 1/8″ NPT; F6-HPS-21, 31, F6-MHS2: 1/2″ NPT; F6-MHS, F6-HPS-11: M16*2.
Mounting Orientation: F6-SS: Vertical ±20°; F6-MHS/HPS/MHS2: Horizontal with index arrow pointing up or down.
Weight: F6-HPS-11, 21: 1.23 oz (38 g); F6-MHS-31: 1.41 oz (40 g); F6-MHS: 3.35 oz (95 g); F6-SS: 1.59 oz (45 g); F6-MHS2: 4.8 oz (136 g).
Specific Gravity: F6-SS: 0.65, F6-MHS, MHS2: 0.85, F6-HPS-11, 21, 31: 0.6.

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Switch Action (Normally Open, Normally Closed)

Vertical Models

Vertical mount models are shipped with normally open switch contacts that close as the float rises toward the mounting threads. To reverse the switch action, remove the float, rotate it end-for-end, and then replace it back on the stem. The floats will be marked for Normal Open and Normal Closed orientation.

Horizontal Models

Contacts in the horizontal models F6-HPS-11 (internally mounted), F6-HPS-21 (externally mounted), and F6-HPS-31 (internally or externally mounted) have indicating arrows on the wrench flat end of the switch to confirm float alignment. When the indicating arrow points up and the float is below the stem the switch is normally open and when the indicating arrow points down and the float is above the stem the switch is normally closed. The models F6-MHS and F6-MHS2 do not have an indication arrow to show normally open or closed orientation. The models F6-MHS and F6-MHS2 are normally open when the switch is oriented so that the float is directly below the stem and normally closed when the switch is oriented so that the float is directly above the stem.

Installation

Choose a location away from fill pipes, drains, or other areas where turbulence or wave motion might occur. Turbulence will cause false actuations and shorten contact life. Excess contaminants in fluid may inhibit float operation and an occasional wipe-down may be necessary. Care should be taken that switches are always operated within electrical ratings.

Mounting

Install the vertical mount model in an appropriate 1/8" NPT fitting. The vertical model mounts internally. It should be aligned within ±20° of vertical, or select optional fittings for external mounting. Models F6-HPS-11, F6-MHS and F6-MHS2 must be mounted internally, which means the switch must be secured to the wall of the tank or vessel from the inside. Install horizontal models F6-HPS-11 and F6-MHS in a M16 suitable size hole and secure them with the nut provided. Models F6-HPS-21 and F6-MHS2 require a horizontal 1/2″ NPT fitting and can be fitted to the tank or vessel from the outside. Models F6-HPS-31 and F6-MHS2 require a horizontal 1/2″ NPT fitting and can be mounted from the inside or outside (internally or externally) of the tank or vessel.

MAINTENANCE

Upon final installation of the Series F6 Level Switches, no routine maintenance is required. A periodic check of system calibration is recommended. The Series F6 is not field serviceable and should be returned if repair is needed (field repair should not be attempted and may void warranty). Be sure to include a brief description of the problem plus any relevant application notes. Contact customer service to receive a return goods authorization number before shipping.

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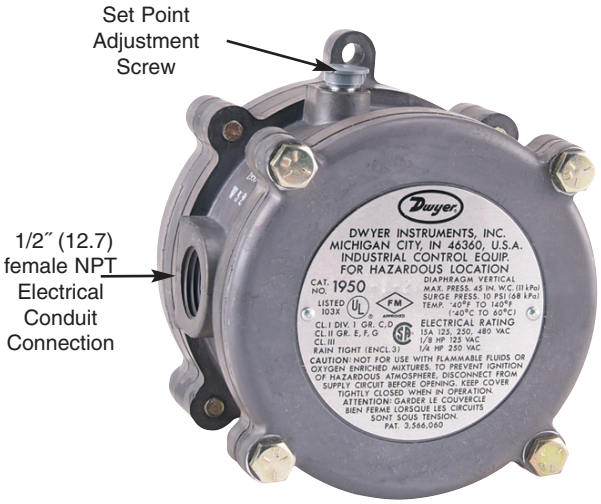
Phone: 219/879-8000
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e-mail: info@dwyermail.com

SVE Vacuum Switch #1950-20-2F

Series 1950 Explosion-Proof Differential Pressure Switches

Specifications - Installation and Operating Instructions



Series 1950 Explosion-Proof Differential Pressure Switches combine the best features of the Dwyer Series 1900 Pressure Switch with an integral explosion-proof and weather-proof housing. Each unit is UL & CSA listed; FM approved for use in Class I, Groups C & D; Class II, Groups E, F, & G; and Class III atmospheres (NEMA 7 & 9). They are totally rain-tight for outdoor installations. Twelve models allow set-points from .03 to 20 inches w.c. and from .5 to 50 psi (3.4 to 345 kPa).

Easy access to the SPDT switch for electrical hook-up is provided by removing the top plate of the three-part aluminum housing. Adjustment to the set point of the switch can be made without disassembling the housing. The unit is very compact, about half the weight and bulk of equivalent conventional explosion-proof switches.

CAUTION

For use only with air or compatible gases. Use of the Model 1950 switch with explosive media connected to the Low pressure port (including differential pressure applications in such media) is not recommended. Switch contact arcing can cause an explosion inside the switch housing which, while contained, may render the switch inoperative. If switch is being used to sense a single positive pressure relative to atmosphere, run a line from the low pressure port to a non-hazardous area free of combustible gases. This may increase response time on -0 and -00 models.

NOTE: The last number-letter combination in the model number identifies the switch's electrical rating (number) and diaphragm material (letter). The 2F combination is standard as described in the physical data above. In case of special models, a number 1 rating is the same as 2; a number 3 or 4 rating is 10A 125, 250, 480 VAC; 1/8 H.P. 125 VAC; 1/4 H.P. 250 VAC; a number 5 or 6 rating is 1A 125 VAC. Letter B indicates a Buna-N diaphragm; N = Neoprene; S = Silicone; and V = Viton®.

UL and CSA Listed, FM Approved For

CL. I GR. C, D - CL. II GR. E, F, G - CL. III

Series 1950 Switches

Operating ranges and deadbands

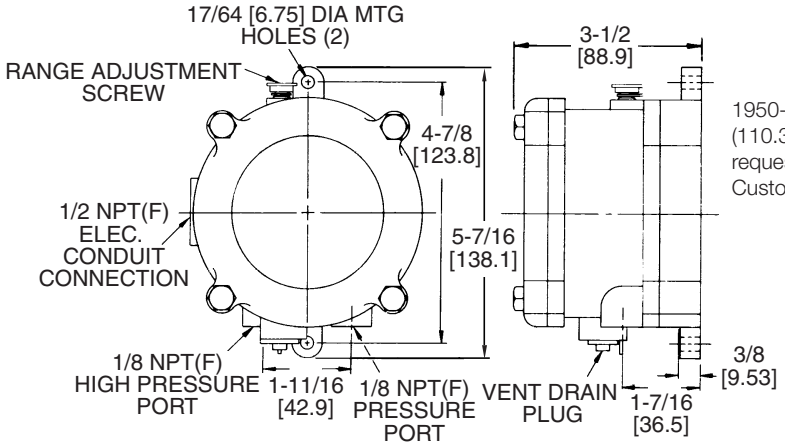
To order specify Model Number	Operating Range: Inches, W.C.	Approximate Dead Band	
		At Min. Set Point	At Max. Set Point
1950-02-2S	0.03 to 0.10	0.025	0.05
1950-00-2F	0.07 to 0.15	0.04	0.05
1950-0-2F	0.15 to 0.5	0.10	0.15
1950-1-2F	0.4 to 1.6	0.15	0.20
1950-5-2F	1.4 to 5.5	0.3	0.4
1950-10-2F	3.0 to 11.0	0.4	0.5
1950-20-2F	4.0 to 20.0	0.4	0.6
Model Number	**Operating Range: PSI**	**Approximate Dead Band**	
		Min. Set Point	Max. Set Point
1950P-2-2F	0.5 to 2.0	0.3 psi	0.3 psi
1950P-8-2F	1.5 to 8.0	1.0 psi	1.0 psi
1950P-15-2F	3.0 to 15.0	0.9 psi	0.9 psi
1950P-25-2F	4.0 to 25.0	0.7 psi	0.7 psi
1950P-50-2F	15.0 to 50	1.0 psi	1.5 psi

SPECIFICATIONS

Service: Air and non-combustible, compatible gases.
Wetted Materials: Consult factory.
Temperature Limits: -40 to 140°F (-40 to 60°C); 0 to 140°F (-17.8 to 60°C) for 1950P-8, 15, 25, and 50. -30 to 130°F (-34.4 to 54.4°C) for 1950-02.
Pressure Limits:
Continuous: 1950's - 45″ w.c. (0.11 bar);
1950P's - 35 psi (2.41 bar); 1950P-50 only - 70 psi (4.83 bar).
Surge: 1950's - 10 psi (0.69 bar), 1950P's - 50 psi (3.45 bar), 1950P-50 only - 90 psi (6.21 bar).
Enclosure Rating: IP64, NEMA 3, 7 and 9.
Switch Type: Single-pole double-throw (SPDT).
Electrical Rating: 15 A @, 125, 250, 480 VAC, 60 Hz. Resistive 1/8 HP @ 125 VAC, 1/4 HP @ 250 VAC, 60 Hz.
Electrical Connections: 3 screw type, common, normally open and normally closed.
Process Connections: 1/8″ female NPT.
Mounting Orientation: Diaphragm in vertical position. Consult factory for other position orientations.
Set Point Adjustment: Screw type on top of housing.
Weight: 3.25 lb (1.5 kg); 1950-02 model, 4.4 lb (2 kg).
Agency Approvals: CE, UL, CSA, FM.

RESPONSE TIME: Because of restrictive effect of flame arrestors, switch response time may be as much as 10-25 seconds where applied pressures are near set point.

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1950-02: 7-3/4″ (196.9) dia. x 4-11/32″ (110.3) depth. For complete dimensions request drawing 28-700175-00 from our Customer Service Department

1950 Switch Outline Dimensions

INSTALLATION

1. Select a location free from excess vibration and corrosive atmospheres where temperatures will be within the limits noted under Specifications on reverse. Switch may be installed outdoors or in areas where the hazard of explosion exists. See reverse for specific types of hazardous service.

2. Mount standard switches with the diaphragm in a vertical plane and with switch lettering and Dwyer nameplate in an upright position. Some switches are position sensitive and may not reset properly unless they are mounted with the diaphragm vertical.

3. Connect switch to source of pressure, vacuum or differential pressure. Metal tubing with 1/4″ O.D. is recommended, but any tubing which will not restrict the air flow can be used. Connect to the two 1/8″ female NPT pressure ports as noted below:

A. Differential pressures - connect pipes or tubes from source of greater pressure to high pressure port marked HIGH PRESS, and from source of lower pressure to low pressure port marked LOW PRESS.

B. Pressure only (above atmospheric pressure) - connect tube from source of pressure to high pressure port. The low pressure port is left open to atmosphere.

C. Vacuum only (below atmospheric pressure) - connect tube from source of vacuum to low pressure port. The high pressure port is left open to atmosphere.

4. To make electrical connections, remove the three hex head screws from the cover and after loosening the fourth captive screw, swing the cover aside. Electrical connections to the standard single pole, double throw snap switch are provided by means of terminals marked “COM” (common), “NO” (norm open), “NC” (norm closed). The normally open contacts close and the normally closed contacts open when pressure increases beyond the set point. Switch loads for standard models should not exceed the maximum specified current rating of 15 amps resistive. Switch capabilities decrease with an increase in ambient temperature, load inductance, or cycling rate. Whenever an application involves one or more of these factors, the user may find it desirable to limit the switched current to 10 amps or less in the interest of prolonging switch life.

ADJUSTMENT: To Change the Set point

1. Remove the plastic cap and turn the slotted Adjust-ment Screw at the top of the housing clockwise to raise the set point pressure and counter-clockwise to lower the set point. After calibration, replace the plastic cap and re-check the set point.

2. The recommended procedure for calibrating or checking calibration is to use a “T” assembly with three rubber tubing leads, all as short as possible and the entire assembly offering minimum flow restriction. Run one lead to the pressure switch, another to a manometer of known accuracy and appropriate range, and apply pressure through the third tube. Make final approach to the set point very slowly. Note that manometer and pressure switch will have different response times due to different internal volumes, lengths of tubing, fluid drainage, etc. Be certain the switch is checked in the position it will assume in use, i.e. with diaphragm in a vertical plane and switch lettering and Dwyer nameplate in an upright position.

3. For highly critical applications check the set point adjustment and if necessary, reset it as noted in step A.

MAINTENANCE

The moving parts of these switches need no maintenance or lubrication. The only adjustment is that of the set point. Care should be taken to keep the switch reasonably clean. Periodically the vent drain plug should be rotated, then returned to its original position. This will dislodge deposits which could accumulate in applications where there is excessive condensation within the switch. The Series 1950 Explosion-Proof Differential Pressure Switch is not field serviceable and should be returned if repair is needed (field repair should not be attempted and may void warranty). Be sure to include a brief description of the problem plus any relevant application notes. Contact customer service to receive a return goods authorization number before shipping.

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KELE ALARM INDICATION STATION
AIS

DESCRIPTION

The **Kele Model AIS Alarm Indication Station** features an indication light, alarm horn and an alarm horn silence switch. Upon an alarm contact closure, the LED indicator will light and the horn will sound. The horn can be silenced through the alarm silence switch, while the visual indication will continue to be lighted until the alarm condition has been corrected.

SEQUENCE OF OPERATION

Upon an alarm contact closure, the LED indicator will light, and the horn will sound. The horn can be silenced through the alarm silence switch, while the visual indication will continue to be lighted until the alarm condition has been corrected. A power interruption or open alarm contact will reset the AIS.

FEATURES

- ***Long lasting, red LED indication***
- ***Distinct continuous audible tone***
- ***Horn silence switch***
- ***Compact and rugged design***
- ***Available in 24 VDC, 24 VAC, or 120 VAC***
- ***Bright yellow panel face***



AIS Series

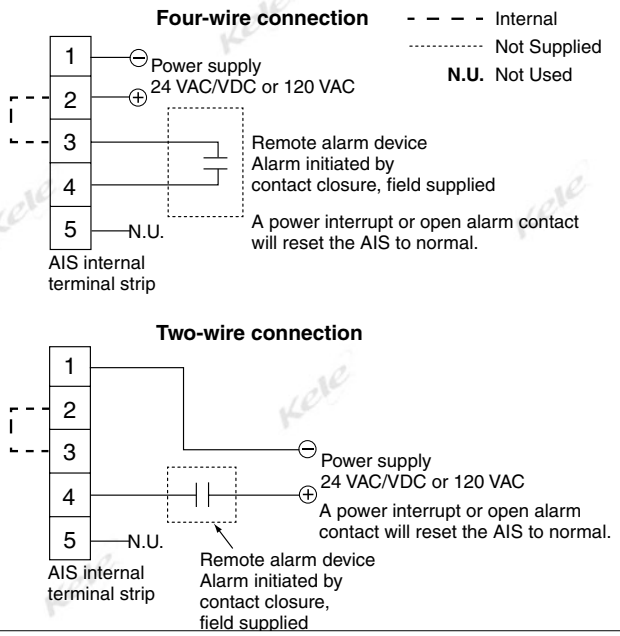
APPLICATION

- ***Refrigerant leak alarm indication***
- ***Water level alarm indication***
- ***Pressure alarm indication***
- ***High/Low temperature limits***
- ***Gas leak indication***
- ***Humidity limit alarm indication***
- ***Vibration limit***
- ***Voltage/Current level limit***
- ***Any contact closure alarm application***

SPECIFICATIONS

Supply Voltage	24 VAC @ 2.4 VA, 24 VDC @ 100 mA max., 120 VAC
Relay Output	
AIS-24D	24 VDC, 50 mA min
AIS-24A	24 VAC, 90 mA min
AIS-120A	120 VAC, 70 mA min
Alarm Horn	80 db
Mounting	Four screws through back
Dimensions	7.09"H x 4.33"W x 4.52"D (18.0 x 11.0 x 11.47 cm)
Enclosure Rating	NEMA 4, Polystyrene, impact resistant, knock-outs
Weight	1.1 lb (0.5 Kg)
Approvals	RoHS
Warranty	1 year

WIRING

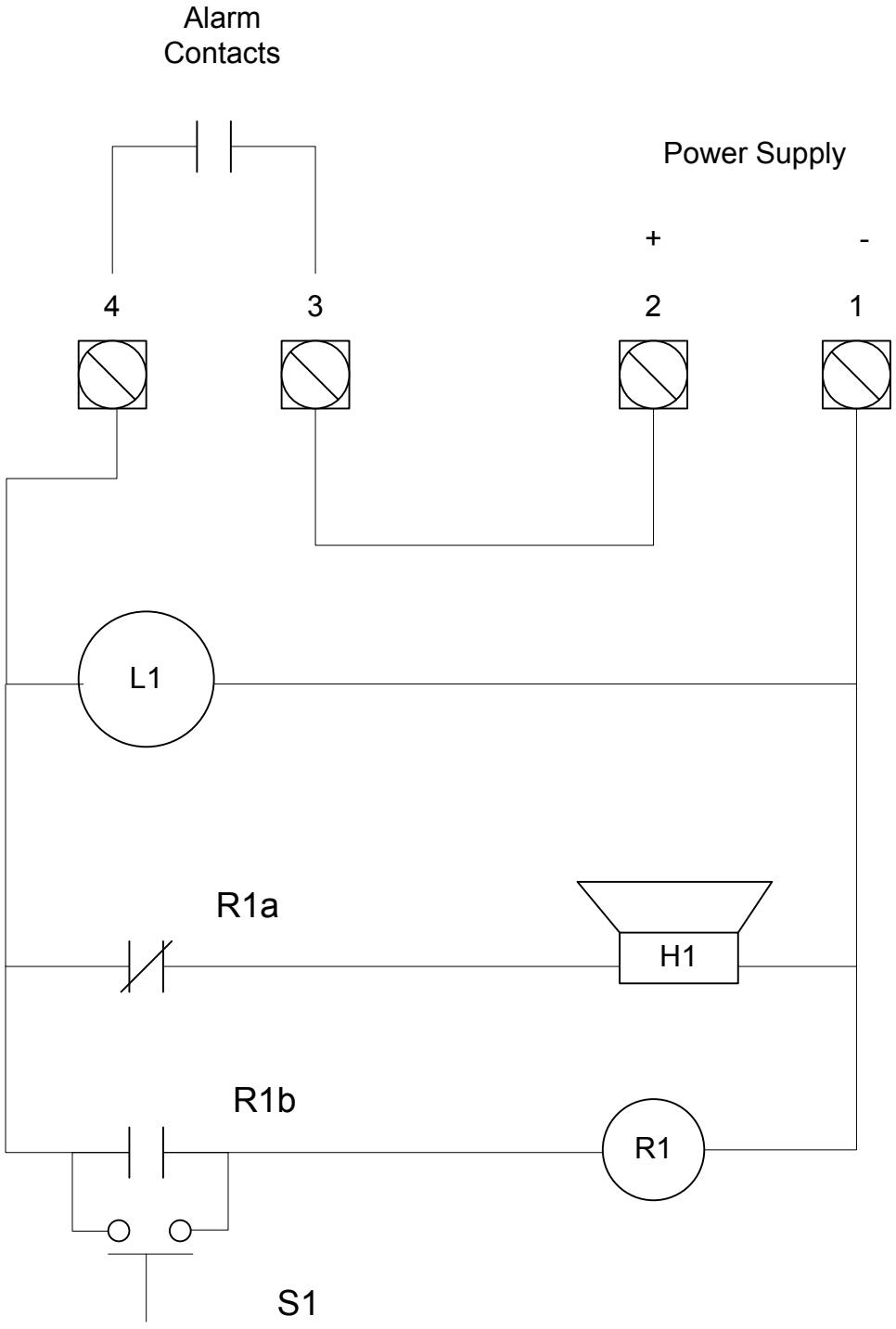


ORDERING INFORMATION

MODEL	DESCRIPTION	
AIS	Alarm indication station	
	12VD	12 VDC powered
	24D	24 VDC powered
	24A	24 VAC powered
	120A	120 VAC powered

AIS – **120A**

Example: **AIS-24A** 24 VAC powered alarm indication station


Alarm
Contacts
Power Supply
+
-
4
3
2
1
L1
R1a
H1
R1b
R1
S1

3. CONTROL PANEL

HAMMOND MANUFACTURING

Quality Products. Service Excellence.

Type 4X Aluminum Wallmount Enclosure *1418 N4 AL Series*

Continuous Hinge Door with Clamps



Inner Panel Included

Application

- Designed for use as instrument enclosures, electric, hydraulic or pneumatic control housings, electrical junction boxes or terminal wiring enclosures.
- Provides protection where equipment may be hosed down or otherwise be very wet, or in specific applications where corrosion may be a problem.

Standards

- UL 508A Type 4, 4X, 12 and 13
- CSA Type 4, 4X, 12 and 13
- Complies with
  - NEMA Type 4, 4X, 12 and 13
  - IEC 60529, IP66

Construction

- Formed from 0.081" (Body) / 0.100" (Door) Type 5052 H-32 aluminum.
- Smooth, continuously welded seams without knockouts, cutouts or holes.
- Door and body stiffeners are provided in the larger enclosures for extra rigidity.
- Welded brackets provide for enclosure mounting.
- Formed lip on door and enclosure excludes flowing liquids and contaminants.
- Aluminum continuous hinge on door may be removed by pulling the aluminum hinge pin.
- Door is secured with easily operated aluminum clamps.
- Provision for padlocking.
- Seamless poured-in place gasket.
- A removable 12 gauge steel inner panel is included.
- Collar studs are provided for mounting inner panels.
- A bonding stud is provided on the door and a grounding stud is provided in the enclosure
- A literature pocket is provided for the inside of the door.

Finish

- Cover and enclosure are natural unfinished aluminum.
- Removable inner panel is finished in white powder coating.

Accessories

- Additional Inner Panels
- Door Stop Kit
- Window Kits
- Climate Control
- General Accessories
- Perforated Inner Panels
- Door Clamping Hardware
- Lock kit
- Lighting

New and improved PDF part drawing files with more detail now available.

Click part number in table below to access PDF, DXF, and STEP files.

	Enclosure			Panel	
Part No.	H	W	D	H	W
1418N4ALB6	16.00	12.00	6.00	13.00	9.00
1418N4ALC6	20.00	16.00	6.00	17.00	13.00
1418N4ALE6	24.00	20.00	6.00	21.00	17.00
1418N4ALJ8	24.00	24.00	8.00	21.00	21.00
1418N4ALK8	30.00	24.00	8.00	27.00	21.00
1418N4ALM8	36.00	30.00	8.00	33.00	27.00
1418N4ALS8	48.00	36.00	8.00	45.00	33.00
1418N4ALC10	20.00	16.00	10.00	17.00	13.00
1418N4ALE10	24.00	20.00	10.00	21.00	17.00
1418N4ALK12	30.00	24.00	12.00	27.00	21.00
1418N4ALM12	36.00	30.00	12.00	33.00	27.00
1418N4ALT12	60.00	36.00	12.00	57.00	33.00

Data subject to change without notice

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Mouser Electronics

Authorized Distributor

Click to View Pricing, Inventory, Delivery & Lifecycle Information:

Hammond:

1418N4ALC10 1418N4ALE10 1418N4ALK12 1418N4ALM12 1418N4ALT12 1418N4ALS8 1418N4ALC6
1418N4ALM8 1418N4ALE6 1418N4ALK8 1418N4ALB6 1418N4ALJ8

PLC Click Plus #C2-01CPU-2

CLICK PLC Family Overview

CLICK PLUS PLC Units and Option Slot Modules

CLICK PLUS PLC Units											
PLC	Number of Option Slots	Communication Ports						MicroSD Slot	Battery Backup	Run-Time Edit	Price
		USB	Ethernet (Port 1)	RS-232 (Port 2)	RS-485 (Port 3)	Bluetooth	WLAN				
C2-01CPU	1	Yes (MicroB)	Yes (10/100)	Yes	None	None	None	None	Yes	Yes	$97.00
C2-01CPU-2	2										$136.00
C2-02CPU	1		None	None	None	Yes (external antenna required)	Yes (external antenna required)	None			$151.00
C2-02CPU-2	2										$193.00
C2-03CPU	1		Yes (10/100)	Yes	Yes			Yes			$205.00
C2-03CPU-2	2										$255.00



C2-01CPU



C2-01CPU-2



C2-02CPU



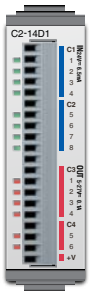
C2-02CPU-2



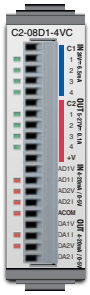
C2-03CPU



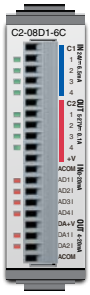
C2-03CPU-2



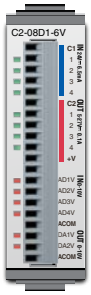
C2-14xx



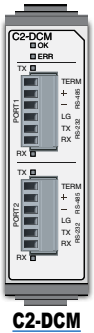
C2-08xx-4VC



C2-08xx-6C



C2-08xx-6V



C2-DCM

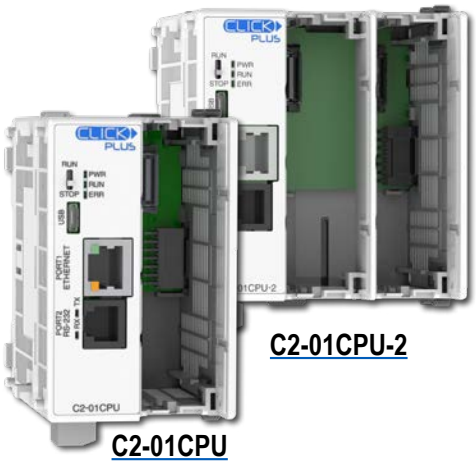
CLICK PLUS Option Slot I/O Modules					
Part Number	Discrete Input Types	Discrete Output Types	Analog Input Types	Analog Output Types	Price
C2-14D1	8 DC (sink/source) 8 points high-speed**	6 DC (sink) 3 points high-speed**	None	None	$58.00
C2-14D2		6 DC (source) 3 points high-speed**			$58.00
C2-14DR		6 relay			$70.00
C2-14AR	8 AC				$70.00
C2-08D1-4VC*	4 DC (sink/source) 4 points high-speed**	4 DC (sink) 2 points high-speed**	2 channel; voltage (0–5 VDC) / current (4–20 mA); selectable separately per channel, 12-bit	2 channel; voltage (0–5 VDC) / current (4–20 mA); selectable separately per channel, 12-bit	$90.00
C2-08D2-4VC*		4 DC (source) 2 points high-speed**			$90.00
C2-08DR-4VC*		4 relay			$103.00
C2-08AR-4VC*	4 AC				$103.00
C2-08D1-6C	4 DC (sink/source) 4 points high-speed**	4 DC (sink) 2 points high-speed**	4 channel; current (0–20 mA), 12-bit	2 channel; current (4–20 mA), 12-bit	$90.00
C2-08D2-6C		4 DC (source) 2 points high-speed**			$90.00
C2-08DR-6C		4 relay			$103.00
C2-08AR-6C	4 AC				$103.00
C2-08D1-6V	4 DC (sink/source) 4 points high-speed**	4 DC (sink) 2 points high-speed**	4 channel; voltage (0–10 VDC), 12-bit	2 channel; voltage (0–10 VDC), 12-bit	$90.00
C2-08D2-6V		4 DC (source) 2 points high-speed**			$90.00
C2-08DR-6V		4 relay			$103.00
C2-08AR-6V	4 AC				$103.00

* -4VC Option Slot modules require that you select analog I/O type (voltage or current) in the CLICK programming software.
** High-speed Inputs and Outputs are only available when the Option Slot I/O Module is installed in Slot 0.

CLICK PLUS Option Slot Intelligent Modules		
Part Number	Description	Price
C2-DCM	Communications module, 2x RS-232/RS-485 ports, supports Modbus RTU and ASCII protocols	$118.00

CLICK PLUS PLC Specifications

PLC Unit Specifications (continued)



C2-01CPU-2

C2-01CPU



C2-02CPU-2

C2-02CPU



C2-03CPU-2

C2-03CPU

CLICK PLUS PLC Unit Specifications				
		C2-01CPU C2-01CPU-2	C2-02CPU C2-02CPU-2	C2-03CPU C2-03CPU-2
Control Method		Stored Program/Cyclic execution method		
I/O Numbering System		Fixed in Decimal		
Ladder Memory (steps)		8000		
Total Data Memory (words)		8000		
Contact Execution (boolean)		< 0.2 µs		
Typical Scan (1k boolean)		< 1ms		
RLL Ladder Style Programming		Yes		
Run Time Edits		Yes		
Scan		Variable / fixed		
PLC Mode Switch		1 (RUN/STOP)		
FLASH Memory		Standard on PLC		
Protocol	Modbus RTU (master/slave)	Yes	No	Yes
	ASCII (in/out)	Yes	No	Yes
	Modbus TCP (client server)	Yes	Yes	Yes
	EtherNet/IP Implicit and Explicit (adapter server)	Yes	No	Yes*
MQTT		Publisher: 4 publishers, 3 blocks each Subscriber: 10 blocks		
Data Logging		N/A	N/A	Time, date, 16 addresses
CLICK Programming Software		Yes (Windows)		
Number of Instructions Available		21		
Control Relays		2000		
System Control Relays		1000		
Timers		500		
Counters		250		
Interrupt		Yes (external: 8 / timed: 4)		
Subroutines		Yes		
For/Next Loops		Yes		
Math (Integer and Hex)		Yes		
Drum Sequencer Instruction		Yes		
Internal Diagnostics		Yes		
Password Security		Yes		
System Error Log		Yes		
User Error Log		No		
Memory Backup		Super capacitor + battery		
Battery Backup		Yes (battery part #D0-MC-BAT)		
Calendar/Clock		Yes		

*** EtherNet/IP available on the Ethernet RJ45 port only. Not available over Wi-Fi.**

CLICK PLUS PLC Specifications

PLC Unit Specifications (continued)

CLICK PLUS PLC Unit Specifications							
		C2-01CPU	C2-01CPU-2	C2-02CPU	C2-02CPU-2	C2-03CPU	C2-03CPU-2
I/O Slot	Internal I/O	N/A (optional)					
	Option Slot Support	Yes, 1	Yes, 2	Yes, 1	Yes, 2	Yes, 1	Yes, 2
	Expansion I/O	Yes (max. 8 modules)					
Com. Ports	USB Port (programming)	Yes (device) (For programming and providing 5VDC power, microB USB)					
	Ethernet (RJ45)	Yes (10/100)		No		Yes (10/100)	
	Serial Port RS-232 (RJ12)	Yes		No		Yes	
	Serial Port RS-485 (terminal block)	No				Yes	
	WLAN	No		Yes (RP-SMA connection for optional external antenna, shared)			
	Bluetooth	No					
Status Indicators	WLAN Status LED	None		1			
	Bluetooth Status LED	None		1			
	CPU Status LED	3 (PWR/RUN/ERR)					
	Ethernet Status LED	2 (LINK/ACT 10/100)		None		2 (LINK/ACT 10/100)	
	Serial Status LED	2 (TX/RX)		None		2 (TX/RX)	
	SD Card Status LED	None				1	
Other	MicroSD Card Slot (SDHC-compatible)	No				Yes	
Power	Nominal Input Voltage	24VDC (4-pin terminal block)					
	Operating Voltage Range	24VDC, Class 2 or SELV (Safety Extra-Low Voltage) or Limited Energy Circuit power supply					
	Input Voltage Range	20.0–28.0 VDC					
	Maximum Inrush Current	30A @ 1ms					
	Power Consumption	20W	22W	20W	22W	20W	22W
	Acceptable External Power Drop	Max 10ms (AC power failure with C0-00AC or C0-01AC)					
	Current Required	110mA	120mA	105mA	115mA	130mA	140mA
	Fuse	None					
	External Fuse Recommended	No					
	Polarity Protection	Power input is reverse polarity protected					
	USB Supply	5VDC (via USB programming port)					
Communication Port & Terminal Block Replacement		N/A		N/A		AutomationDirect p/n C0-3TB	
24VDC Power Terminal Block Replacement		AutomationDirect p/n C0-4TB					
Antenna Requirements		N/A		2.4 GHz antenna, RP-SMA connector (AutomationDirect p/n SE-ANT250 or SE-ANT210)			
Drawing Link		PDF	PDF	PDF	PDF	PDF	PDF
Weight		3.5 oz [99g]	4.0 oz [114g]	3.3 oz [94g]	3.8 oz [109g]	4.0 oz [114g]	4.6 oz [129g]

CLICK PLUS PLC Specifications

General Specifications For All CLICK PLUS PLC Products

These general specifications apply to all CLICK PLUS PLCs. Please refer to the appropriate I/O temperature derating charts under the Option Slot module and Stackable I/O module specifications to determine best operating conditions based on the ambient temperature of your particular application.

General Specifications	
Operating Temperature	32°F to 131°F [0°C to 55°C]
Storage Temperature	–4°F to 158°F [–20°C to 70°C] IEC 60068-2-1 (Test Ab, Cold) IEC 60068-2-2 (Test Bb, Dry Heat) IEC 60068-2-14 (Test Na, Thermal Shock)
Ambient Humidity	30% to 95% relative humidity (non–condensing)
Environmental Air	No corrosive gases. Environmental pollution level is 2 (UL840)
Environment	For Indoor Use Only
Vibration	IEC60068-2-6 (Test Fc) 5–9Hz:3.5mm amplitude, 9–150Hz 1.0G 10 sweep cycles per axis on each of 3 mutually perpendicular axes.
Shock	IEC60068-2-27 (Test Ea) 15G peak, 11ms duration, 3 shocks in each direction per axis, on 3 mutually perpendicular axes.
Voltage Withstand (Dielectric)	1000VAC, 1 minute (between G and 24V IN)
Insulation Resistance	500VDC, 10M ohm (between G and 24V IN)
Noise Immunity	<EN61131-2> EN61000-4-2 (ESD): 4kV(Contact Discharge) 8kV(Air Discharge) EN61000-4-3 (RFI): 10V/m (80MHz–1GHz) ,3V/m (1.4 GHz–2.0 GHz) 1V/m (2.0 GHz–2.7 GHz) EN61000-4-4 (FTB) : 2kV ,positve/negative , 5kHz (DC Power Port) 1kV ,positve/negative, 5kHz (I/O and Communication Port) EN61000-4-5 (Surge): 0.5 kV/1kV line to line 0.5 kV/1kV line to earth EN61000-4-6 (Conducted): 10V ,0.15 MHz – 80MHz EN61000-4-8 (Power frequency magnetic field immunity) : 30A/m <Local Test> Impulse Immunity : 1000V @ 1µs pulse
Emissions	EN55011 Class A (Radiated RF emission)
Agency Approvals	UL61010 (File No. E157382, E316037); CE (EN61131-2); CUL Canadian C22.2
Radio Standards	FCC part15C (US), RED Article3.2 (CE), IC RSS-247 (Canada), MIC Item 19 of Article 2-1 (Japan), AS/NZS 4268 (Australia/New Zealand)
Other	RoHS 2011/65/EU Amendment (EU)2015/863

CLICK PLUS PLC Specifications

CLICK PLUS PLC Hardware/Software Compatibility

The table below shows the minimum software and hardware versions required for the CLICK PLUS PLCs and Option Slot Modules. The CLICK PLUS PLC can also utilize the CLICK Stackable I/O Modules, as any software and hardware version compatible with CLICK PLUS is also compatible with the CLICK Stackable I/O Modules.

CLICK PLUS PLC Features Software Compatibility						
		Minimum CLICK Software Version				
Device Type	**Part Number**	**Hardware**	**High-Speed Inputs***	**High-Speed Outputs***	**EtherNet/IP**	**PID, DHCP, DNS, SNTP, MQTT**
CLICK PLUS CPU	C2-01CPU	v3.00	v3.00	v3.30	v3.00	v3.00
	C2-02CPU				N/A	
	C2-03CPU				v3.00	
	C2-01CPU-2	v3.20	v3.20		v3.20	v3.20
	C2-02CPU-2				N/A	
	C2-03CPU-2				v3.20	
Option Slot I/O Modules	C2-14D1	v3.00	v3.00	v3.30	N/A	N/A
	C2-14D2					
	C2-14DR			N/A		
	C2-14AR		N/A			
	C2-08D1-4VC	v3.00	v3.00	v3.30	N/A	N/A
	C2-08D2-4VC					
	C2-08DR-4VC			N/A		
	C2-08AR-4VC		N/A			
	C2-08D1-6C	v3.00	v3.00	v3.30	N/A	N/A
	C2-08D2-6C					
	C2-08DR-6C			N/A		
	C2-08AR-6C		N/A			
	C2-08D1-6V	v3.00	v3.00	v3.30	N/A	N/A
	C2-08D2-6V					
	C2-08DR-6V			N/A		
	C2-08AR-6V		N/A			
Option Slot Intelligent Modules	C2-DCM	v3.20	N/A	N/A	N/A	N/A

*** High-speed Inputs and Outputs are only available when the Option Slot I/O Module is installed in Slot 0.**

CLICK PLC Family Overview

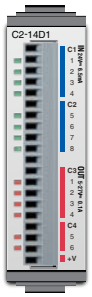
What you'll need

Of course, what you'll need for your system depends on your particular application, but this overview shows you what you'll need for a simple system.

1. ***Select your CLICK or CLICK PLUS PLC unit.***



2. ***If using a CLICK PLUS PLC, select an Option Slot Module if desired.***



3. ***If you need additional I/O, select from 24 different types of Stackable I/O modules.***



4. ***Select a 24VDC power supply.***



or



5. ***Download the FREE CLICK programming software.***
support.automationdirect.com/products/clickplcs.html



6. ***Download the FREE CLICK mobile app. The CLICK mobile app is available for iOS and Android. It can connect to your C2-02CPU or C2-03CPU over Bluetooth to provision the PLC onto a Wi-Fi network. (PLC requires an external antenna)***

Download on the App Store

GET IT ON Google Play

CLICK PLC Family Overview

What you'll need (continued)

7. ***Select your PC-to-PLC programming cable.***
If your PC has a USB port, use cable EA-MG-PGM-CBL to connect to the PLC port. If your PC has a 9-pin serial communications port, use programming cable D2-DSCBL. If your PC has an Ethernet port, use C5E-STPYL-C3 (crossover) or C5E-STPYL-S3 (straight through) Ethernet cable. If your PC is on a network with a wireless access point, you can connect using one of our Wi-Fi anteannas.

USB-CBL-AMICB6



USB A to USB microB Programming Cable Assembly (CLICK PLUS Only)

C5E-STPYL-C3 (crossover)
C5E-STPYL-S3 (straight through)



For Ethernet PLC Unit

or

SE-ANT250
Wi-Fi/Bluetooth Dome Antenna
(C2-02CPU & C2-03CPU only)



or

SE-ANT210
Wi-Fi/Bluetooth Whip Antenna
(C2-02CPU & C2-03CPU only)
(nonmetal enclosure only)



D2-DSCBL



(PC requires RS-232 port to use this cable)

or

EA-MG-PGM-CBL



Connects to PC USB Port

8. ***Select tools, wire, and provide power.***

Screwdriver
TW-SD-MSL-2



Wire Strippers
DN-WS



Hookup Wire



Power Supplies

Power Supplies

The CLICK PLC family offers two 24VDC power supplies. They are identical except for the output current.

It is not mandatory to use one of these CLICK power supplies for the CLICK/CLICK PLUS PLC system. You can use any other 24VDC power supply that Automationdirect.com offers, including the PSP24-DC12-1 12 to 24 VDC converter shown below.

C0-00AC Power Supply

Limited auxiliary AC power supply allows you to power the 24VDC CLICK C0 and C2 series PLCs with 100–240 VAC supply power. The 0.5 A DC power supply is capable of controlling the PLC plus a limited configuration based on the power budget of each I/O module. The C0-00AC is a low-cost solution for applications requiring only minimal I/O and power consumption. This power supply will not support a fully-populated CLICK PLC system with all possible I/O module combinations.

C0-01AC Power Supply

Expanded auxiliary AC power supply allows you to power the 24VDC CLICK C0 and C2 series PLCs with 100–240 VAC supply power. The 1.3 A DC power supply is capable of supporting a fully-populated CLICK PLC system with all possible I/O module
combinations, with no concerns for exceeding the power budget.

PSP24-DC12-1 DC-DC Converter

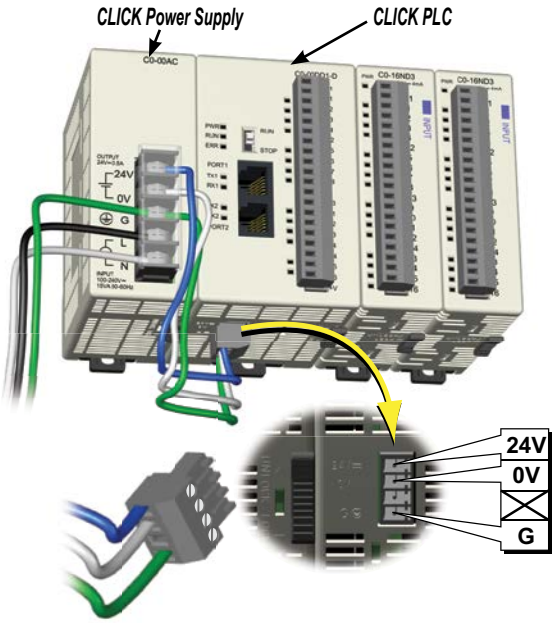
With this DC-DC converter you can operate the CLICK/CLICK PLUS PLC with 12VDC input power.

C0-00AC



C0-01AC





24VDC power is supplied to the PLC unit through wiring connected from the power supply output to the 4-pin 24VDC input connector located on the bottom of the PLC unit.



PSP24-DC12-1

CLICK 24VDC Power Supply Ratings

Part Number	Output Current	Price
C0-00AC	0.5 A	$51.00
C0-01AC	1.3 A	$63.00

Power Supply Input Specifications

Part Number	C0-00AC	C0-01AC
Input Voltage Range	85–264 VAC	
Input Frequency	47–63 Hz	
Input Current (typical)	0.3 A @ 100VAC, 0.2 A @ 200VAC	0.9 A @ 100VAC, 0.6 A @ 200VAC
Inrush Current	30A	
Efficiency	80% typical	

Power Supply Output Specs

Part Number	C0-00AC	C0-01AC
Output Voltage Range	23–25 VDC	
Output Current	0.5 A	1.3 A
Ripple	200mV p-p max (0–55°C)	
Ripple Noise	300mV p-p max (0–55°C)	
Over Current Protection	@ 0.65 A (automatic recovery)	@ 1.6 A (automatic recovery)
Over Voltage Protection	@ 27.6 V (clamped by Zener diode)	
Start-up Time	1000ms max at rated input and load	
Hold-up Time	10ms minimum at 85VAC, I=max	

Power Supply General Specs

Part Number	C0-00AC	C0-01AC
Ambient Operating Temperature	32–131°F [0–55°C]	
Storage Temperature	-4–158°F [-20–70°C]	
Humidity	30–95%, non-condensing	
Vibration Resistance	JIS C60068-2-6, sine wave vibration	
Shock Resistance	JIS C60068-2-27	
Voltage Withstand Input-Output Input-Ground Output-Ground	 1500VAC, 5mA cutoff current 1500VAC, 5mA cutoff current 500VAC, 5mA cutoff current	
Insulation Resistance Input-Output Input-Ground Output-Ground	 10MΩ minimum, 500VDC 10MΩ minimum, 500VDC 5MΩ minimum, 500VDC	
Noise Immunity	FCC Class A, EN55022:1998 Class A	
Input/Output Interface	5P terminal block, Fujicon UF2362AX series or equivalent	
Agency Approvals	UL508, UL1604, EN61010-1 (IEC 1010-1), CAN/CSA E60079-15:02, JIS C0025	
Drawing Link	PDF	PDF
Weight	5.3 oz [150g]	6.0 oz [170g]

PSP24-DC12-1 DC-DC Converter Specs

Input Voltage Range	9.5–18 VDC
Input Power (no load)	1.0 W max.
Startup Voltage	8.4 VDC
Undervoltage Shutdown	7.6 VDC
Output Voltage Range	24–28 VDC (adjustable)
Output Current	1.0 A
Short Circuit Protection	Current limited at 110% typical
Drawing Link	PDF
Weight	7.5 oz [213g]

Accessories

C2-USER-M ***$0.00***
CLICK PLUS PLC Hardware User Manual

Manual covers all CLICK PLUS PLC and I/O module installation and wiring, specifications, error codes and troubleshooting guide. The CLICK PLUS PLC Hardware User Manual can be downloaded free at the AutomationDirect Web site; www.AutomationDirect.com



C0-USER-M ***$0.00***
CLICK PLC Hardware User Manual

Manual covers all CLICK PLC and I/O module installation and wiring, specifications, error codes and troubleshooting guide. The CLICK PLC Hardware User Manual can be downloaded free at the AutomationDirect Web site; www.AutomationDirect.com



C0-PGMSW ***$12.00***
Programming Software USB

The programming software can be downloaded free at the AutomationDirect Web site, or the USB can be purchased from the AutomationDirect online Web store. www.AutomationDirect.com



EA-MG-PGM-CBL ***$52.00***
PC to Panel Programming Cable Assembly for C-more Micro-Graphic Panels and CLICK/CLICK PLUS PLCs

The 6-ft cable assembly connects a personal computer to any ***C-more*** Micro-Graphic panel, CLICK PLC, or select CLICK PLUS PLC for setup and programming.

Note: This cable assembly uses the PC's USB port and converts the signals to serial transmissions. The USB port supplies 5VDC to the Micro-Graphic panel for configuration operations.
Assembly includes standard USB A-type connector to B-type connector cable, custom converter, and an RS232C cable with an RJ12 modular connector on each end.



USB-CBL-AMICB6 ***$5.25***
USB A to USB microB Programming Cable Assembly (CLICK PLUS Only)

Programming cable, USB A to USB microB, 6ft (1.83 m) length. For use with CLICK PLUS PLCs and most USB devices. The USB port supplies 5VDC to the CLICK PLUS CPU for programming.



D2-DSCBL ***$35.00***
Programming Cable for CLICK/CLICK PLUS and DirectLOGIC PLCs

12ft. (3.66 m) RS232 shielded PC programming cable for CLICK, select CLICK PLUS PLCs, DL05, DL06, DL105, DL205, D3-350, D4-450, D4-454, and Do-more H2 and T1H series CPUs. 9-pin D-shell female connector to an RJ12 6P6C connector.



Note: If your PC has a USB port but does not have a serial port, you must use programming cable EA-MG-PGM-CBL to connect to CLICK PLCs. For CLICK PLUS PLCs, you may also use USB-CBL-AMICB6

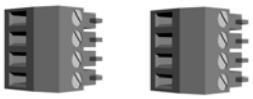
C0-3TB ***$10.00***
Spare 3-Pole Terminal Block

Replacement 3-pole terminal block for the 3-wire RS-485 Port 3 on CLICK Standard and Analog PLCs as well as the CLICK PLUS C2-03CPU. Sold in packs of 2.



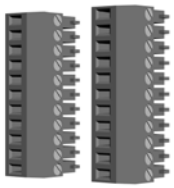
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C0-8TB ***$16.50***
Spare 8-Point I/O Terminal Block

Replacement terminal block for the 8-point I/O modules. Sold in packs of 2.



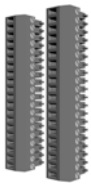
C0-8TB-1 ***$19.50***
Spare 13-Point I/O Terminal Block

Replacement terminal block for the 8-point I/O relay modules. Sold in packs of 2.



C0-16TB ***$23.00***
Spare 16-Point I/O Terminal Block

Replacement terminal block for the 16-point I/O modules and PLC built-in I/O. Sold in packs of 2.



C2-6TB ***$16.50***
Spare 6-pt Terminal Block

Replacement terminal block for the C2-DCM serial ports.
Sold in packs of 2.



Accessories

SE-ANT250 ***$50.50***
Wi-Fi/Bluetooth Dome Antenna

2.4 GHz antenna, IP67, panel mount, 9.8 ft (3m) cable length, for external mounting when CLICK PLUS PLC is installed in a metallic enclosure.



C2-FILL ***$8.50***
CPU Option Slot Cover

Snap-on cover for CLICK PLUS CPU Option Slot in applications without an Option Slot module present.



MSD-SLC16G ***$100.00***
16GB microSD card, industrial grade, 3D NAND Flash (with SLC Mode), 85°C [185°F] max operating temp.



SE-ANT210 ***$10.50***
Wi-Fi/Bluetooth Whip Antenna

Whip/straight 2.4 GHz antenna, IP65, connector mount. Not recommended for installation in a metallic enclosure.



D2-BAT-1 ***$6.50***
Replacement CR2354 battery for Standard, Analog, Ethernet Standard and Ethernet Analog PLC units.



TW-SD-MSL-2 ***$3.75***
Insulated Slotted Screwdriver
0.4 x 2.5 x 80 mm slotted screwdriver for terminal blocks.



DN-EB35MN ***$31.50***
DIN*nector* ***End Bracket***



D0-MC-BAT ***$3.00***
Replacement CR2032 battery for CLICK PLUS PLC units.



DN-WS ***$63.00***
Wire Stripper



C-more and C-more Micro Graphic Operator Interfaces



ZIPLink Wiring Systems





Manual Number: C2-USER-M

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CLICK PLUS PLC User Manual

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Please include the Manual Number and the Manual Issue, both shown below, when communicating with Technical Support regarding this publication.

Manual Number: C2-USER-M
Issue: 1st Edition, Rev. K
Issue Date: 05/2023

Publication History		
Issue	**Date**	**Description of Changes**
1st Edition	02/2021	Original
1st Edition, Rev. A	03/2021	Added Factory Reset to Troubleshooting, clarified meaning of XD, YD registers.
1st Edition, Rev. B	05/2021	Corrected Wireless LAN and Bluetooth transmission distances.
1st Edition, Rev. C	07/2021	Added resetting to factory defaults using Run/Stop switch in Troubleshooting.
1st Edition, Rev. D	11/2021	Added C2-0xCPU-2 CPUs, C2-DCM Option Slot module and MSD-SLC16G SD Card.
1st Edition, Rev. E	02/2022	Clarified EtherNet/IP only available on RJ45 ports.
1st Edition, Rev. F	04/2022	Added High-Speed Output functions in software v.3.30.
1st Edition, Rev. G	09/2022	Corrected WLAN security specifications.
1st Edition, Rev. H	11/2022	Updated Koyo Electronics Industries CO., LTD. to JTEKT Electronics Corporation.
1st Edition, Rev. I	12/2022	Added "Silent Install" feature. Removed Type 1 fonts.
1st Edition, Rev. J	03/2023	Clarified UL insulation requirements. Corrected MSD-SLC16G max temperature.
1st Edition, Rev. K	05/2023	Changed references to CLICK software media from CD to USB.

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Chapter 1

Getting Started

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Introduction

Purpose of this Manual

Thank you for purchasing the AutomationDirect CLICK PLUS PLC family of products. This hardware user manual provides information that will help you install, set up, program, troubleshoot, and maintain your CLICK PLUS PLC system. The manual includes information that is critical to the safety of the personnel who will install and use the PLC, as well as the integrity of the machinery, processes, and equipment controlled by the PLC.

The manual also includes important information about power and signal wiring, mounting of the PLC, and configuring the PLC system.

About Getting Started

If you are familiar with PLCs in general, then following the simple steps in this first chapter may be all you require to start being productive using a CLICK PLUS PLC system. After you have completed these simple steps, your CLICK PLUS PLC will be running a ladder logic project that you programmed. If you are new to the world of PLCs, be sure to read through all of the chapters in this hardware user manual.

Supplemental Manuals and Other Help

The CLICK Programming Software, C0-PGMSW, can be downloaded free from the AutomationDirect web site (link shown below under Technical Support). Both this Hardware User Manual, *C2-USER-M*, and the *Software Installation Guide* are free as a download. **The CLICK Programming Software includes searchable online help topics covering all aspects of the software and instruction set.**

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Conventions Used

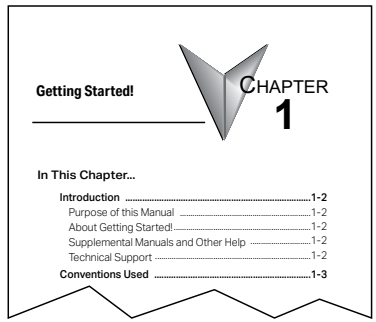
WARNING: When you see the exclamation point icon in the left-hand margin, the paragraph to its immediate right will be a warning. This information could prevent injury, loss of property, or even death in extreme cases. Any warning in this manual should be regarded as critical information that should be read in its entirety. The word WARNING: in boldface will mark the beginning of the text.

NOTE: *When you see the notepad icon in the left-hand margin, the paragraph to its immediate right will be a special note. Notes represent information that may make your work quicker or more efficient. The word* ***NOTE:*** *in boldface will mark the beginning of the text.*

TIP: *Whenever the "light bulb" is shown in the left-hand margin, the paragraph to its immediate right will provide a special tip. The word TIP: in boldface will mark the beginning of the text.*

Key Topics for Each Chapter

The beginning of each chapter will list the key topics that can be found in that chapter.


Getting Started!

CHAPTER 1

In This Chapter...

Introduction 1-2
Purpose of this Manual 1-2
About Getting Started! 1-2
Supplemental Manuals and Other Help 1-2
Technical Support 1-2
Conventions Used 1-3

Before you begin...

It is recommended that the following items be available to make this short step-by-step introduction to the CLICK PLUS PLC go smoothly.

CLICK PLUS PLC unit



CLICK 24VDC Power Supply
C0-00AC or C0-01AC



or

Other 24VDC Power Supply
Example: PSP24-60S



PC Running Windows



Not available from ADC.

CLICK Programming Software
C0-PGMSW



USB or Free download @
http://support.automationdirect.com/products/clickplcs.html

Based on your CLICK PLUS PLC, One of the cables shown below:



Ethernet Cat5 Cable

USB A to USB micro B Programming Cable Assembly
USB-CBL-AMICB6



Screwdriver
TW-SD-MSL-2



Wire Strippers
DN-WS



Hookup Wire



AC Power Cord



Not available from ADC.

PC Programming Cable
D2-DSCBL



PC requires RS-232 port.

Step 1: Install Software

The CLICK PLC family offers two methods of connecting and configuring the PLCs

1. CLICK PLC mobile app for iOS and Android devices
2. CLICK programming software for Windows-based PCs

Installing the CLICK PLUS Provisioning Mobile App

The CLICK PLUS Provisioning App connects your mobile device to a CLICK PLUS PLC via Bluetooth and offers a quick plug and play way to provision the CLICK PLUS PLC to connect to a wireless LAN.

Install the CLICK PLUS Provisioning mobile app from the Apple App Store or Google Play Store (CLICK PLUS Provisioning, published by Automationdirect.com).



Install the CLICK Programming Software

1. If you have the programming software on USB, insert the USB drive in a USB slot and follow the instructions. Otherwise, download the free CLICK Programming Software, C0-PGMSW, from the following Automationdirect.com web site: **http://support.automationdirect.com/products/clickplcs.html**
2. Unzip the downloaded ZIP file.
3. Double click Install.exe. The CLICK PLC Programming Software splash screen should appear after a short time.
4. Click on the splash screen's Install Software button and follow the dialog boxes.

Silent Install

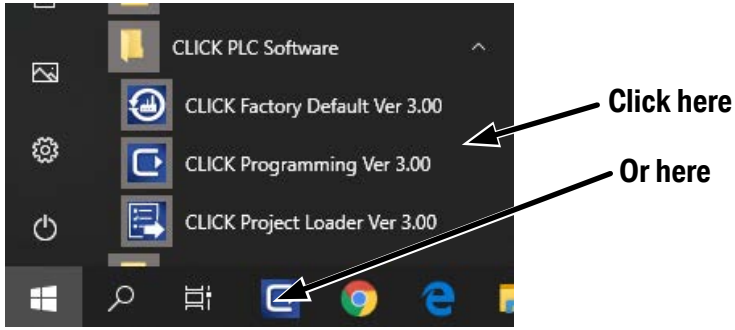
The silent install feature allows the software to be installed from the Windows command line or deployment management software without further user interaction.

Command for Silent Install: **CLICK_Setup.exe -s**



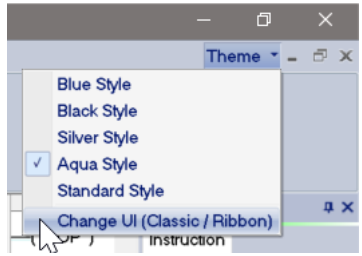
Step 2: Launch Programming Software

After installing the CLICK Programming Software, C0-PGMSW, choose one of three methods to launch the software. Double click the desktop CLICK icon, or from the PC's Start menu, select Start > AutomationDirect > CLICK Programming Software, or simply click the icon on the Quick Launch bar. See examples below.



The CLICK Programming Software will start up and display the Main Window as shown on the next page.

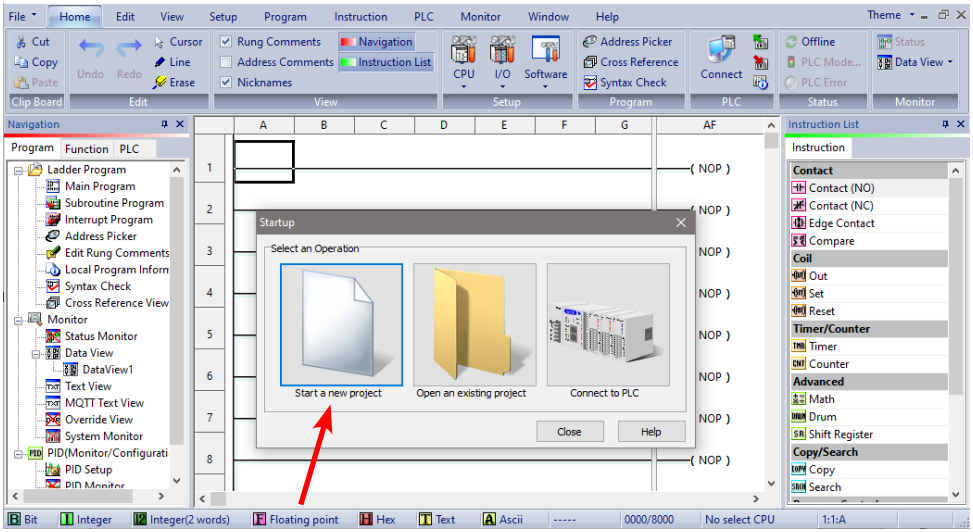
The example in this manual use the 'Classic' user interface of the CLICK programming software. If you are starting the software for the first time, you may want to change to this UI to follow the example more easily. To do so, click the Theme button in the upper right of the display, and select Change UI (Classic/Ribbon).



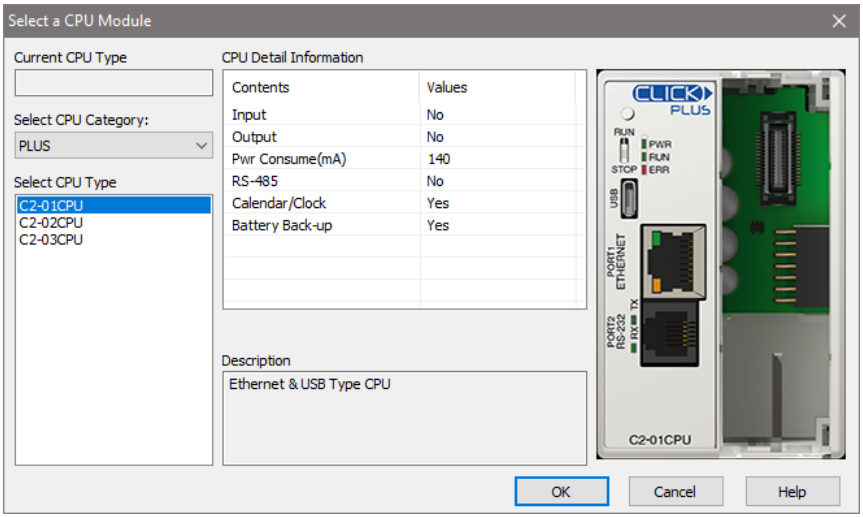
NOTE: *The recommended minimum screen size for the CLICK Programming Software is 1024 X 786 pixels.*

Step 2: Launch Programming Software (cont'd)

The Main Window is divided into Menus, Toolbars, and Windows that work together to make project development as simple as possible. See the software's online help for additional details.



Click on the "Start a new project" graphic in the **Startup** dialog box. The **Select a CPU Module** window opens.

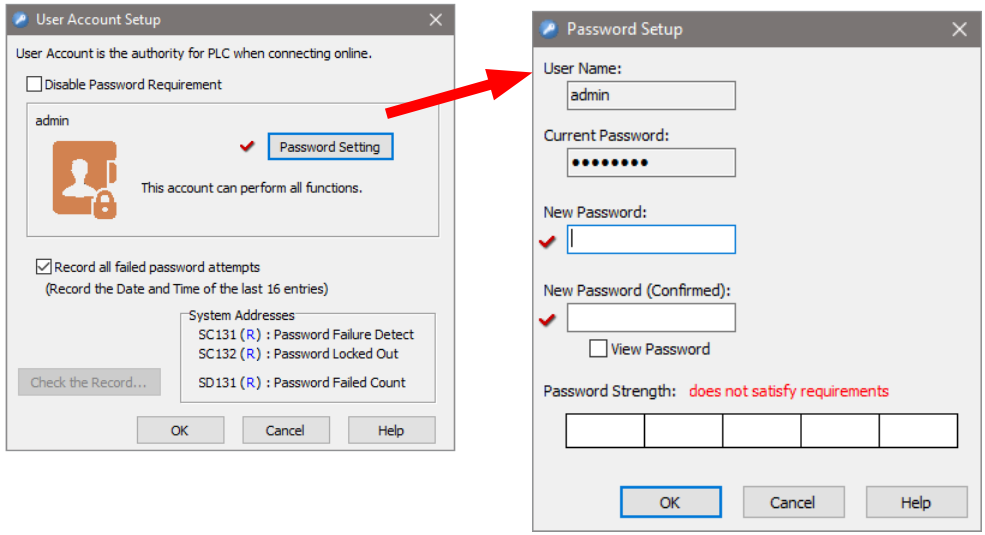


Select from the list on the left for the CLICK PLUS PLC unit that you will use for the ladder logic example that follows.

Step 3: Set Up User Account

A single 'admin' user account exists on the CLICK platform, with the default password set to 'click'. This must be disabled or changed to a unique password in any project for a CLICK CPU with network capabilities before it can be downloaded. This helps greatly reduce the chances of malicious software taking control of the PLC with easy-to-guess or publicly disclosed default login credentials.

The User Account Setup dialog guides you through setting up a strong password and monitoring password activity. This dialog opens when creating a new project, if a CPU with network capabilities is selected, and can also be accessed at any time from the User Account Setup menu option.



The password must be at least 8 characters long, and the following special characters are not allowed:

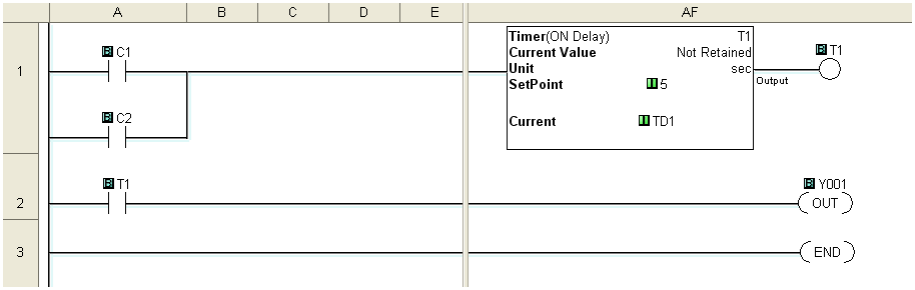
, " < > ' ( ) + - . / : ; = ? [\ ] ^ ` { | } ~



NOTE: *Make sure you remember your Password. If you forget your Password you will not be able to access the CPU. You can use the Reset to Factory Default command to erase the Password. However, the command erases the Entire Project file. Therefore, you will have to download a project file again.*

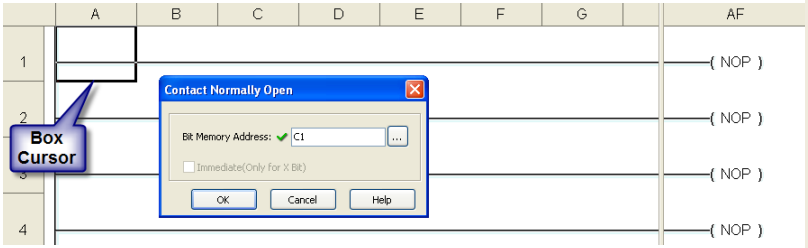
Step 4: Create a Project

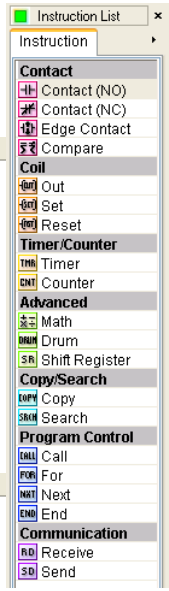
In this step, we'll create a simple project. The project assumes the presence of an I/O module with discrete outputs. The project shown below is created by entering the ladder logic program in the order that follows.



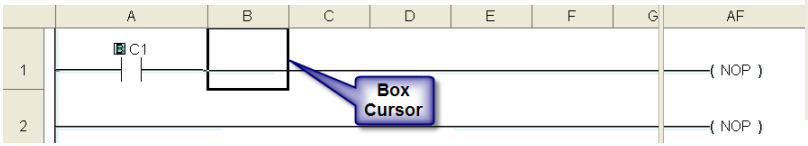
Rung #1

Place the Box Cursor on the first position on Rung #1, as shown below. From the Instruction List, click & drag a Contact (NO) into this box. Enter C1 into the **Bit Memory Address** text box of





the **Contact Normally Open** dialog box that pops up and click OK. A normally open contact labeled C1 will be placed in the beginning of Rung



#1.

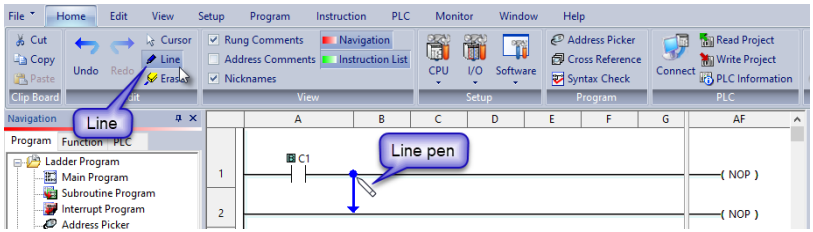
The Box Cursor will move to the next available location.

Proceed to the next page to continue construction of Rung #1.

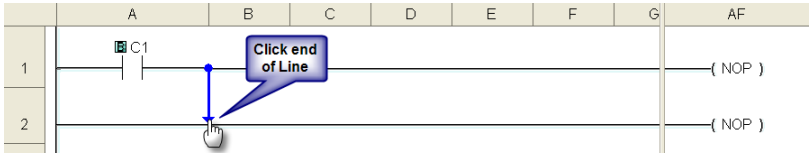
Step 4: Create a Project (cont'd)

Rung #1 (cont'd)

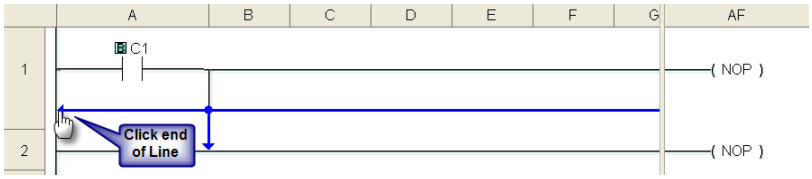
The Line creation tool is used to add a normally open contact in parallel with the C1 contact. Click on the Line creation tool icon located on the Edit toolbar. A blue line will appear, showing the direction of the new line. The Line pen is used to redirect the new line.



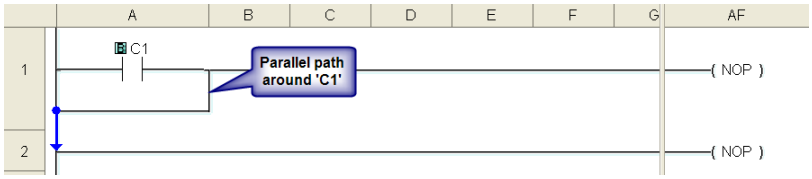
Move the mouse pointer to the end of the new line (arrow) until the mouse pointer becomes a hand with a pointing index finger. Click on the line's arrow.



Additional new lines are shown in blue. Move the mouse pointer to the end of the new line that extends to the left and click.



There is now a parallel path around the C1 contact that was first entered as shown here.

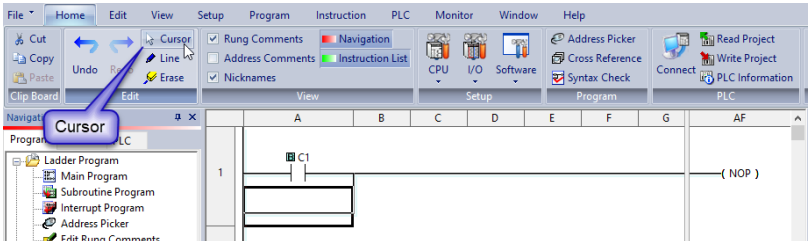


Proceed to the next page to continue construction of Rung #1.

Step 4: Create a Project (cont'd)

Rung #1 (cont'd)

Next, click on the **Cursor Mode** icon located on the Edit toolbar (Esc key has the same function as the **Cursor Mode**). The Box Cursor will move to the newly created path. If not, position the Box Cursor over the new path to get ready for the next instruction.



NOTE: *There is also a Line Erase tool icon next to the Line tool icon on the Edit toolbar that is used to erase any of the lines that were created using the Line tool. Also, to exit the Line or Line Erase function, click on the Cursor Mode icon on the Edit toolbar. All of the Line type tools are also available under the Edit drop down menu.*

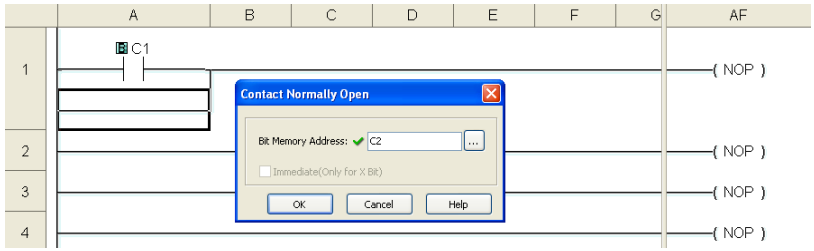
NOTE: *Lines to form parallel paths in the ladder logic can also be created with the use of the cursor keys in conjunction with the CTRL key on the PC's keyboard.*

Proceed to the next page to continue construction of Rung #1.

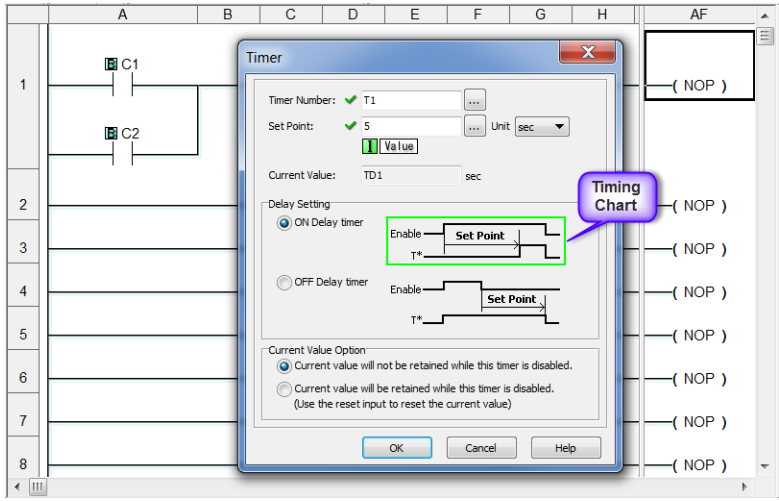
Step 4: Create a Project (cont'd)

Rung #1 (cont'd)

From the Instruction List, click & drag a Contact (NO) into the Box Cursor. Enter C2 into the Bit Memory Address text box of the Contact Normally Open dialog box that pops up and click OK. A normally open contact labeled C2 will be placed in parallel with the C1 contact.



Next, place the Box Cursor on the NOP coil at the far right of Rung #1. NOP stands for No Operation and is a place holder in the ladder logic Coil Area. Click and drag a Timer from the Instruction List into this location. Within the Timer dialog box, enter T1 into the Timer Number text box, the value 5 into the Set Point, and select **sec** for the timing Unit. The Timer dialog box shows a Timing Chart that graphically represents the function of the ON Delay Timer, and also shows a selection for an alternative OFF Delay Timer mode of operation.



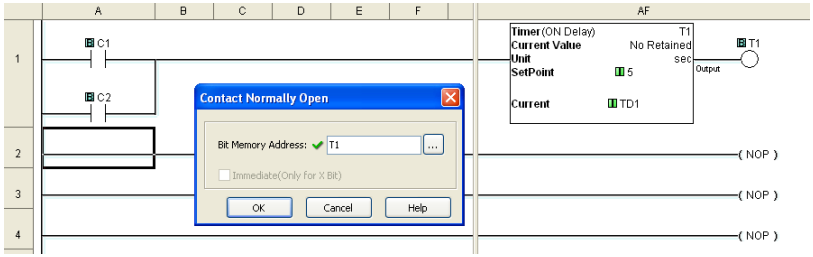
Leave the Delay Setting at ON Delay Timer and the Current Value Option set for the first selection. Click OK. A timer labeled T1 will be placed at the end of Rung #1.

Proceed to the next page to enter Rung #2.

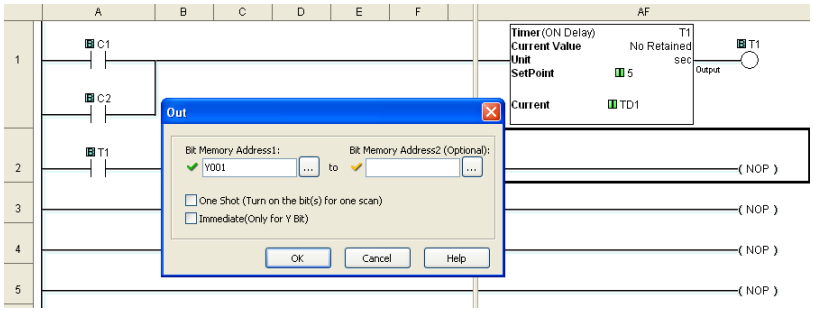
Step 4: Create a Project (cont'd)

Rung #2

Place the Box Cursor at the beginning of Rung #2. From the Instruction List, click and drag a Contact (NO) into this box. Enter T1 into the Bit Memory Address text box of the Contact Normally Open dialog box that pops up. Click OK. A normally open contact labeled T1 will be placed in the beginning of Rung #2.

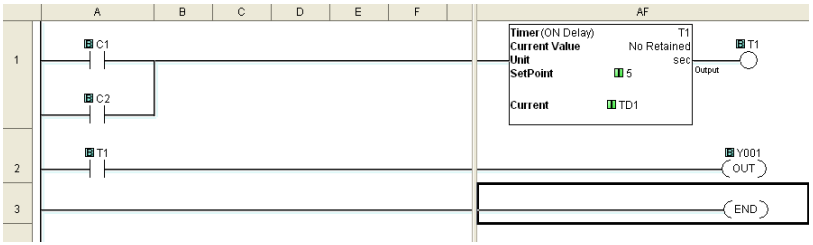


Next, place the Box Cursor on the NOP coil at the far right of Rung #2. Click and drag an OUT from the Instruction List into this location. Within the Out dialog box, enter Y001 into the Bit Memory Address: text box. Click OK. An out coil labeled Y001 will be placed at the end of Rung #2.



Rung #3

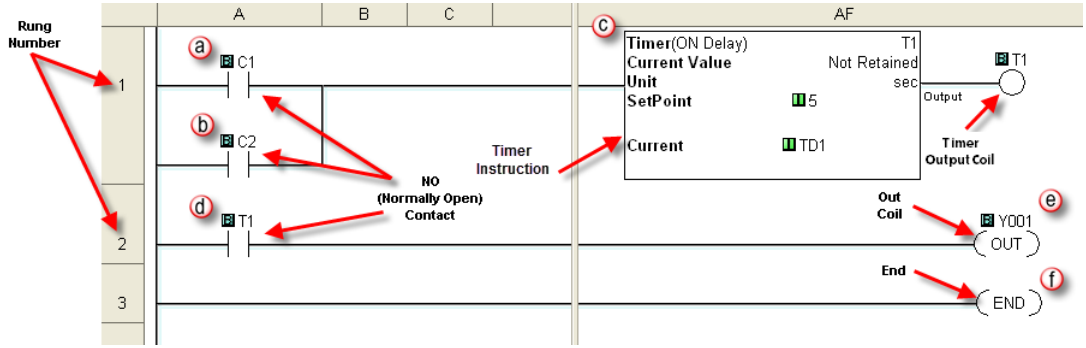
Finally, place the Box Cursor on the NOP coil at the far right of Rung #3. Click and drag an END from the Instruction List into this location. An END instruction indicates the last part of the main ladder logic program. You have created your first project!



Step 4: Create a Project (cont'd)

Program Execution

The following is an explanation of how the CLICK PLC executes the ladder logic program that was just entered.



The CLICK PLC executes the ladder logic program instructions, starting with Rung #1, from left to right, and then proceeds to execute the next rung in the same fashion, carrying on through all of the rungs in sequential order. The 6 instructions (a, b, c, d, e, and f) in the above ladder logic program are executed in the following order.



Explanation of the Program Execution

a b NO (Normally Open) Contact: Address C1 and C2 are assigned to a NO Contact. C1 and C2 are internal control bits. The internal control bits are 1 bit memory and hold the status of ON or OFF. The contacts are enabled when the status of C1 or C2 is ON.

c Timer: This instruction is used to delay an action once it is enabled. The CLICK PLC unit can use up to 500 timers (T1 to T500) in a project. In this ladder logic program, timer T1 is assigned. The Timer instruction is set up as an ON Delay Timer with a 5 second set point. That is, the timer status bit T1 output coil turns on 5 seconds after the enable input of the Timer instruction turns on.

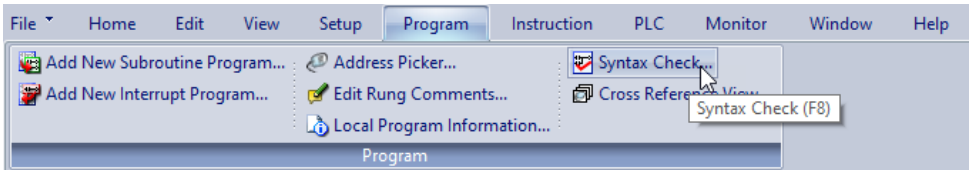
d This is a NO Contact addressed as T1 and whose status is controlled by Timer T1. The contact is enabled when Timer T1 output coil becomes true after the 5 second delay.

e OUT: This is an output coil addressed as real world output Y001, which happens to be the first output on the CLICK PLC unit. It becomes active when the T1 NO Contact in this rung becomes enabled.

f END: This is the END of the ladder logic scan, and causes the scan to start at the beginning.

Step 5: Compile and Save Project

Syntax Check (Compile)





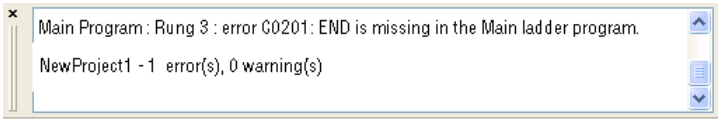
Next, you will need to compile the ladder logic program. Compiling the program is done with the Syntax Check function. The ladder program is checked for problems and other conditions that may prevent the ladder program from executing correctly. The results of the Syntax Check are displayed in the Output Window at the bottom of the Main Window as shown below.

From the Program drop down menu, select Syntax Check as shown at left, or press the F8 function key on your keyboard, or click on the Syntax Check icon located on the Program Toolbar.

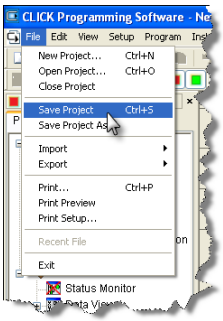
If everything in the program checks out correctly, then the Output Window will indicate 0 error(s) as shown in the following example.



If there are any errors, they will be indicated in the Output Window. For quicker troubleshooting, double click on any particular error in the Output Window and be taken directly to the rung and instruction that may be causing the error. The following is an example of an error.

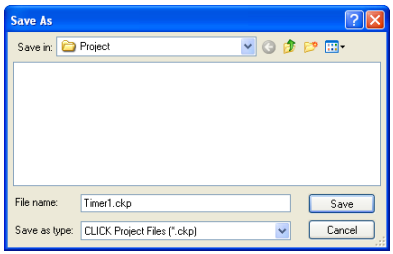


Save Project



It is always a good practice to save your project at this point. From the File drop down menu, select Save Project, as shown here, or click on the Save Project icon located on the File Toolbar.



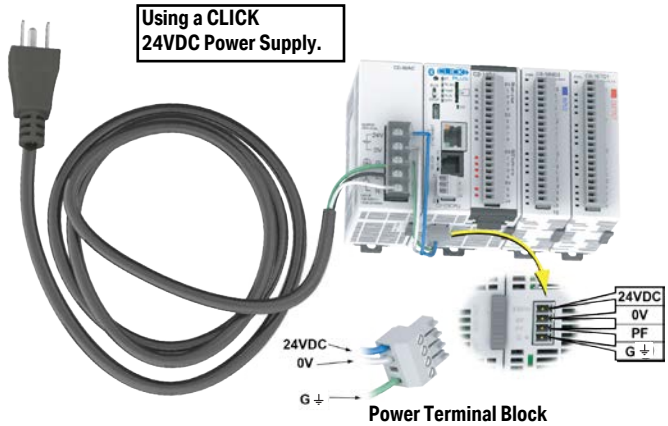


Enter the File Name for your project in the Save As dialog box. You can also browse to the folder that you want the project saved under. Click Save.

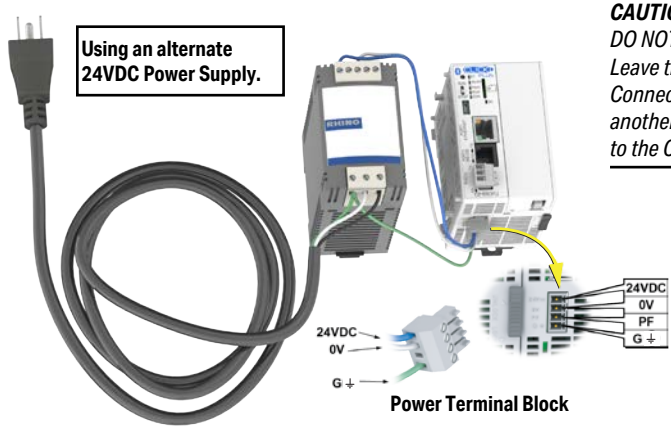
Step 6: Apply Power

The CLICK PLUS PLC system works with 24VDC power. There is a small terminal block on the bottom of the CLICK PLUS PLC unit. Wire the 24VDC output from a CLICK power supply, or a properly sized and rated 24VDC power supply such as AutomationDirect's RHINO series, to the bottom terminal block (See Chapter 2: Specifications for power supply specifications.)

EITHER



OR



CAUTION:
DO NOT USE the PF connector. Leave this terminal unconnected. Connecting the PF terminal to another device may cause damage to the CLICK PLUS CPU.

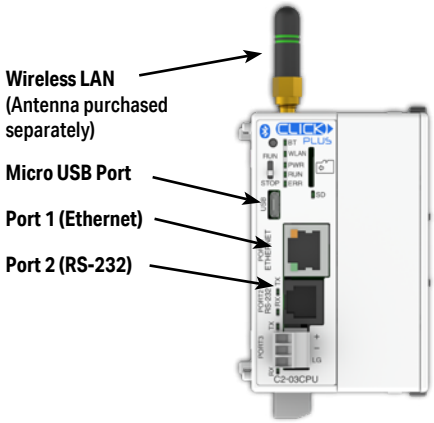
Once you wire and power up the power supply, confirm the PWR indicator (Green LED) on the CLICK PLUS PLC unit is on.

If the PWR indicator is not on, check the voltage on the terminal block with a voltage meter. If you measure 24VDC on the terminal block, the CLICK PLUS PLC unit may be defective. Please try another one or contact us for a replacement.



Step 7: Establish PC to PLC Communications

Next, connect a personal computer (PC) to the CLICK PLUS PLC unit. You can use any of the following communication ports on the CLICK PLUS PLC unit for programming, depending on model.



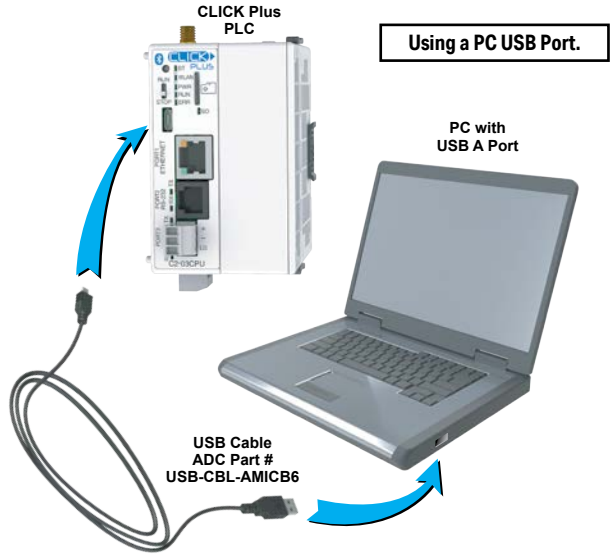
NOTE: *Connection via wireless LAN requires provisioning the CLICK PLUS PLC onto your wireless LAN. This initial setup can be performed through the CLICK Provisioning mobile app over Bluetooth, as described on page 1-21. It can also be done through the USB connection or wired LAN connection with the CLICK programming software.*

Step 7: Establish PC to PLC Communications (cont'd)

Using a USB or Serial Port for Programming

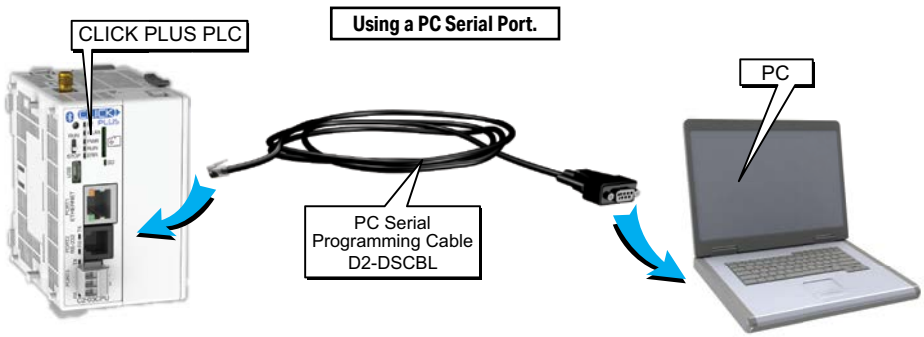
Connecting to a USB Port

If a USB port is available on the PC, then use an AutomationDirect USB A to USB micro B Programming Cable (P/N - USB-CBL-AMICB6) to connect between the USB port on the PC and the micro-B USB connector on the CLICK PLUS PLC., or use an AutomationDirect PC to Panel Programming Cable Assembly (P/N - EA-MG-PGM-CBL) to connect between the USB port on the PC and the RJ12 serial port on a CLICK PLC.



Connecting to an RS-232 Port

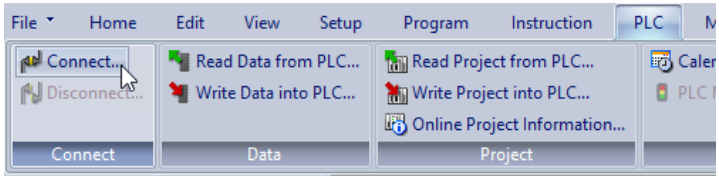
If a 9-pin RS-232 serial communications port is available on the PC, then use an AutomationDirect PC Serial Programming Cable (P/N - D2-DSCBL) to connect between the 9-pin port on the PC and the RJ12 connector on the PLC's RS-232 Port.



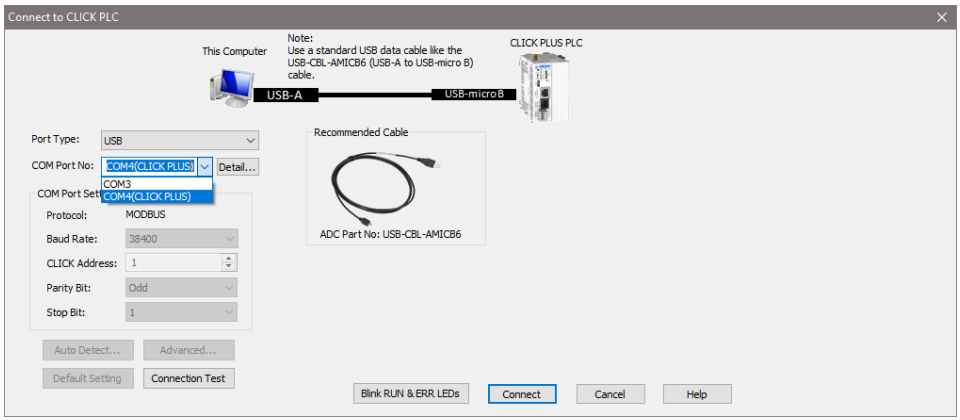
Step 7: Establish PC to PLC communications (cont'd)

Configuring the USB or RS-232 Serial Connection

Once we have a communications cable connected between a port on the PC and either the USB port or PORT2 on the CLICK PLUS PLC,



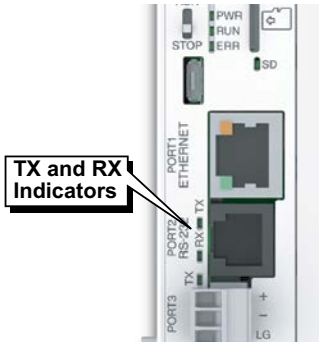
we need to select the PC COM port that is connected to the PLC. From the PLC ribbon, select Connect as shown to the right, or click on the Connect icon (left) located on the PLC Toolbar. The Connect to PLC dialog box will be displayed. Under the **COM Port No.:** drop down list, select the communications port that is connected to the PLC.



You do not need to change any of the parameters, just click the Connect button. The software should start to immediately connect to the PLC.

If you cannot connect the software to the CLICK PLUS PLC, try the above procedure one more time and keep watching the TX and RX indicators on the unit if using the RS-232 port.

If the RX is not blinking, it means the CLICK PLC unit is not receiving any data from the programming software. Check to make sure you have selected the correct PC COM Port, and also check the cable connections.



NOTE: *If you are not sure to which PC COM Port the USB port is assigned, click the Detail button next to the COM Port drop down list to identify it. Select it and click OK.*

Proceed to page 1-29.

Step 7: Establish PC to PLC Communications, (cont'd)

Provisioning your Wireless CLICK PLUS PLC via Bluetooth (C2-02CPU Series and C2-03CPU Series only)

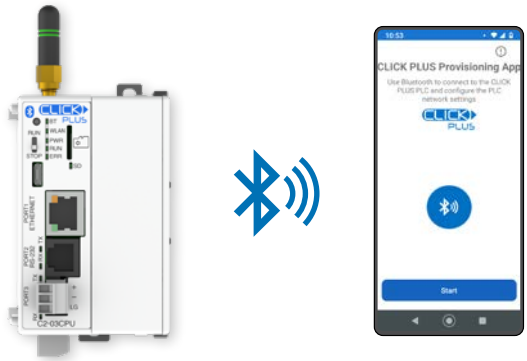
To improve the out-of-box experience, a new CLICK PLUS C2-02CPU, C2-02CPU-2, C2-03CPU or C2-03CPU-2 has Bluetooth enabled by default and allows the user with the CLICK PLUS Provisioning App to connect and configure the needed Wi-Fi settings. This removes the need for cables with a new CLICK PLUS. Once the Wi-Fi is configured to connect to the local network access point, the user can then connect the Click Programming software via Wi-Fi to load and edit the project. The Temporary settings used for provisioning are stored in temporary memory and will be overwritten by the project settings when written to the PLC.

Install an external antenna

In order to connect to the CLICK PLUS PLC over Bluetooth or WLAN, you will need to install an external 2.4 GHz antenna. We recommend the remote-mounted AutomationDirect P/N SE-ANT250 for a permanent installation. The direct-mounted AutomationDirect P/N SE-ANT210 will also work, but is not intended for use inside a closed metal enclosure.

Prepare a Mobile Device for Connection

If you haven't already done so, install the CLICK PLUS Provisioning mobile app from the Apple App Store or Google Play Store (CLICK PLUS Provisioning, published by Automationdirect.com).



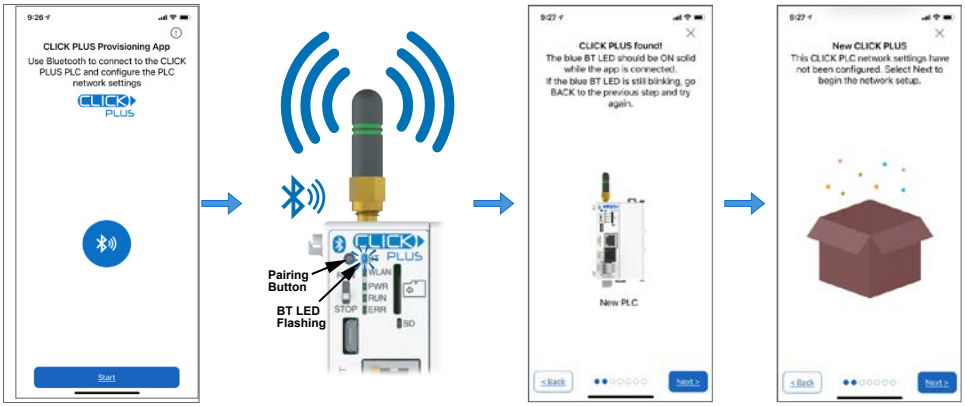
Step 7: Establish PC to PLC Communications, (cont'd)

Provisioning your Wireless CLICK PLUS PLC via Bluetooth, (cont'd)

Find the New CPU

Connect to the CPU, as follows:

1. Open the CLICK PLUS Provisioning App.
2. Tap *Start* in the App.
3. Press the pairing button on the CLICK PLUS CPU for 1 second. The BT (Bluetooth) LED will start flashing. If the PLC is factory new, or you have Reset Factory Defaults, the BT LED will flash for 30 seconds after power up.
4. The App will find the CLICK PLUS PLC that is in Provisioning mode. The blue BT LED will be ON solid when the App is connected to the PLC. Tap *Next* in the App to continue.
5. If the App detects that the PLC is factory new and the network settings have not been configured, it will prompt you to Tap *Next* to begin the provisioning process.





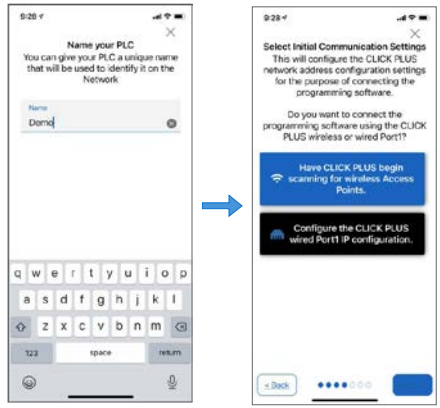
NOTE: *If you find that you need to change the settings in order to connect to the network. The PLC can be placed in pairing mode and the provisions app can be used to make needed changes.*

Step 7: Establish PC to PLC Communications, (cont'd)

Provisioning your Wireless CLICK PLUS PLC via Bluetooth, (cont'd)

Name the CPU and select port to configure

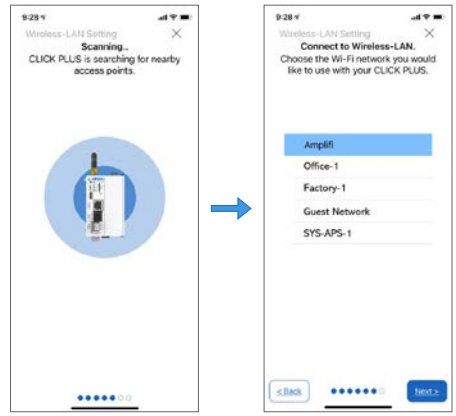
6. You will be requested to assign a name to the PLC. This name will be used to identify it on the network when using the programming software connection Ethernet browse tool. It is good practice to choose a unique name if there are other CLICK PLCs on the network. Enter a name for the PLC and tap *Next*.
7. Choose which network port to provision. This will configure the CLICK PLUS network address settings for the purpose of connecting the programming software.



Setup the Wireless LAN Connection (Skip for Wired Connection)

For this option you will need an active Network Access point available within range of the CLICK PLUS PLC, and know the password to allow the PLC to connect to the Network.

8. The CLICK PLC will scan for any access point within range and then display all access points that are available (you may need to scroll the list to find the desired Access Point). Select an Access Point and type in the correct password that the PLC will need to connect. If the incorrect password is entered, you will be prompted to correct it after the CLICK PLUS fails to connect.



Step 7: Establish PC to PLC Communications, (cont'd)

Provisioning your Wireless CLICK PLUS PLC via Bluetooth, (cont'd)

Setup the Network Parameters

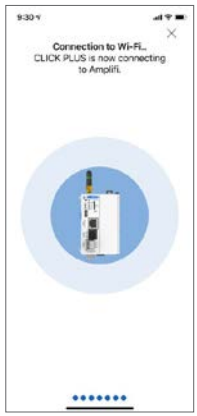
9. Once the PLC is connected to the wireless access point or wired network, choose which IP address configuration to use.
   i. Use DHCP: Automatically assign a network IP address to the CLICK PLUS PLC. This is often the simplest way to connect. Tap *Next* to continue.
   ii. Use Default Fixed Address: The CLICK PLUS wireless LAN default IP address is 192.168.0.11. This can be selected if it is a valid IP address for your wireless network. Tap *Next* to continue.
   iii. Use the following IP address: Choose this option if you need to input a valid IP address for your network. Tap *Next* to continue







10. The CLICK PLUS will connect to the access point and exchange configuration information. If the settings are correct, the App will show the Completion screen and the network settings of the CLICK PLUS can be viewed. If using a wireless connection, the CLICK PLUS WLAN LED will also be ON. The PLC is now connected to the network and accessible to PC's running the CLICK Programming Software and connected to the same network.



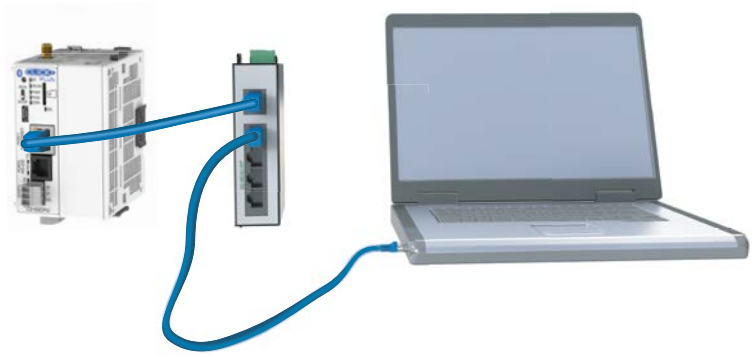


Step 7: Establish PC to PLC Communications, (cont'd)

Connecting to a Wired LAN (Models C2-01CPU and C2-03CPU only)

You can connect your PC to the CLICK PLC via an Ethernet switch/hub or directly to the Ethernet port. You can use a straight or crossover Ethernet cable.

Once we have communications cable(s) connected between the Ethernet port on the CLICK PLUS PLC and the Ethernet port on the PC, we are ready to configure the Ethernet connection and connect the CLICK Programming Software to the PLC.

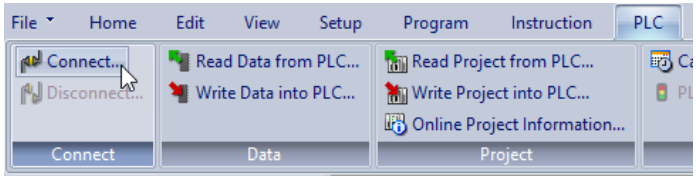


Step 7: Establish PC to PLC Communications, (cont'd)

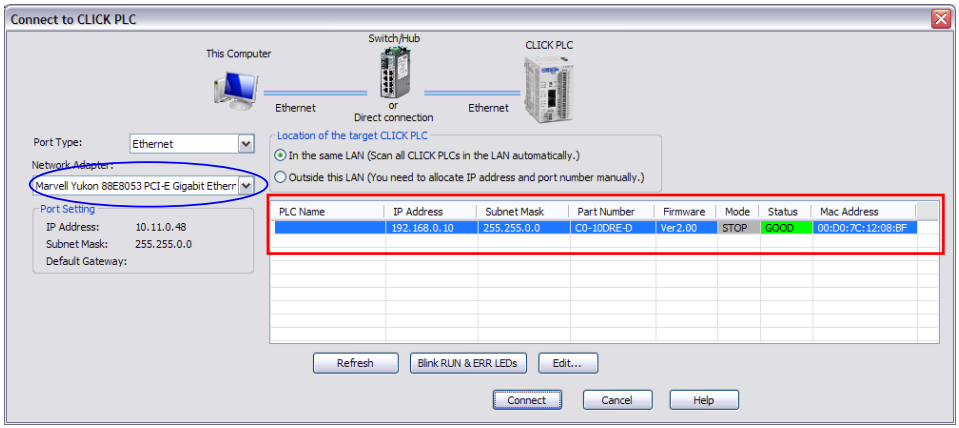
Using a Wired or Wireless Network Connection for Programming

Configure the Ethernet Connection

From the PLC ribbon, select Connect as shown to the right, or click on the **Connect** icon located on the PLC Toolbar.



Select Ethernet as the Port Type. Select the network adapter that you want to connect to the CLICK PLUS PLC, if you have more than one network adapter on your PC. The selection of wired or wireless network adapter here is independent of the type of network connection you set up on the PLC. Choose the adapter that is on the same subnet as the PLC. The CLICK programming software automatically scans the CLICK and CLICK PLUS PLC units in the LAN connected to the network adapter and displays them in the list as shown below, or you can click the **Refresh** button to update the list.

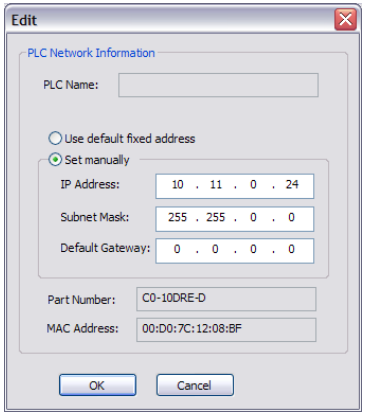


The PLC Port 1 Ethernet Port is configured by default for DHCP. If there is a DHCP server on the network then the CLICK PLC will get an IP Address compatible with the network. If there is no DHCP server on the network then the CLICK PLC will be assigned an APIPA IP Address. This will be in the form of 169.254.xxx.xxx.

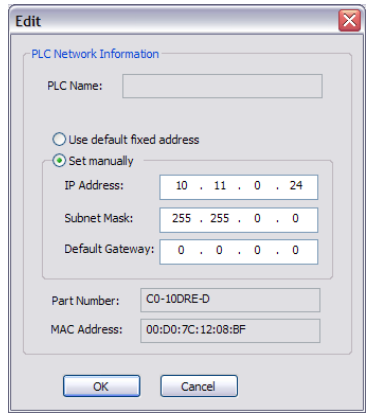
To connect the CLICK programming software to the CLICK PLUS PLC, both the PC and the PLC must be in the same subnet. In the above **Connect to CLICK PLC** window, the IP Address of the PC is '10.11.0.48' and the Subnet Mask is '255.255.0.0'. You can determine the subnet that your PC is located in by applying the logical AND operation between the IP Address and the Subnet Mask.

Example: **(IP Address = 10.11.0.48) AND (Subnet Mask = 255.255.0.0) = (Subnet = 10.11.0.0)**

Step 7: Establish PC to PLC Communications, (cont'd)



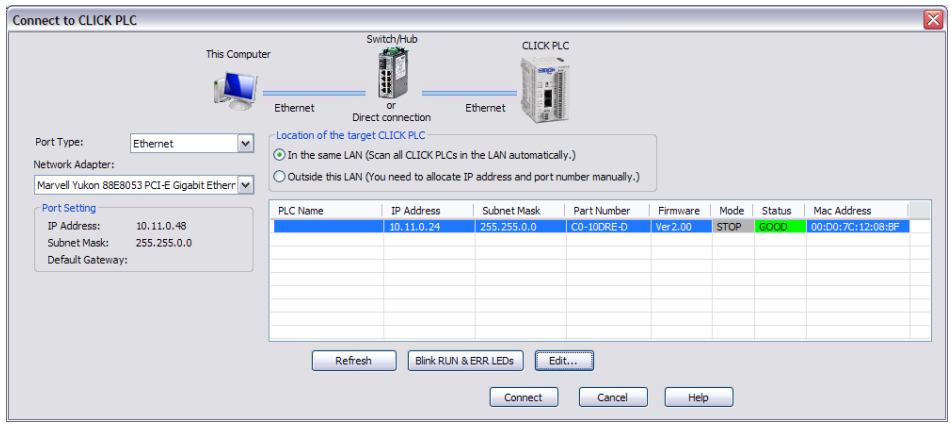
To match the subnet setup of the CLICK PLUS PLC to the subnet that your PC locates in, select the PLC unit in the list and click the **Edit** button under the list. The Edit window opens.



Next, the new IP Address needs to start with '10.11' to match the subnet of the PC. The following 2 numbers however, can be any number between 1 and 254 as long as the new IP Address is unique in the LAN. In the window here, the IP Address was changed to '10.11.0.24'.

Click the OK button to continue. The new IP Address setup is sent to the CLICK PLUS PLC.

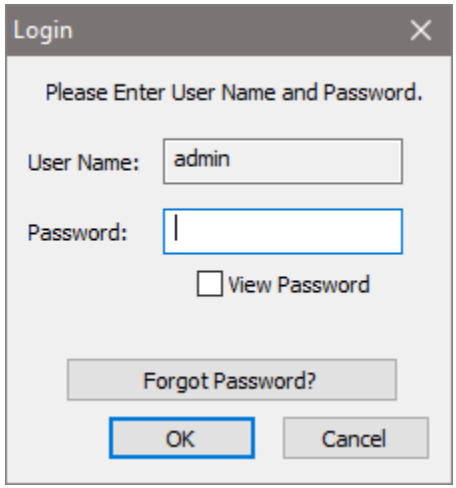
Your PC and the CLICK PLUS PLC should be in the same subnet now. Click the Connect button on the bottom to connect the CLICK programming software to the PLC.



Step 7: Establish PC to PLC Communications, (cont'd)

If you are trying to connect the CLICK Programming Software to a new CLICK PLUS PLC or an existing CLICK PLUS PLC that was reset to the factory default, you will be prompted to enter the default password, as follows:

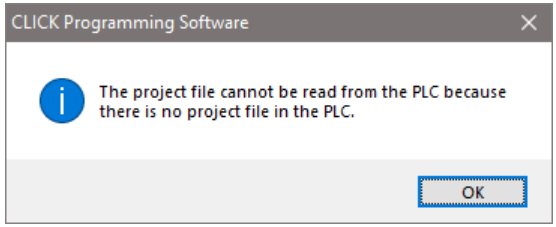
- User: admin
- Password: click



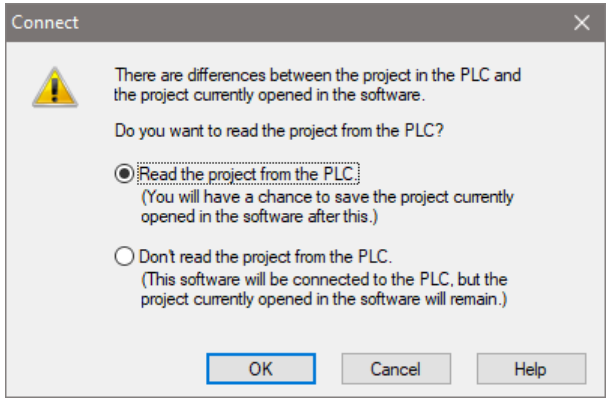
When you download your first project, the admin account password must be set to something other than the default before the project can be downloaded.

Step 7: Establish PC to PLC Communications, (cont'd)

If you are trying to connect the CLICK Programming Software to a new CLICK PLUS PLC or an existing CLICK PLUS PLC that was reset to the factory default, you will see the following pop-up message once communication has been established with the PLC. This is because there is no user project in the PLC currently. Click the OK button to close the message and proceed to the next step.



If you are trying to connect the CLICK Programming Software to a CLICK PLUS PLC that already has a user project, the following Connect dialog box will appear.



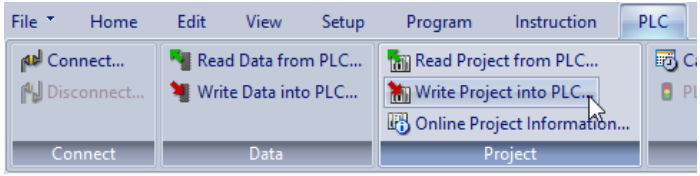
It is not unusual that the project opened in the programming software will not match the project that resides in the PLC. The dialog box gives you a choice to either read the PLC's project for viewing purposes, but at the same time allowing the project opened in the software to still be saved, or not read the project in the PLC.

For the Getting Started exercise, click the radio button for the "**Don't read the project from the PLC**" and click OK. Proceed to the next step which will allow the created project to be written into the CPU memory.

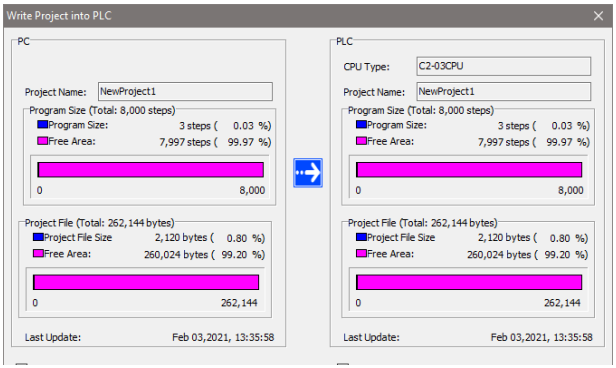
Step 8: Write Project into PLC



The next step is used to transfer the project that was created into the CLICK PLUS PLC. From the PLC ribbon, select Write Project into PLC as shown below, or click on the Write Project into PLC icon located on the PLC Toolbar.



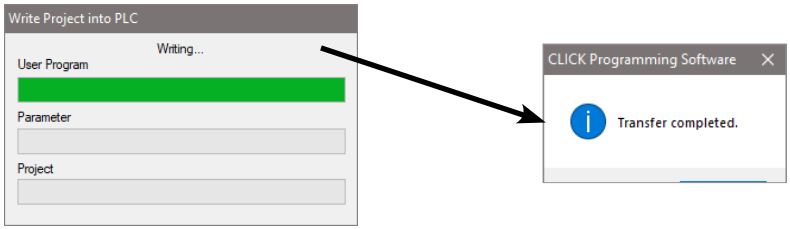
The following dialog box is displayed.



The dialog box displays the information for the Project that is currently opened in the programming software (PC) on the left side. The dialog box also displays the information for any Project that may be stored in the CLICK PLUS PLC unit (PLC) on the right side.

Click **OK** to write the project data from the **PC** to the **CLICK** PLUS PLC unit.

The **Writing...** progress window will open to allow verification that the Project is being written to the CPU. When finished, a Transfer Completed message will be displayed. Click OK to continue.



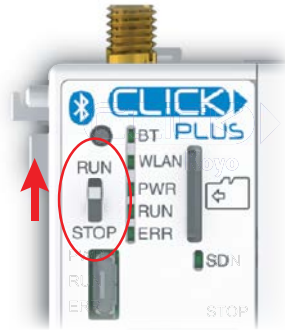
Step 9: Place PLC in RUN Mode

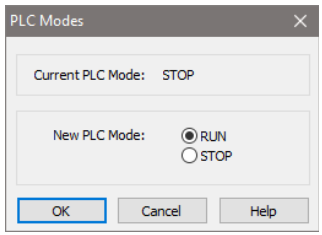


The next step is to place the CLICK PLUS PLC into its Run mode so that the ladder logic program will execute.

If the PLC Mode Switch was in the STOP position when the project was written to the PLC, now move the switch to RUN. The CLICK PLUS PLC is now in RUN mode and executing your ladder logic program.

If the PLC Mode Switch was in the RUN position when the project was written, the PLC Modes dialog is displayed. Click the radio button for RUN and then click the OK button. The CLICK PLUS PLC is now in RUN mode and executing your ladder logic program..

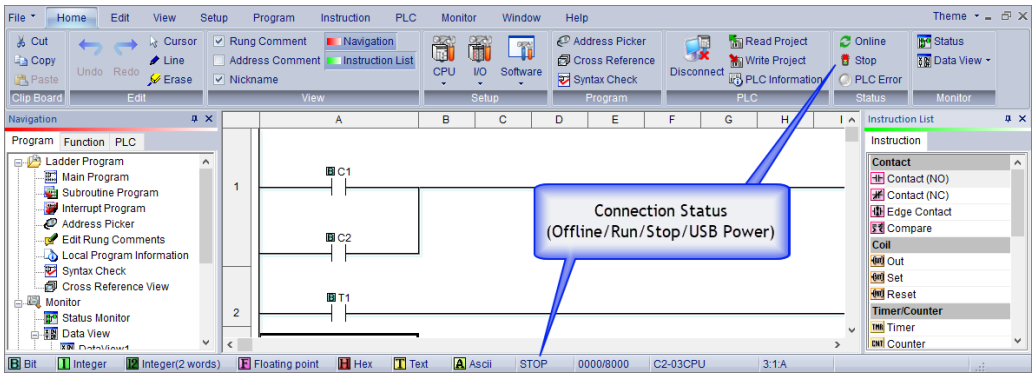




Click the radio button for RUN and then click the OK button. The CLICK PLUS PLC is now in Run mode and executing your ladder logic program.

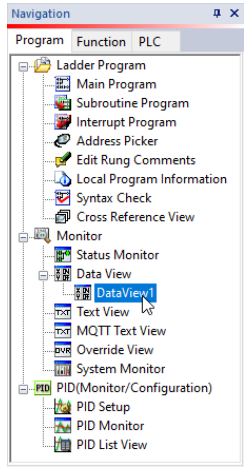


NOTE: *The PLC Modes dialog box can also be accessed by clicking on the Connection status (Offline/Run/Stop, USB Power) indicator button that is located on the toolbar.*

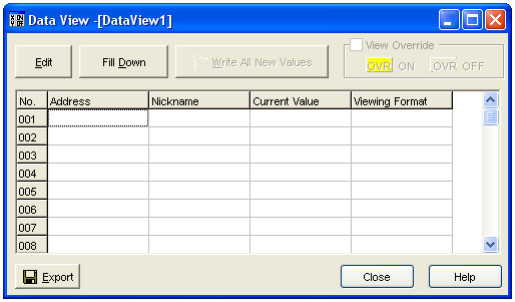


Step 10: Test Project using Data View Monitor

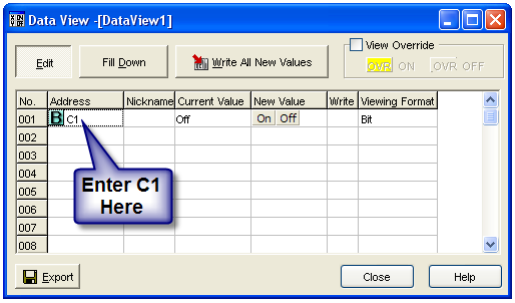
In this next step, use the Data View Monitor to test the ladder logic program by manually overriding the status of the internal C1 bit that was programmed. The purpose of this will be to have the C1 bit enable Timer T1. From the Navigation window on the left side of the development screen, select the Program tab, open the Data View folder under Monitor and double click on DataView1.



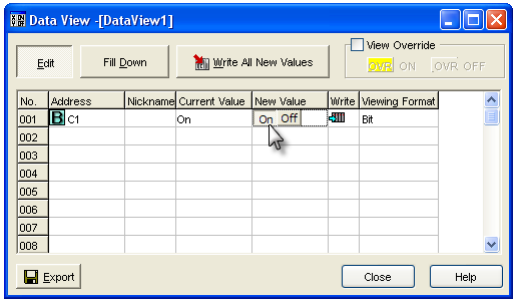
The Data View window is displayed.



Click the Edit button and type in C1 as the Address as shown below.

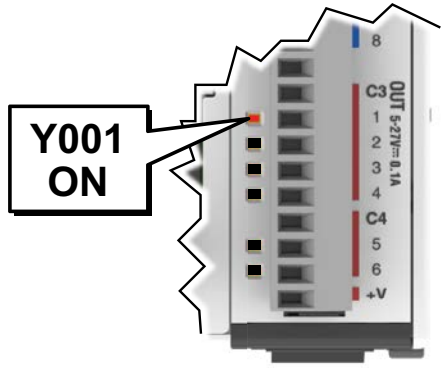


Double click the ON button in the New Value column. The Current Value of the C1 bit changes from OFF to ON. Go to Step 10: "Y001 Output On?"



Step 11: Y001 Output On?

CLICK PLC output Y001 will turn on 5 seconds after you write the ON state to the C1 bit using Data View in the Edit mode. The location and labeling of this output will depend on your installed output modules.



If you missed viewing the transition of the Y001 status LED from OFF to ON, write an OFF state to the C1 bit and then an ON state in the Data View Monitor to do it again.

NOTE: *Also, try changing the status of the internal C2 bit. The results should be the same because the C2 bit is in parallel with the C1 bit. The ladder logic reads: "Enable timer T1, if either C1 or 'C2 is true."*

Congratulations!

You have now learned how to create, compile and transfer a ladder logic project to a CLICK PLUS PLC, and then run and test the project. There are additional instructions available for the CLICK PLUS PLC. Please refer to the programming software online help topics for details on these instructions.

Again, thank you very much for using the CLICK PLUS PLC system.

Additional Training Resources

In addition to this Getting Started chapter, there are other resources we recommend, for both the novice and pros, that will aid you in learning more about using the CLICK PLC system.

Automationdirect.com Online Video Site - http://automationdirect.com/videos/home is an online video tutorial site offering free on-demand video tutorials on a wide range of practical industrial products, including the CLICK PLC system.

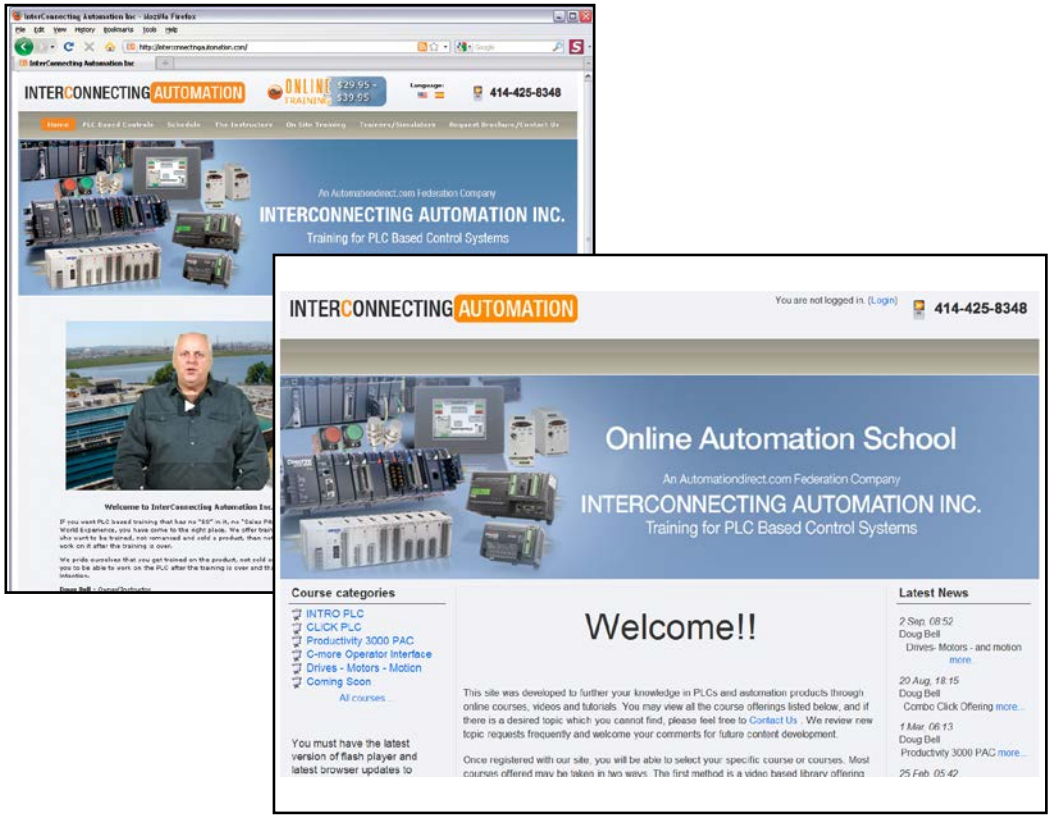
From the Automationdirect.com home page, select (a) "Video Tutorials". When the page opens select (b) "Programmable Controllers" on the top, lefthand topic bar for Video Filter list. Select (c) "CLICK series PLCs". A page of CLICK specific videos will open. A search for CLICK (d) will pull up all the CLICK videos as well. The videos cover all aspects of the CLICK PLC system, from an introductory video, to communications, and programming.



Interconnecting Automation Online Training Courses offered at-

http://www.interconnectingautomation.com/onlinecourses

Interconnecting Automation offers inexpensive subscription-based online training, including CLICK PLC training.



Also, a CLICK PLC Trainer is available from this web site.



SPECIFICATIONS



In This Chapter...

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Regulatory and Standards Compliance 2-3
CLICK PLUS PLC Units 2-4
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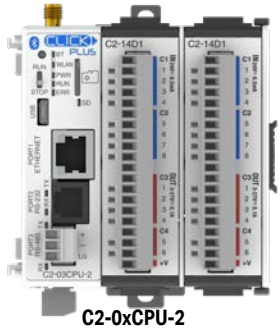
Overview of PLC System

The CLICK PLC family of components is designed to combine practical PLC features in a compact and expandable design, with a simple-to-use philosophy. A powered CLICK PLUS PLC unit by itself can be used as a complete PLC system with up to two Option Slot modules, or the system can be expanded with the addition of up to eight Stackable I/O modules. The CLICK PLC system does not require a mounting base. The CLICK PLUS PLC and I/O modules are connected together via an expansion port on the right side of the PLC case. A variety of I/O modules is available for flexible and optimal system configuration. The CLICK PLUS PLC supports a very simple but useful instruction set. There are 21 easy-to-use instructions that cover most applications that are suitable for this class of PLC.

Use a CLICK PLUS PLC unit as a stand-alone controller with Option Slot I/O...

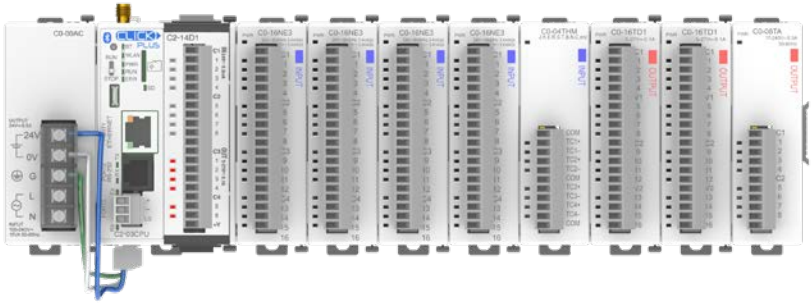


C2-0xCPU



C2-0xCPU-2

...or, expand the system by installing up to eight additional I/O modules.



NOTE: *It is not necessary to use the CLICK power supply with a CLICK PLUS PLC. An alternate, regulated, properly-sized 24VDC power source can be used to power the PLC and can also provide 24VDC to any optional I/O modules used in the CLICK PLUS PLC hardware configuration. Please refer to the Power Budgeting section later in this chapter for details on choosing the correct size power supply.*

Regulatory and Standards Compliance

FCC and ISED(Canada)

Per FCC 15.19(a)(3) and (a)(4) This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Per FCC 15.21, changes or modifications not expressly approved by the JTEKT Electronics Corporation could void the user's authority to operate the equipment.

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Cet appareil est conforme à la norme RSS Industrie Canada exempt de licence. Son fonctionnement est soumis aux deux conditions suivantes: (1) cet appareil ne doit pas provoquer d'interférences et (2) cet appareil doit accepter toute interférence, y compris les interférences pouvant causer un mauvais fonctionnement du dispositif.

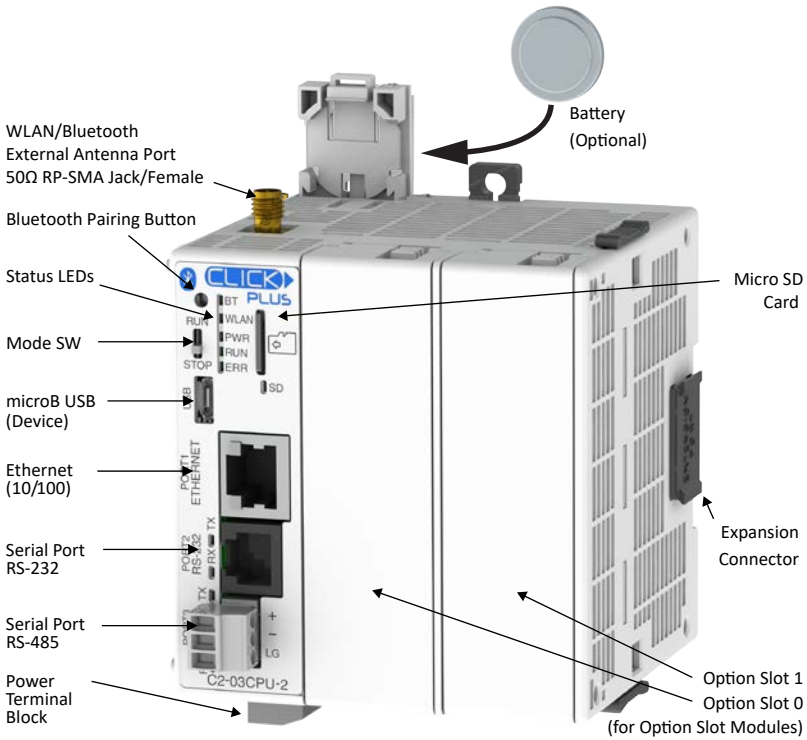
CLICK PLUS PLC Units

All CLICK PLUS PLC units offer the same instruction set and support CLICK PLUS Option Slot modules as well as all CLICK stackable I/O modules. The six types of PLC units available are listed in the table below.

PLC	Communication Ports						Micro SD Slot	Battery Backup	RUN time Edit
	USB	Ethernet (Port 1)	RS-232 (Port 2)	RS-485 (Port 3)	Bluetooth	WLAN			
C2-01CPU C2-01CPU-2	Yes (microB)	Yes (10/100)	Yes	None	None	None	None	Yes	Yes
C2-02CPU C2-02CPU-2		None	None	None	Yes (external antenna required)	Yes (external antenna required)	None		
C2-03CPU C2-03CPU-2		Yes (10/100)	Yes	Yes			Yes		

CLICK PLUS PLC Units

The layout of the CLICK PLUS external features is illustrated below using the C2-03CPU-2 model. Some features are not present in other models as outlined in the table above.



NOTE: High-speed Inputs and Outputs are only available on Slot 0.

CPU is shown with optional C2-FILL Option Slot Covers installed.

Memory

All CLICK PLUS PLC units have a non-volatile FLASH ROM to store the downloaded ladder program and project file. The FLASH ROM will retain the ladder program even with power removed from the PLC module.

The CLICK PLUS PLC units make use of data registers to store values and conditions that are used during program execution. This data is stored in the SRAM memory. It is volatile memory that is backed up by a super capacitor. This super capacitor is a special type of capacitor designed to provide power to volatile memory like the SRAM when the power to the PLC is off. However, it will not back up the memory for an extended time. In the case of the CLICK PLUS PLC, the super capacitor will back up the SRAM for approximately 1 hour after the power is shut off. Once the super capacitor is discharged, all data in the SRAM is cleared.

To prevent the loss of SRAM memory during power down, the CLICK PLUS PLCs have a battery backup feature that will retain data in the SRAM for three years. Use part number D0-MC-BAT as the replacement battery.

Refer to the PLC Unit Specifications section later in this chapter for more PLC information.



NOTE: *The SD Card Memory available on the C2-03CPU and C2-03CPU-2 is only used for data logging. The PLC project and SRAM memory data are not stored on the SD Card.*

Option Slot I/O Modules

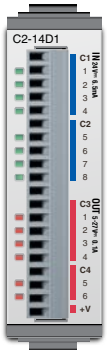
The CLICK PLUS PLCs have one or two internal expansion slots (Option Slots). The first Option Slot (Slot 0) has access to a high-speed bus. A variety of Option Slot I/O modules are available, as listed below. Complete I/O module specifications and wiring diagrams can be found later in this chapter.

CLICK PLUS Option Slot I/O Modules					
Part Number	**Corresponding CLICK C0 CPU**	**Discrete Input Types**	**Discrete Output Types**	**Analog Input Types**	**Analog Output Types**
C2-14D1	C0-11DD1E-D	8 DC (sink/source) 8 points High-Speed**	6 DC (sink) 3 points High-Speed**	None	None
C2-14D2	C0-11DD2E-D		6 DC (source) 3 points High-Speed**		
C2-14DR	C0-11DRE-D		6 Relay		
C2-14AR	C0-11ARE-D	8 AC			
C2-08D1-4VC*	C0-12DD1E-D	4 DC (sink/source) 4 points High-Speed**	4 DC (sink) 2 points High-Speed**	2 channel; voltage (0–5 VDC) / current (4–20 mA); selectable separately per channel, 12-bit	2 channel; voltage (0–5 VDC) / current (4–20 mA); selectable separately per channel, 12-bit
C2-08D2-4VC*	C0-12DD2E-D		4 DC (source) 2 points High-Speed**		
C2-08DR-4VC*	C0-12DRE-D		4 relay		
C2-08AR-4VC*	C0-12ARE-D	4 AC			

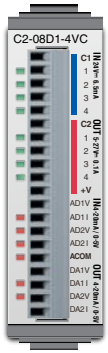
* *These four Option Slot modules require that you select analog I/O as voltage or current type in the CLICK programming software. See the Analog I/O Configuration section in Chapter 3.*

** *For high-speed inputs and outputs, the Option Slot Module must be installed in Slot 0.*

Table continued on next page.



C2-14xx

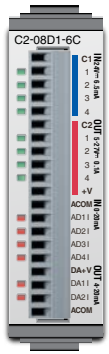


C2-08xx-4VC

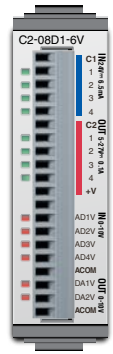
CLICK PLUS Option Slot I/O Modules (continued)					
Part Number	**Corresponding CLICK C0 CPU**	**Discrete Input Types**	**Discrete Output Types**	**Analog Input Types**	**Analog Output Types**
C2-08D1-6C	C0-12DD1E-1-D	4 DC (sink/source) 4 points High-Speed**	4 DC (sink) 2 points High-Speed**	4 channel; current (0–20 mA), 12-bit	2 channel; current (4–20 mA), 12-bit
C2-08D2-6C	C0-12DD2E-1-D		4 DC (source) 2 points High-Speed**		
C2-08DR-6C	C0-12DRE-1-D		4 relay		
C2-08AR-6C	C0-12ARE-1-D	4 AC			
C2-08D1-6V	C0-12DD1E-2-D	4 DC (sink/source) 4 points High-Speed**	4 DC (sink) 2 points High-Speed**	4 channel; voltage (0–10 VDC), 12-bit	2 channel; voltage (0–10 VDC), 12-bit
C2-08D2-6V	C0-12DD2E-2-D		4 DC (source) 2 points High-Speed**		
C2-08DR-6V	C0-12DRE-2-D		4 relay		
C2-08AR-6V	C0-12ARE-2-D	4 AC			

* *These four Option Slot modules require that you select analog I/O as voltage or current type in the CLICK programming software. See the Analog I/O Configuration section in Chapter 3.*

** *For high-speed inputs and outputs, the Option Slot Module must be installed in Slot 0.*



C2-08xx-6C

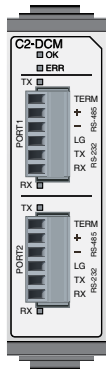


C2-08xx-6V

Option Slot Intelligent Modules

In addition to I/O modules, the Option Slots on CLICK PLUS PLCs can accept Option Slot Intelligent Modules. The first of these is the C2-DCM communications module, as shown in the table below. Complete Intelligent Module specifications and wiring diagrams can be found later in this chapter. Option Slot Intelligent Modules facilitate expansion of the capabilities of the CLICK PLUS system without requiring replacement of your existing CLICK PLUS CPU.

CLICK PLUS Option Slot Intelligent Modules	
Part Number	**Description**
C2-DCM	Communications module, 2 RS-232/RS-485 ports, supports Modbus RTU and ASCII.



C2-DCM

Stackable I/O Modules

A variety of I/O modules is available for the CLICK PLC System. Up to 8 I/O modules can be connected to a CLICK PLC unit to expand the system I/O count and meet the needs of a specific application. Complete I/O module specifications and wiring diagrams can be found later in this chapter. Here are the I/O modules that are supported by the CLICK PLC system.

Discrete Input Modules



C0-08ND3



C0-08ND3-1



C0-16ND3

Discrete Input Modules		
Part Number	**Input Type**	**Voltage Ratings**
C0-08ND3	8 DC (Sink/Source)	12–24 VDC
C0-08ND3-1	8 DC (Sink/Source)	3.3–5 VDC
C0-16ND3	16 DC (Sink/Source)	24VDC
C0-08NE3	8 AC/DC (Sink/Source)	24 VAC/VDC
C0-16NE3	16 AC/DC (Sink/Source)	24 VAC/VDC
C0-08NA	8 AC	100–120 VAC



C0-08NE3



C0-16NE3



C0-08NA

Specialty Modules

Specialty Modules		
Part Number	**Input Type**	**Voltage Ratings**
C0-08SIM	8, Toggle Switch	N/A



C0-08SIM

Discrete Output Modules



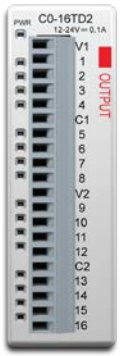
C0-08TD1



C0-08TD2



C0-16TD1



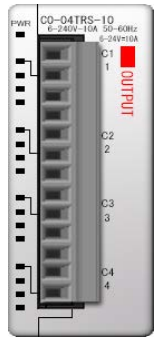
C0-16TD2



C0-08TA



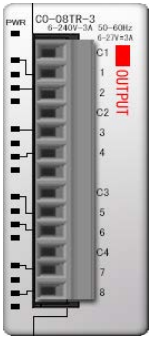
C0-04TRS



C0-04TRS-10



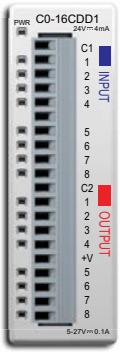
C0-08TR



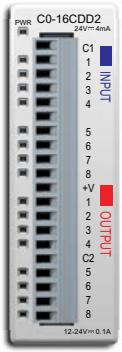
C0-08TR-3

Discrete Output Modules		
Part Number	**Output Type**	**Voltage/Current Ratings**
C0-08TD1	8 DC (Sink)	3.3–27 VDC / 0.3 A
C0-08TD2	8 DC (Source)	12–24 VDC / 0.3 A
C0-16TD1	16 DC (Sink)	5–27 VDC / 0.1 A
C0-16TD2	16 DC (Source)	12–24 VDC / 0.1 A
C0-08TA	8 AC	17–240 VAC / 0.3 A
C0-04TRS	4 Relay	6–27 VDC / 7A 6–240 VAC / 7A
C0-04TRS-10	4 Relay	6–24 VDC / 10A 6–240 VAC / 10A
C0-08TR	8 Relay	6–27 VDC / 1A 6–240 VAC / 1A
C0-08TR-3	8 Relay	6–27 VDC / 3A 6–240 VAC / 3A

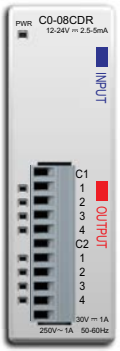
Discrete Combo I/O Modules



C0-16CDD1



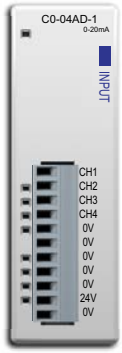
C0-16CDD2



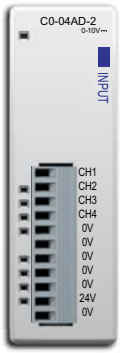
C0-08CDR

Discrete Combo I/O Modules				
Part Number	**Input Type**	**Input Voltage**	**Output Type**	**Output Voltage / Current Ratings**
C0-16CDD1	8 DC (sink/source)	24VDC	8 DC (sink)	5–27 VDC / 0.1 A
C0-16CDD2	8 DC (sink/source)	24VDC	8 DC (source)	12–24 VDC / 0.1 A
C0-08CDR	4 DC (sink/source)	12–24 VDC	4 (relay)	6.25–24 VDC / 1A 6–240 VAC / 1A

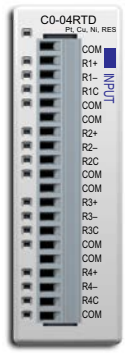
Analog Input Modules



C0-04AD-1



C0-04AD-2



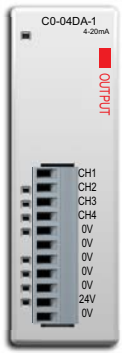
C0-04RTD



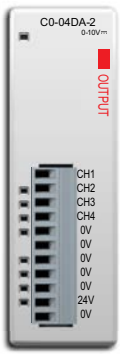
C0-04THM

Analog Input Modules		
Part Number	Analog Input Types	External Power Required
C0-04AD-1	4 channel, current (0–20 mA), 13-bit	24VDC
C0-04AD-2	4 channel, voltage (0–10 V), 13-bit	24VDC
C0-04RTD	4 channel RTD input (0.1 degree °C/°F resolution), or resistive input (0–3125 Ω, 0.1 Ω or 0.01 Ω resolution)	None
C0-04THM	4 channel thermocouple input (0.1 degree °C/°F resolution), or voltage input (-156.25 mV to 1.25 V, 16-bit)	None

Analog Output Modules



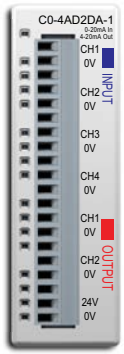
C0-04DA-1



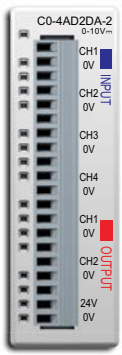
C0-04DA-2

Analog Output Modules		
Part Number	Analog Output Types	External Power Required
C0-04DA-1	4 channel, current sourcing (4–20 mA), 12-bit	24VDC
C0-04DA-2	4 channel, voltage (0–10 V), 12-bit	24VDC

Analog Combo I/O Modules



C0-4AD2DA-1



C0-4AD2DA-2

Analog Combo I/O Modules			
Part Number	Analog Input Type	Analog Output Type	External Power Required
C0-4AD2DA-1	4 channel, current (0–20 mA), 13-bit	2 channel, current sourcing (4–20 mA), 12-bit	24VDC
C0-4AD2DA-2	4 channel, voltage (0–10 V), 13-bit	4 channel, voltage (0–10 V), 12-bit	24VDC

Power Supply

Two different 24VDC power supplies are available for the CLICK PLC family. They are designed to attach to the left side of the CLICK PLC, creating a compact footprint. They are identical except for the output current rating. The 24VDC power is wired from the DC output terminals of the power supply to a removable power terminal block located on the bottom of the CLICK PLC unit.



CLICK 24VDC Power Supply Ratings	
Part Number	**Output Current**
C0-00AC	0.5 A
C0-01AC	1.3 A

C0-00AC

The C0-00AC is a low-cost solution for applications requiring only minimal I/O and power consumption. This power supply will not support a fully-populated CLICK PLC system with all possible I/O module combinations. Please see Power Budgeting section of this chapter for details.

C0-01AC

The C0-01AC is designed to support a fully-populated CLICK PLC system with all possible I/O module combinations with no concerns of exceeding the power budget.

Please refer to the Power Supply Specifications section later in this chapter for specification details.

NOTE: *It is not mandatory to use one of the above CLICK power supplies for the CLICK PLC system. A properly-sized and rated 24VDC power supply, such as some of those offered by Automationdirect.com, can also be used to power a CLICK PLC system.*



12 VDC-to-24VDC Converter		
Part Number	**Input Voltage**	**Output Current**
PSP24-DC12-1	9.5–18 VDC	1.0 A @ 24VDC

PSP24-DC12-1

With this DC-DC converter you can operate the CLICK PLC with 12VDC input power.

To select a power supply to use with your CLICK PLC system, you need to consider the total PLC system's power budget. Please refer to the Power Budget section of this chapter for details.

Power Budgeting

What is Power Budgeting?

There are two areas that need to be considered when determining the power required to operate a CLICK PLUS PLC system. The first is the power required internally by the CLICK PLUS PLC. This includes the internal logic-side power that the PLC provides to its Option Slot modules, connected I/O modules that are powered through the PLC expansion port, and any device, such as a C-more Micro-Graphic panel, that is powered through one of the PLC's communication ports.

The second area is the power required by all externally-connected I/O devices. This should be viewed as the field-side power required. The field-side power is dependent on the voltage used for a particular input or output device as it relates to the wired I/O point and on the calculated load rating of the connected device

It is strongly recommended that the power source for the logic side be separate from the power source for the field side to help eliminate possible electrical noise.

Be aware that the CLICK PLUS PLC sinking DC output points require a sustained voltage to work with their output drivers. This includes the C0-08TD1 and C0-16TD1 output modules. It is recommended that this voltage be provided from the field-side power source.

The CLICK PLUS PLC operates from a 24VDC power source. The 24VDC power source can be provided by an optional CLICK PLC unit power supply (C0-00AC or C0-01AC) or one of our standard industrial 24VDC power supplies.



CLICK 24VDC Power Supply
C0-00AC or C0-01AC



Alternative 24VDC Power Supply
Example: PSP24-DC12-1

Visit www.automationdirect.com for the complete line.

Choice of the power source for the connected I/O devices is dependent on the voltage rating of the devices and the type of CLICK I/O module that is being used.

Power Budgeting requires the calculation of the total current that the 24VDC power source needs to provide to the CLICK PLUS PLC unit logic side and also a separate calculation of the total current required from all devices operating from the field side of the CLICK PLC system.

Refer to the following pages which includes tables listing the CLICK PLUS PLC and I/O module current requirements, plus a power budgeting example.

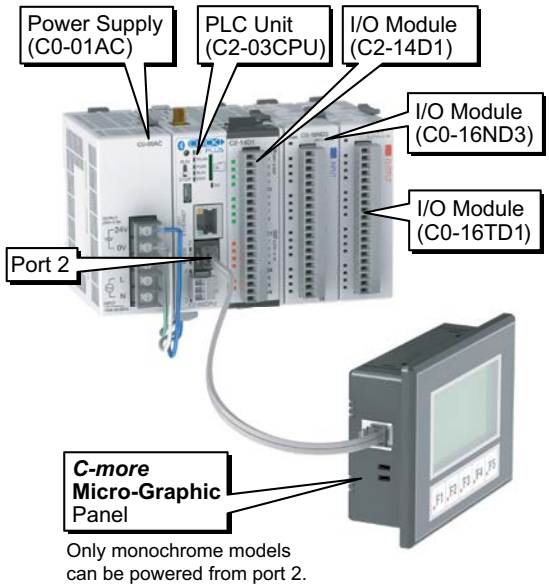
Power Budget Calculation

The following table shows the current consumption required for both the logic side and field side of the CLICK units.

PLC Current Consumption (mA)		
Part Number	Power Budget 24VDC (logic side)	External 24VDC (field side)
PLC CPU Units		
C2-01CPU	110	0
C2-02CPU	105	0
C2-03CPU	130	0
C2-01CPU-2	120	0
C2-02CPU-2	115	0
C2-03CPU-2	140	0
Option Slot I/O Modules		
C2-14D1	50	60
C2-14D2	50	0
C2-14DR	75	0
C2-14AR	75	0
C2-08D1-4VC	80	60
C2-08D2-4VC	80	0
C2-08DR-4VC	100	0
C2-08AR-4VC	100	0
C2-08D1-6C	80	60
C2-08D2-6C	80	0
C2-08DR-6C	100	0
C2-08AR-6C	100	0
C2-08D1-6V	80	60
C2-08D2-6V	80	0
C2-08DR-6V	100	0
C2-08AR-6V	100	0
Option Slot Intelligent Modules		
C2-DCM	60	0

I/O Module Current Consumption (mA)		
Part Number	Power Budget 24VDC (logic side)	External 24VDC (field side)
Discrete Input Modules		
C0-08ND3	30	0
C0-08ND3-1	30	0
C0-16ND3	40	0
C0-08NE3	30	0
C0-16NE3	40	0
C0-08NA	30	0
Discrete Output Modules		
C0-08TD1	50	15
C0-08TD2	50	0
C0-16TD1	80	100
C0-16TD2	80	0
C0-08TA	80	0
C0-04TRS	100	0
C0-04TRS-10	120	0
C0-08TR	100	0
C0-08TR-3	90	0
Discrete Combo I/O Modules		
C0-16CDD1	80	50
C0-16CDD2	80	0
C0-08CDR	80	0
Specialty Modules		
C0-08SIM	50	0
Analog Input Modules		
C0-04AD-1	20	65
C0-04AD-2	23	65
C0-04RTD	25	0
C0-04THM	25	0
Analog Output Modules		
C0-04DA-1	20	145
C0-04DA-2	20	85
Analog Combo I/O Modules		
C0-4AD2DA-1	25	75
C0-4AD2DA-2	20	65
C-more Micro-Graphic Panel (Monochrome only)		
All p/n	90	0

Power Budget Example



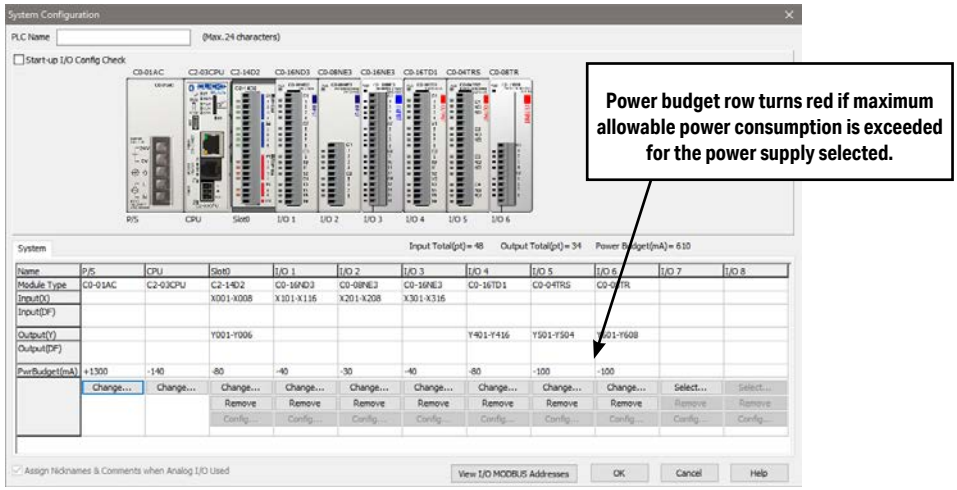
Only monochrome models can be powered from port 2.

Add the current consumption for each module in the system as shown in this example.

Current Consumption (mA)		
Part Number	**Power Budget 24VDC (logic side)**	**External 24VDC (field side)**
C2-03CPU	130	0
C2-14D1	50	60
C0-16ND3	40	0
C0-16TD1	80	100
***C-more* Micro**	90	0
Total:	**390**	**160 ***
* Plus calculated load of connected I/O devices.		

Power Budgeting using the CLICK Programming Software

The following example shows the logic-side current consumption as calculated in the System Configuration Setup section of the CLICK Programming Software. Based on the amperage rating of the power supply selected in the first column, your power budget is calculated by subtracting each consecutive module's power consumption from the total available power budget. If you exceed the maximum allowable power consumption, the power budget row fills in red.



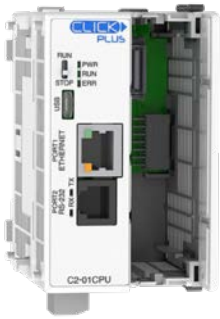
PLC Unit Specifications

General Specifications for all CLICK PLUS CPUs

CLICK PLUS PLC Unit General Specifications	
Operating Temperature	32°F to 131°F (0°C to 55°C)
Storage Temperature	−4°F to 158°F (−20°C to 70°C) IEC 60068-2-1 (Test Ab, Cold) IEC 60068-2-2 (Test Bb, Dry Heat) IEC 60068-2-14 (Test Na, Thermal Shock)
Ambient Humidity	30% to 95% relative humidity (non–condensing)
Environmental Air	No corrosive gases The level for the environmental pollution is 2 (UL840)
Environment	For Indoor Use Only
Vibration	IEC60068-2-6 (Test Fc) 5–9Hz: 3.5mm amplitude, 9–150Hz 1.0G 10 sweep cycles per axis on each of 3 mutually perpendicular axes.
Shock	IEC60068-2-27 (Test Ea) 15G peak, 11ms duration, 3 shocks in each direction per axis, on 3 mutually perpendicular axes.
Voltage Withstand (Dielectric)	1000VAC, 1 minute (between G and 24V IN)
Insulation Resistance	500VDC, 10M ohm (between G and 24V IN)
Noise Immunity	<EN61131-2> EN61000-4-2 (ESD): 4kV (Contact Discharge) 8kV (Air Discharge) EN61000-4-3 (RFI): 10V/m (80MHz-1GHz), 3V/m (1.4GHz-2.0GHz 1V/m(2.0GHz-2.7GHz EN61000-4-4 (FTB) : 2kV, positive/negative, 5kHz (DC Power Port) 1kV, positive/negative, 5kHz (I/O and Communication Port) EN61000-4-5 (Surge): 0.5kV/1kV line to line 0.5kV/1kV line to earth EN61000-4-6 (Conducted): 10V, 0.15MHz – 80MHz EN61000-4-8 (Power frequency magnetic field immunity) : 30A/m <Local Test> Impulse Immunity: 1000V @ 1uS pulse
Emissions	EN55011 Class A (Radiated RF emission)
Agency Approvals	UL61010 (File No. E157382, E316037); CE (EN61131-2); CUL Canadian C22.2
Radio Standards	FCC part15C (US), RED Article3.2 (CE), IC RSS-247 (Canada), MIC Item 19 of Article 2-1 (Japan), AS/NZS 4268 (Australia/New Zealand)
Other	RoHS 2011/65/EU Amendment (EU)2015/863 Bluetooth SIG, SD associate

PLC Unit Specifications, continued

C2-01CPU



C2-01CPU-2



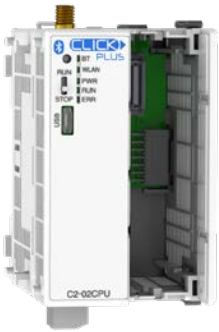
CLICK PLUS C2-01CPU and C2-01CPU-2 PLC Unit Specifications	
Control Method	Stored Program/Cyclic execution method
I/O Numbering System	Fixed in Decimal
Ladder Memory (steps)	8000
Total Data Memory (words)	8000
Contact Execution (boolean)	< 0.2 µs
Typical Scan (1k boolean)	< 1ms
RLL Ladder Style Programming	Yes
Run Time Edits	Yes
Scan	Variable / fixed
PLC Mode Switch	1 (RUN/STOP)
FLASH Memory	Standard on PLC
Protocol	Modbus RTU (master/slave) and ASCII (in/out), Modbus TCP (client server), EtherNet/IP Implicit and Explicit (adapter server)
MQTT	Publisher: 4 Publishers, 3 blocks each Subscriber: 10 blocks
Data Logging	N/A
CLICK Programming Software	Yes (Windows)
Number of Instructions Available	21
Control Relays	2000
System Control Relays	1000
Timers	500
Counters	250
Interrupt	Yes (external: 8 / timed: 4)
Subroutines	Yes
For/Next Loops	Yes
Math (Integer and Hex)	Yes
Drum Sequencer Instruction	Yes
Internal Diagnostics	Yes
Password Security	Yes
System Error Log	Yes
User Error Log	No
Memory Backup	Super Capacitor + Battery
Battery Backup	Yes (battery part # D0-MC-BAT)
Calendar/Clock	Yes

PLC Unit Specifications, continued

CLICK PLUS C2-01CPU and C2-01CPU-2 PLC Unit Specifications			
		C2-01CPU	C2-01CPU-2
I/O Slot	Internal I/O	N/A (Optional)	
	Option Slot Support	Yes	
	Stackable I/O	Yes (max. 8 modules)	
Com. Ports	USB Port (Programming)	Yes (Device) (For programming and providing 5VDC power, microB USB)	
	Ethernet (RJ45)	Yes (10/100)	
	Serial Port RS-232 (RJ12)	Yes	
	Serial Port RS-485 (Terminal Block)	None	
	WLAN	None	
	Bluetooth	None	
Status Indicators	WLAN Status LED	None	
	Bluetooth Status LED	None	
	CPU Status LED	3 (PWR/RUN/ERR)	
	Ethernet Status LED	2 (LINK/ACT 10/100)	
	Serial Status LED	2 (TX/RX)	
	SD Card Status LED	None	
Other	Micro SD Card Slot (SDHC Compatible)	None	
Power	Nominal Input Voltage	24VDC (4-pin terminal block)	
	Operating Voltage Range	24VDC, Class 2 or SELV (Safety Extra-Low Voltage) or Limited Energy Circuit power supply	
	Input Voltage Range	20.0 – 28.0 VDC	
	Maximum Inrush Current	30A @ 1ms	
	Power Consumption	20W	22W
	Acceptable External Power Drop	Max 10ms (AC Power Failure with C0-00AC or C0-01AC)	
	Current Required	110mA	120mA
	Fuse	No	
	External Fuse Recommended	No	
	Polarity Protection	Power input is reverse polarity protected	
	USB Supply	5VDC (via USB programming port)	
Communication Port & Terminal Block Replacement		N/A	
24VDC Power Terminal Block Replacement		AutomationDirect p/n C0-4TB	
Antenna Requirements		N/A	
Weight		3.5 oz [99g]	4.0 oz [114g]

PLC Unit Specifications, continued

C2-02CPU



C2-02CPU-2



CLICK PLUS C2-02CPU and C2-02CPU-2 PLC Unit Specifications	
Control Method	Stored Program/Cyclic execution method
I/O Numbering System	Fixed in Decimal
Ladder Memory (steps)	8000
Total Data Memory (words)	8000
Contact Execution (boolean)	< 0.2 µs
Typical Scan (1k boolean)	< 1ms
RLL Ladder Style Programming	Yes
Run Time Edits	Yes
Scan	Variable / fixed
PLC Mode Switch	1 (RUN/STOP)
FLASH Memory	Standard on PLC
Protocol	Modbus RTU (master/slave) and ASCII (in/out), Modbus TCP (client server)
MQTT	Publisher: 4 Publishers, 3 blocks each Subscriber: 10 blocks
Data Logging	N/A
CLICK Programming Software	Yes (Windows)
Number of Instructions Available	21
Control Relays	2000
System Control Relays	1000
Timers	500
Counters	250
Interrupt	Yes (external: 8 / timed: 4)
Subroutines	Yes
For/Next Loops	Yes
Math (Integer and Hex)	Yes
Drum Sequencer Instruction	Yes
Internal Diagnostics	Yes
Password Security	Yes
System Error Log	Yes
User Error Log	No
Memory Backup	Super Capacitor + Battery
Battery Backup	Yes (battery part # D0-MC-BAT)
Calendar/Clock	Yes

PLC Unit Specifications, continued

CLICK PLUS C2-02CPU and C2-02CPU-2 PLC Unit Specifications			
		C2-02CPU	C2-02CPU-2
I/O Slot	Internal I/O	N/A (Optional)	
	Option Slot Support	Yes	
	Stackable I/O	Yes (max. 8 modules)	
Com. Ports	USB Port (Programming)	Yes (Device) (For programming and providing 5VDC power, microB USB)	
	Ethernet (RJ45)	None	
	Serial Port RS-232 (RJ12)	None	
	Serial Port RS-485 (Terminal Block)	None	
	WLAN	Yes (RP-SMA connection for optional external antenna, shared)	
	Bluetooth		
Status Indicators	WLAN Status LED	1	
	Bluetooth Status LED	1	
	CPU Status LED	3 (PWR/RUN/ERR)	
	Ethernet Status LED	None	
	Serial Status LED	None	
	SD Card Status LED	None	
Other	Micro SD Card Slot (SDHC Compatible)	None	
Power	Nominal Input Voltage	24VDC (4-pin terminal block)	
	Operating Voltage Range	24VDC, Class 2 or SELV (Safety Extra-Low Voltage) or Limited Energy Circuit power supply	
	Input Voltage Range	20.0 – 28.0 VDC	
	Maximum Inrush Current	30A @ 1ms	
	Power Consumption	20W	22W
	Acceptable External Power Drop	Max 10ms (AC Power Failure with C0-00AC or C0-01AC)	
	Current Required	105mA	115mA
	Fuse	No	
	External Fuse Recommended	No	
	Polarity Protection	Power input is reverse polarity protected	
	USB Supply	5VDC (via USB programming port)	
Communication Port & Terminal Block Replacement		N/A	
24VDC Power Terminal Block Replacement		AutomationDirect p/n C0-4TB	
Antenna Requirements		2.4 GHz antenna, RP-SMA connector (AutomationDirect p/n SE-ANT250 or SE-ANT210)	
Weight		3.3 oz [94g]	3.8 oz [109g]

PLC Unit Specifications, continued

C2-03CPU



C2-03CPU-2



CLICK PLUS C2-03CPU and C2-03CPU-2 PLC Unit Specifications	
Control Method	Stored Program/Cyclic execution method
I/O Numbering System	Fixed in Decimal
Ladder Memory (steps)	8000
Total Data Memory (words)	8000
Contact Execution (boolean)	< 0.2 µs
Typical Scan (1k boolean)	< 1ms
RLL Ladder Style Programming	Yes
Run Time Edits	Yes
Scan	Variable / fixed
PLC Mode Switch	1 (RUN/STOP)
FLASH Memory	Standard on PLC
Protocol	Modbus RTU (master/slave) and ASCII (in/out), Modbus TCP (client server), EtherNet/IP Implicit and Explicit (adapter server)*
MQTT	Publisher: 4 Publishers, 3 blocks each Subscriber: 10 blocks
Data Logging	Time, Date, 16 Addresses
CLICK Programming Software	Yes (Windows)
Number of Instructions Available	21
Control Relays	2000
System Control Relays	1000
Timers	500
Counters	250
Interrupt	Yes (external: 8 / timed: 4)
Subroutines	Yes
For/Next Loops	Yes
Math (Integer and Hex)	Yes
Drum Sequencer Instruction	Yes
Internal Diagnostics	Yes
Password Security	Yes
System Error Log	Yes
User Error Log	No
Memory Backup	Super Capacitor + Battery
Battery Backup	Yes (battery part # D0-MC-BAT)
Calendar/Clock	Yes

* EtherNet/IP available on the Ethernet RJ45 port only. Not available over Wi-Fi.

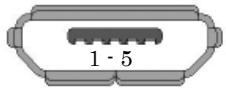
PLC Unit Specifications, continued

CLICK PLUS C2-03CPU and C2-03CPU-2 PLC Unit Specifications			
		C2-03CPU	C2-03CPU-2
I/O Slot	Internal I/O	N/A (Optional)	
	Option Slot Support	Yes	
	Stackable I/O	Yes (max. 8 modules)	
Com. Ports	USB Port (Programming)	Yes (Device) (For programming and providing 5VDC power, microB USB)	
	Ethernet (RJ45)	Yes (10/100)	
	Serial Port RS-232 (RJ12)	Yes	
	Serial Port RS-485 (Terminal Block)	Yes	
	WLAN	Yes (RP-SMA connection for optional external antenna, shared)	
	Bluetooth		
Status Indicators	WLAN Status LED	1	
	Bluetooth Status LED	1	
	CPU Status LED	3 (PWR/RUN/ERR)	
	Ethernet Status LED	2 (LINK/ACT 10/100)	
	Serial Status LED	2 (TX/RX)	
	SD Card Status LED	1	
Other	Micro SD Card Slot (SDHC Compatible)	YES	
Power	Nominal Input Voltage	24VDC (4-pin terminal block)	
	Operating Voltage Range	24VDC, Class 2 or SELV (Safety Extra-Low Voltage) or Limited Energy Circuit power supply	
	Input Voltage Range	20.0 – 28.0 VDC	
	Maximum Inrush Current	30A @ 1ms	
	Power Consumption	20W	22W
	Acceptable External Power Drop	Max 10ms (AC Power Failure with C0-00AC or C0-01AC)	
	Current Required	130mA	140mA
	Fuse	No	
	External Fuse Recommended	No	
	Polarity Protection	Power input is reverse polarity protected	
	USB Supply	5VDC (via USB programming port)	
Communication Port & Terminal Block Replacement		AutomationDirect p/n C0-3TB	
24VDC Power Terminal Block Replacement		AutomationDirect p/n C0-4TB	
Antenna Requirements		2.4 GHz antenna, RP-SMA connector (AutomationDirect p/n SE-ANT250 or SE-ANT210)	
Weight		4.0 oz [114g]	4.6 oz [129g]

PLC Unit Specifications, continued

USB Programming Port Specifications	
Communications Ratings	USB 2.0 Full Speed (12Mbps)
Connector	Micro USB Type B
Bus Power	Yes, Max 500mA 5VDC USB Bus power supplied under the following conditions: • Firmware update and Project update • Stop WLAN and Bluetooth function • Stop access the modules on Stackable I/O bus • PLC in Stop Mode
Recommended Cable	AutomationDirect p/n USB-CBL-AMICB6
USB Cable Length	Max 15ft.

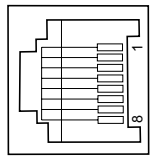
USB Port Pin Descriptions		
1	VBUS	5V Power supply in
2	D-	Differential signal -
3	D+	Differential signal +
4	NC	Not connected (ID not used)
5	GND	Ground



Ethernet Port Specifications	
Communications Ratings	10/100 Base-T
Cable Specifications	Category 5
Auto MDI/MDIX	Yes
Connector	RJ45
Default Settings	IP Address assigned by DHCP Fallback on DHCP Failure: • IP Address: 169.254.x.x (APIPA) • Subnet Mask: 255.255.0.0 • Default Gateway: 0.0.0.0

Ethernet Port Pin Descriptions		
1	TD+	Transmit Data (+)
2	TD-	Transmit Data (-)
3	RD+	Receive Data (+)
4	-	Not connected
5	-	Not connected
6	RD-	Receive Data (-)
7	-	Not connected
8	-	Not connected

8 pin RJ45 Phone Type Jack

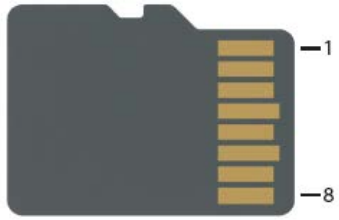


PLC Unit Specifications, continued

Micro SD Card Slot Specifications	
Card Type	microSDHC
Format	FAT32
Capacity	4GB to 32GB

NOTE: *An SD card with SLC mode, such as AutomationDirect #MSD-SLC16G, is strongly recommended for increased maximum lifetime write cycles.*

SD Card Pin Descriptions	
1	DAT2
2	CD/DAT3
3	CMD
4	VDD
5	CLK
6	VSS
7	DAT0
8	DAT1



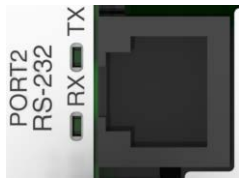
Wireless LAN (WLAN) Specifications	
Standard	IEEE 802.11/b/g/n
Frequency	2.4 GHz
Maximum Transmitting Power	20.5 dBm
Transmission Distance	Up to 30m
Line Speed	Up to 150 Mbps
WLAN Mode	Station
Security	WPA/WPA2
Encryption	AES/RSA/ECC/SHA
Antenna	External (50Ω RP-SMA Jack/Female Port)
RF Certification	FCC/CE(Red)/IC/MIC/RCM
Status Lamp	WLAN(Green)

Bluetooth Specifications	
Standard	IEEE 802.15.1 v4.2 Bluetooth Low Energy
Frequency	2.4 GHz
Maximum Transmitting Power	13.4 dBm (EIRP)
Transmission Distance	Up to 10m
Line Speed	Up to 260 kbps
Antenna	External (50Ω RP-SMA Jack/Female Port)
Association Certification	Bluetooth SIG
Pairing	Yes
RF Certification	FCC/CE(Red)/IC/MIC/RCM
Status Lamp	BT (Blue)

PLC Unit Specifications, continued

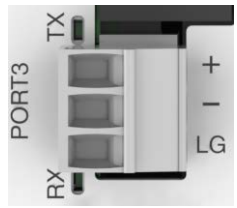
RS-232 Port Specifications	
Communications Ratings	Conforms to RS-232
Communications Parameters	• Baud rate: 2400, 4800, 9600, 19200, 38400, 57600, 115.2k bps • Data bit: 7 bits, 8 bits • Parity: None, Odd, Even • Stop bit: 1 bit, 2 bits
Connector	RJ12 Phone Jack
Recommended Cable	AutomationDirect p/n USB-CBL-AMICB6
Power Supply to HMI (Output) (EA1 or EA3 series)	Supply 5V, 200mA

RS-232 Port Pin Descriptions		
1	GND	Ground
2	5V out	5V output, 200mA
3	RXD	Receive Data (RS-232)
4	TXD	Transmit Data (RS-232)
5	RTS	Request to Send (RS-232)
6	GND	Ground



RS-485 Port Specifications	
Communications Ratings	Conforms to RS-485
Communications Parameters	• Baud rate: 2400, 4800, 9600, 19200, 38400, 57600, 115.2k bps • Data bit: 7 bits, 8 bits • Parity: None, Odd, Even • Stop bit: 1 bit, 2 bits
Connector	3-wire terminal block
Terminal Type	Removable connector (Phoenix Contact MC1.5 / 3-ST-3.5GY)
Wire Size Range	16–28 AWG
Wire Specification	Supported temperature: > 60°C Material: Copper
Screw Torque	Minimum 1.95 lb-inch [0.22 N·m]
Screwdriver Size	DN-SS1 or compatible (insulated slotted screwdriver 0.4 x 2.5 x 75 mm)
Recommended Cable	Shielded cable (example FUJI ELECTRIC WIRE FKEV-SB-0.3-2P-**)
Recommended Ferrite Core	E04SR401938 (SEIWA)

RS-485 Port Pin Descriptions		
1	+	Differential Signal (+)
2	-	Differential Signal (-)
3	LG	Logic Ground

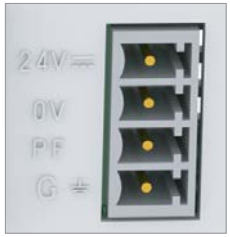


PLC Unit Specifications, continued

Power Terminal Wiring Specifications	
Terminal Type	3.5 mm pitch pluggable terminal block
Wire Range	16–28 AWG
Wire Strip Length	7.0 mm
Wire Specification	Supported temperature: > 60°C Material: Copper
Screw Torque	2.0–2.2 lb-inch [0.22–0.25 N·m]
Screw Size	M2
Number of Pins	4-pin terminal block
Screwdriver Size	DN-SS1 or compatible (insulated slotted screwdriver 0.4 x 2.5 x 75 mm)

Note: C0-00AC or C0-01AC Power Supply recommended.

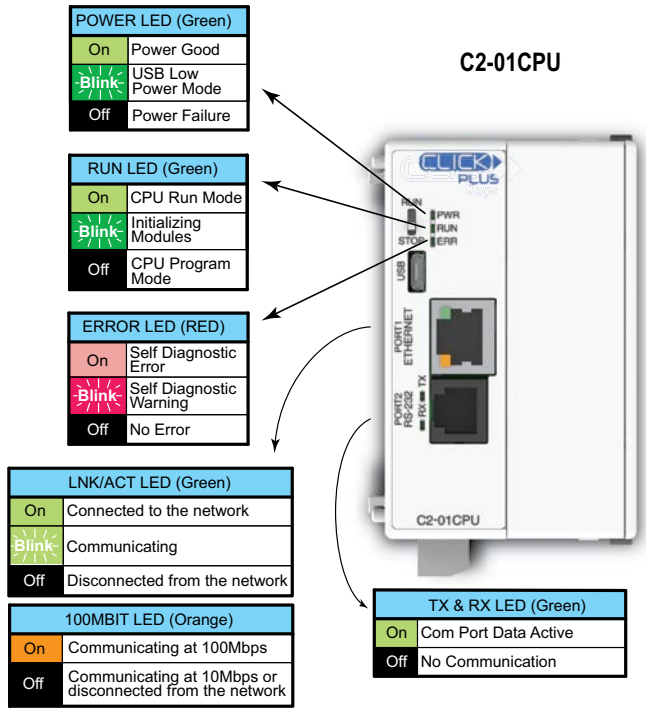
Power Terminal Pinout	
24V	24V Power supply in
0V	0V Power supply reference
PF	unused
G	Ground



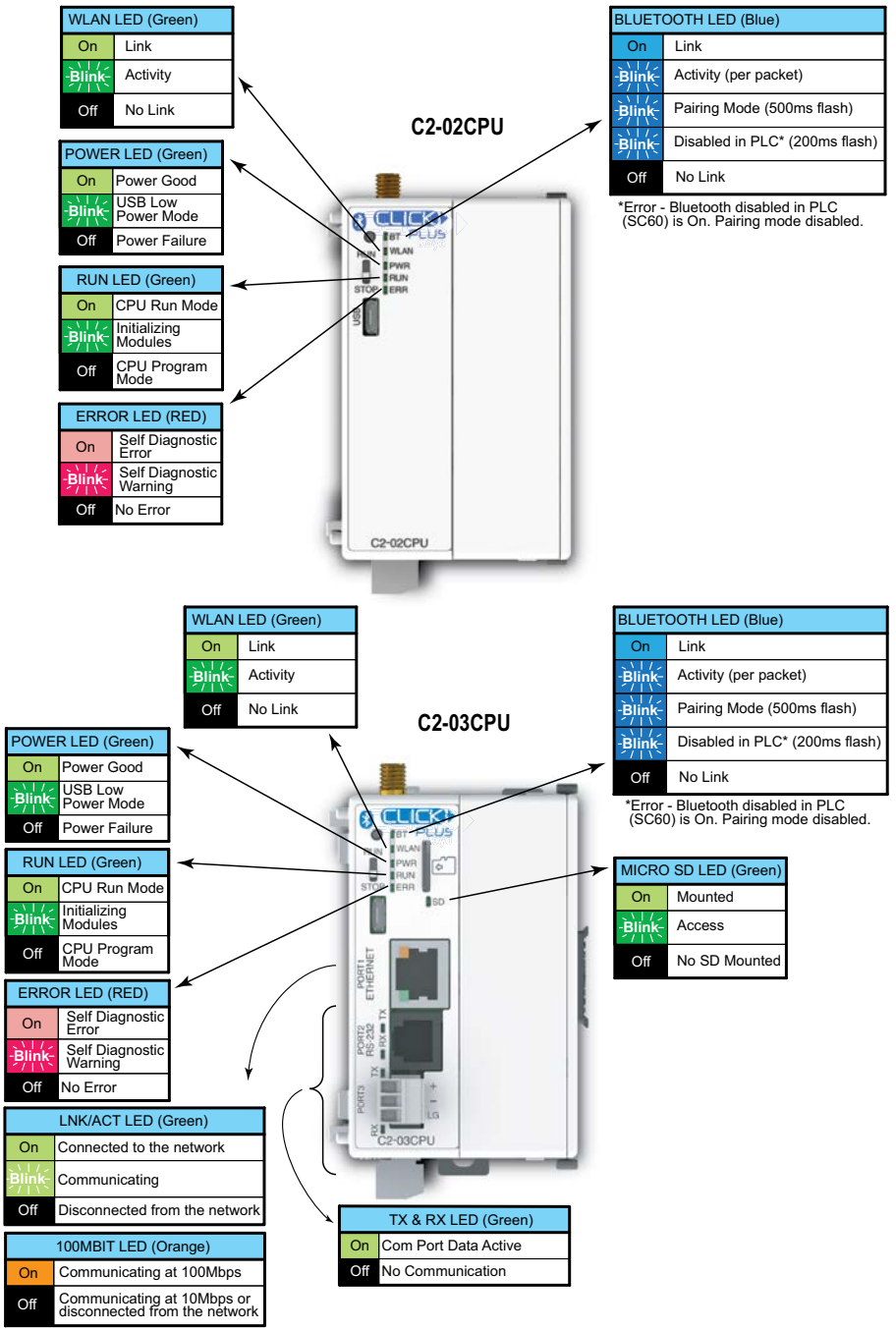
NOTE: *DO NOT USE the PF connector. Leave this terminal unconnected. Connecting the PF terminal to another device may cause damage to the CLICK PLUS CPU.*

PLC LED Status Indicators

Each CPU includes several LED Status Indicators on the front panel as described in the following illustrations.



PLC LED Status Indicators, (cont'd)



Memory Map

All of the CLICK PLC units support the same memory map. The CLICK PLC uses decimal numbers for the memory addressing. See page 2-127 for the definitions of each data type and memory type.

Memory Type	Symbol	Data Type	S/W Icon	Range
Input Point	X	Bit		X001 – X816
Output Point	Y			Y001 – Y816
Control Relay	C			C1 – C2000
Timer	T			T1 – T500
Counter	CT			CT1 – CT250
System Control Bit	SC			SC1 – SC1000
Data Register	DS	Integer		DS1 – DS4500
	DD	Integer2		DD1 – DD1000
	DH	HEX		DH1 – DH500
	DF	Floating Point		DF1 – DF500
Input Register	XD	HEX		XD0 – XD8
Output Register	YD			YD0 – YD8
Timer Register	TD	Integer		TD1 – TD500
Counter Register	CTD	Integer2		CTD1 – CTD250
System Data Register	SD	Integer		SD1 – SD1000
Text	TXT	Text		TXT1 – TXT1000

CLICK Programming Software PID Specifications

PID Specifications	
PID maximum number of loops	8
Required Memory	40 C bits, 15 DS registers, 25 DF registers
Control Algorithm	Position
Control Loop Action	Direct-acting or Reverse-acting
Error Term	Linear or Squared
Error Dead band	Configurable
Proportional Gain	0.01–10000
Reset Time (Integral)	0.01–6000
Derivative Gain	0.0–6000
Sampling rate	100ms to 30000ms
Loop Calculation	PID or PI
PV Filter	Configurable
Set Point	Maximum and minimum values can be set
Control Output	Maximum and minimum values can be set
Derivative Gain Limit	Configurable
Bias Freeze (Anti-Windup)	Yes
Bumpless Transfer	2 Modes
Pulse Width Modulation (PWM) Output	Yes, up to 600 second period
Auto Tuning	Ziegler-Nichols Limit Cycle
Alarms	
PV Alarm	PV alarm value can be set at Low-low, Low, High, High-high condition
Deviation Alarm	Specify alarms for two ranges of PV deviation from the setpoint value
PV Rate of Change	Detect when PV exceeds a rate of change limit you specify

CLICK PLUS PLC Hardware/Software Compatibility

CLICK programming software version 3.00 or higher is required to utilize the CLICK PLUS CPUs and Option Slot I/O modules.

CLICK programming software version 3.20 or higher is required to utilize the CLICK PLUS 2-slot CPUs and Option Slot Intelligent module C2-DCM.

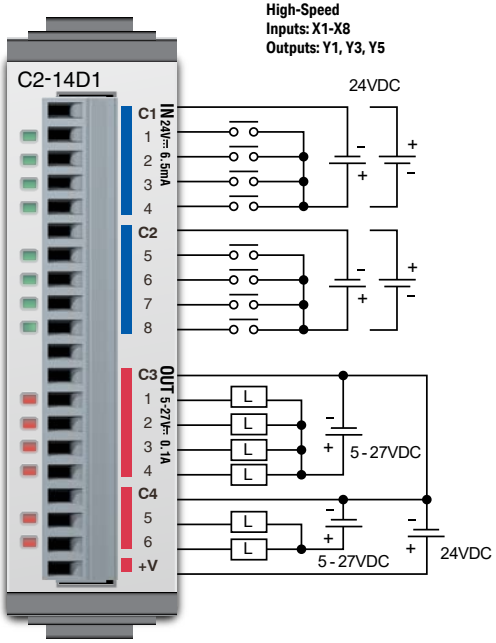
Option Slot I/O Module Specifications

General Specifications for all CLICK PLUS Option Slot I/O Modules

CLICK PLUS Option Slot Module General Specifications	
Operating Temperature	32°F to 131°F [0°C to 55°C]
Storage Temperature	−4°F to 158°F [−20°C to 70°C] IEC 60068-2-1 (Test Ab, Cold) IEC 60068-2-2 (Test Bb, Dry Heat) IEC 60068-2-14 (Test Na, Thermal Shock)
Ambient Humidity	30% to 95% relative humidity (non–condensing)
Environmental Air	No corrosive gases The level for the environmental pollution is 2 (UL840)
Environment	For Indoor Use Only
Vibration	IEC60068-2-6 (Test Fc) 5–9Hz:3.5mm amplitude, 9–150Hz 1.0G 10 sweep cycles per axis on each of 3 mutually perpendicular axes.
Shock	IEC60068-2-27 (Test Ea) 15G peak, 11ms duration, 3 shocks in each direction per axis, on 3 mutually perpendicular axes.
Noise Immunity	<EN61131-2> EN61000-4-2 (ESD) EN61000-4-3 (RFI) EN61000-4-4 (FTB) EN61000-4-6 (Conducted) EN61000-4-8 (Power frequency magnetic field immunity) <Local Test> Impulse Immunity : 1000V @ 1uS pulse
Emissions	EN55011 Class A (Radiated RF emission)
Agency Approvals	UL61010 (File No. E157382, E316037); CE (EN61131-2); CUL Canadian C22.2
Other	RoHS 2011/65/EU Amendment (EU)2015/863 Bluetooth SIG, SD associate

C2-14D1 – 8 DC Input/6 Sinking DC Output Option Slot I/O Module

Wiring Diagram

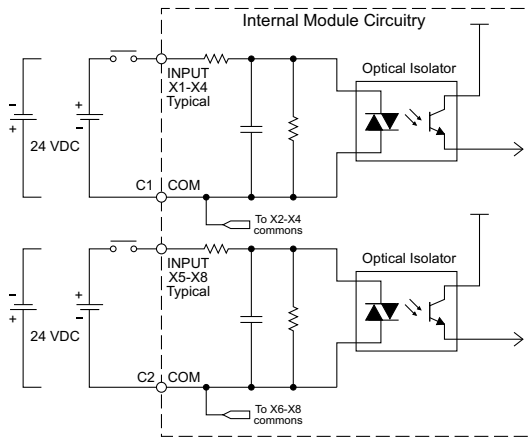


I/O Specifications - Inputs	
Inputs per Module	8 (Sink/Source)
Operating Voltage Range	24VDC
Input Voltage Range	21.6 – 26.4 VDC
Input Current	Typ 6.5 mA @ 24VDC
Maximum Input Current	7.0 mA @ 26.4 VDC
Input Impedance	3.9 kΩ @ 24VDC
Input Frequency (Max)	X1-X8: 100kHz (3m cable)
ON Voltage Level	> 19VDC
OFF Voltage Level	< 2VDC
Minimum ON Current	4.5 mA
Maximum OFF Current	0.5 mA
OFF to ON Response	Typ 3µs Max 5µs
ON to OFF Response	Typ 1µs Max 3µs
Status Indicators	Logic Side (8 points, green LED)
Commons	2 (4 points/common) Isolated

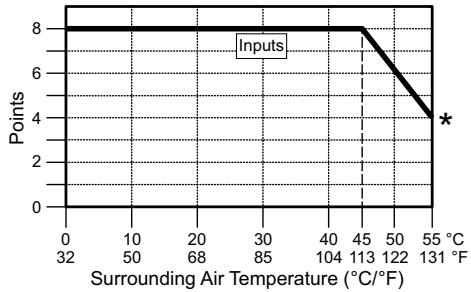
General Specifications	
Current Consumption at 24VDC	50mA max (All Points On)
Terminal Block Replacement Part No.	C0-16TB
Weight	48g

Maximum Number of High Speed Counters	
Up	6
Down	6
Up/Down	3
Pulse/Direction	4
Quadrature A-B	4
Quadrature A-B+Z	2

Equivalent Input Circuit



C2-14D1 Temperature Derating Chart



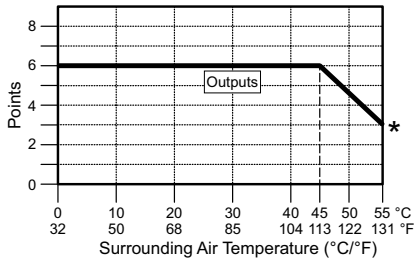
* Use every other input.

C2-14D1 – 8 DC Input/6 Sinking DC Output Option Slot I/O Module (continued)

I/O Specifications - Outputs	
Outputs per Module	6 (Sink)
Operating Voltage Range	5–27 VDC
Output Voltage Range	4–30 VDC
Maximum Output Current	0.1 A/point; C3: 0.4 A/common, C4: 0.2 A/common
Minimum Output Current	0.2 mA
Maximum Leakage Current	0.1 mA @ 30.0 VDC
On Voltage Drop	0.5 VDC @ 0.1 A
Maximum Inrush Current	150mA for 10ms
Output Frequency (Max)	Y1, Y3, Y5: 100kHz (3m cable)
OFF to ON Response	< 5µs (Duty 40–60%, Load current 20mA)
ON to OFF Response	< 5µs (Duty 40–60%, Load current 20mA)
Status Indicators	Logic Side (6 points, red LED)
Commons	2 (4 points/com & 2 points/com)
External DC Power Required	20–28 VDC Maximum @ 60mA (All Points On)

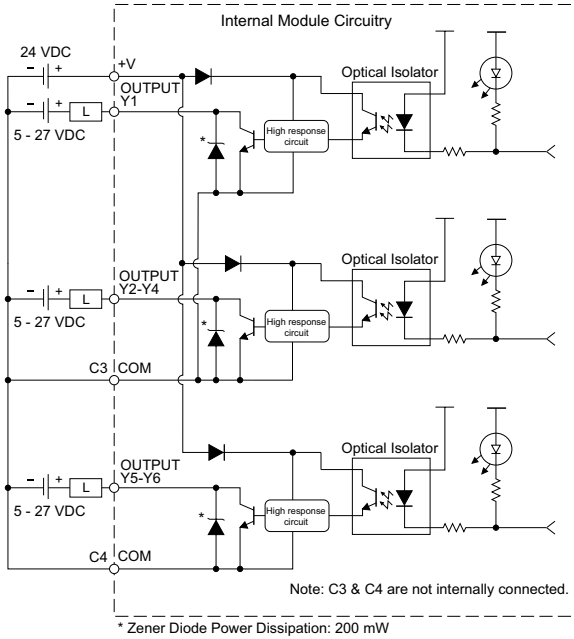
Maximum Number of High Speed Outputs	
Pulse Train	3
Pulse Width Modulation	3

C2-14D1 Temperature Derating Chart



* Use every other output.

Equivalent Output Circuit



Note: C3 & C4 are not internally connected.

* Zener Diode Power Dissipation: 200 mW

***ZIP*Link Pre-Wired PLC Connection Cables and Modules for CLICK PLC**



20-pin connector cable
ZL-C0-CBL20 (0.5 m length)
ZL-C0-CBL20-1 (1.0 m length)
ZL-C0-CBL20-2 (2.0 m length)

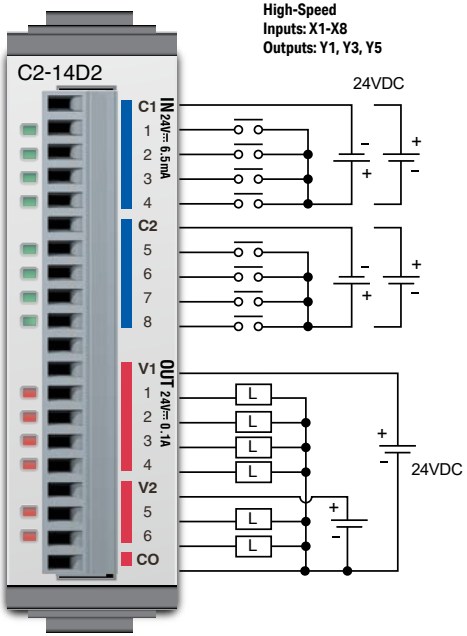


ZL-RTB20
20-pin feed-through connector module

C2-14D2 – 8 DC Input/6 Sourcing DC Output Option Slot I/O Module

Wiring Diagram

High-Speed
Inputs: X1-X8
Outputs: Y1, Y3, Y5

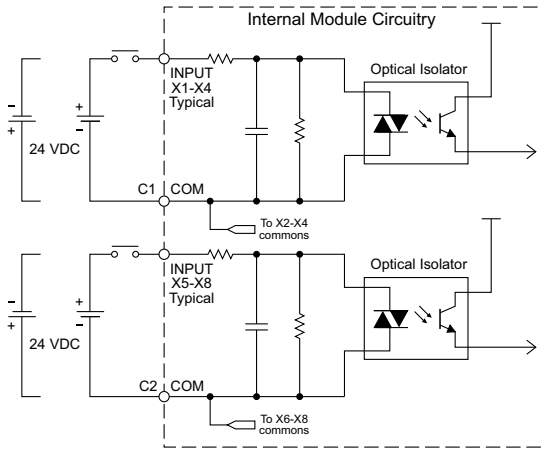


I/O Specifications - Inputs	
Inputs per Module	8 (Sink/Source)
Operating Voltage Range	24VDC
Input Voltage Range	21.6 – 26.4 VDC
Input Current	Typ 6.5 mA @ 24VDC
Maximum Input Current	7.0 mA @ 26.4 VDC
Input Impedance	3.9 kΩ @ 24VDC
Input Frequency (Max)	X1-X8: 100kHz (3m cable)
ON Voltage Level	> 19VDC
OFF Voltage Level	< 2VDC
Minimum ON Current	4.5 mA
Maximum OFF Current	0.5 mA
OFF to ON Response	Typ 3µs Max 5µs
ON to OFF Response	Typ 1µs Max 3µs
Status Indicators	Logic Side (8 points, green LED)
Commons	2 (4 points/common) Isolated

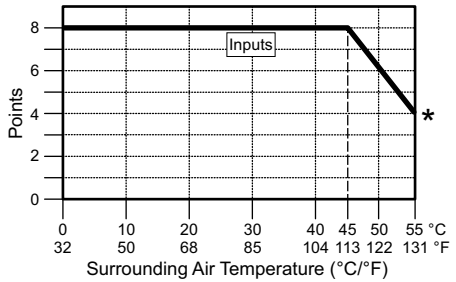
General Specifications	
Current Consumption at 24VDC	50mA max (All Points On)
Terminal Block Replacement Part No.	C0-16TB
Weight	47g

Maximum Number of High Speed Counters	
Up	6
Down	6
Up/Down	3
Pulse/Direction	4
Quadrature A-B	4
Quadrature A-B+Z	2

Equivalent Input Circuit



C2-14D2 Temperature Derating Chart

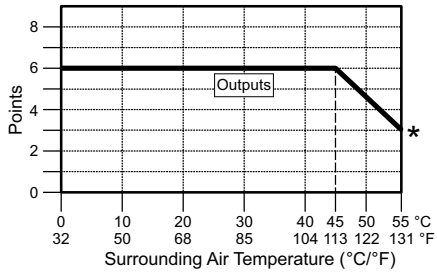


C2-14D2 – 8 DC Input/6 Sourcing DC Output Option Slot I/O Module (continued)

I/O Specifications - Outputs	
Outputs per Module	6 (Source)
Operating Voltage Range	24VDC
Output Voltage Range	19.2–30 VDC
Maximum Output Current	0.1 A/point, 0.6 A/common
Minimum Output Current	0.2 mA
Maximum Leakage Current	0.1 mA @ 30VDC
On Voltage Drop	0.5 VDC @ 0.1 A
Maximum Inrush Current	150mA for 10ms
Output Frequency (Max)	Y1, Y3, Y5: 100kHz (3m cable)
OFF to ON Response	< 5µs (Duty 40–60%, Load current 20mA)
ON to OFF Response	< 5µs (Duty 40–60%, Load current 20mA)
Status Indicators	Logic Side (6 points, red LED)
Commons	1 (6 points/common)

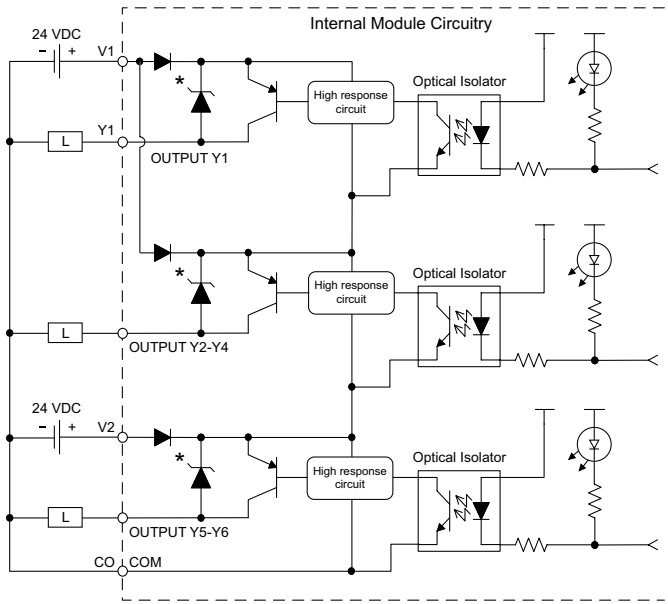
Maximum Number of High Speed Outputs	
Pulse Train	3
Pulse Width Modulation	3

C2-14D2 Temperature Derating Chart



* Use every other output.

Equivalent Output Circuit



*Zener Diode Power Dissipation: 200 mW

***ZIP*Link Pre-Wired PLC Connection Cables and Modules for CLICK PLC**



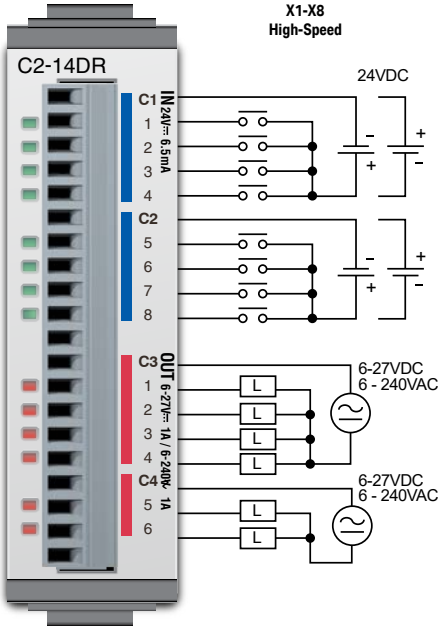
20-pin connector cable
ZL-C0-CBL20 (0.5 m length)
ZL-C0-CBL20-1 (1.0 m length)
ZL-C0-CBL20-2 (2.0 m length)



ZL-RTB20
20-pin feed-through connector module

C2-14DR – 8 DC Input/6 Relay Output Option Slot I/O Module

Wiring Diagram

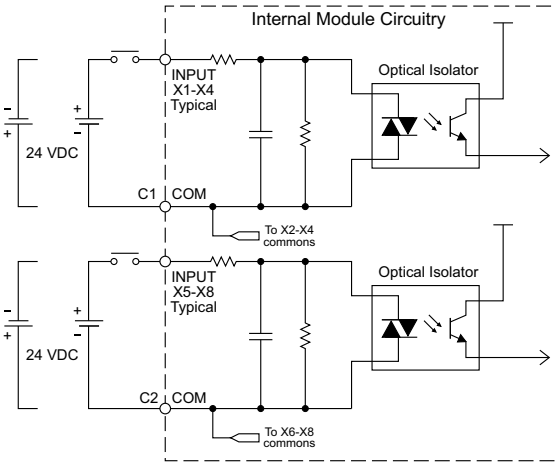


I/O Specifications - Inputs	
Inputs per Module	8 (Sink/Source)
Operating Voltage Range	24VDC
Input Voltage Range	21.6 – 26.4 VDC
Input Current	Typ 6.5 mA @ 24VDC
Maximum Input Current	7.0 mA @ 26.4 VDC
Input Impedance	3.9 kΩ @ 24VDC
Input Frequency (Max)	X1-X8: 100kHz (3m cable)
ON Voltage Level	> 19VDC
OFF Voltage Level	< 2VDC
Minimum ON Current	4.5 mA
Maximum OFF Current	0.5 mA
OFF to ON Response	Typ 3µs Max 5µs
ON to OFF Response	Typ 1µs Max 3µs
Status Indicators	Logic Side (8 points, green LED)
Commons	2 (4 points/common) Isolated

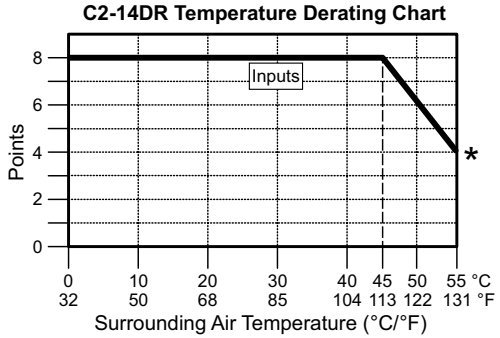
General Specifications	
Current Consumption at 24VDC	75mA max (All Points On)
Terminal Block Replacement Part No.	C0-16TB
Weight	62g

Maximum Number of High Speed Counters	
Up	6
Down	6
Up/Down	3
Pulse/Direction	4
Quadrature A-B	4
Quadrature A-B+Z	2

Equivalent Input Circuit



C2-14DR Temperature Derating Chart

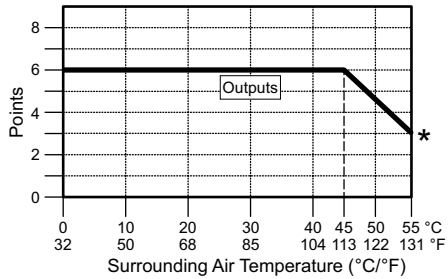


* Use every other input.

C2-14DR – 8 DC Input/6 Relay Output Option Slot I/O Module (continued)

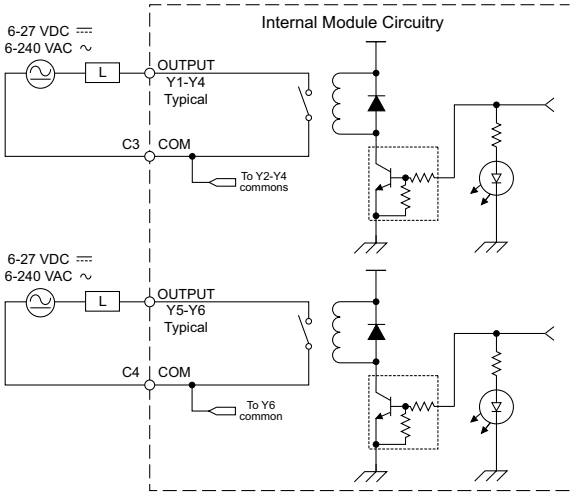
I/O Specifications - Outputs	
Outputs per Module	6
Operating Voltage Range	6–240 VAC (47–63 Hz), 6–27 VDC
Output Voltage Range	5–264 VAC (47–63 Hz), 5–30 VDC
Output Type	Relay, form A (SPST)
Maximum Current	1A/point; C3: 4A/common, C4: 2A/common
Minimum Load Current	5mA @ 5VDC
Maximum Inrush Current	3A for 10ms
OFF to ON Response	< 15ms
ON to OFF Response	< 15ms
Status Indicators	Logic Side (6 points, red LED)
Commons	2 (4 points/com & 2 points/com) Isolated

C2-14DR Temperature Derating Chart



* Use every other output.

Equivalent Output Circuit



Typical Relay Life (Operations) at Room Temperature	
Voltage & Load Type	Relay Life
30VDC, 1A Resistive	200,000 cycles
30VDC, 1A Inductive	100,000 cycles
250VAC, 1A Resistive	200,000 cycles
250VAC, 1A Inductive	50,000 cycles
ON to OFF = 1 cycle	

***ZIP*Link Pre-Wired PLC Connection Cables and Modules for CLICK PLC**



20-pin connector cable
ZL-C0-CBL20 (0.5 m length)
ZL-C0-CBL20-1 (1.0 m length)
ZL-C0-CBL20-2 (2.0 m length)



ZL-RTB20
20-pin feed-through connector module

C2-14DR – 8 DC Input/6 Relay Output Option Slot I/O Module (continued)

Insulation Requirements for IEC/UL 61010-1 and 61010-2-201 (sections 6.5 and 6.7)

Input to Output Insulation

Basic insulation is provided between Relay Output 1 and the closest Input terminal. When connecting the Relay Output to a circuit that exceeds 100VAC (141VDC) more than the closest input circuit an additional basic insulation layer must be added to the input circuit.

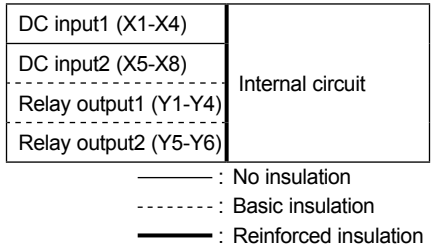
Output to Output Insulation

Basic insulation is provided between Relay Outputs. When connecting a Relay Output to a circuit that exceeds 100VAC (141VDC) more than the adjacent Relay Outputs, an additional basic insulation layer must be added to the adjacent Relay Output circuits.

Additional Basic Insulation Examples

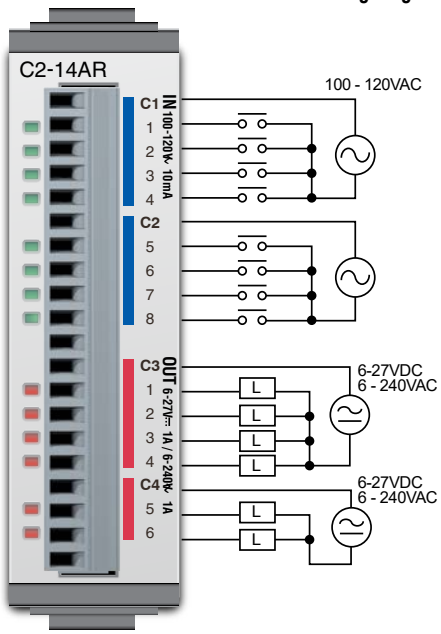
- Supplementary Insulation: Interposing relay, additional insulating material,… (sec. 6.5.3)
- Automatic Disconnection of the Supply: Properly sized breaker (sec. 6.5.5)
- Current or Voltage Limiting device: Properly sized fuse (sec. 6.5.6)

Basic insulation requires a clearance distance of 1.5 mm or more, a creepage distance of 2.5 mm or more, and dielectric voltage withstand of 1500Vrms.



C2-14AR – 8 AC Input/6 Relay Output Option Slot I/O Module

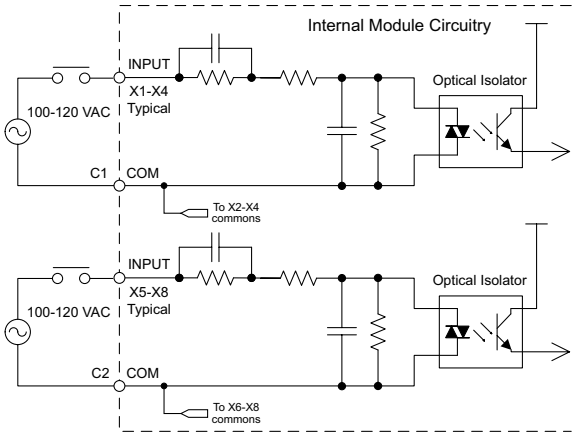
Wiring Diagram



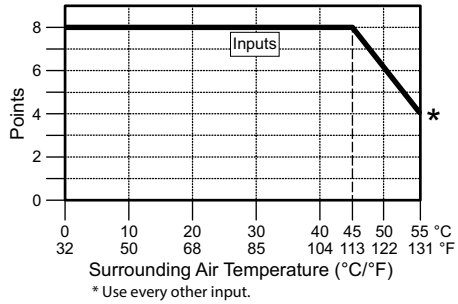
I/O Specifications - Inputs	
Inputs per Module	8
Operating Voltage Range	100–120 VAC
Input Voltage Range	80–144 VAC
AC Frequency	47–63 Hz
Input Current	8.5 mA @ 100VAC at 50Hz 10mA @ 100VAC at 60Hz
Maximum Input Current	16mA @ 144VAC
Input Impedance	15kΩ @ 50Hz 12kΩ @ 60Hz
ON Voltage Level	> 60VAC
OFF Voltage Level	< 20VAC
Minimum ON Current	5mA
Maximum OFF Current	2mA
OFF to ON Response	< 40ms
ON to OFF Response	< 40ms
Status Indicators	Logic Side (8 points, green LED)
Commons	2 (4 points/common) Isolated

General Specifications	
Current Consumption at 24VDC	75mA max (All Points On)
Terminal Block Replacement Part No.	C0-16TB
Weight	63g

Equivalent Input Circuit



C2-14AR Temperature Derating Chart

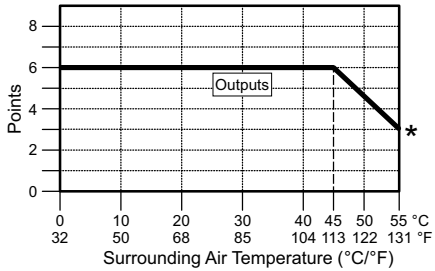


* Use every other input.

C2-14AR – 8 AC Input/6 Relay Output Option Slot I/O Module (continued)

I/O Specifications - Outputs	
Outputs per Module	6
Operating Voltage Range	6–240 VAC (47–63 Hz), 6–27 VDC
Output Voltage Range	5–264 VAC (47–63 Hz), 5–30 VDC
Output Type	Relay, form A (SPST)
Maximum Current	1A/point; C3: 4A/common, C4: 2A/common
Minimum Load Current	5mA @ 5VDC
Maximum Inrush Current	3A for 10ms
OFF to ON Response	< 15ms
ON to OFF Response	< 15ms
Status Indicators	Logic Side (6 points, red LED)
Commons	2 (4 points/com & 2 points/com) Isolated

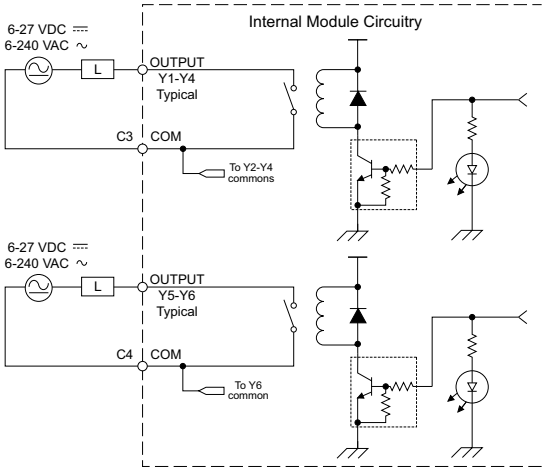
C2-14AR Temperature Derating Chart



* Use every other output.

Typical Relay Life (Operations) at Room Temperature	
Voltage & Load Type	Relay Life
30VDC, 1A Resistive	200,000 cycles
30VDC, 1A Inductive	100,000 cycles
250VAC, 1A Resistive	200,000 cycles
250VAC, 1A Inductive	50,000 cycles
ON to OFF = 1 cycle	

Equivalent Output Circuit



***ZIP*Link Pre-Wired PLC Connection Cables and Modules for CLICK PLC**



20-pin connector cable
ZL-C0-CBL20 (0.5 m length)
ZL-C0-CBL20-1 (1.0 m length)
ZL-C0-CBL20-2 (2.0 m length)



ZL-RTB20
20-pin feed-through connector module

C2-14AR – 8 AC Input/6 Relay Output Option Slot I/O Module (continued)

Insulation Requirements for IEC/UL 61010-1 and 61010-2-201 (sections 6.5 and 6.7)

Input to Output Insulation

Basic insulation is provided between Relay Output 1 and the closest Input terminal. When connecting the Relay Output to a circuit that exceeds 100VAC (141VDC) more than the closest input circuit an additional basic insulation layer must be added to the input circuit.

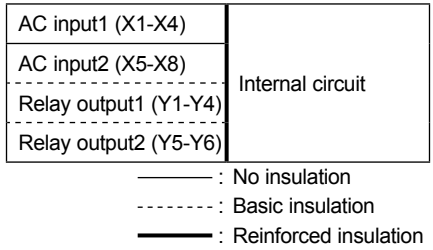
Output to Output Insulation

Basic insulation is provided between Relay Outputs. When connecting a Relay Output to a circuit that exceeds 100VAC (141VDC) more than the adjacent Relay Outputs, an additional basic insulation layer must be added to the adjacent Relay Output circuits.

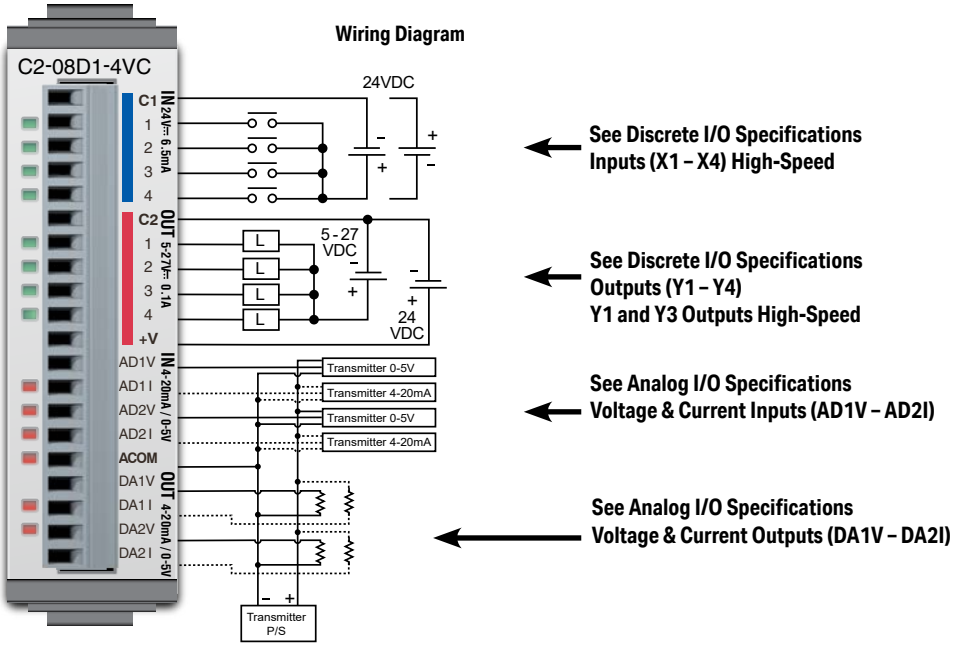
Additional Basic Insulation Examples

- Supplementary Insulation: Interposing relay, additional insulating material,… (sec. 6.5.3)
- Automatic Disconnection of the Supply: Properly sized breaker (sec. 6.5.5)
- Current or Voltage Limiting device: Properly sized fuse (sec. 6.5.6)

Basic insulation requires a clearance distance of 1.5 mm or more, a creepage distance of 2.5 mm or more, and dielectric voltage withstand of 1500Vrms.



C2-08D1-4VC – 4 DC Input (Sink/Source)/4 Sinking DC Output
2 Analog Voltage/Current Input
2 Analog Voltage/Current Output Option Slot I/O Module



General Specifications	
Current Consumption at 24VDC	80mA max (All Points On)
Terminal Block Replacement Part No.	C0-16TB
Weight	48g

NOTE: *Please refer to the Analog I/O Configuration section in Chapter 3 for information on using the analog I/O.*

NOTE: *There are no ZIPLink pre-wired PLC connection cables and modules for the Analog Option Slot Modules (cannot mix discrete I/O and analog I/O signals in a ZIPLink cable).*

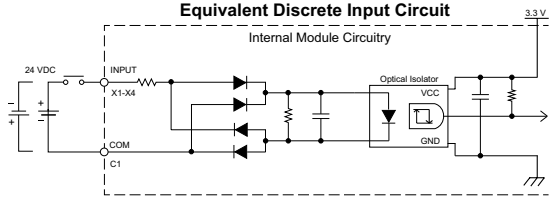
C2-08D1-4VC (continued)

X1 - X4

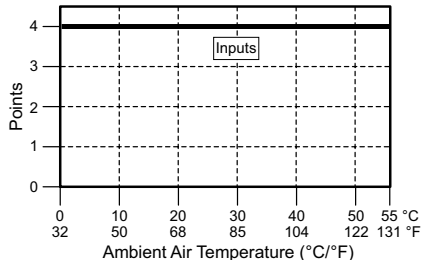
Discrete I/O Specifications - Inputs	
Inputs per Module	4 (Sink/Source)
Operating Voltage Range	24VDC
Input Voltage Range	21.6 – 26.4 VDC
Input Current	Typ 6.5 mA @ 24VDC
Maximum Input Current	7.0 mA @ 26.4 VDC
Input Impedance	3.9 kΩ @ 24VDC
Input Frequency (Max)	X1-X4: 100kHz (3m cable)
ON Voltage Level	> 19VDC
OFF Voltage Level	< 2VDC
Minimum ON Current	4.5 mA
Maximum OFF Current	0.5 mA
OFF to ON Response	Typ 3µs Max 5µs
ON to OFF Response	Typ 1µs Max 3µs
Status Indicators	Logic Side (4 points, green LED)
Commons	1 (4 points/common)

Maximum Number of High Speed Counters	
Up	4
Down	4
Up/Down	2
Pulse/Direction	2
Quadrature A-B	2
Quadrature A-B+Z	1

Equivalent Discrete Input Circuit



C2-08D1-4VC Temperature Derating Chart

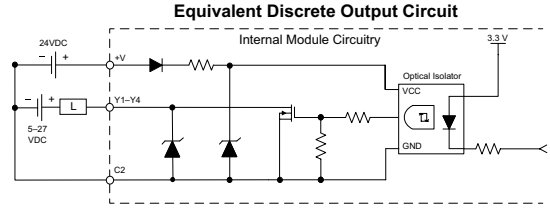


Y1 - Y4

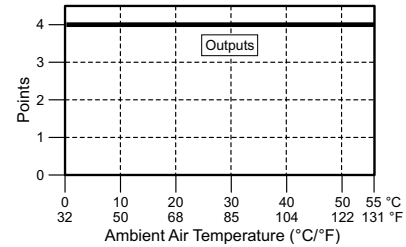
Discrete I/O Specifications - Outputs	
Outputs per Module	4 (Sink)
Operating Voltage Range	5–27 VDC
Maximum Output Current	0.1 A/point; 0.4 A/common
Minimum Output Current	0.2 mA
Maximum Leakage Current	0.1 mA @ 30.0 VDC
On Voltage Drop	0.5 VDC @ 0.1 A
Maximum Inrush Current	150mA for 10ms
Output Frequency (Max)	Y1, Y3: 100kHz (3m cable)
OFF to ON Response	< 5µs (Duty 40–60%, Load current 20mA)
ON to OFF Response	< 5µs (Duty 40–60%, Load current 20mA)
Status Indicators	Logic Side (4 points, red LED)
Commons	1 (4 points/common)
External DC Power Required	20–28 VDC Maximum @ 60mA (All points ON)

Maximum Number of High Speed Outputs	
Pulse Train	2
Pulse Width Modulation	2

Equivalent Discrete Output Circuit



C2-08D1-4VC Temperature Derating Chart



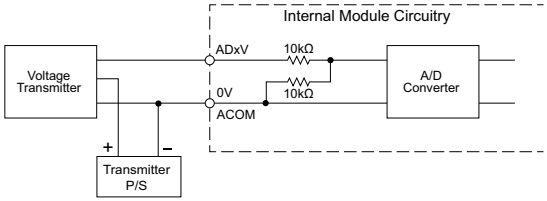
C2-08D1-4VC (continued)

AD1V - AD2I

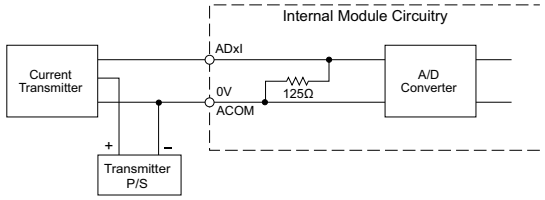
Analog Specifications - Voltage Input	
Inputs per Module	2 (voltage/current selectable)
Input Range	0–5 VDC (6VDC Max.)
Resolution	12-bit
Conversion Time	50ms
Input Impedance	20kΩ
Input Stability	±2 LSB maximum
Full-Scale Calibration Error	±2% maximum
Offset Calibration Error	±25mV maximum
Accuracy vs. Temperature Error	±100ppm/°C maximum

Analog Specifications - Current Input	
Inputs per Module	2 (voltage/current selectable)
Input Range	4–20 mA (sink)
Resolution	12-bit
Conversion Time	50ms
Input Impedance	125Ω
Input Stability	±2 LSB maximum
Full-Scale Calibration Error	±2% maximum
Offset Calibration Error	±0.1 mA maximum
Accuracy vs. Temperature Error	±100ppm/°C maximum

Analog Voltage Input Circuit



Analog Current Input Circuit

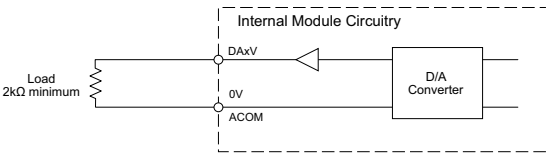


DA1V - DA2I

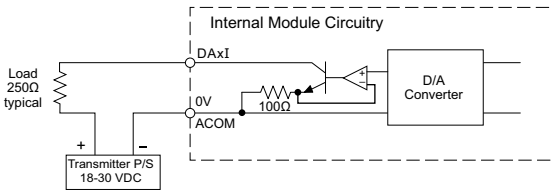
Analog Specifications - Voltage Output	
Outputs per Module	2 (voltage/current selectable)
Output Range	0–5 VDC
Resolution	12-bit
Conversion Time	1ms
Load Impedance	2kΩ minimum (output current 2.5 mA maximum)
Full-Scale Calibration Error	±2% maximum
Offset Calibration Error	±25mV maximum
Accuracy vs. Temperature Error	±100ppm/°C maximum

Analog Specifications - Current Output	
Outputs per Module	2 (voltage/current selectable)
Output Range	4–20 mA (sink)
Resolution	12-bit
Conversion Time	1ms
Loop Supply Voltage	DC 18–30 V
Load Impedance	250Ω Load Power Supply: DC 18V: 600Ω maximum DC 24V: 900Ω maximum DC 30V: 1200Ω maximum
Full-Scale Calibration Error	±2% maximum
Offset Calibration Error	±25mA maximum
Accuracy vs. Temperature Error	±100ppm/°C maximum

Analog Voltage Output Circuit

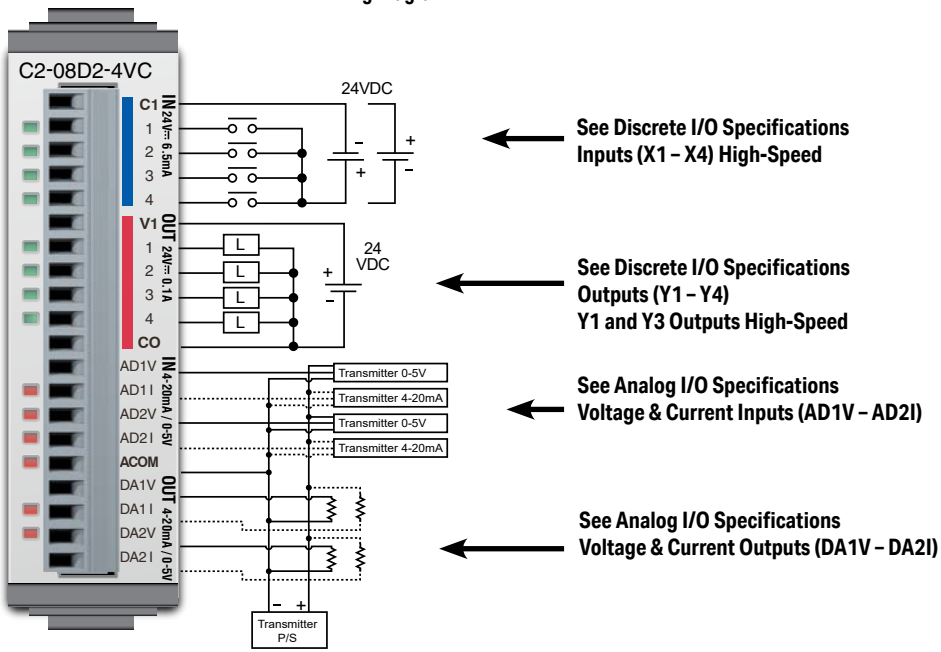


Analog Current Output Circuit



C2-08D2-4VC – 4 DC Input (Sink/Source)/4 Sourcing DC Output
2 Analog Voltage/Current Input
2 Analog Voltage/Current Output Option Slot I/O Module

Wiring Diagram



General Specifications	
Current Consumption at 24VDC	80mA max (All Points On)
Terminal Block Replacement Part No.	C0-16TB
Weight	48g

NOTE: *Please refer to the Analog I/O Configuration section in Chapter 3 for information on using the analog I/O.*

NOTE: *There are no ZIPLink pre-wired PLC connection cables and modules for the Analog Option Slot Modules (cannot mix discrete I/O and analog I/O signals in a ZIPLink cable).*

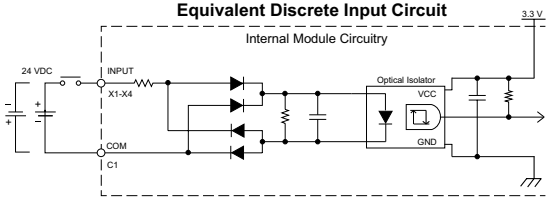
C2-08D2-4VC (continued)

X1 - X4

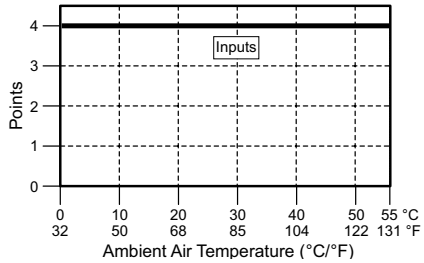
Discrete I/O Specifications - Inputs	
Inputs per Module	4 (Sink/Source)
Operating Voltage Range	24VDC
Input Voltage Range	21.6 – 26.4 VDC
Input Current	Typ 6.5 mA @ 24VDC
Maximum Input Current	7mA @ 26.4 VDC
Input Impedance	3.9 kΩ @ 24VDC
Input Frequency (Max)	X1-X4: 100kHz (3m cable)
ON Voltage Level	> 19VDC
OFF Voltage Level	< 2VDC
Minimum ON Current	4.5 mA
Maximum OFF Current	0.5 mA
OFF to ON Response	Typ 3µs, Max 5µs
ON to OFF Response	Typ 1µs, Max 3µs
Status Indicators	Logic Side (4 points, green LED)
Commons	1 (4 points/common)

Maximum Number of High Speed Counters	
Up	4
Down	4
Up/Down	2
Pulse/Direction	2
Quadrature A-B	2
Quadrature A-B+Z	1

Equivalent Discrete Input Circuit



C2-08D2-4VC Temperature Derating Chart

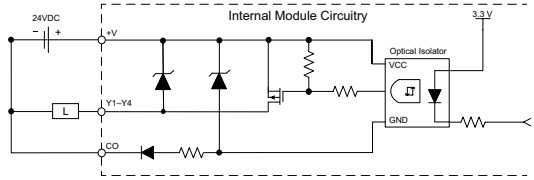


Y1 - Y4

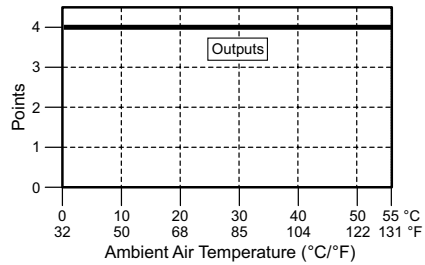
Discrete I/O Specifications - Outputs	
Outputs per Module	4 (Source)
Operating Voltage Range	24VDC
Output Voltage Range	19.2–30 VDC
Maximum Output Current	0.1 A/point , 0.4 A/common
Minimum Output Current	0.2 mA
Maximum Leakage Current	0.1mA @ 30VDC
On Voltage Drop	0.5 VDC@ 0.1 A
Maximum Inrush Current	150mA for 10ms
Output Frequency (Max)	Y1, Y3: 100kHz (3m cable)
OFF to ON Response	< 5µs (Duty 40–60%, Load current 20mA)
ON to OFF Response	< 5µs (Duty 40–60%, Load current 20mA)
Status Indicators	Logic Side (4 points, red LED)
Commons	1 (4 points/common)

Maximum Number of High Speed Outputs	
Pulse Train	2
Pulse Width Modulation	2

Equivalent Discrete Output Circuit



C2-08D2-4VC Temperature Derating Chart



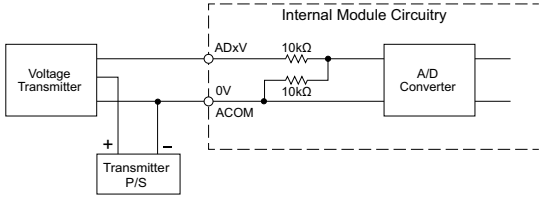
C2-08D2-4VC (continued)

AD1V - AD2I

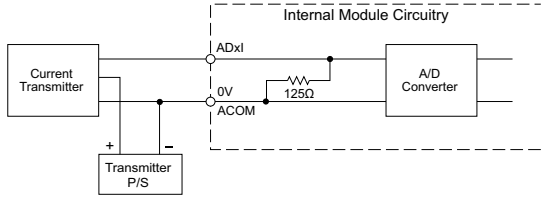
Analog Specifications - Voltage Input	
Inputs per Module	2 (voltage/current selectable)
Input Range	0–5 VDC
Resolution	12-bit
Conversion Time	50ms
Input Impedance	20kΩ
Input Stability	±2 LSB maximum
Full-Scale Calibration Error	±2% maximum
Offset Calibration Error	±25mV maximum
Accuracy vs. Temperature Error	±100ppm/°C maximum

Analog Specifications - Current Input	
Inputs per Module	2 (voltage/current selectable)
Input Range	4–20 mA (sink)
Resolution	12-bit
Conversion Time	50ms
Input Impedance	125Ω
Input Stability	±2 LSB maximum
Full-Scale Calibration Error	±2% maximum
Offset Calibration Error	±0.1 mA maximum
Accuracy vs. Temperature Error	Less than ±100ppm/°C

Analog Voltage Input Circuit



Analog Current Input Circuit

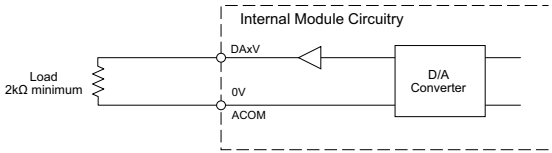


DA1V - DA2I

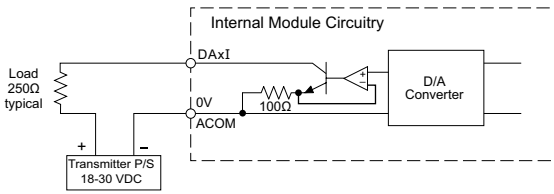
Analog Specifications - Voltage Output	
Outputs per Module	2 (voltage/current selectable)
Output Range	0–5 VDC
Resolution	12-bit
Conversion Time	1ms
Load Impedance	2kΩ minimum (output current 2.5 mA maximum)
Full-Scale Calibration Error	±2% maximum
Offset Calibration Error	±25mV maximum
Accuracy vs. Temperature Error	±100ppm/°C maximum

Analog Specifications - Current Output	
Outputs per Module	2 (voltage/current selectable)
Output Range	4–20 mA (sink)
Resolution	12-bit
Conversion Time	1ms
Loop Supply Voltage	DC 18–30 V
Load Impedance	250Ω Load Power Supply: DC 18V: 600Ω maximum DC 24V: 900Ω maximum DC 30V: 1200Ω maximum
Full-Scale Calibration Error	±2% maximum
Offset Calibration Error	±25mA maximum
Accuracy vs. Temperature Error	±100ppm/°C maximum

Analog Voltage Output Circuit

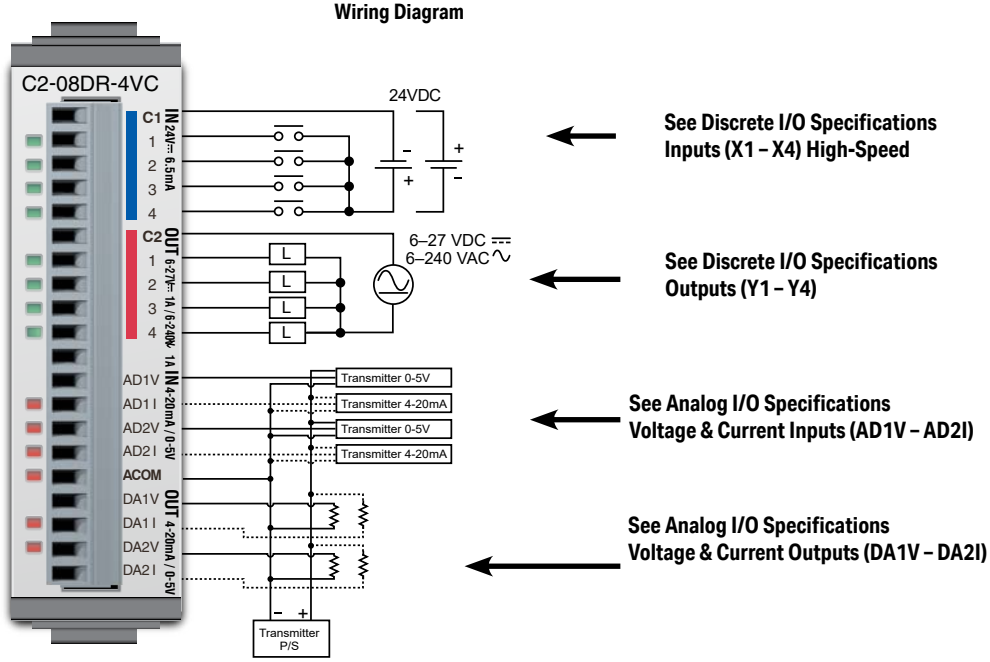


Analog Current Output Circuit



C2-08DR-4VC – 4 DC Input (Sink/Source)/4 Relay Output
2 Analog Voltage/Current Input
2 Analog Voltage/Current Output Option Slot I/O Module

Wiring Diagram



General Specifications	
Current Consumption at 24VDC	100mA max (All Points On)
Terminal Block Replacement Part No.	C0-16TB
Weight	58g

NOTE: *Please refer to the Analog I/O Configuration section in Chapter 3 for information on using the analog I/O.*

NOTE: *There are no ZIPLink pre-wired PLC connection cables and modules for the Analog Option Slot Modules (cannot mix discrete I/O and analog I/O signals in a ZIPLink cable).*

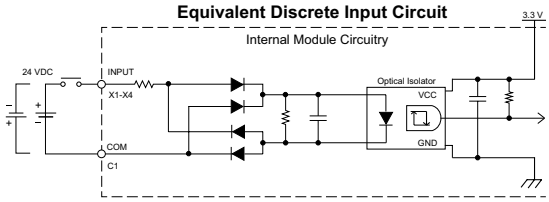
C2-08DR-4VC (continued)

X1 - X4

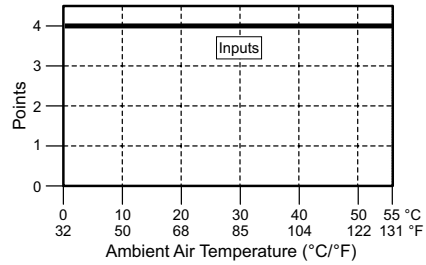
Discrete I/O Specifications - Inputs	
Inputs per Module	4 (Source/Sink)
Operating Voltage Range	24VDC
Input Voltage Range	21.6 – 26.4 VDC
Input Current	Typ 6.5 mA @ 24VDC
Input Impedance	3.9 kΩ @ 24 VDC
Input Frequency (Max)	X1-X4: 100kHz (3m cable)
ON Voltage Level	> 19VDC
OFF Voltage Level	< 2VDC
Minimum ON Current	4.5 mA
Maximum OFF Current	0.5 mA
OFF to ON Response	Typ 3µs, Max 5µs
ON to OFF Response	Typ 1µs, Max 3µs
Status Indicators	Logic Side (4 points, green LED)
Commons	1 (4 points/common)

Maximum Number of High Speed Counters	
Up	4
Down	4
Up/Down	2
Pulse/Direction	2
Quadrature A-B	2
Quadrature A-B+Z	1

Equivalent Discrete Input Circuit



C2-08DR-4VC Temperature Derating Chart

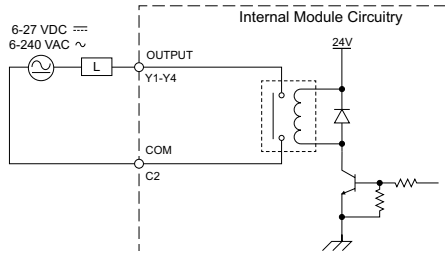


Y1 - Y4

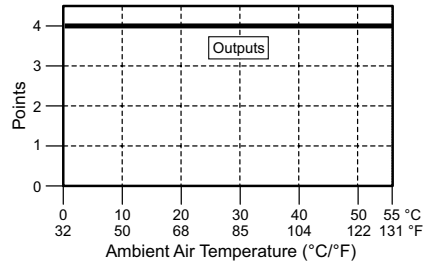
Discrete I/O Specifications - Outputs	
Outputs per Module	4
Operating Voltage Range	6–27 VDC / 6–240 VAC
Output Type	Relay, form A (SPST)
AC Frequency	47–63 Hz
Maximum Current	1A/point (resistive)
Minimum Load Current	5mA @ 5VDC
Maximum Inrush Current	3A for 10ms
OFF to ON Response	< 15ms
ON to OFF Response	< 15ms
Status Indicators	Logic Side (4 points, red LED)
Commons per Module	1 (4 points/common)

Typical Relay Life (Operations) at Room Temperature	
Voltage & Load Type	Relay Life
30VDC, 1A Resistive	200,000 cycles
30VDC, 1A Inductive	100,000 cycles
250VAC, 1A Resistive	200,000 cycles
250VAC, 1A Inductive	50,000 cycles
ON to OFF = 1 cycle	

Equivalent Discrete Output Circuit



C2-08DR-4VC Temperature Derating Chart



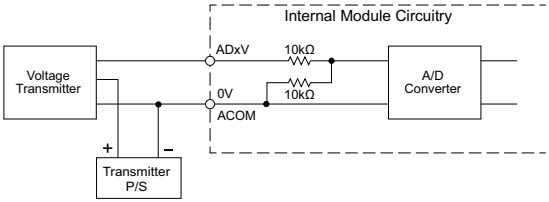
C2-08DR-4VC (continued)

AD1V - AD2I

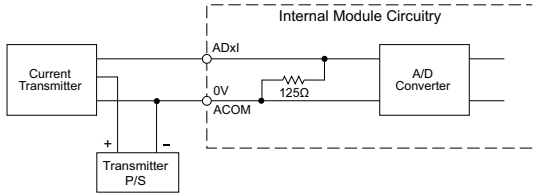
Analog Specifications - Voltage Input	
Inputs per Module	2 (voltage/current selectable)
Input Range	0–5 VDC (6VDC Max.)
Resolution	12-bit
Conversion Time	50ms
Input Impedance	20kΩ
Input Stability	±2 LSB maximum
Full-Scale Calibration Error	±2% maximum
Offset Calibration Error	±25mV maximum
Accuracy vs. Temperature Error	±100ppm/°C maximum

Analog Specifications - Current Input	
Inputs per Module	2 (voltage/current selectable)
Input Range	4–20 mA (sink)
Resolution	12-bit
Conversion Time	50ms
Input Impedance	125Ω
Input Stability	±2 LSB maximum
Full-Scale Calibration Error	±2% maximum
Offset Calibration Error	±0.1 mA maximum
Accuracy vs. Temperature Error	±100ppm/°C maximum

Analog Voltage Input Circuit



Analog Current Input Circuit

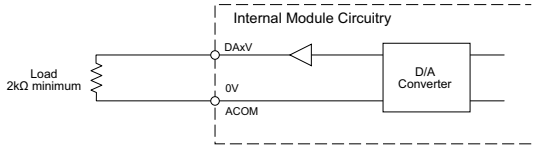


DA1V - DA2I

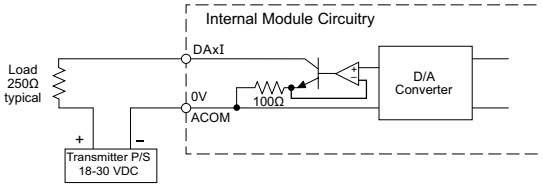
Analog Specifications - Voltage Output	
Outputs per Module	2 (voltage/current selectable)
Output Range	0–5 VDC
Resolution	12-bit
Conversion Time	1ms
Load Impedance	2kΩ minimum (output current 2.5 mA maximum)
Full-Scale Calibration Error	±2% maximum
Offset Calibration Error	±25mV maximum
Accuracy vs. Temperature Error	±100ppm/°C maximum

Analog Specifications - Current Output	
Outputs per Module	2 (voltage/current selectable)
Output Range	4–20 mA (sink)
Resolution	12-bit
Conversion Time	1ms
Loop Supply Voltage	DC 18–30 V
Load Impedance	250Ω Load Power Supply: DC 18V: 600Ω maximum DC 24V: 900Ω maximum DC 30V: 1200Ω maximum
Full-Scale Calibration Error	±2% maximum
Offset Calibration Error	±25mA maximum
Accuracy vs. Temperature Error	±100ppm/°C maximum

Analog Voltage Output Circuit



Analog Current Output Circuit



C2-08DR-4VC (continued)

Insulation Requirements for IEC/UL 61010-1 and 61010-2-201 (sections 6.5 and 6.7)

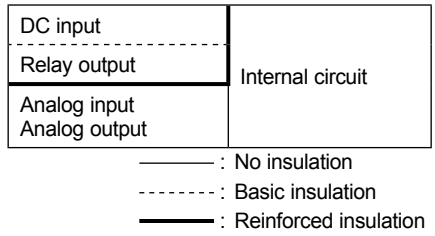
Input to Output Insulation

Basic insulation is provided between the Relay Output and the closest Input terminal. When connecting the Relay Output to a circuit that exceeds 100VAC (141VDC) more than the closest input circuit an additional basic insulation layer must be added to the input circuit.

Additional Basic Insulation Examples

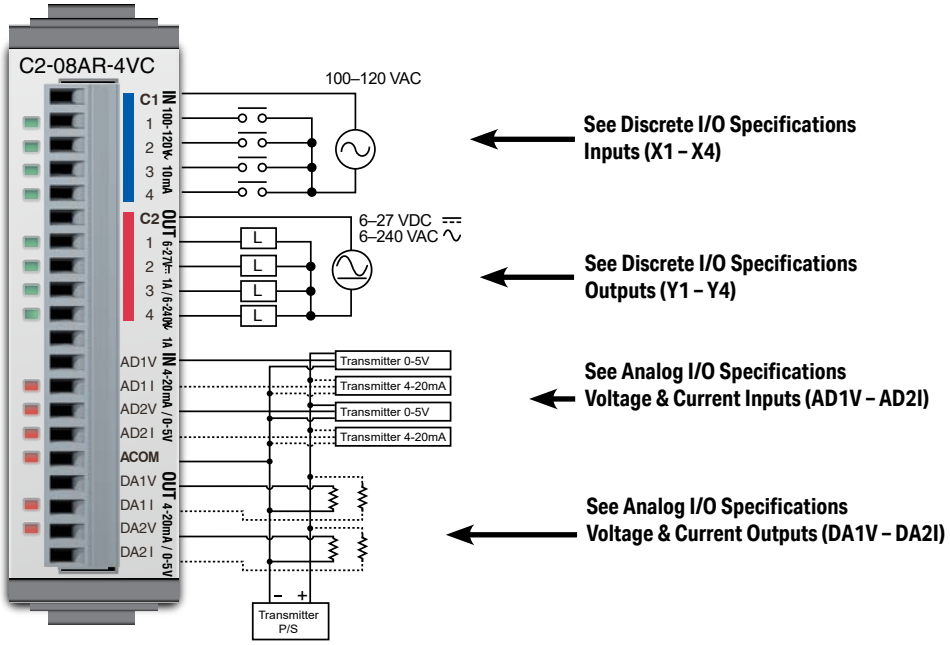
- Supplementary Insulation: Interposing relay, additional insulating material,… (sec. 6.5.3)
- Automatic Disconnection of the Supply: Properly sized breaker (sec. 6.5.5)
- Current or Voltage Limiting device: Properly sized fuse (sec. 6.5.6)

Basic insulation requires a clearance distance of 1.5 mm or more, a creepage distance of 2.5 mm or more, and dielectric voltage withstand of 1500Vrms.



C2-08AR-4VC – 4 AC Input/4 Relay Output
2 Analog Voltage/Current Input
2 Analog Voltage/Current Output Option Slot I/O Module

Wiring Diagram



General Specifications	
Current Consumption at 24VDC	100mA max (All Points On)
Terminal Block Replacement Part No.	C0-16TB
Weight	58g

NOTE: *Please refer to the Analog I/O Configuration section in Chapter 3 for information on using the analog I/O.*

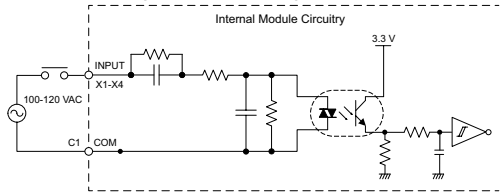
NOTE: *There are no ZIPLink pre-wired PLC connection cables and modules for the Analog Option Slot Modules (cannot mix discrete I/O and analog I/O signals in a ZIPLink cable).*

C2-08AR-4VC (continued)

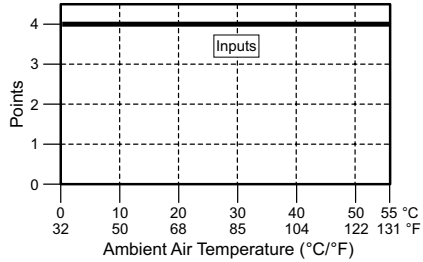
X1 - X4

Discrete I/O Specifications - Inputs	
Inputs per Module	4
Operating Voltage Range	100–120 VAC
AC Frequency	47–63 Hz
Input Current	Typ 8.5 mA @ 100VAC (50Hz) Typ 10mA @100VAC (60Hz)
Max. Input Current	16mA @ 144VAC
Input Impedance	15kΩ @ 50Hz 12kΩ @ 60Hz
ON Voltage Level	> 60VAC
OFF Voltage Level	< 20VAC
Minimum ON Current	5mA
Maximum OFF Current	2mA
OFF to ON Response	< 40ms
ON to OFF Response	< 40ms
Status Indicators	Logic Side (4 points, green LED)
Commons	1 (4 points/common)

Equivalent Discrete Input Circuit



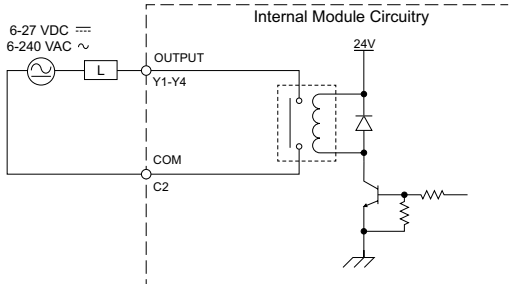
C2-08AR-4VC Temperature Derating Chart



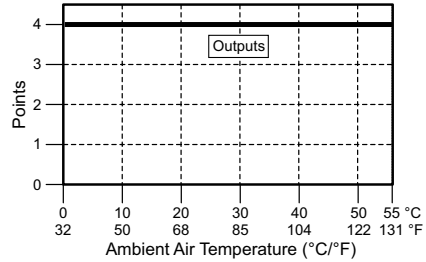
Y1 - Y4

Discrete I/O Specifications - Outputs	
Outputs per Module	4
Operating Voltage Range	6–27 VDC, 6–240 VAC
Output Type	Relay, form A (SPST)
AC Frequency	47–63 Hz
Maximum Current	1A/point (resistive)
Minimum Load Current	5mA @ 5VDC
Maximum Inrush Current	3A for 10ms
OFF to ON Response	< 15ms
ON to OFF Response	< 15ms
Status Indicators	Logic Side (4 points, red LED)
Commons per Module	1 (4 points/common)

Equivalent Discrete Output Circuit



C2-08AR-4VC Temperature Derating Chart



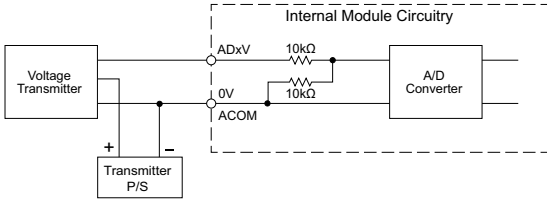
Typical Relay Life (Operations) at Room Temperature	
Voltage & Load Type	Relay Life
30VDC, 1A Resistive	200,000 cycles
30VDC, 1A Inductive	100,000 cycles
250VAC, 1A Resistive	200,000 cycles
250VAC, 1A Inductive	50,000 cycles
ON to OFF = 1 cycle	

C2-08AR-4VC (continued)

AD1V - AD2V

Analog Specifications - Voltage Input	
Inputs per Module	2 (voltage/current selectable)
Input Range	0–5 VDC (6VDC Max.)
Resolution	12-bit
Conversion Time	50ms
Input Impedance	20kΩ
Input Stability	±2 LSB maximum
Full-Scale Calibration Error	±2% maximum
Offset Calibration Error	±25mV maximum
Accuracy vs. Temperature Error	±100ppm/°C maximum

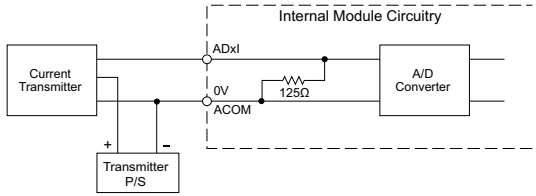
Analog Voltage Input Circuit



AD1I - AD2I

Analog Specifications - Current Input	
Inputs per Module	2 (voltage/current selectable)
Input Range	4–20 mA (sink)
Resolution	12-bit
Conversion Time	50ms
Input Impedance	125Ω
Input Stability	±2 LSB maximum
Full-Scale Calibration Error	±2% maximum
Offset Calibration Error	±0.1 mA maximum
Accuracy vs. Temperature Error	±100ppm/°C maximum

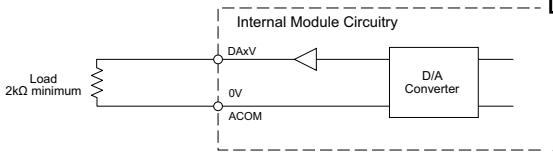
Analog Current Input Circuit



DA1V - DA2V

Analog Specifications - Voltage Output	
Outputs per Module	2 (voltage/current selectable)
Output Range	0–5 VDC
Resolution	12-bit
Conversion Time	1ms
Load Impedance	2kΩ minimum (output current 2.5 mA maximum)
Full-Scale Calibration Error	±2% maximum
Offset Calibration Error	±25mV maximum
Accuracy vs. Temperature Error	±100ppm/°C maximum

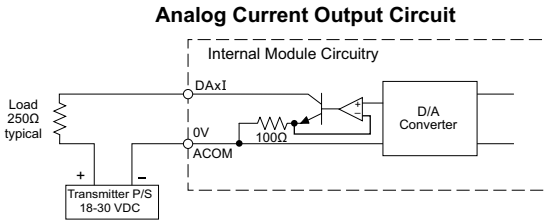
Analog Voltage Output Circuit



DA1I - DA2I

Analog Specifications - Current Output	
Outputs per Module	2 (voltage/current selectable)
Output Range	4–20 mA (sink)
Resolution	12-bit
Conversion Time	1ms
Loop Supply Voltage	DC 18–30 V
Load Impedance	250Ω Load Power Supply: DC 18V: 600Ω maximum DC 24V: 900Ω maximum DC 30V: 1200Ω maximum
Full-Scale Calibration Error	±2% maximum
Offset Calibration Error	±25mA maximum
Accuracy vs. Temperature Error	±100ppm/°C maximum

Analog Current Output Circuit



C2-08AR-4VC (continued)

Insulation Requirements for IEC/UL 61010-1 and 61010-2-201 (sections 6.5 and 6.7)

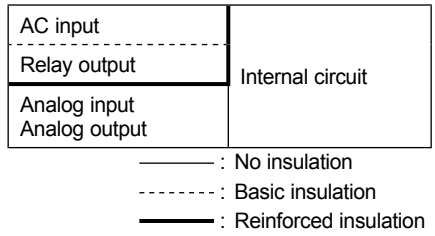
Input to Output Insulation

Basic insulation is provided between the Relay Output and the closest Input terminal. When connecting the Relay Output to a circuit that exceeds 100VAC (141VDC) more than the closest input circuit an additional basic insulation layer must be added to the input circuit.

Additional Basic Insulation Examples

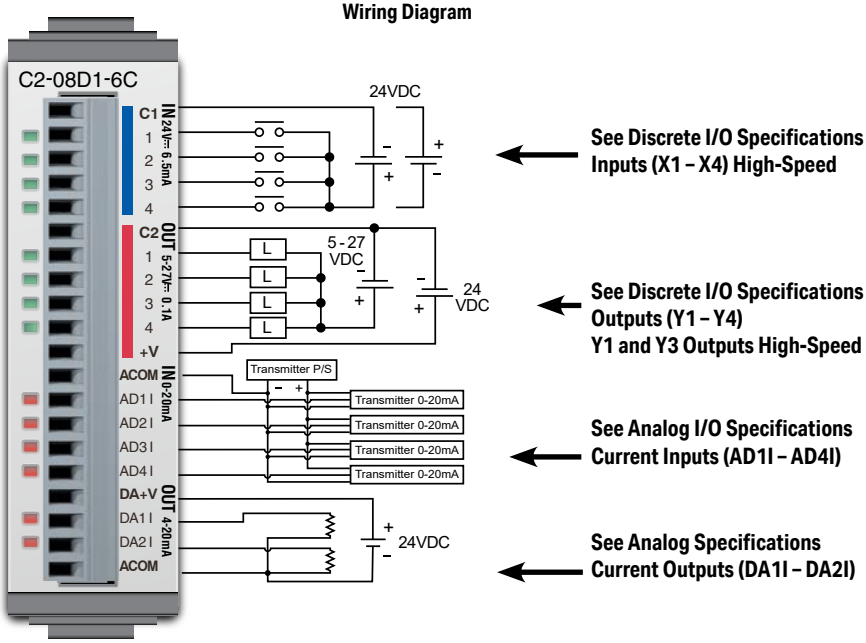
- Supplementary Insulation: Interposing relay, additional insulating material,… (sec. 6.5.3)
- Automatic Disconnection of the Supply: Properly sized breaker (sec. 6.5.5)
- Current or Voltage Limiting device: Properly sized fuse (sec. 6.5.6)

Basic insulation requires a clearance distance of 1.5 mm or more, a creepage distance of 2.5 mm or more, and dielectric voltage withstand of 1500Vrms.



C2-08D1-6C – 4 DC Input (Sink/Source)/4 Sinking DC Output
4 Analog Current Input
2 Analog Current Output Option Slot I/O Module

Wiring Diagram



General Specifications	
Current Consumption at 24VDC	80mA max (All Points On)
Terminal Block Replacement Part No.	C0-16TB
Weight	48g

NOTE: *Please refer to the Analog I/O Configuration section in Chapter 3 for information on using the analog I/O.*

NOTE: *There are no ZIPLink pre-wired PLC connection cables and modules for the Analog Option Slot Modules (cannot mix discrete I/O and analog I/O signals in a ZIPLink cable).*

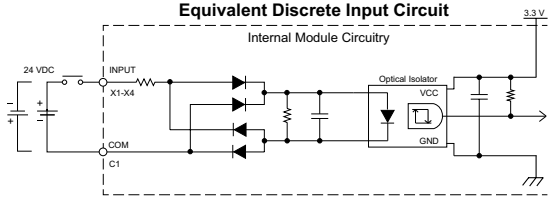
C2-08D1-6C (continued)

X1 - X4

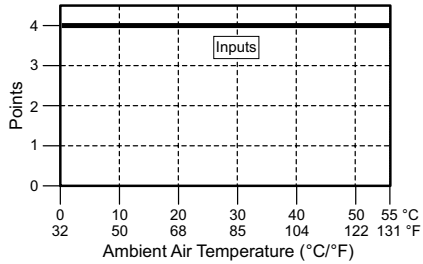
Discrete I/O Specifications - Inputs	
Inputs per Module	4 (Sink/Source)
Operating Voltage Range	24VDC
Input Voltage Range	21.6 – 26.4 VDC
Input Current	Typ 6.5 mA @ 24VDC
Maximum Input Current	7mA @ 26.4 VDC
Input Impedance	3.9 kΩ @ 24VDC
Input Frequency (Max)	X1-X4: 100kHz (3m cable)
ON Voltage Level	>19VDC
OFF Voltage Level	< 2VDC
Minimum ON Current	4.5 mA
Maximum OFF Current	0.5 mA
OFF to ON Response	Typ 3µs Max 5µs
ON to OFF Response	Typ 1µs Max 3µs
Status Indicators	Logic Side (4 points, green LED
Commons	1 (4 points/common)

Maximum Number of High Speed Counters	
Up	4
Down	4
Up/Down	2
Pulse/Direction	2
Quadrature A-B	2
Quadrature A-B+Z	1

Equivalent Discrete Input Circuit



C2-08D1-6C Temperature Derating Chart

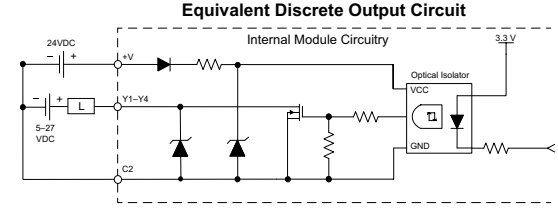


Y1 - Y4

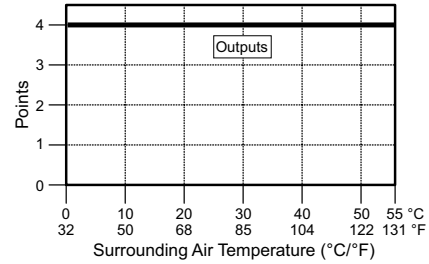
Discrete I/O Specifications - Outputs	
Outputs per Module	4 (Sink)
Operating Voltage Range	5–27 VDC
Maximum Output Current	0.1 A/point; 0.4 A/common
Minimum Output Current	0.2 mA
Maximum Leakage Current	0.1 mA @ 30.0 VDC
On Voltage Drop	0.5 VDC @ 0.1 A
Maximum Inrush Current	150mA for 10ms
Output Frequency (Max)	Y1, Y3: 100kHz (3m cable)
OFF to ON Response	< 5µs (Duty 40–60%, Load current 20mA)
ON to OFF Response	< 5µs (Duty 40–60%, Load current 20mA)
Status Indicators	Logic Side (4 points, red LED)
Commons	1 (4 points/common)
External DC Power Required	20–28 VDC Maximum @ 60mA (All points on)

Maximum Number of High Speed Outputs	
Pulse Train	2
Pulse Width Modulation	2

Equivalent Discrete Output Circuit



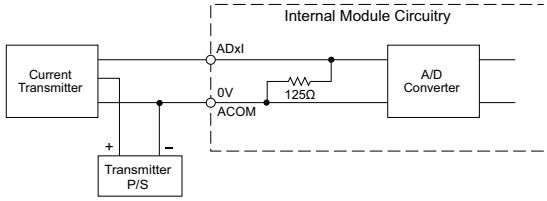
C2-08D1-6C Temperature Derating Chart



AD1I - AD4I

Analog Specifications - Current Input	
Inputs per Module	4 (current)
Input Range	0–20 mA (sink)
Resolution	12-bit
Conversion Time	50ms
Input Impedance	125Ω
Input Stability	±2 LSB maximum
Full-Scale Calibration Error	±2% maximum
Offset Calibration Error	±0.1 mA maximum
Accuracy vs. Temperature Error	±120ppm/°C maximum

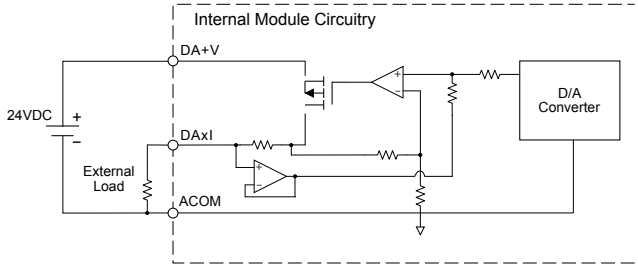
Analog Current Input Circuit



DA1I - DA2I

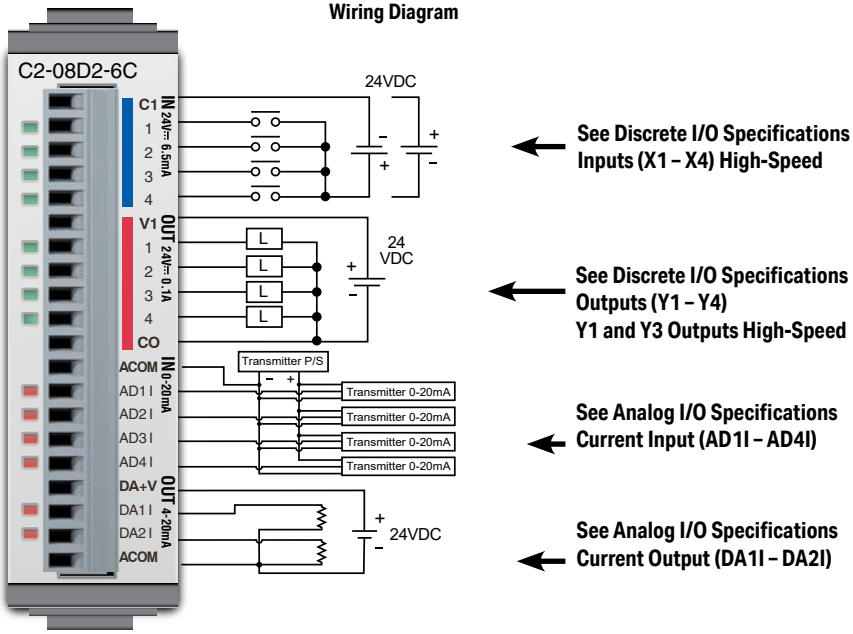
Analog Specifications - Current Output	
Outputs per Module	2 (current)
Output Range	4–20 mA (source)
Resolution	12-bit
Conversion Time	2.5 ms
Load Impedance	250Ω TYP (200–800 Ω)
Loop Supply Voltage	DC 24V TYP (21.6 – 26.4 VDC)
Full-Scale Calibration Error	±2% maximum
Offset Calibration Error	±25mA maximum
Accuracy vs. Temperature Error	±120ppm/°C maximum
External DC Power Required	21.6 – 26.4 VDC

Analog Current Output Circuit



C2-08D2-6C – 4 DC Input (Sink/Source)/4 Sourcing DC Output
4 Analog Current Input
2 Analog Current Output Option Slot I/O Module

Wiring Diagram



General Specifications	
Current Consumption at 24VDC	80mA max (All Points On)
Terminal Block Replacement Part No.	C0-16TB
Weight	48g

NOTE: *Please refer to the Analog I/O Configuration section in Chapter 3 for information on using the analog I/O.*

NOTE: *There are no ZIPLink pre-wired PLC connection cables and modules for the Analog Option Slot Modules (cannot mix discrete I/O and analog I/O signals in a ZIPLink cable).*

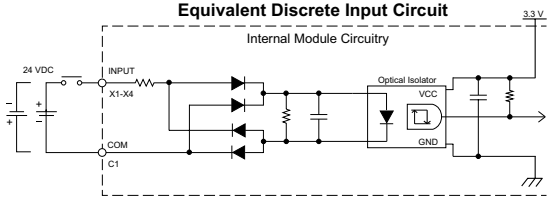
C2-08D2-6C (continued)

X1 - X4

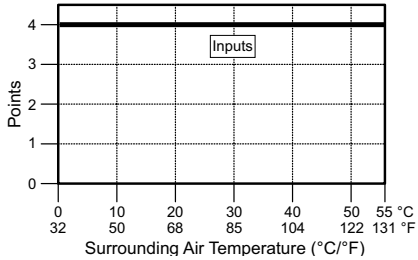
Discrete I/O Specifications - Inputs	
Inputs per Module	4 (Sink/Source)
Operating Voltage Range	24VDC
Input Voltage Range	21.6 – 26.4 VDC
Input Current	Typ 6.5 mA @ 24VDC
Maximum Input Current	7mA @ 26.4 VDC
Input Impedance	3.9 kΩ @ 24VDC
Input Frequency (Max)	X1-X4: 100kHz (3m cable)
ON Voltage Level	>19VDC
OFF Voltage Level	< 2VDC
Minimum ON Current	4.5 mA
Maximum OFF Current	0.5 mA
OFF to ON Response	Typ 3µs Max 5µs
ON to OFF Response	Typ 1µs Max 3µs
Status Indicators	Logic Side (4 points, green LED)
Commons	1 (4 points/common)

Maximum Number of High Speed Counters	
Up	4
Down	4
Up/Down	2
Pulse/Direction	2
Quadrature A-B	2
Quadrature A-B+Z	1

Equivalent Discrete Input Circuit



C2-08D2-6C Temperature Derating Chart

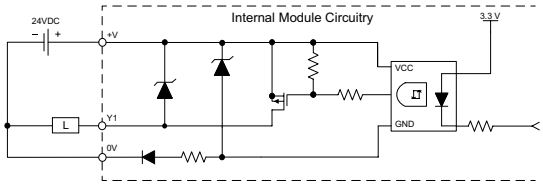


Y1 - Y4

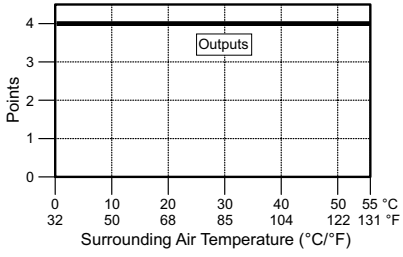
Discrete I/O Specifications - Outputs	
Outputs per Module	4 (Source)
Operating Voltage Range	19.2–30 VDC
Maximum Output Current	0.1 A/point; 0.4 A/common C0
Minimum Output Current	0.2 mA
Maximum Leakage Current	0.1 mA @ 30.0 VDC
On Voltage Drop	0.5 VDC @ 0.1 A
Maximum Inrush Current	150mA for 10ms
Output Frequency (Max)	Y1, Y3: 100kHz (3m cable)
OFF to ON Response	< 5µs (Duty 40–60%, Load current 20mA)
ON to OFF Response	< 5µs (Duty 40–60%, Load current 20mA)
Status Indicators	Logic side (4 points, red LED)
Commons	1 (4 points/common)

Maximum Number of High Speed Outputs	
Pulse Train	2
Pulse Width Modulation	2

Equivalent Discrete Output Circuit



C2-08D2-6C Temperature Derating Chart

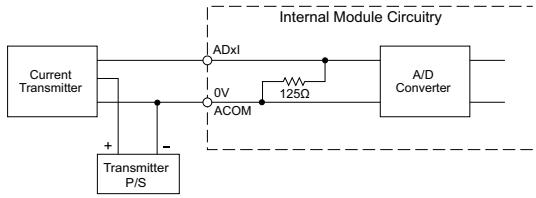


C2-08D2-6C (continued)

AD1I - AD4I

Analog Specifications - Current Input	
Inputs per Module	4 (current)
Input Range	0–20 mA (sink)
Resolution	12-bit
Conversion Time	50ms
Input Impedance	125Ω
Input Stability	±2 LSB maximum
Full-Scale Calibration Error	±2% maximum
Offset Calibration Error	±0.1 mA maximum
Accuracy vs. Temperature Error	±100ppm/°C maximum

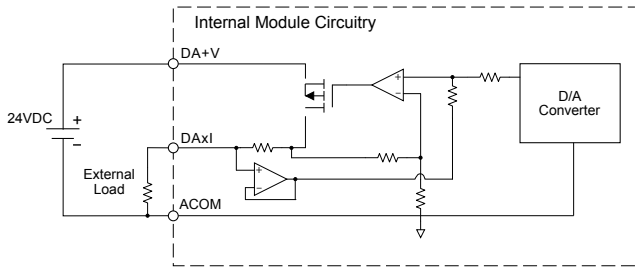
Analog Current Input Circuit



DA1I - DA2I

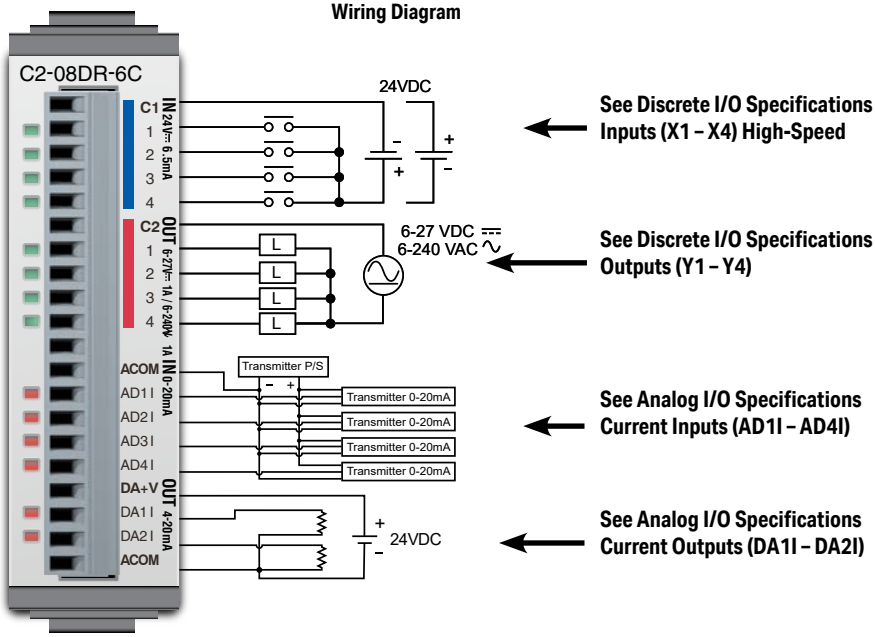
Analog Specifications - Current Output	
Outputs per Module	2 (current)
Output Range	4–20 mA (source)
Resolution	12-bit
Conversion Time	2.5 ms
Load Impedance	250Ω Typ (200Ω to 800Ω)
Loop Supply Voltage	24VDC Typ (21.6 – 26.4 VDC)
Full-Scale Calibration Error	±2% maximum
Offset Calibration Error	±25mA maximum
Accuracy vs. Temperature Error	±120ppm/°C maximum
External DC Power Required	21.6 – 26.4 VDC

Analog Current Output Circuit



C2-08DR-6C – 4 DC Input (Sink/Source)/4 Relay Output
4 Analog Current Input
2 Analog Current Output Option Slot I/O Module

Wiring Diagram



General Specifications	
Current Consumption at 24VDC	100mA max (All Points On)
Terminal Block Replacement Part No.	C0-16TB
Weight	58g

NOTE: *Please refer to the Analog I/O Configuration section in Chapter 3 for information on using the analog I/O.*

NOTE: *There are no ZIPLink pre-wired PLC connection cables and modules for the Analog Option Slot Modules (cannot mix discrete I/O and analog I/O signals in a ZIPLink cable).*

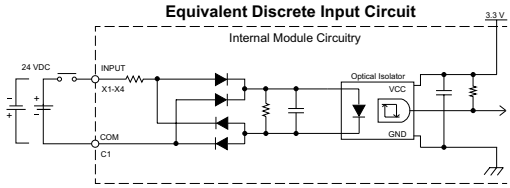
C2-08DR-6C (continued)

X1 - X4

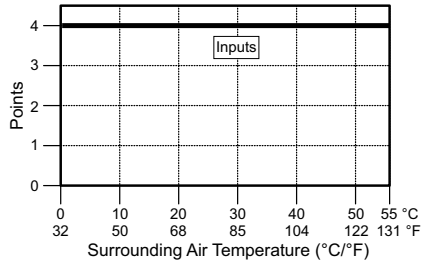
Discrete I/O Specifications - Inputs	
Inputs per Module	4
Operating Voltage Range	24VDC
Input Voltage Range	21.6 – 26.4 VDC
Input Current	Typ 6.5 mA @ 24VDC
Max. Input Current	7mA @ 26.4 VDC
Input Impedance	3.9 kΩ @ 24VDC
Input Frequency (Max)	X1-X4: 100kHz (3m cable)
ON Voltage Level	>19VDC
OFF Voltage Level	< 2VDC
Minimum ON Current	4.5 mA
Maximum OFF Current	0.5 mA
OFF to ON Response	Typ 3µs Max 5µs
ON to OFF Response	Typ 1µs Max 3µs
Status Indicators	Logic Side (4 points, green LED)
Commons	1 (4 points/common)

Maximum Number of High Speed Counters	
Up	4
Down	4
Up/Down	2
Pulse/Direction	2
Quadrature A-B	2
Quadrature A-B+Z	1

Equivalent Discrete Input Circuit



C2-08DR-6C Temperature Derating Chart

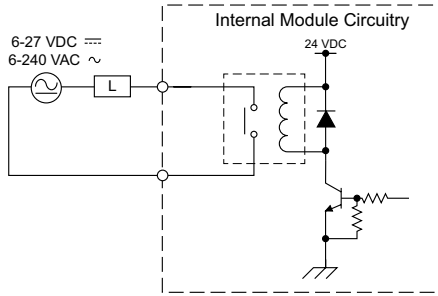


Y1 - Y4

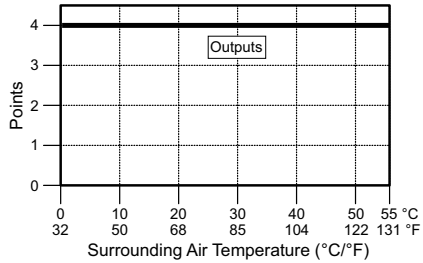
Discrete I/O Specifications - Outputs	
Outputs per Module	4
Operating Voltage Range	6–27 VDC, 6–240 VAC
Output Type	Relay, form A (SPST)
AC Frequency	47–63 Hz
Maximum Current	1A/point (resistive)
Minimum Load Current	5mA @ 5VDC
Maximum Inrush Current	3A for 10ms
OFF to ON Response	< 15ms
ON to OFF Response	< 15ms
Status Indicators	Logic Side (4 points, red LED)
Commons	1 (4 points/common)

Typical Relay Life (Operations) at Room Temperature	
Voltage & Load Type	Relay Life
30VDC, 1A Resistive	200,000 cycles
30VDC, 1A Inductive	100,000 cycles
250VAC, 1A Resistive	200,000 cycles
250VAC, 1A Inductive	50,000 cycles
ON to OFF = 1 cycle	

Equivalent Discrete Output Circuit



C2-08DR-6C Temperature Derating Chart

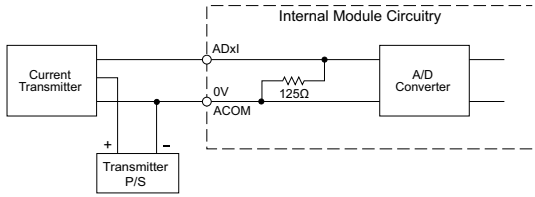


C2-08DR-6C (continued)

AD1I - AD4I

Analog Specifications - Current Input	
Inputs per Module	4 (Current)
Input Range	0–20 mA (Sink)
Resolution	12-bit
Conversion Time	50ms
Input Impedance	125Ω
Input Stability	±2 LSB maximum
Full-Scale Calibration Error	±2% maximum
Offset Calibration Error	±0.1 mA maximum
Accuracy vs. Temperature Error	±100ppm/°C maximum

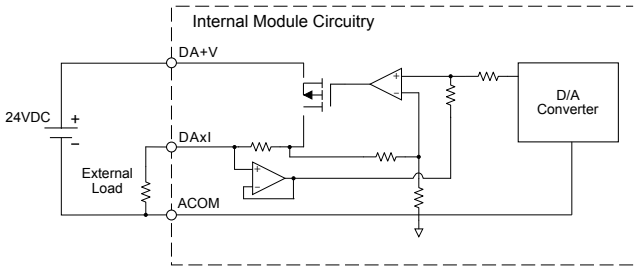
Analog Current Input Circuit



DA1I - DA2I

Analog Specifications - Current Output	
Outputs per Module	2 (Current)
Output Range	4–20 mA (Source)
Resolution	12-bit
Conversion Time	2.5 ms
Load Impedance	250Ω Typ (200Ω to 800Ω)
Loop Supply Voltage	24VDC Typ (21.6–26.4)
Full-Scale Calibration Error	±2% maximum
Offset Calibration Error	±25mA maximum
Accuracy vs. Temperature Error	±120ppm/°C maximum
External DC Power Required	21.6 – 26.4 VDC

Analog Current Output Circuit



C2-08DR-6C (continued)

Insulation Requirements for IEC/UL 61010-1 and 61010-2-201 (sections 6.5 and 6.7)

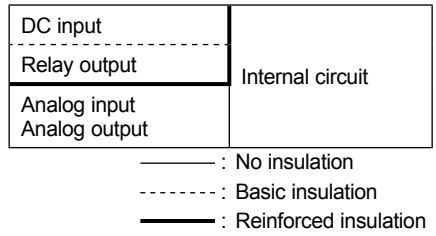
Input to Output Insulation

Basic insulation is provided between the Relay Output and the closest Input terminal. When connecting the Relay Output to a circuit that exceeds 100VAC (141VDC) more than the closest input circuit an additional basic insulation layer must be added to the input circuit.

Additional Basic Insulation Examples

- Supplementary Insulation: Interposing relay, additional insulating material,… (sec. 6.5.3)
- Automatic Disconnection of the Supply: Properly sized breaker (sec. 6.5.5)
- Current or Voltage Limiting device: Properly sized fuse (sec. 6.5.6)

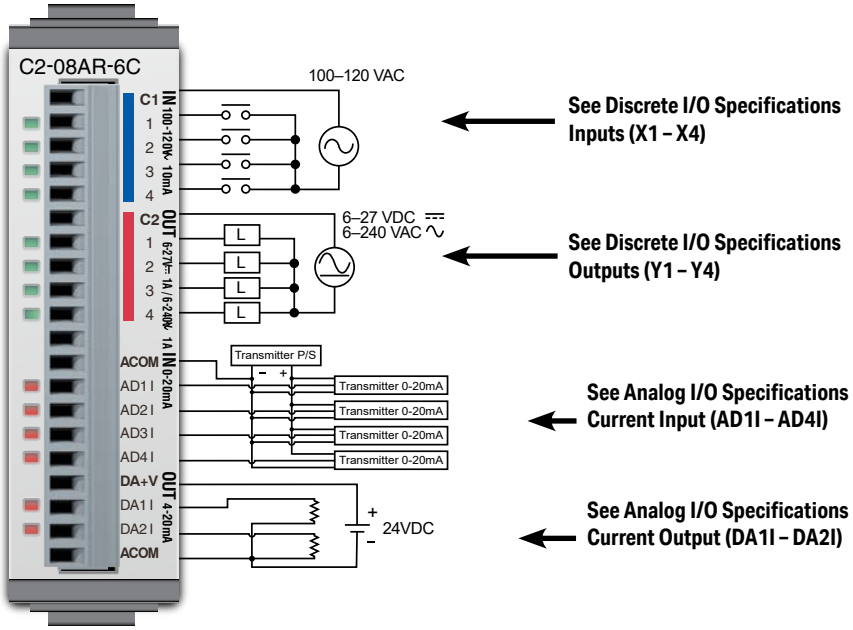
Basic insulation requires a clearance distance of 1.5 mm or more, a creepage distance of 2.5 mm or more, and dielectric voltage withstand of 1500Vrms.



C2-08AR-6C – 4 AC Input/4 Relay Output

4 Analog Current Input
2 Analog Current Output Option Slot I/O Module

Wiring Diagram



General Specifications	
Current Consumption at 24VDC	100mA max (All Points On)
Terminal Block Replacement Part No.	C0-16TB
Weight	58g

NOTE: *Please refer to the Analog I/O Configuration section in Chapter 3 for information on using the analog I/O.*

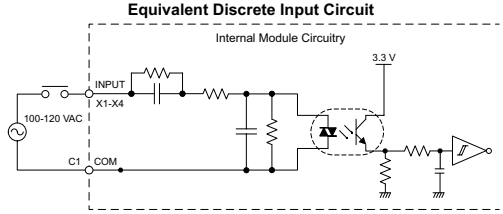
NOTE: *There are no ZIPLink pre-wired PLC connection cables and modules for the Analog Option Slot Modules (cannot mix discrete I/O and analog I/O signals in a ZIPLink cable).*

C2-08AR-6C (continued)

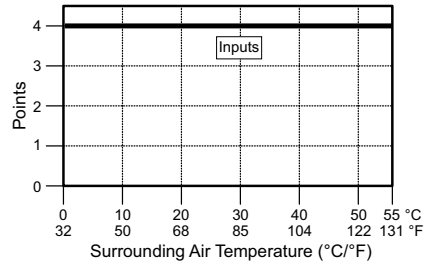
X1 - X4

Discrete I/O Specifications - Inputs	
Inputs per Module	4
Operating Voltage Range	100–120 VAC
AC Frequency	47–63 Hz
Input Current	Typ 8.5 mA @ 100VAC at 50Hz Typ 10mA @ 100VAC at 60Hz
Maximum Input Current	16mA @ 144VAC
Input Impedance	15kΩ @ 50Hz 12kΩ @ 60Hz
ON Voltage Level	> 60VAC
OFF Voltage Level	< 20VAC
Minimum ON Current	5mA
Maximum OFF Current	2mA
OFF to ON Response	< 40ms
ON to OFF Response	< 40ms
Status Indicators	Logic Side (4 points, green LED)
Commons	1 (4 points/common)

Equivalent Discrete Input Circuit



C2-08AR-6C Temperature Derating Chart

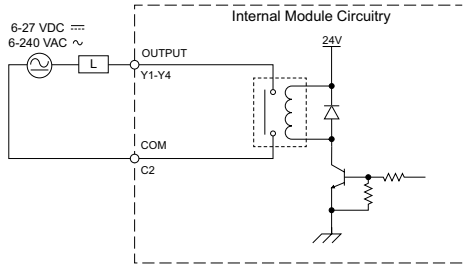


Y1 - Y4

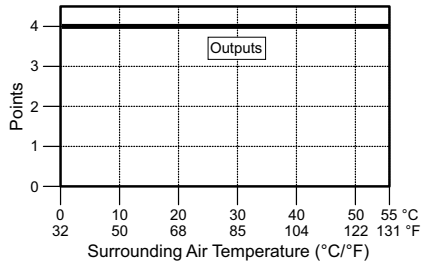
Discrete I/O Specifications - Outputs	
Outputs per Module	4
Operating Voltage Range	6–27 VDC, 6–240 VAC
Output Type	Relay, form A (SPST)
AC Frequency	47–63 Hz
Maximum Current	1A/point (resistive)
Minimum Load Current	5mA @ 5VDC
Maximum Inrush Current	3A for 10ms
OFF to ON Response	< 15ms
ON to OFF Response	< 15ms
Status Indicators	Logic Side (4 points, red LED)
Commons per Module	1 (4 points/common)

Typical Relay Life (Operations) at Room Temperature	
Voltage & Load Type	Relay Life
30VDC, 1A Resistive	200,000 cycles
30VDC, 1A Inductive	100,000 cycles
250VAC, 1A Resistive	200,000 cycles
250VAC, 1A Inductive	50,000 cycles
ON to OFF = 1 cycle	

Equivalent Discrete Output Circuit



C2-08AR-6C Temperature Derating Chart

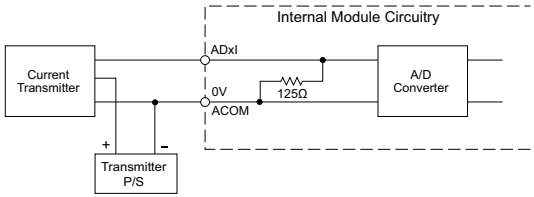


C2-08AR-6C (continued)

AD1I – AD4I

Analog Specifications - Current Input	
Inputs per Module	4 (current)
Input Range	0–20 mA (sink)
Resolution	12-bit
Conversion Time	50ms
Input Impedance	125Ω
Input Stability	±2 LSB maximum
Full-Scale Calibration Error	±2% maximum
Offset Calibration Error	±0.1 mA maximum
Accuracy vs. Temperature Error	±100ppm/°C maximum

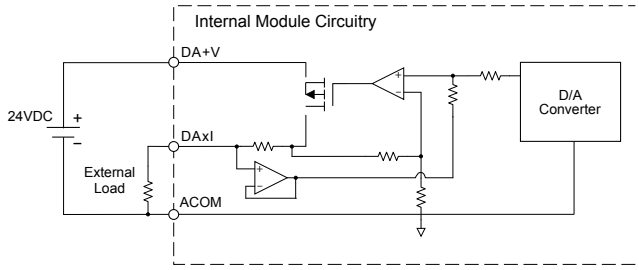
Analog Current Input Circuit



DA1I – DA2I

Analog Specifications - Current Output	
Outputs per Module	2 (current)
Output Range	4–20 mA (source)
Resolution	12-bit
Conversion Time	2.5 ms
Load Impedance	250Ω Typ (200Ω to 800Ω)
Loop Supply Voltage	DC 24V Typ (21.6 – 26.4 V)
Full-Scale Calibration Error	±2% maximum
Offset Calibration Error	±25mA maximum
Accuracy vs. Temperature Error	±120ppm/°C maximum
External DC Power Supply Required	21.6 –26.4 VDC

Analog Current Output Circuit



C2-08AR-6C (continued)

Insulation Requirements for IEC/UL 61010-1 and 61010-2-201 (sections 6.5 and 6.7)

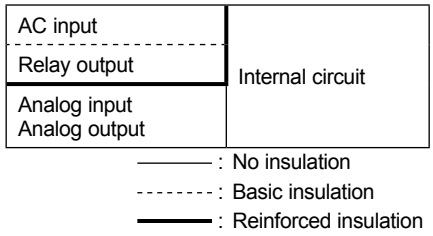
Input to Output Insulation

Basic insulation is provided between the Relay Output and the closest Input terminal. When connecting the Relay Output to a circuit that exceeds 100VAC (141VDC) more than the closest input circuit an additional basic insulation layer must be added to the input circuit.

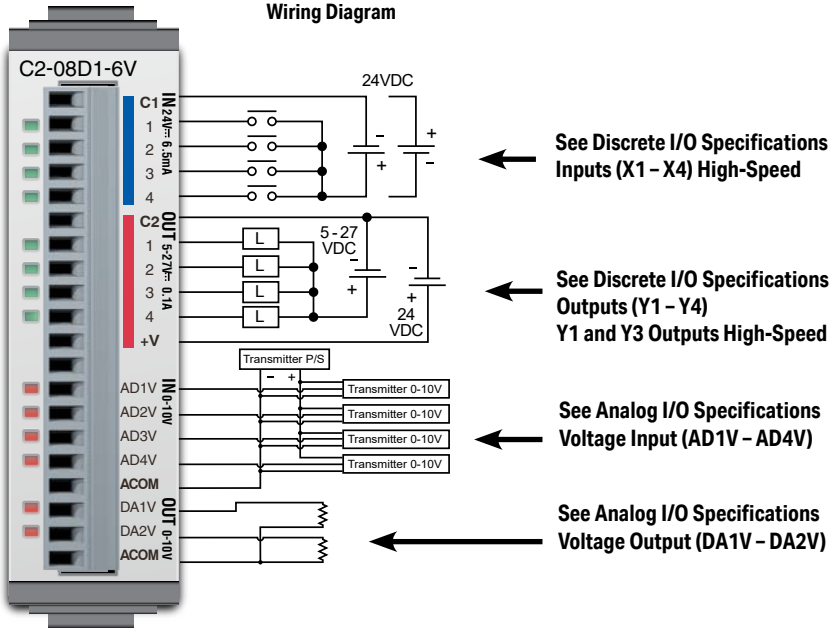
Additional Basic Insulation Examples

- Supplementary Insulation: Interposing relay, additional insulating material,… (sec. 6.5.3)
- Automatic Disconnection of the Supply: Properly sized breaker (sec. 6.5.5)
- Current or Voltage Limiting device: Properly sized fuse (sec. 6.5.6)

Basic insulation requires a clearance distance of 1.5 mm or more, a creepage distance of 2.5 mm or more, and dielectric voltage withstand of 1500Vrms.



C2-08D1-6V – 4 DC Input (Sink/Source)/4 Sinking DC Output
4 Analog Voltage Input
2 Analog Voltage Output Option Slot I/O Module



General Specifications	
Current Consumption at 24VDC	80mA max (All Points On)
Terminal Block Replacement Part No.	C0-16TB
Weight	48g

NOTE: *Please refer to the Analog I/O Configuration section in Chapter 3 for information on using the analog I/O.*

NOTE: *There are no ZIPLink pre-wired PLC connection cables and modules for the Analog Option Slot Modules (cannot mix discrete I/O and analog I/O signals in a ZIPLink cable).*

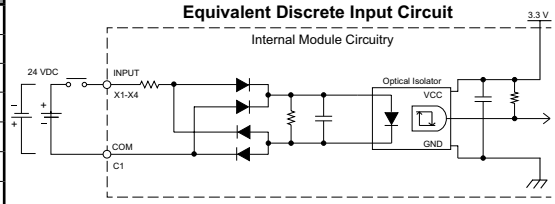
C2-08D1-6V (continued)

X1 - X4

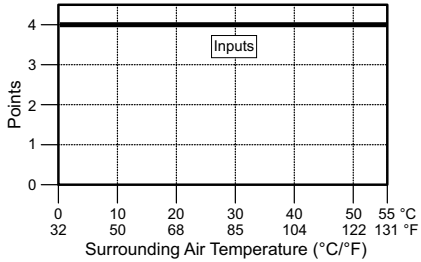
Discrete I/O Specifications - Inputs	
Inputs per Module	4 (Source/Sink)
Operating Voltage Range	24VDC
Input Voltage Range	21.6 – 26.4 VDC
Input Current	Typ 6.5 mA @ 24VDC
Max. Input Current	7mA @ 26.4 VDC
Input Impedance	3.9 kΩ @ 24VDC
Input Frequency (Max)	X1-X4: 100kHz (3m cable)
ON Voltage Level	>19VDC
OFF Voltage Level	< 2VDC
Minimum ON Current	4.5 mA
Maximum OFF Current	0.5 mA
OFF to ON Response	Typ 3µs Max 5µs
ON to OFF Response	Typ 1µs Max 3µs
Status Indicators	Logic Side (4 points, green LED)
Commons	1 (4 points/common)

Maximum Number of High Speed Counters	
Up	4
Down	4
Up/Down	2
Pulse/Direction	2
Quadrature A-B	2
Quadrature A-B+Z	1

Equivalent Discrete Input Circuit



C2-08D1-6V Temperature Derating Chart

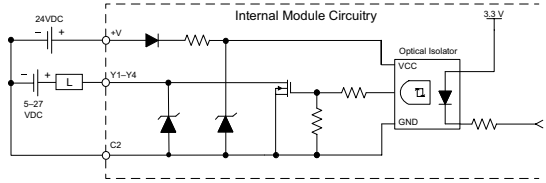


Y1 - Y4

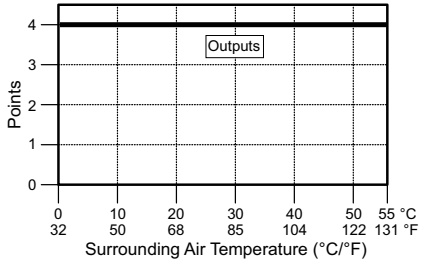
Discrete I/O Specifications - Outputs	
Outputs per Module	4 (Sink)
Operating Voltage Range	5–27 VDC
Maximum Output Current	0.1 A/point; 0.4 A/common
Minimum Output Current	0.2 mA
Maximum Leakage Current	0.1 mA @ 30.0 VDC
On Voltage Drop	0.5 VDC @ 0.1 A
Maximum Inrush Current	150 mA for 10ms
Output Frequency (Max)	Y1, Y3: 100kHz (3m cable)
OFF to ON Response	< 5µs (Duty 40–60%, Load current 20mA)
ON to OFF Response	< 5µs (Duty 40–60%, Load current 20mA)
Status Indicators	Logic Side (4 points, red LED)
Commons	1 (4 points/common)
External DC Power Required	20–28 VDC Maximum @ 60mA (All points on)

Maximum Number of High Speed Outputs	
Pulse Train	2
Pulse Width Modulation	2

Equivalent Discrete Output Circuit



C2-08D1-6V Temperature Derating Chart

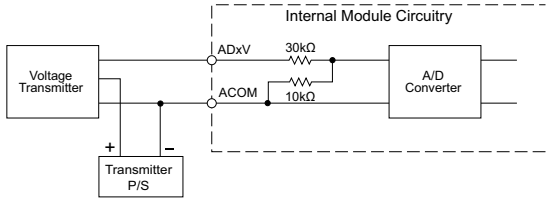


C2-08D1-6V (continued)

AD1V - AD4V

Analog Specifications - Voltage Input	
Inputs per Module	4 (voltage)
Input Range	0–10 VDC
Resolution	12-bit
Conversion Time	50ms
Input Impedance	40kΩ
Input Stability	±2 LSB maximum
Full-Scale Calibration Error	±2% maximum
Offset Calibration Error	±25mV maximum
Accuracy vs. Temperature Error	±100ppm/°C maximum

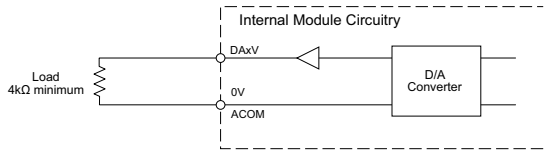
Analog Voltage Input Circuit



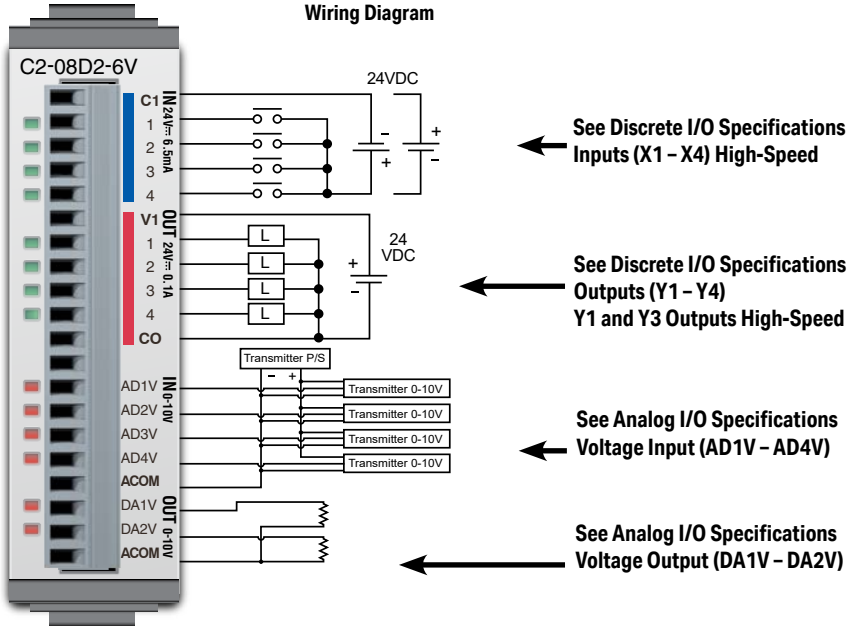
DA1V - DA2V

Analog Specifications - Voltage Output	
Outputs per Module	2 (voltage)
Output Range	0–10 VDC
Resolution	12-bit
Conversion Time	1ms
Load Impedance	4kΩ minimum (output current 2.5 mA maximum)
Full-Scale Calibration Error	±2% maximum
Offset Calibration Error	±25mV maximum
Accuracy vs. Temperature Error	±100ppm/°C maximum

Analog Voltage Output Circuit



C2-08D2-6V – 4 DC Input (Sink/Source)/4 Sourcing DC Output
4 Analog Voltage Input
2 Analog Voltage Output Option Slot I/O Module



General Specifications	
Current Consumption at 24VDC	80mA max (All Points On)
Terminal Block Replacement Part No.	C0-16TB
Weight	48g

NOTE: *Please refer to the Analog I/O Configuration section in Chapter 3 for information on using the analog I/O.*

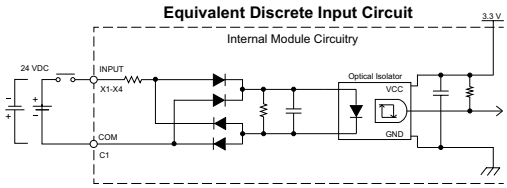
NOTE: *There are no ZIPLink pre-wired PLC connection cables and modules for the Analog Option Slot Modules (cannot mix discrete I/O and analog I/O signals in a ZIPLink cable).*

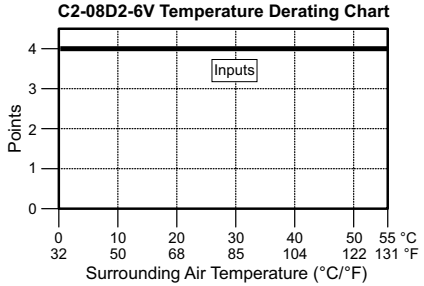
C2-08D2-6V (continued)

X1 - X4

Discrete I/O Specifications - Inputs	
Inputs per Module	4 (Source/Sink)
Operating Voltage Range	24VDC
Input Voltage Range	21.6 – 26.4 VDC
Input Current	Typ 6.5 mA @ 24VDC
Max. Input Current	7mA @ 26.4 VDC
Input Impedance	3.9 kΩ @ 24VDC
Input Frequency (Max)	X1-X4: 100kHz (3m cable)
ON Voltage Level	>19VDC
OFF Voltage Level	< 2VDC
Minimum ON Current	4.5 mA
Maximum OFF Current	0.5 mA
OFF to ON Response	Typ 3µs Max 5µs
ON to OFF Response	Typ 1µs Max 3µs
Status Indicators	Logic Side (4 points, green LED)
Commons	1 (4 points/common)

Maximum Number of High Speed Counters	
Up	4
Down	4
Up/Down	2
Pulse/Direction	2
Quadrature A-B	2
Quadrature A-B+Z	1

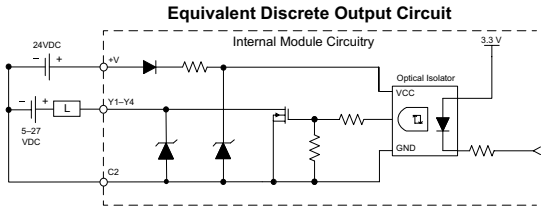


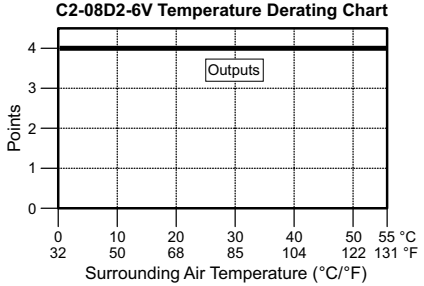


Y1 - Y4

Discrete I/O Specifications - Outputs	
Outputs per Module	4 (Source)
Operating Voltage Range	24VDC
Output Voltage Range	19.2–30 VDC
Maximum Output Current	0.1 A/point , 0.4 A/common
Minimum Output Current	0.2 mA
Maximum Leakage Current	0.1mA @ 30VDC
On Voltage Drop	0.5 VDC@ 0.1 mA
Maximum Inrush Current	150mA for 10ms
Output Frequency (Max)	Y1, Y3: 100kHz (3m cable)
OFF to ON Response	< 5µs (Duty 40–60%, Load current 20mA)
ON to OFF Response	< 5µs (Duty 40–60%, Load current 20mA)
Status Indicators	Logic Side (4 points, red LED)
Commons	1 (4 points/common)

Maximum Number of High Speed Outputs	
Pulse Train	2
Pulse Width Modulation	2



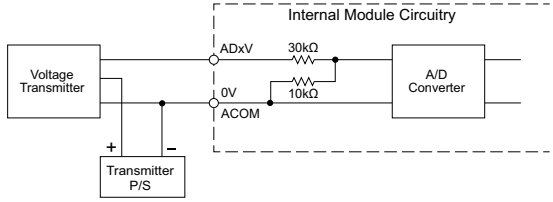


C2-08D2-6V (continued)

AD1V - AD4V

Analog Specifications - Voltage Input	
Inputs per Module	4 (voltage)
Input Range	0–10 VDC
Resolution	12-bit
Conversion Time	50ms
Input Impedance	40kΩ
Input Stability	±2 LSB maximum
Full-Scale Calibration Error	±2% maximum
Offset Calibration Error	±25mV maximum
Accuracy vs. Temperature Error	±100ppm/°C maximum

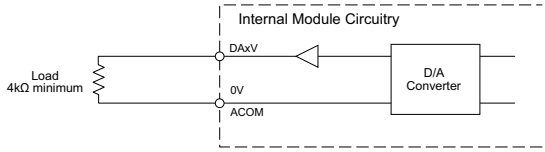
Analog Voltage Input Circuit



DA1V - DA2V

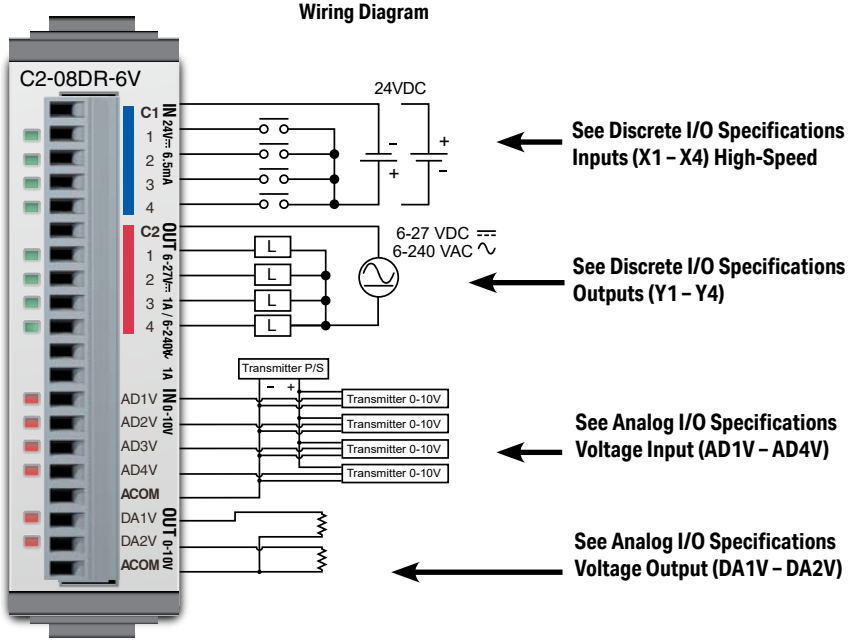
Analog Specifications - Voltage Output	
Outputs per Module	2 (voltage)
Output Range	0–10 VDC
Resolution	12-bit
Conversion Time	1ms
Load Impedance	4kΩ minimum (output current 2.5 mA maximum)
Full-Scale Calibration Error	±2% maximum
Offset Calibration Error	±25mV maximum
Accuracy vs. Temperature Error	±100ppm/°C maximum

Analog Voltage Output Circuit



C2-08DR-6V – 4 DC Input (Sink/Source)/4 Relay Output
4 Analog Voltage Input
2 Analog Voltage Output Option Slot I/O Module

Wiring Diagram



General Specifications	
Current Consumption at 24VDC	80mA max (All Points On)
Terminal Block Replacement Part No.	C0-16TB
Weight	57g

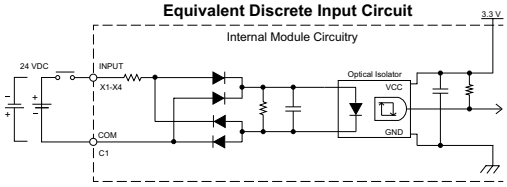
NOTE: *Please refer to the Analog I/O Configuration section in Chapter 3 for information on using the analog I/O.*

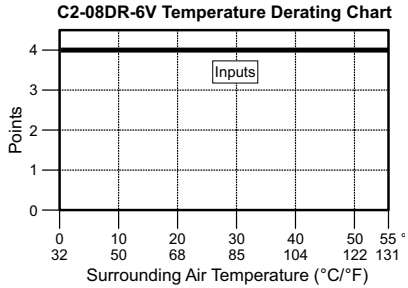
NOTE: *There are no ZIPLink pre-wired PLC connection cables and modules for the Analog Option Slot Modules (cannot mix discrete I/O and analog I/O signals in a ZIPLink cable).*

C2-08DR-6V (continued)

X1 - X4

Discrete I/O Specifications - Inputs	
Inputs per Module	4
Operating Voltage Range	24VDC
Input Voltage Range	21.6 – 26.4 VDC
Input Current	Typ 6.5 mA @ 24VDC
Max. Input Current	7mA @ 26.4 VDC
Input Impedance	3.9 kΩ @ 24VDC
Input Frequency (Max)	X1-X4: 100kHz (3m cable)
ON Voltage Level	>19VDC
OFF Voltage Level	< 2VDC
Minimum ON Current	4.5 mA
Maximum OFF Current	0.5 mA
OFF to ON Response	Typ 3µs Max 5µs
ON to OFF Response	Typ 1µs Max 3µs
Status Indicators	Logic side (4 points, green LED)
Commons	1 (4 points/common)

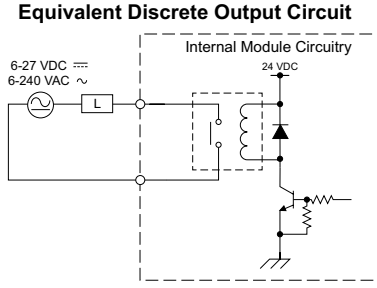




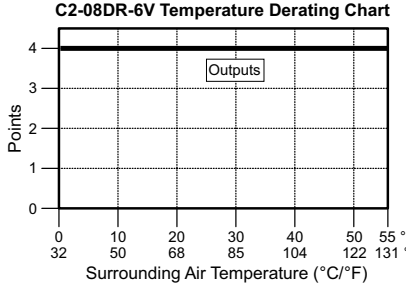
Y1 - Y4

Maximum Number of High Speed Counters	
Up	4
Down	4
Up/Down	2
Pulse/Direction	2
Quadrature A-B	2
Quadrature A-B+Z	1

Discrete I/O Specifications - Outputs	
Outputs per Module	4
Operating Voltage Range	6–27 VDC, 6–240 VAC
Output Type	Relay, form A (SPST)
AC Frequency	47–63 Hz
Maximum Current	1A/point (resistive)
Minimum Load Current	5mA @ 5VDC
Maximum Inrush Current	3A for 10ms
OFF to ON Response	< 15ms
ON to OFF Response	< 15ms
Status Indicators	Logic Side (4 points, red LED)
Commons per Module	1 (4 points/common)



Typical Relay Life (Operations) at Room Temperature	
Voltage & Load Type	Relay Life
30VDC, 1A Resistive	200,000 cycles
30VDC, 1A Inductive	100,000 cycles
250VAC, 1A Resistive	200,000 cycles
250VAC, 1A Inductive	50,000 cycles
ON to OFF = 1 cycle	

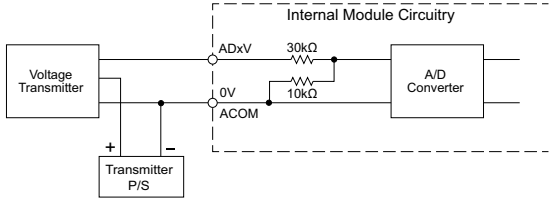


C2-08DR-6V (continued)

AD1V - AD4V

Analog Specifications - Voltage Input	
Inputs per Module	4 (voltage)
Input Range	0–10 VDC
Resolution	12-bit
Conversion Time	50ms
Input Impedance	40kΩ
Input Stability	±2 LSB maximum
Full-Scale Calibration Error	±2% maximum
Offset Calibration Error	±25mV maximum
Accuracy vs. Temperature Error	±100ppm/°C maximum

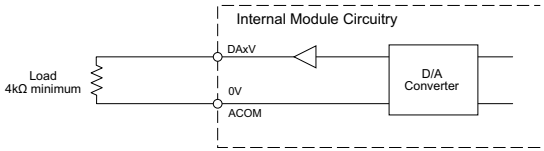
Analog Voltage Input Circuit



DA1V - DA2V

Analog Specifications - Voltage Output	
Outputs per Module	2 (voltage)
Output Range	0–10 VDC
Resolution	12-bit
Conversion Time	1ms
Load Impedance	4kΩ minimum (output current 2.5 mA maximum)
Full-Scale Calibration Error	±2% maximum
Offset Calibration Error	±25mV maximum
Accuracy vs. Temperature Error	±100ppm/°C maximum

Analog Voltage Output Circuit



C2-08DR-6V (continued)

Insulation Requirements for IEC/UL 61010-1 and 61010-2-201 (sections 6.5 and 6.7)

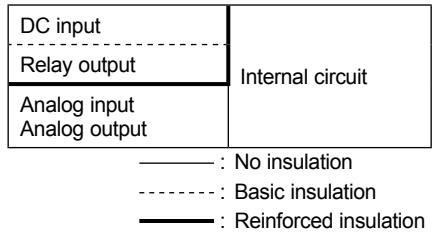
Input to Output Insulation

Basic insulation is provided between the Relay Output and the closest Input terminal. When connecting the Relay Output to a circuit that exceeds 100VAC (141VDC) more than the closest input circuit an additional basic insulation layer must be added to the input circuit.

Additional Basic Insulation Examples

- Supplementary Insulation: Interposing relay, additional insulating material,… (sec. 6.5.3)
- Automatic Disconnection of the Supply: Properly sized breaker (sec. 6.5.5)
- Current or Voltage Limiting device: Properly sized fuse (sec. 6.5.6)

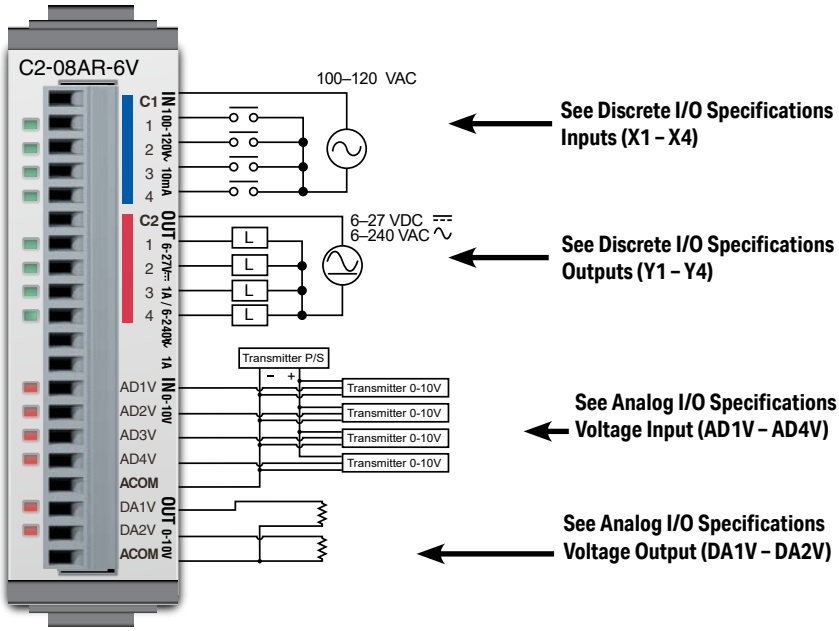
Basic insulation requires a clearance distance of 1.5 mm or more, a creepage distance of 2.5 mm or more, and dielectric voltage withstand of 1500Vrms.



C2-08AR-6V – 4 AC Input (Sink/Source) /4 Relay Output

4 Analog Voltage Input
2 Analog Voltage Output Option Slot I/O Module

Wiring Diagram



General Specifications	
Current Consumption at 24VDC	100mA max (All Points On)
Terminal Block Replacement Part No.	C0-16TB
Weight	58g

NOTE: *Please refer to the Analog I/O Configuration section in Chapter 3 for information on using the analog I/O.*

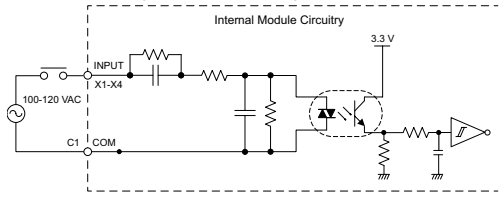
NOTE: *There are no ZIPLink pre-wired PLC connection cables and modules for the Analog Option Slot Modules (cannot mix discrete I/O and analog I/O signals in a ZIPLink cable).*

C2-08AR-6V (continued)

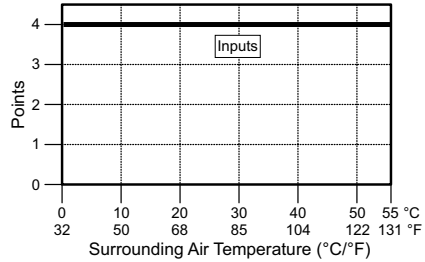
X1 - X4

Discrete I/O Specifications - Inputs	
Inputs per Module	4
Operating Voltage Range	100–120 VAC
AC Frequency	47–63 Hz
Input Current	Typ 8.5 mA @ 100VAC at 50Hz Typ 10mA @ 100VAC at 60Hz
Maximum Input Current	16mA @ 144VAC
Input Impedance	15kΩ @ 50Hz 12kΩ @ 60Hz
ON Voltage Level	> 60VAC
OFF Voltage Level	< 20VAC
Minimum ON Current	5mA
Maximum OFF Current	2mA
OFF to ON Response	< 40ms
ON to OFF Response	< 40ms
Status Indicators	Logic Side (4 points, green LED)
Commons	1 (4 points/common)

Equivalent Discrete Input Circuit



C2-08AR-6V Temperature Derating Chart

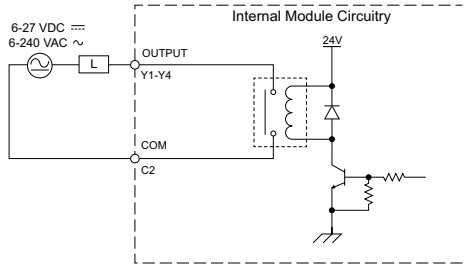


Y1 - Y4

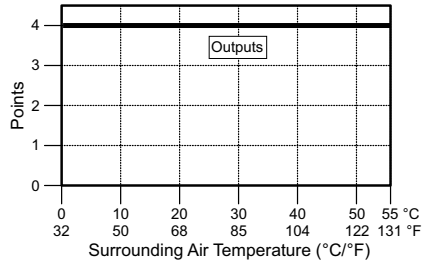
Discrete I/O Specifications - Outputs	
Outputs per Module	4
Operating Voltage Range	6–27 VDC, 6–240 VAC
Output Type	Relay, form A (SPST)
AC Frequency	47–63 Hz
Maximum Current	1A/point (resistive)
Minimum Load Current	5mA @ 5VDC
Maximum Inrush Current	3A for 10ms
OFF to ON Response	< 15ms
ON to OFF Response	< 15ms
Status Indicators	Logic Side (4 points, red LED)
Commons per Module	1 (4 points/common)

Typical Relay Life (Operations) at Room Temperature	
Voltage & Load Type	Relay Life
30VDC, 1A Resistive	200,000 cycles
30VDC, 1A Inductive	100,000 cycles
250VAC, 1A Resistive	200,000 cycles
250VAC, 1A Inductive	50,000 cycles
ON to OFF = 1 cycle	

Equivalent Discrete Output Circuit



C2-08AR-6V Temperature Derating Chart

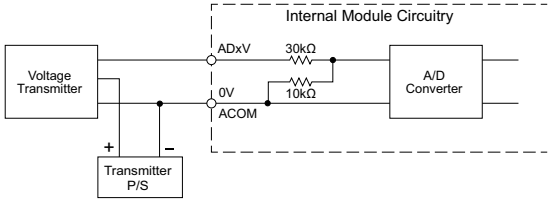


C2-08AR-6V (continued)

AD1V - AD4V

Analog Specifications - Voltage Input	
Inputs per Module	4 (voltage)
Input Range	0–10 VDC
Resolution	12-bit
Conversion Time	50ms
Input Impedance	40kΩ
Input Stability	±2 LSB maximum
Full-Scale Calibration Error	±2% maximum
Offset Calibration Error	±25mV maximum
Accuracy vs. Temperature Error	±100ppm/°C maximum

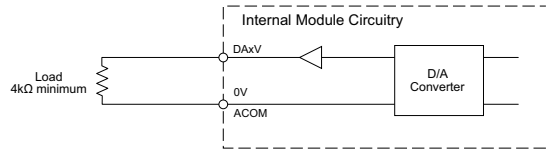
Analog Voltage Input Circuit



DA1V - DA2V

Analog Specifications - Voltage Output	
Outputs per Module	2 (voltage)
Output Range	0–10 VDC
Resolution	12-bit
Conversion Time	1ms
Load Impedance	4kΩ minimum (output current 2.5 mA maximum)
Full-Scale Calibration Error	±2% maximum
Offset Calibration Error	±25mV maximum
Accuracy vs. Temperature Error	±100ppm/°C maximum

Analog Voltage Output Circuit



C2-08AR-6V (continued)

Insulation Requirements for IEC/UL 61010-1 and 61010-2-201 (sections 6.5 and 6.7)

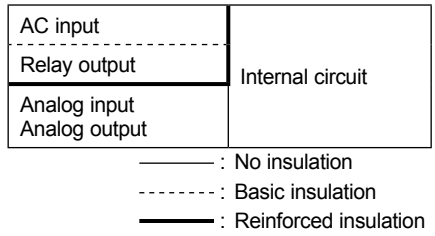
Input to Output Insulation

Basic insulation is provided between the Relay Output and the closest Input terminal. When connecting the Relay Output to a circuit that exceeds 100VAC (141VDC) more than the closest input circuit an additional basic insulation layer must be added to the input circuit.

Additional Basic Insulation Examples

- Supplementary Insulation: Interposing relay, additional insulating material,… (sec. 6.5.3)
- Automatic Disconnection of the Supply: Properly sized breaker (sec. 6.5.5)
- Current or Voltage Limiting device: Properly sized fuse (sec. 6.5.6)

Basic insulation requires a clearance distance of 1.5 mm or more, a creepage distance of 2.5 mm or more, and dielectric voltage withstand of 1500Vrms.



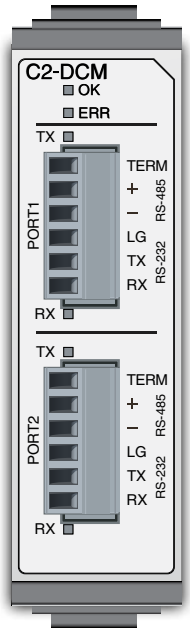
Option Slot Intelligent Module Specifications

General Specifications for all CLICK PLUS Option Slot Intelligent Modules

CLICK PLUS Option Slot Module General Specifications	
Operating Temperature	32°F to 131°F [0°C to 55°C]
Storage Temperature	–4°F to 158°F [–20°C to 70°C] IEC 60068-2-1 (Test Ab, Cold) IEC 60068-2-2 (Test Bb, Dry Heat) IEC 60068-2-14 (Test Na, Thermal Shock)
Ambient Humidity	30% to 95% relative humidity (non–condensing)
Environmental Air	No corrosive gases The level for the environmental pollution is 2 (UL840)
Environment	For Indoor Use Only
Vibration	IEC60068-2-6 (Test Fc) 5–9Hz:3.5mm amplitude, 9–150Hz 1.0G 10 sweep cycles per axis on each of 3 mutually perpendicular axes.
Shock	IEC60068-2-27 (Test Ea) 15G peak, 11ms duration, 3 shocks in each direction per axis, on 3 mutually perpendicular axes.
Noise Immunity	<EN61131-2> EN61000-4-2 (ESD) EN61000-4-3 (RFI) EN61000-4-4 (FTB) EN61000-4-5 (Surge) EN61000-4-6 (Conducted) EN61000-4-8 (Power frequency magnetic field immunity) <Local Test> Impulse Immunity : 1000V @ 1uS pulse
Emissions	EN55011 Class A (Radiated RF emission)
Agency Approvals	UL61010 (File No. E157382, E316037); CE (EN61131-2); CUL Canadian C22.2
Other	RoHS 2011/65/EU Amendment (EU)2015/863

C2-DCM – Data Communication Module

The CLICK PLUS serial communications module provides two RS-232/RS-485 ports. This configuration allows Modbus master/slave networking or connection to serial devices using ASCII communications protocol.



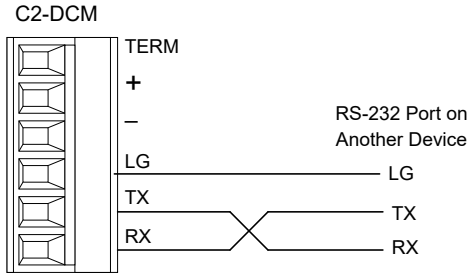
Port Specifications	
Number of Ports	2
Port Types	RS-232, RS-485 (2-wire)
Supported Protocols	Modbus RTU, ASCII (user-defined)
Communications Parameters	• Baud rate: 2400, 4800, 9600, 19200, 38400, 57600, 115.2k bps • Data bit: 7 bits, 8 bits • Parity: None, Odd, Even • Stop bit: 1 bit, 2 bits • Flow Control: None
RS-485 Terminating Resistor	120Ω, Internal
Status Indicator LEDs	OK, ERR, TX (per port), RX (per port)

Modbus Specifications	
Station Number Range	1–247
Timeout Setting	100ms, 200ms, 500ms, 1s, 2s, 5s, 10s, 20s, 30s
Character Timeout	2–1000ms
Response Delay Time	0–5000ms
Modbus Function Codes	Master/Slave: 01 - Read Coil Status 02 - Read Input Bits 03 - Read Holding Register 04 - Read Input Register 05 - Write Single Coil 06 - Write Single Register 15 - Write Multiple Coils 16 - Write Multiple Registers

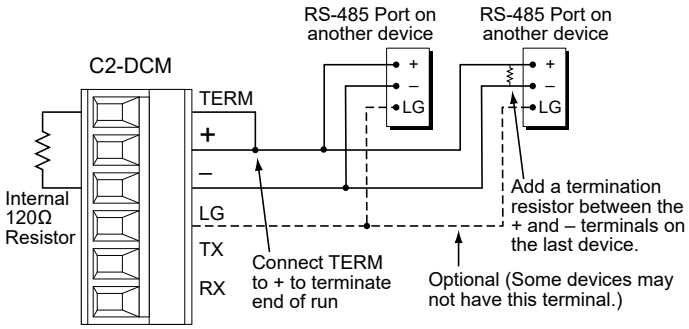
General Specifications	
Current Consumption at 24VDC	60mA max
Weight	41g

Terminal Block Specifications	
Connector Type	Pluggable Terminal Block
Number of Pins	6 (x2 terminal blocks)
Pitch	3.50 mm
Wire Size Range	22–26 AWG
Stripping Length	7.0 mm
Wire Specification	Lead-free, heat resistant, polyvinyl chloride insulated copper wire, rated over 80°C
Screw Thread	M2.0
Tightening Torque	1.7 lb-inch [0.19 N·m]
Recommended Cable	Shielded cable (AutomationDirect Q8105-1 or Q8302-1 recommended)

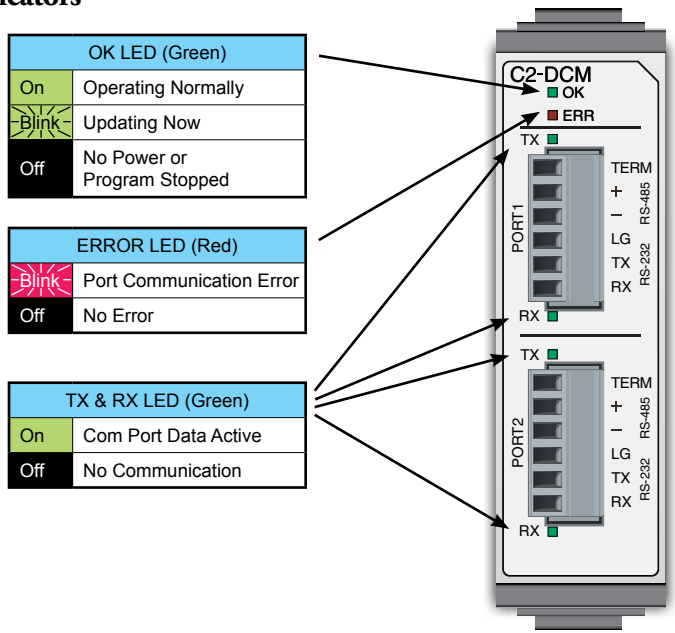
Wiring Diagrams



Port Pin Descriptions		
1	TERM	Internal 120Ω resistor
2	+	Signal A (RS-485)
3	-	Signal B (RS-485)
4	LG	Logic Ground
5	TX	RS-232 Transmit
6	RX	RS-232 Receive



LED Indicators



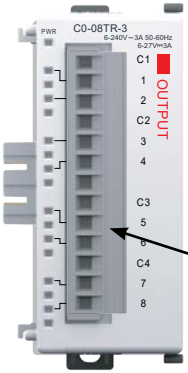
Stackable I/O Module Specifications

I/O Terminal Block Specifications for CPUs and I/O Modules



11-Pin Terminal Block, C0-8TB

11-pin Terminal Block Specifications	
Connector Type	Pluggable Terminal Block
Number of Pins	11 pt
Pitch	3.50 mm
Wire Range	28–16 AWG
Wire Strip Length	7mm
Screw Size	M2.0
Screw Torque	2.0 to 2.2 lb-inch
AutomationDirect Part Number	C0-8TB



13-Pin Terminal Block, C0-8TB-1

13-pin Terminal Block Specifications	
Connector Type	Pluggable Terminal Block
Number of Pins	13 pt
Pitch	5.08 mm
Wire Range	12–20 AWG
Wire Strip Length	7.0–8.0 mm
Screw Size	M2.5
Screw Torque	4.51 lb·inch
AutomationDirect Part Number	C0-8TB-1



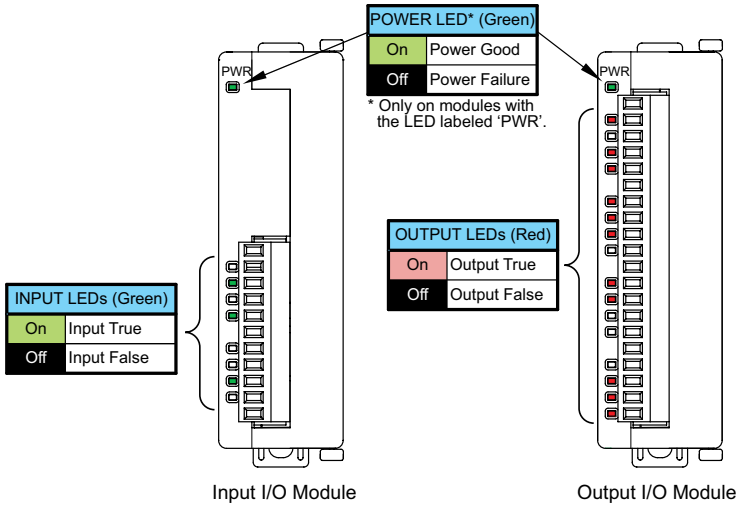
20-Pin Terminal Block, C0-16TB

20-pin Terminal Block Specifications	
Connector Type	Pluggable Terminal Block
Number of Pins	20 pt
Pitch	3.50 mm
Wire Range	28-16 AWG
Wire Strip Length	7mm
Screw Size	M2.0
Screw Torque	2.0 to 2.2 lb-inch
AutomationDirect Part Number	C0-16TB

LED Indicators

All CLICK Discrete I/O modules have an LED Power Indicator, PWR. When this LED is on, the I/O module is receiving 24VDC through the backplane connector. The input modules have green LEDs and the output modules have red LEDs respectively as the status indicator. When the LED is on, the I/O point is on.

I/O Module LED Status Indicators



C0-08SIM – 8-Point Toggle Switch Input Module

8-point toggle switch input module provides for simple simulation of system discrete inputs.



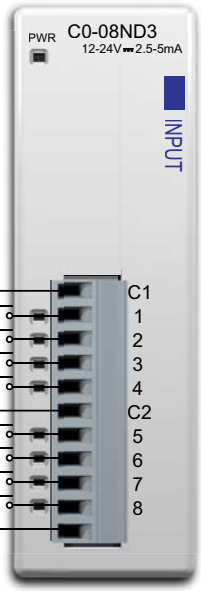
Input Specifications	
Inputs per Module	8 Toggle Switches
OFF to ON Response	Max 140ms, Typ 90ms
ON to OFF Response	Max 110ms, Typ 60ms
Status Indicators	Logic Side (8 points, green LED) Power Indicator (green LED)
Bus Power Required	Max. 50mA (All points ON)
Weight	2.9 oz (84g)

CAUTION

The C0-08SIM unit toggle switch can get hot when mounted in hot environment. Wear heat-resistant gloves before use, as it may cause burns.

C0-08ND3 – 8-Point Sink/Source DC Input Module

8-point 12–24 VDC current sinking or sourcing input module, 2 commons, isolated, removable terminal block included.

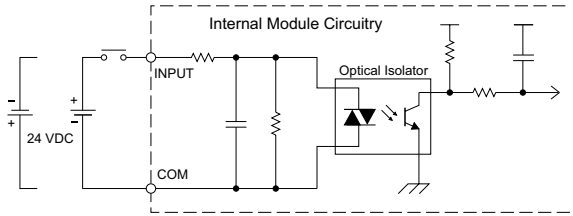


Wiring Diagram

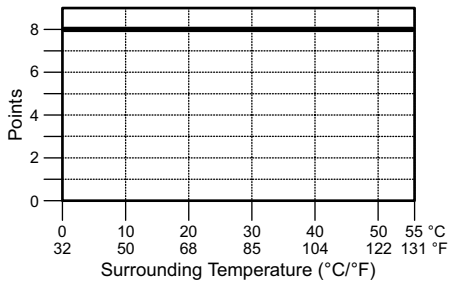
N.C. = Not Connected

Input Specifications	
Inputs per Module	8 (Sink/Source)
Operating Voltage Range	12–24 VDC
Input Voltage Range	10.8 – 26.4 VDC
Input Current	Typ 5mA @ 24VDC
Maximum Input Current	7mA @ 26.4 VDC
Input Impedance	4.7 kΩ @ 24VDC
ON Voltage Level	> 8.0 VDC
OFF Voltage Level	< 3.0 VDC
Minimum ON Current	1.4 mA
Maximum OFF Current	0.5 mA
OFF to ON Response	Max 3.5 ms, Typ 2ms
ON to OFF Response	Max 4 ms, Typ 2.5 ms
Status Indicators	Logic Side (8 points, green LED) Power Indicator (green LED)
Commons	2 (4 points/common) Isolated
Bus Power Required (24VDC)	Max. 30mA (All Inputs On)
Terminal Block Replacement	AutomationDirect p/n C0-8TB
Weight	2.8 oz (80g)

Equivalent Input Circuit



Input Module Temperature Derating Chart



***ZIP*Link Pre-Wired PLC Connection Cables and Modules for CLICK PLC**



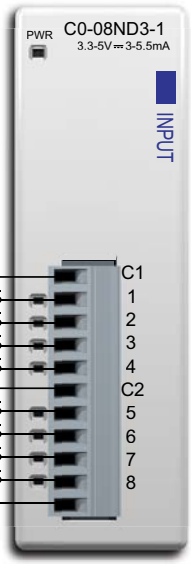
11-pin connector cable
ZL-C0-CBL11 (0.5 m length)
ZL-C0-CBL11-1 (1.0 m length)
ZL-C0-CBL11-2 (2.0 m length)



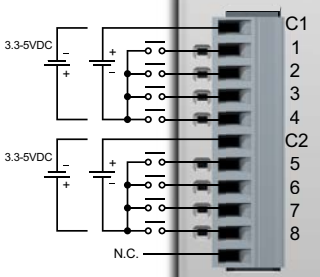
ZL-RTB20
20-pin feed-through connector module

C0-08ND3-1 – 8-Point Sink/Source DC Input Module

8-point 3.3–5 VDC current sinking or sourcing input module, 2 commons, isolated, removable terminal block included.



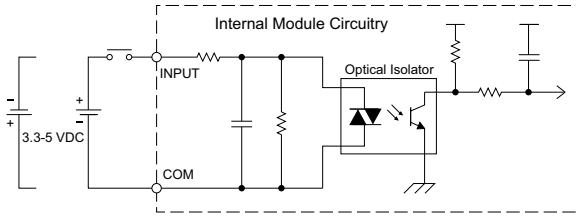
Wiring Diagram



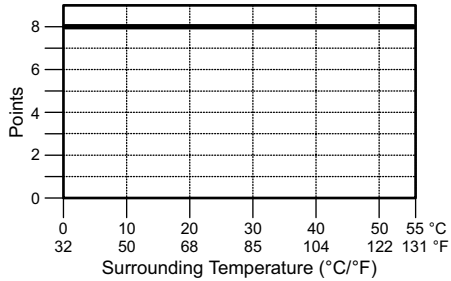
N.C. = Not Connected

Input Specifications	
Inputs per Module	8 (Sink/Source)
Operating Voltage Range	3.3–5 VDC
Input Voltage Range	2.8 – 5.5 VDC
Input Current	Typ 5.5 mA @ 5 VDC
Maximum Input Current	7.5 mA @ 5.5 VDC
Input Impedance	680 Ω
ON Voltage Level	> 2.2 VDC
OFF Voltage Level	< 0.8 VDC
Minimum ON Current	1.4 mA
Maximum OFF Current	0.2 mA
OFF to ON Response	Max. 3ms Typ. 1.6 ms
ON to OFF Response	Max. 4ms Typ. 2.3 ms
Status Indicators	Logic Side (8 points, green LED) Power Indicator (green LED)
Commons	2 (4 points/common) Isolated
Bus Power Required (24VDC)	Max. 30mA (All Inputs On)
Terminal Block Replacement	AutomationDirect p/n C0-8TB
Weight	2.8 oz (80g)

Equivalent Input Circuit



Input Module Temperature Derating Chart



***ZIP*Link Pre-Wired PLC Connection Cables and Modules for CLICK PLC**



11-pin connector cable
ZL-C0-CBL11 (0.5 m length)
ZL-C0-CBL11-1 (1.0 m length)
ZL-C0-CBL11-2 (2.0 m length)

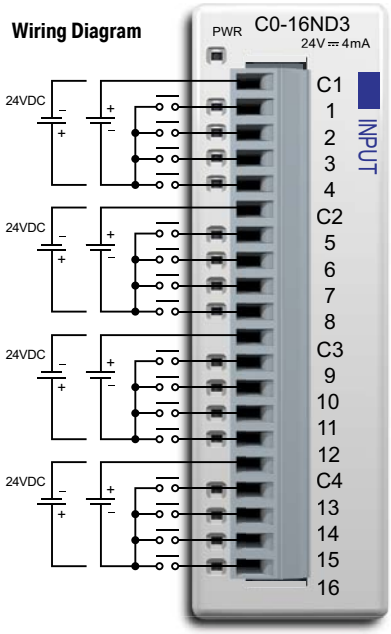


ZL-RTB20
20-pin feed-through connector module

C0-16ND3 – 16-Point Sink/Source DC Input Module

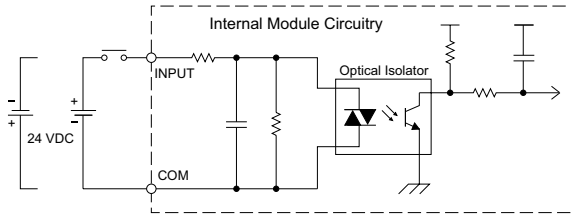
16-point 24VDC current sinking or sourcing input module, 4 commons, isolated, removable terminal block included.

Wiring Diagram

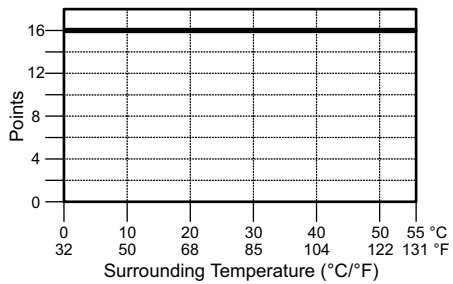


Input Specifications	
Inputs per Module	16 (Sink/Source)
Operating Voltage Range	24VDC
Input Voltage Range	21.6 – 26.4 VDC
Input Current	Typ 4.0 mA @ 24VDC
Maximum Input Current	5.0 mA @ 26.4 VDC
Input Impedance	6.8 kΩ @ 24VDC
ON Voltage Level	> 19VDC
OFF Voltage Level	< 7VDC
Minimum ON Current	3.5 mA
Maximum OFF Current	0.5 mA
OFF to ON Response	Max. 10ms Typ 2ms
ON to OFF Response	Max. 10ms Typ 3ms
Status Indicators	Logic Side (16 points, green LED) Power Indicator (green LED)
Commons	4 (4 points/common) Isolated
Bus Power Required (24VDC)	Max. 40 mA (All Inputs On)
Terminal Block Replacement	AutomationDirect p/n C0-16TB
Weight	3.2 oz (90g)

Equivalent Input Circuit



Input Module Temperature Derating Chart



***ZIP*Link Pre-Wired PLC Connection Cables and Modules for CLICK PLC**

20-pin connector cable
ZL-C0-CBL20 (0.5 m length)
ZL-C0-CBL20-1 (1.0 m length)
ZL-C0-CBL20-2 (2.0 m length)





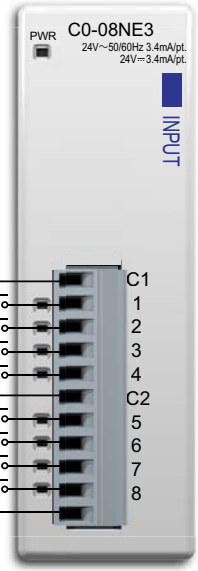
ZL-RTB20 20-pin feed-through connector module



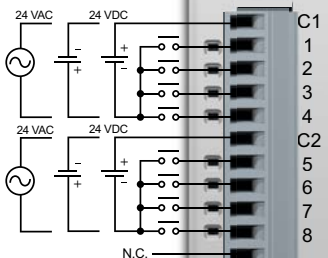
ZL-LTB16-24-1 sensor input module

C0-08NE3 – 8-Point Sink/Source AC/DC Input Module

8-point 24VAC / 24VDC current sinking or sourcing input module, 2 commons, 4 points per common, removable terminal block included.



Wiring Diagram

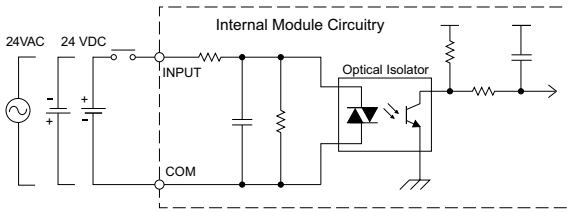


N.C. = Not Connected

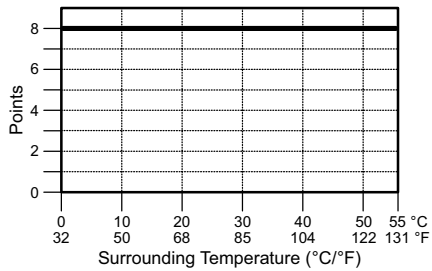
Input Specifications	
Inputs per Module	8 (Sink/Source)
Operating Voltage Range	24 VAC/VDC
Input Voltage Range	20.4 – 27.6 VAC/VDC
Peak Voltage	27.6 VAC/VDC
AC Frequency	47–63 Hz
Input Current	Typ 3.4 mA @ 24 VAC/VDC
Maximum Input Current	5.0 mA @ 27.6 VAC/VDC
Input Impedance	6.8 KΩ @ 24 VAC/VDC
ON Voltage Level	> 18.0 VAC/VDC
OFF Voltage Level	< 4.0 VAC/VDC
Minimum ON Current	2.5 mA
Maximum OFF Current	0.5 mA
OFF to ON Response	5–40 ms
ON to OFF Response	10–50 ms
Status Indicators	Logic Side (8 points, green LED) Power Indicator (green LED)
Commons	2 (4 points/common) Isolated
Bus Power Required (24VDC)	Max. 30mA (All Inputs On)
Terminal Block Replacement	AutomationDirect p/n C0-8TB
Weight	2.9 oz (82g)

NOTE: *When using this module you must also use CLICK programming software version V1.20 or later.*

Equivalent Input Circuit



Input Module Temperature Derating Chart



***ZIP*Link Pre-Wired PLC Connection Cables and Modules for CLICK PLC**



11-pin connector cable
ZL-C0-CBL11 (0.5 m length)
ZL-C0-CBL11-1 (1.0 m length)
ZL-C0-CBL11-2 (2.0 m length)

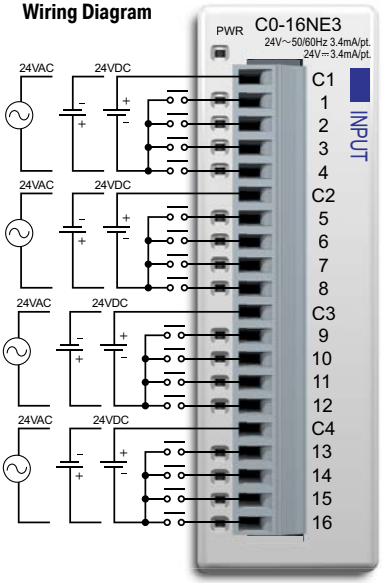


ZL-RTB20
20-pin feed-through connector module

C0-16NE3 – 16-Point Sink/Source AC/DC Input Module

16-point 24VAC / 24VDC current sinking or sourcing input module, 4 commons, 4 points per common, removable terminal block included.

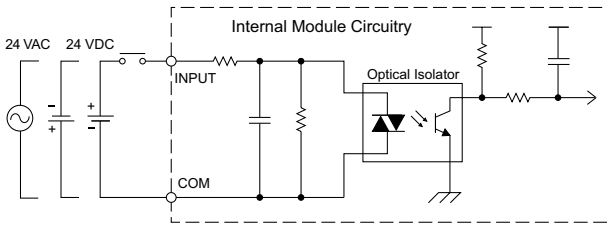
Wiring Diagram



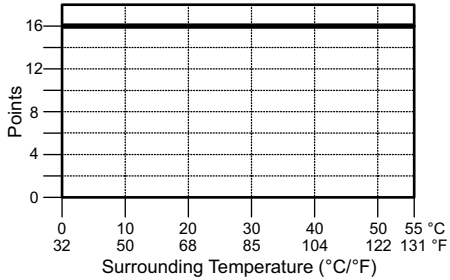
Input Specifications	
Inputs per Module	16 (Sink/Source)
Operating Voltage Range	24 VAC/VDC
Input Voltage Range	20.4 – 27.6 VAC/VDC
Peak Voltage	27.6 VAC/VDC
AC Frequency	47-63 Hz
Input Current	Typ 3.4 mA @ 24 VAC/VDC
Maximum Input Current	5.0 mA @ 27.6 VAC/VDC
Input Impedance	6.8 kΩ @ 24 VAC/VDC
ON Voltage Level	> 18.0 VAC/VDC
OFF Voltage Level	< 4.0 VAC/VDC
Minimum ON Current	2.5 mA
Maximum OFF Current	0.5 mA
OFF to ON Response	5–40 ms
ON to OFF Response	10–50 ms
Status Indicators	Logic Side (16 points, green LED) Power Indicator (green LED)
Commons	4 (4 points/common) Isolated
Bus Power Required (24VDC)	Max. 40mA (All Inputs On)
Terminal Block Replacement	AutomationDirect p/n C0-16TB
Weight	3.2 oz (90g)

NOTE: *When using this module you must also use CLICK programming software version V1.20 or later.*

Equivalent Input Circuit



Input Module Temperature Derating Chart



***ZIP*Link Pre-Wired PLC Connection Cables and Modules for CLICK PLC**



20-pin connector cable
ZL-C0-CBL20 (0.5 m length)
ZL-C0-CBL20-1 (1.0 m length)
ZL-C0-CBL20-2 (2.0 m length)



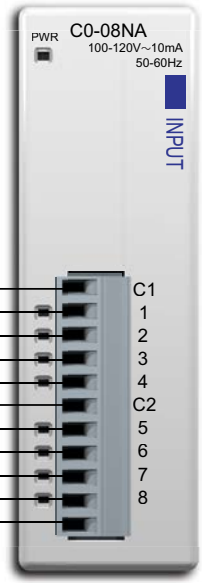
ZL-RTB20 20-pin feed-through connector module



ZL-LTB16-24-1 sensor input module

C0-08NA – 8-Point AC Input Module

8-point 100–120 VAC input module, 2 commons, isolated, removable terminal block included.

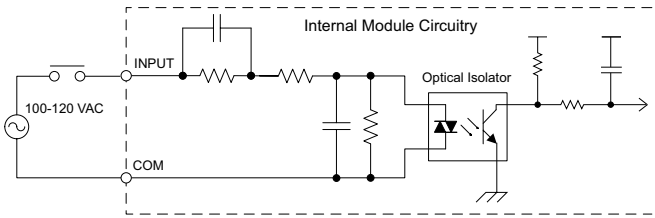


N.C. = Not Connected

Input Specifications	
Inputs per Module	8
Operating Voltage Range	100–120 VAC
Input Voltage Range	80–144 VAC
AC Frequency	47–63 Hz
Input Current	Typ 8.5 mA @ 100VAC (50Hz) Typ 10mA @ 100VAC (60Hz)
Maximum Input Current	16mA @ 144VAC
Input Impedance	15kΩ (50 Hz), 12kΩ (60Hz)
ON Voltage Level	> 70VAC
OFF Voltage Level	< 20VAC
Minimum ON Current	5mA
Maximum OFF Current	2mA
OFF to ON Response	< 40ms
ON to OFF Response	< 40ms
Status Indicators	Logic Side (8 points, green LED) Power Indicator (green LED)
Commons	2 (4 points/common) Isolated
Bus Power Required (24VDC)	Max. 30mA (All Inputs On)
Terminal Block Replacement	AutomationDirect p/n C0-8TB
Weight	2.8 oz (80g)

Wiring Diagram

Equivalent Input Circuit

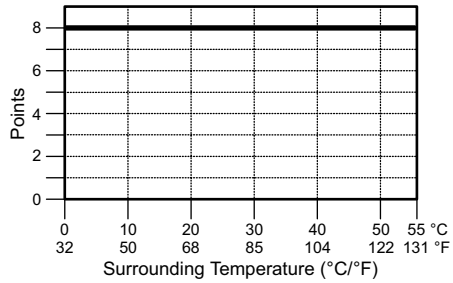


*ZIP*Link Pre-Wired PLC Connection Cables and Modules for CLICK PLC



11-pin connector cable
ZL-C0-CBL11 (0.5 m length)
ZL-C0-CBL11-1 (1.0 m length)
ZL-C0-CBL11-2 (2.0 m length)

Input Module Temperature Derating Chart

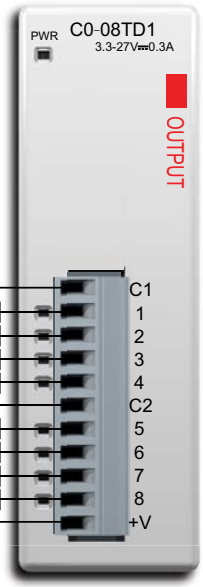




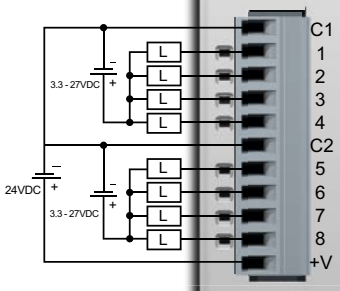
ZL-RTB20
20-pin feed-through connector module

C0-08TD1 – 8-Point Sinking DC Output Module

8-point 3.3–27 VDC current sinking output module, 2 commons, 0.3 A/pt, removable terminal block included.

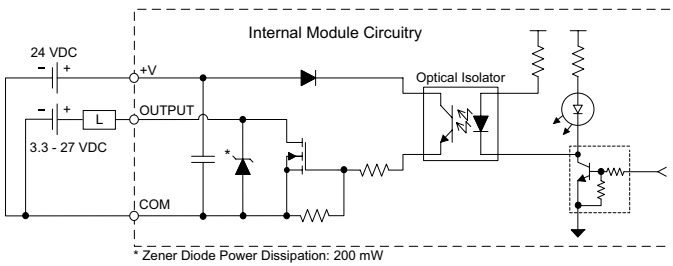


Wiring Diagram

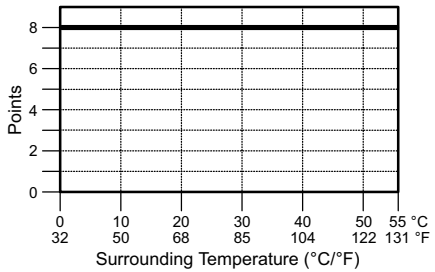


Output Specifications	
Outputs per Module	8 (Sink)
Operating Voltage Range	3.3–27 VDC
Output Voltage Range	2.8–30 VDC
Maximum Output Current	0.3 A/point , 1.2 A/common
Minimum Output Current	0.5 mA
Maximum Leakage Current	0.1 mA @ 30.0 VDC
On Voltage Drop	1.5 VDC @ 0.3 A
Maximum Inrush Current	1A for 10ms
OFF to ON Response	< 0.5 ms
ON to OFF Response	< 0.5 ms
Status Indicators	Logic Side (8 points, red LED) Power Indicator (green LED)
Commons	2 (4 points/common)
External DC Power Required	21.6 – 26.4 VDC Max 15mA (All Outputs On)
Bus Power Required (24VDC)	Max. 50mA (All Outputs On)
Terminal Block Replacement	AutomationDirect p/n C0-8TB
Weight	2.8 oz (80g)

Equivalent Output Circuit



Output Module Temperature Derating Chart



***ZIP*Link Pre-Wired PLC Connection Cables and Modules for CLICK PLC**



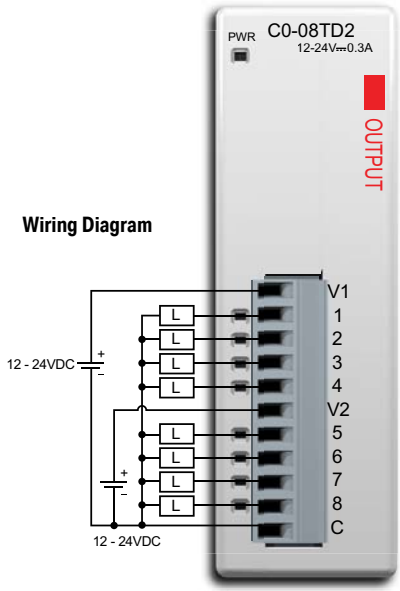
11-pin connector cable
ZL-C0-CBL11 (0.5 m length)
ZL-C0-CBL11-1 (1.0 m length)
ZL-C0-CBL11-2 (2.0 m length)



ZL-RTB20
20-pin feed-through connector module

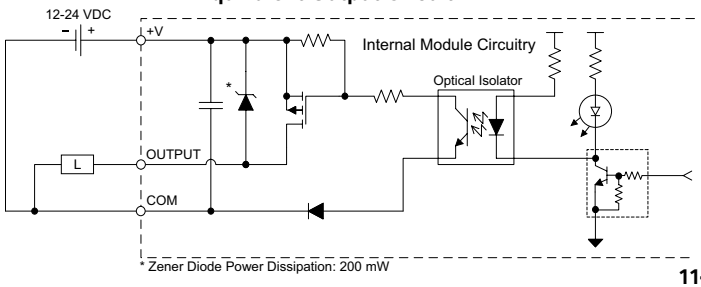
C0-08TD2 – 8-Point Sourcing DC Output Module

8-point 12–24VDC current sourcing output module, 1 common, 0.3 A/pt, removable terminal block included.

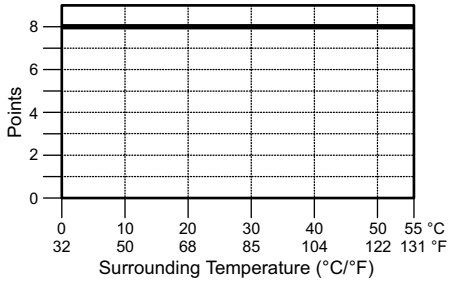


Output Specifications	
Outputs per Module	8 (Source)
Operating Voltage Range	12–24VDC
Output Voltage Range	9.6–30 VDC
Maximum Output Current	0.3 A/point , 1.2 A/common
Minimum Output Current	0.5 mA
Maximum Leakage Current	0.1 mA @ 30.0 VDC
On Voltage Drop	1.5 VDC @ 0.3 A
Maximum Inrush Current	1A for 10ms
OFF to ON Response	< 1ms
ON to OFF Response	< 1ms
Status Indicators	Logic Side (8 points, red LED) Power Indicator (green LED)
Commons	1 (8 points/common)
Bus Power Required (24VDC)	Max. 50mA (All Outputs On)
Terminal Block Replacement	AutomationDirect p/n C0-8TB
Weight	2.8 oz (80g)

Equivalent Output Circuit



Output Module Temperature Derating Chart



***ZIP*Link Pre-Wired PLC Connection Cables and Modules for CLICK PLC**



11-pin connector cable
ZL-C0-CBL11 (0.5 m length)
ZL-C0-CBL11-1 (1.0 m length)
ZL-C0-CBL11-2 (2.0 m length)

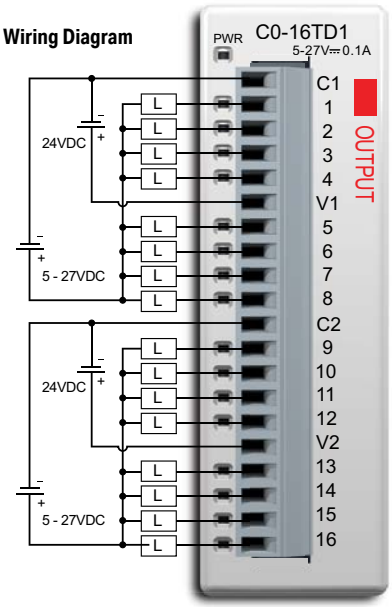


ZL-RTB20
20-pin feed-through connector module

C0-16TD1 – 16-Point Sinking DC Output Module

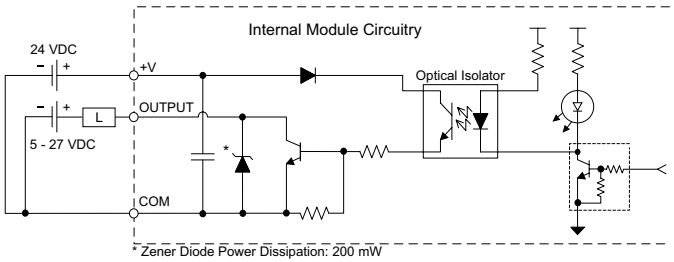
16-point 5–27 VDC current sinking output module, 2 commons, isolated, 0.1 A/pt, removable terminal block included.

Wiring Diagram



Output Specifications	
Outputs per Module	16 (Sink)
Operating Voltage Range	5–27 VDC
Output Voltage Range	4–30 VDC
Maximum Output Current	0.1 A/point , 0.8 A/common
Minimum Output Current	0.2 mA
Maximum Leakage Current	0.1 mA @ 30.0 VDC
On Voltage Drop	0.5 VDC @ 0.1 A
Maximum Inrush Current	150mA for 10ms
OFF to ON Response	< 0.5 ms
ON to OFF Response	< 0.5 ms
Status Indicators	Logic Side (16 points, red LED) Power Indicator (green LED)
Commons	2 (8 Points/common) Isolated
External DC Power Required	21.6 – 26.4 VDC Max 100mA (All Outputs On)
Bus Power Required (24VDC)	Max. 80mA (All Outputs On)
Terminal Block Replacement	AutomationDirect p/n C0-16TB
Weight	3.2 oz (90g)

Equivalent Output Circuit

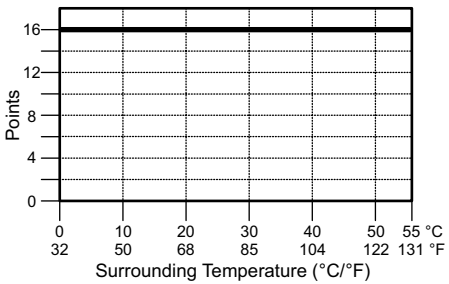


***ZIP*Link Pre-Wired PLC Connection Cables and Modules for CLICK PLC**



20-pin connector cable
ZL-C0-CBL20 (0.5 m length)
ZL-C0-CBL20-1 (1.0 m length)
ZL-C0-CBL20-2 (2.0 m length)

Output Module Temperature Derating Chart





ZL-RTB20 20-pin feed-through connector module



ZL-RFU20 fuse module

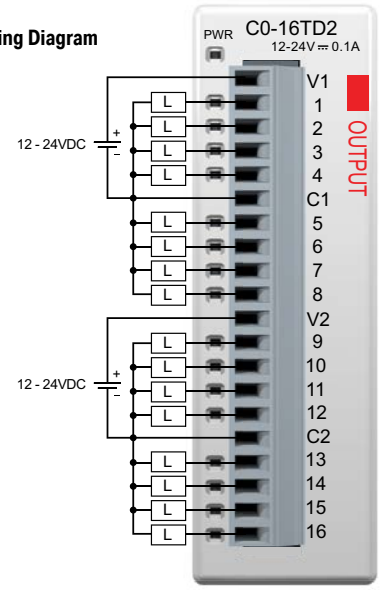


ZL-RRL16-24-1 relay module
Note: 10A/Point (DC)
8A/Point (AC)
(Replaceable relays)

C0-16TD2 – 16-Point Sourcing Output Module

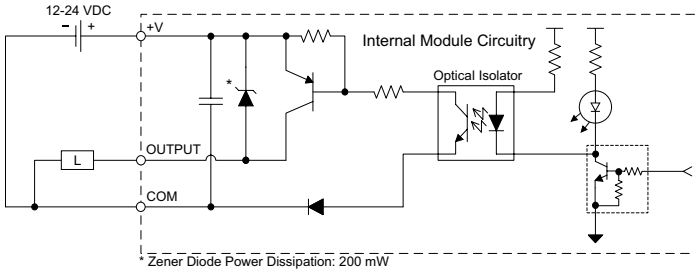
16-point 12–24 VDC current sourcing output module, 2 commons, isolated, 0.1 A/pt, removable terminal block included.

Wiring Diagram



Output Specifications	
Outputs per Module	16 (Source)
Operating Voltage Range	12–24VDC
Output Voltage Range	9.6 – 30.0 VDC
Maximum Output Current	0.1 A/point , 0.8 A/common
Minimum Output Current	0.2 mA
Maximum Leakage Current	0.1 mA @ 30.0 VDC
On Voltage Drop	0.6 VDC @ 0.1 A
Maximum Inrush Current	150mA for 10ms
OFF to ON Response	< 0.5 ms
ON to OFF Response	< 0.5 ms
Status Indicators	Logic Side (16 points, red LED) Power Indicator (green LED)
Commons	2 (8 points/common) Isolated
Bus Power Required (24VDC)	Max. 80mA (All Outputs On)
Terminal Block Replacement	AutomationDirect p/n C0-16TB
Weight	3.2 oz (90g)

Equivalent Output Circuit

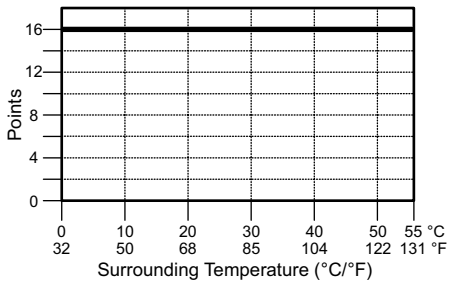


***ZIP*Link Pre-Wired PLC Connection Cables and Modules for CLICK PLC**



20-pin connector cable
ZL-C0-CBL20 (0.5 m length)
ZL-C0-CBL20-1 (1.0 m length)
ZL-C0-CBL20-2 (2.0 m length)

Output Module Temperature Derating Chart





ZL-RTB20 20-pin feed-through connector module



ZL-RFU20 fuse module

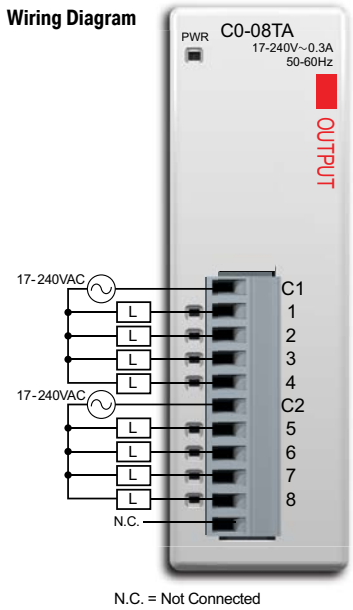


ZL-RRL16-24-2 relay module
Note: 10A/Point (DC)
8A/Point (AC)
(Replaceable relays)

C0-08TA – 8-Point AC Output Module

8-point 17-240 VAC triac output module, 2 commons, isolated, 0.3 A/pt, removable terminal block included.

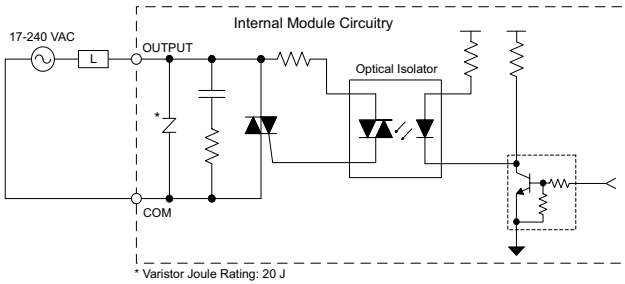
Wiring Diagram



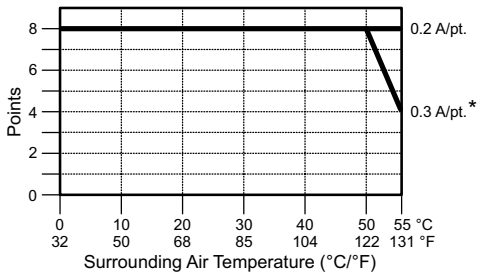
N.C. = Not Connected

Output Specifications	
Outputs per Module	8
Operating Voltage Range	17–240 VAC
Output Voltage Range	13.5–288 VAC
AC Frequency	47–63 Hz
Maximum Output Current	0.3 A/point, 1.2 A/common
Minimum Load	10mA
Maximum Leakage Current	4mA @ 288 VAC
On Voltage Drop	1.5 VAC @ > 0.1 A 3.0 VAC @ < 0.1 A
Maximum Inrush Current	10A for 10ms
OFF to ON Response	1ms
ON to OFF Response	1ms + 1/2 cycle
Status Indicators	Logic Side (8 points, red LED) Power Indicator (green LED)
Commons	2 (4 points/common) Isolated
Bus Power Required (24VDC)	Max. 80mA (All Outputs On)
Protection Circuit	Not built into the module - Install protection elements such as external fuse.
Terminal Block Replacement	AutomationDirect p/n C0-8TB
Weight	3.5 oz (100g)

Equivalent Output Circuit



Output Temperature Derating Chart



* Use every other output.

***ZIP*Link Pre-Wired PLC Connection Cables and Modules for CLICK PLC**



11-pin connector cable
ZL-C0-CBL11 (0.5 m length)
ZL-C0-CBL11-1 (1.0 m length)
ZL-C0-CBL11-2 (2.0 m length)

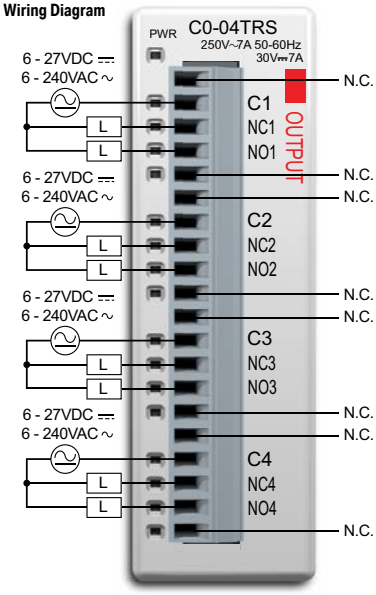


ZL-RTB20
20-pin feed-through connector module

C0-04TRS – 4-Point Relay Output Module

4-point 6–240 VAC / 6–27 VDC Isolated relay output module, 4 Form C (SPDT) relays, 4 isolated commons, 7 A/point, removable terminal block included.

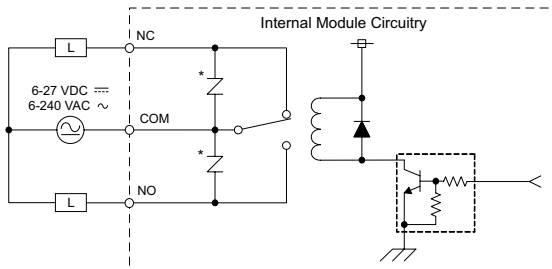
Wiring Diagram



N.C. = Not Connected

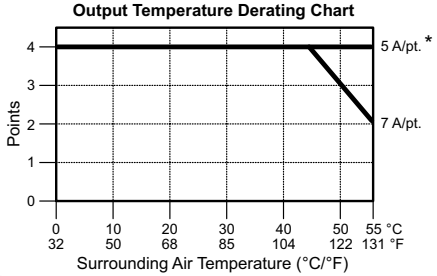
Output Specifications	
Outputs per Module	4
Operating Voltage Range	6–27 VDC / 6–240 VAC
Output Voltage Range	5–30 VDC / 5–264 VAC
Output Type	Relay, form C (SPDT)
AC Frequency	47–63 Hz
Maximum Current	7A / point, 7A / common
Minimum Load Current	100mA @ 5VDC
Maximum Leakage Current	0.1 mA @ 264VAC
Maximum Inrush Current	12A
OFF to ON Response	< 15ms
ON to OFF Response	< 15ms
Status Indicators	Logic Side (4 points, red LED) Power Indicator (green LED)
Commons	4 (1 point/common) Isolated
Bus Power Required (24VDC)	Max. 100mA (All Outputs On)
Protection Circuit	Not built into the module - Install protection elements such as external fuse.
Terminal Block Replacement	AutomationDirect p/n C0-16TB
Weight	4.4 oz (125g)

Equivalent Output Circuit



* Varistor Joule Rating: 20 J

Output Temperature Derating Chart



* No derating when the load current is 5A or less for each output point.

Typical Relay Life (Operations) at Room Temperature	
Voltage & Load Type	**Relay Life**
30VDC, 7A Resistive	100,000 cycles
250VAC, 7A Resistive	100,000 cycles
250VAC, 4.9 A Solenoid	90,000 cycles
250VAC, 2.9 A Solenoid	100,000 cycles
ON to OFF = 1 cycle	

NOTE: *The C0-04TRS relay output module is derated to 2A per point maximum when used with the ZIPLink wiring system.*

***ZIP*Link Pre-Wired PLC Connection Cables and Modules for CLICK PLC**



20-pin connector cable
ZL-C0-CBL20 (0.5 m length)
ZL-C0-CBL20-1 (1.0 m length)
ZL-C0-CBL20-2 (2.0 m length)

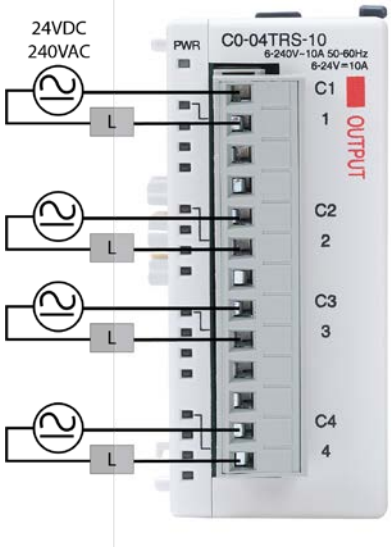


ZL-RTB20
20-pin feed-through connector module

C0-04TRS-10 – 4-Point Relay Output Module

4-point 6–240 VAC / 6–24 VDC Isolated relay output module, 4 Form A (SPST) relays, 4 isolated commons, 10A/point, removable terminal block included.

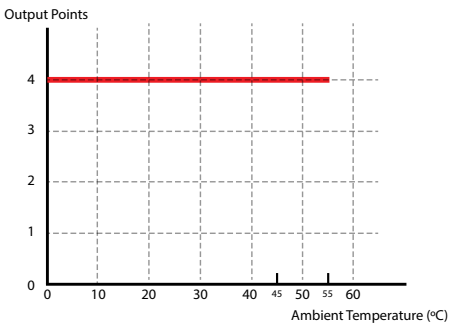
Wiring Diagram



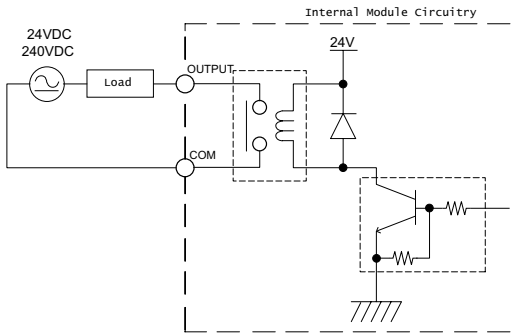
Output Specifications	
Outputs per Module	4
Operating Voltage Range	6–24 VDC / 6–240 VAC
Peak Voltage	24VDC / 264VAC
Output Type	Relay, form A (SPST)
AC Frequency	47–63 Hz
Maximum Current	10A / point, 10A / common
Minimum Load Current	100mA @ 5VDC
Maximum Inrush Current	16A for 10ms
OFF to ON Response	< 15ms
ON to OFF Response	< 15ms
Status Indicators	Logic Side (4 points, red LED) Power Indicator (green LED)
Commons	4 (1 point/common) Isolated
Bus Power Required (24VDC)	Max. 120mA (All Outputs On)
Protection Circuit	Not built into the module - Install protection elements such as external fuse.
Terminal Block Replacement	AutomationDirect p/n C0-8TB-1
Weight	5.22 oz (148g)

Typical Relay Life (Operations) at Room Temperature	
Voltage & Load Type	Relay Life
24VDC, 10A Resistive	120,000 cycles
24VDC, 10A Inductive	60,000 cycles
110VAC, 10A Resistive	120,000 cycles
110VAC, 10A Inductive	35,000 cycles
220VAC, 10A Resistive	120,000 cycles
220VAC, 10A Inductive	35,000 cycles
ON to OFF = 1 cycle	

Output Temperature Derating Chart



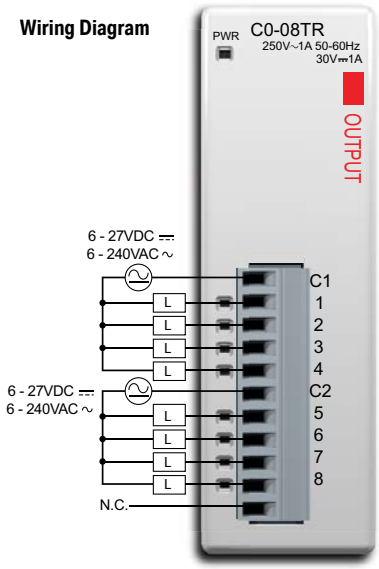
Equivalent Output Circuit



C0-08TR – 8-Point Relay Output Module

8-point 6–240 VAC /6–27 VDC relay output module, 8 Form A (SPST) relays, 2 commons, isolated, 4 A/common, removable terminal block included.

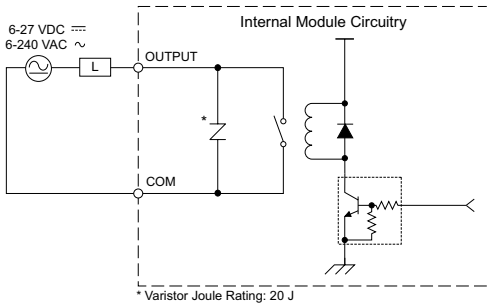
Wiring Diagram



N.C. = Not Connected

Output Specifications	
Outputs per Module	8
Operating Voltage Range	6–27 VDC / 6–240 VAC
Output Voltage Range	5–30 VDC / 5–264 VAC
Output Type	Relay, form A (SPST)
AC Frequency	47–63 Hz
Maximum Current (resistive)	1A /point, 4A /common
Minimum Load Current	5mA @ 5VDC
Maximum Leakage Current	0.1 mA @ 264VAC
Maximum Inrush Current	3A for 10ms
OFF to ON Response	< 15ms
ON to OFF Response	< 15ms
Status Indicators	Logic Side (8 points, red LED) Power Indicator (green LED)
Commons	2 (4 points/common) Isolated
Bus Power Required (24VDC)	Max. 100mA (All Outputs On)
Protection Circuit	Not built into the module - Install protection elements such as external fuse.
Terminal Block Replacement	AutomationDirect p/n C0-8TB
Weight	3.9 oz (110g)

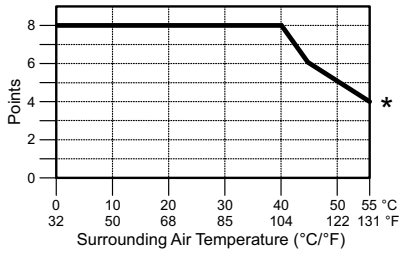
Equivalent Output Circuit



* Varistor Joule Rating: 20 J

Typical Relay Life (Operations) at Room Temperature	
Voltage & Load Type	Relay Life
30VDC, 1A Resistive	300,000 cycles
30VDC, 1A Solenoid	50,000 cycles
250VAC, 1A Resistive	500,000 cycles
250VAC, 1A Solenoid	200,000 cycles
ON to OFF = 1 cycle	

Output Temperature Derating Chart



* Use every other output.

***ZIP*Link Pre-Wired PLC Connection Cables and Modules for CLICK PLC**



11-pin connector cable
ZL-C0-CBL11 (0.5 m length)
ZL-C0-CBL11-1 (1.0 m length)
ZL-C0-CBL11-2 (2.0 m length)

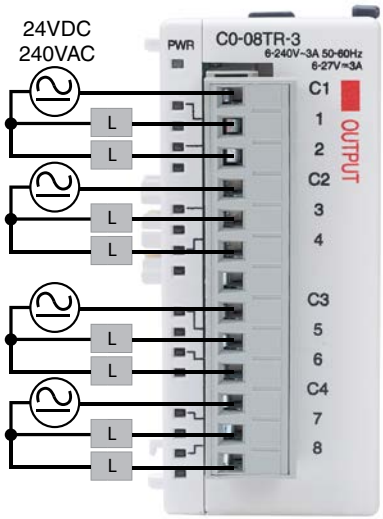


ZL-RTB20
20-pin feed-through connector module

C0-08TR-3 – 8-Point Relay Output Module

8-point 6–240 VAC /6–27 VDC relay output module, 8 Form A (SPST) relays, 4 commons, isolated, 3A/point, removable terminal block included.

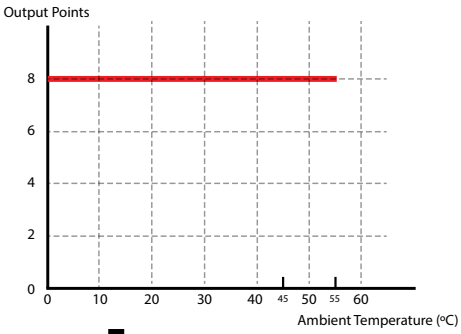
Wiring Diagram



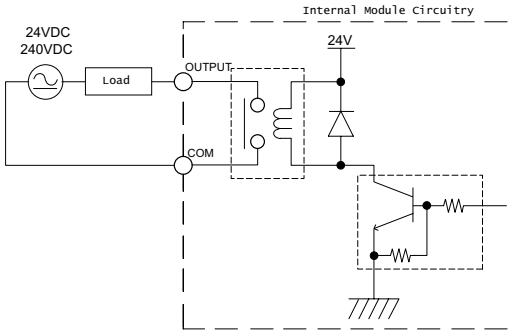
Output Specifications	
Outputs per Module	8
Operating Voltage Range	6–27 VDC / 6–240 VAC
Peak Voltage	30 VDC / 264 VAC
Output Type	Relay, form A (SPST)
AC Frequency	47–63 Hz
Maximum Current (resistive)	3A /point, 6A /common
Minimum Load Current	5mA @ 5VDC
Maximum Inrush Current	5A for 10ms
OFF to ON Response	< 15ms
ON to OFF Response	< 15ms
Status Indicators	Logic Side (8 points, red LED) Power Indicator (green LED)
Commons	4 (2 points/common) Isolated
Bus Power Required (24VDC)	Max. 90mA (All Outputs ON)
Protection Circuit	Not built into the module - Install protection elements such as external fuse.
Terminal Block Replacement	AutomationDirect p/n C0-8TB-1
Weight	4.12 oz (117g)

Typical Relay Life (Operations) at Room Temperature	
Voltage & Load Type	Relay Life
24VDC, 3A Resistive	100,000 cycles
24VDC, 3A Inductive	50,000 cycles
110VAC, 3A Resistive	100,000 cycles
110VAC, 3A Inductive	25,000 cycles
220VAC, 3A Resistive	100,000 cycles
220VAC, 3A Inductive	25,000 cycles
ON to OFF = 1 cycle	

Output Temperature Derating Chart



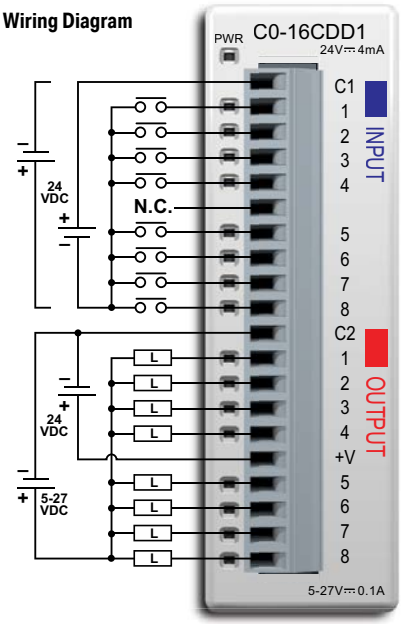
Equivalent Output Circuit



C0-16CDD1 – 8-Point DC Input and 8-Point DC Sinking Output Module

8-point 24VDC current sinking/sourcing input, 1 common, 8-point 5–27 VDC sinking output, 0.1A/pt., 1 common, non-fused, removable terminal block included.

Wiring Diagram



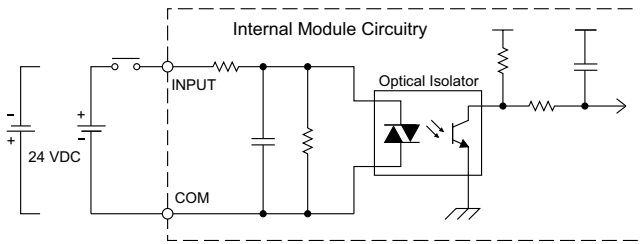
N.C. = Not Connected

Input Specifications	
Inputs per Module	8 (Source/Sink)
Operating Voltage Range	CE: 24VDC (-10%/+10%) UL: 24VDC (-10%/+10%)
Input Voltage Range	21.6 – 26.4 VDC
Input Current	Typ 4.0 mA @ 24VDC
Maximum Input Current	5.0 mA @ 26.4 VDC
Input Impedance	6.8 kΩ @ 24VDC
ON Voltage Level	>19.0 VDC
OFF Voltage Level	<7.0 VDC
Minimum ON Current	3.5 mA
Maximum OFF Current	0.5 mA
OFF to ON Response	Max. 10ms Typ 2ms
ON to OFF Response	Max. 10ms Typ 3ms
Status Indicators	Logic Side (8 points, green LED) Power Indicator (green LED)
Commons	1 (8 points/common)

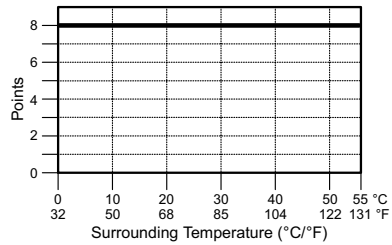
General Specifications	
Bus Power Required (24VDC)	Max. 80mA (all points on)
Terminal Block Replacement	AutomationDirect p/n C0-16TB
Weight	3.2 oz (90g)

NOTE: *When using this module you must also use CLICK programming software and PLC firmware version V1.40 or later.*

Equivalent Input Circuit



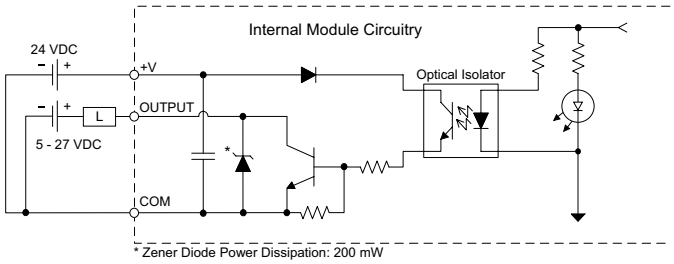
Input Module Temperature Derating Chart



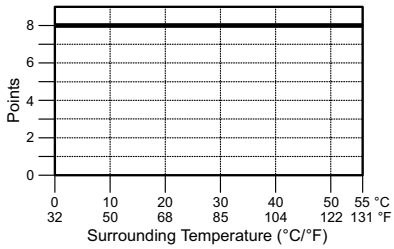
C0-16CDD1 (continued)

Output Specifications	
Outputs per Module	8 (sink)
Operating Voltage Range	CE: 5–24 VDC (-15%/+20%) UL: 5–27 VDC (-15%/+20%)
Output Voltage Range	4–30 VDC
Maximum Output Current	0.1 A/point, 0.8 A/common
Minimum Output Current	0.2 mA
Maximum Leakage Current	0.1 mA @ 30VDC
On Voltage Drop	0.5 VDC @ 0.1 A
Maximum Inrush Current	0.15 A for 10ms
OFF to ON Response	< 0.5 ms
ON to OFF Response	< 0.5 ms
Status Indicators	Logic Side (8 points, red LED)
Commons	1 (8 points/common)
External DC Power Required	24VDC (-10%/+10%) max. 50mA (all points on)

Equivalent Output Circuit



Output Module Temperature Derating Chart



***ZIP*Link Pre-Wired PLC Connection Cables and Modules for CLICK PLC**



ZL-RTB20
20-pin feed-through connector module

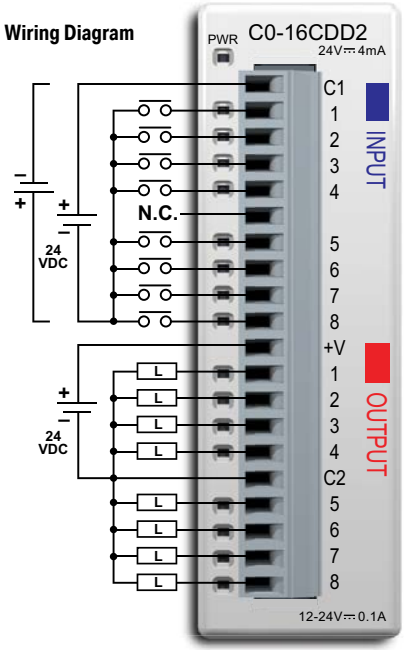
20-pin connector cable
ZL-C0-CBL20 (0.5 m length)
ZL-C0-CBL20-1 (1.0 m length)
ZL-C0-CBL20-2 (2.0 m length)



C0-16CDD2 – 8-Point DC Input and 8-Point DC Sourcing Output Module

8-point 24VDC current sinking/sourcing input, 1 common, 8-point 12–24 VDC sourcing output, 0.1A/pt, 1 common, non-fused, removable terminal block included.

Wiring Diagram



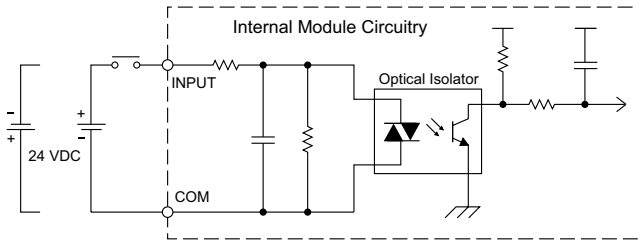
N.C. = Not Connected

Input Specifications	
Inputs per Module	8 (source/sink)
Operating Voltage Range	CE: 24VDC (-10%/+10%) UL: 24VDC (-10%/+10%)
Input Voltage Range	21.6 – 26.4 VDC
Input Current	Typ 4.0 mA @ 24VDC
Maximum Input Current	5.0 mA @ 26.4 VDC
Input Impedance	6.8 kΩ @ 24VDC
ON Voltage Level	>19.0 VDC
OFF Voltage Level	<7.0 VDC
Minimum ON Current	3.5 mA
Maximum OFF Current	0.5 mA
OFF to ON Response	Max. 10ms Typ 2ms
ON to OFF Response	Max. 10ms Typ 3ms
Status Indicators	Logic Side (8 points, green LED) Power Indicator (green LED)
Commons	1 (8 points/common)

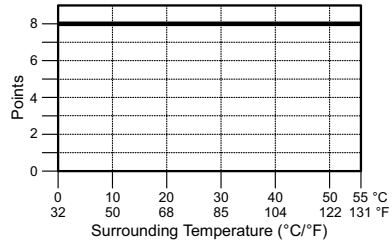
General Specifications	
Bus Power Required (24VDC)	Max. 80mA (all points on)
Terminal Block Replacement	AutomationDirect p/n C0-16TB
Weight	3.2 oz (90g)

NOTE: *When using this module you must also use CLICK programming software and PLC firmware version V1.40 or later.*

Equivalent Input Circuit



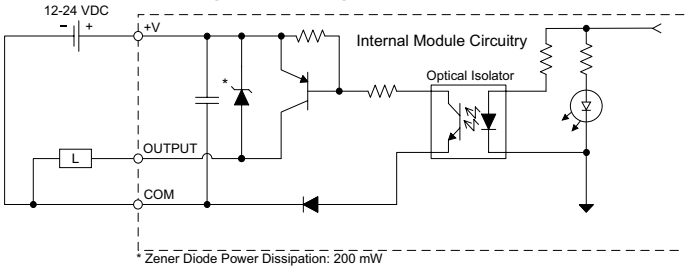
Input Module Temperature Derating Chart



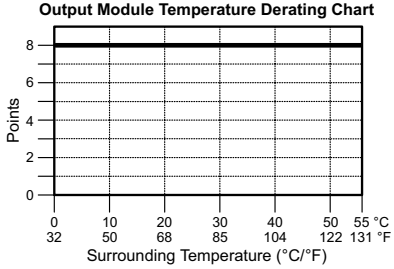
C0-16CDD2 (continued)

Output Specifications	
Outputs per Module	8 (Source)
Operating Voltage Range	CE: 12–24 VDC (-15%/+20%) UL: 12–24 VDC (-20%/+25%)
Output Voltage Range	9.6–30 VDC
Maximum Output Current	0.1 A/point , 0.8 A/common
Minimum Output Current	0.2 mA
Maximum Leakage Current	0.1 mA @ 30VDC
On Voltage Drop	0.6 VDC @ 0.1 A
Maximum Inrush Current	0.15 A for 10ms
OFF to ON Response	<0.5 ms
ON to OFF Response	<0.5 ms
Status Indicators	Logic Side (8 points, red LED)
Commons	1 (8 points/common)

Equivalent Output Circuit



Output Module Temperature Derating Chart



***ZIP*Link Pre-Wired PLC Connection Cables and Modules for CLICK PLC**



ZL-RTB20
20-pin feed-through connector module

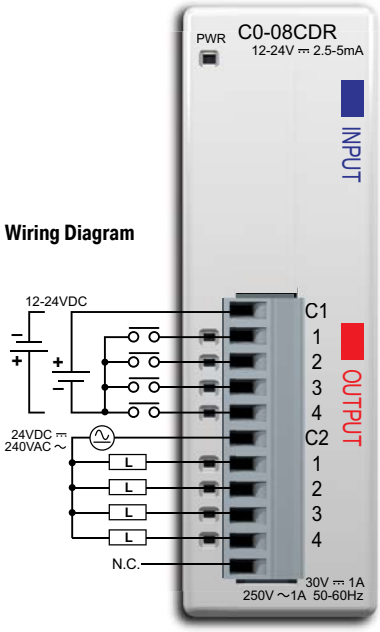
20-pin connector cable
ZL-C0-CBL20 (0.5 m length)
ZL-C0-CBL20-1 (1.0 m length)
ZL-C0-CBL20-2 (2.0 m length)



C0-08CDR – 4-Point DC Input and 4-Point Relay Output Module

4-point 12–24 VDC current sinking/sourcing input, 1 common, 4-point 6.25–24 VDC / 6–240 VAC relay output, Form A (SPST) relays 1A/pt, 1 common, non-fused, removable terminal block included.

Wiring Diagram



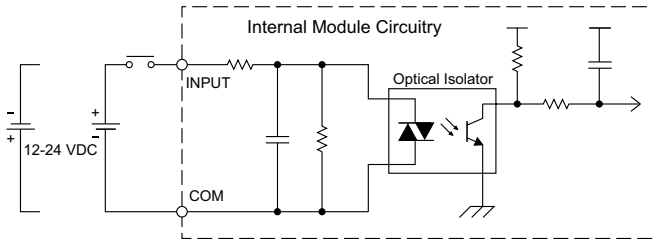
N.C. = Not Connected

Input Specifications	
Inputs per Module	4 (source/sink)
Operating Voltage Range	CE: 12–24 VDC (-10%/+10%) UL: 12–24 VDC (-10%/+10%)
Input Voltage Range	10.8 – 26.4 VDC
Input Current	Typ 5.0 mA @ 24VDC
Maximum Input Current	7.0 mA @ 26.4 VDC
Input Impedance	4.7 kΩ @ 24VDC
ON Voltage Level	>8.0 VDC
OFF Voltage Level	<3.0 VDC
Minimum ON Current	1.4 mA
Maximum OFF Current	0.5 mA
OFF to ON Response	Max. 3.5 ms Typ 2ms
ON to OFF Response	Max. 4ms Typ 2.5 ms
Status Indicators	Logic Side (4 points, green LED) Power Indicator (green LED)
Commons	1 (4 points/common)

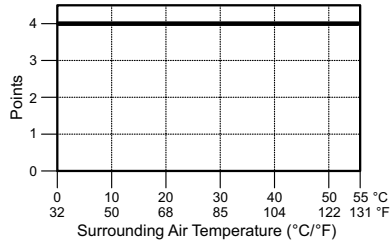
General Specifications	
Bus Power Required (24VDC)	Max. 80mA (all points on)
Protection Circuit	Not built into the module - Install protection elements such as external fuse
Terminal Block Replacement	AutomationDirect p/n C0-8TB
Weight	3.2 oz (90g)

NOTE: *When using this module you must also use CLICK programming software and PLC firmware version V1.40 or later.*

Equivalent Input Circuit



Input Temperature Derating Chart



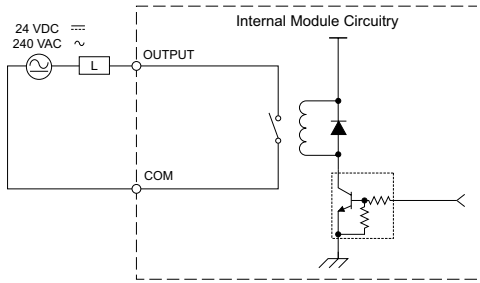
C0-08CDR (continued)

Output Specifications	
Outputs per Module	4 (Relay)
Operating Voltage Range	CE: 6.25–24 VDC (-15%/+10%) / 6–240 VAC (-15%/+10%) UL: 24VDC (-15%/+10%) / 240VAC (-10%/+10%)
Peak Voltage	30VDC / 264VAC
Output Type	Relay, Form A (SPST)
AC Frequency	47–63 Hz
Maximum Current	1A /point, 4 A/common
Minimum Load Current	5mA @ 5VDC
Maximum Leakage Current	0.1 mA @ 264VAC
Maximum Inrush Current	3A for 10ms
OFF to ON Response	<15ms
ON to OFF Response	<15ms
Status Indicators	Logic Side (4 points, red LED)
Commons	1 (4 points/common)

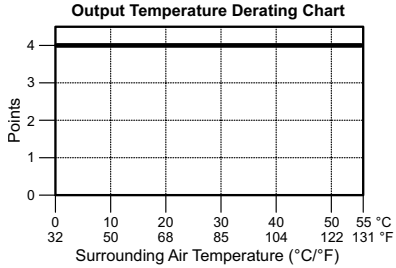
Typical Relay Life (Operations) at Room Temperature	
Voltage & Load Type*	Relay Life (ON to OFF = 1 cycle)
30VDC, 1A, Resistive	80,000 cycles
30VDC, 1A, Solenoid	80,000 cycles
250VAC, 1A, Resistive	80,000 cycles
250VAC, 1A, Solenoid	80,000 cycles

** These relay outputs support both inductive (solenoid) and resistive loads.*

Equivalent Output Circuit



Output Temperature Derating Chart



***ZIP*Link Pre-Wired PLC Connection Cables and Modules for CLICK PLC**



ZL-RTB20
20-pin feed-through connector module

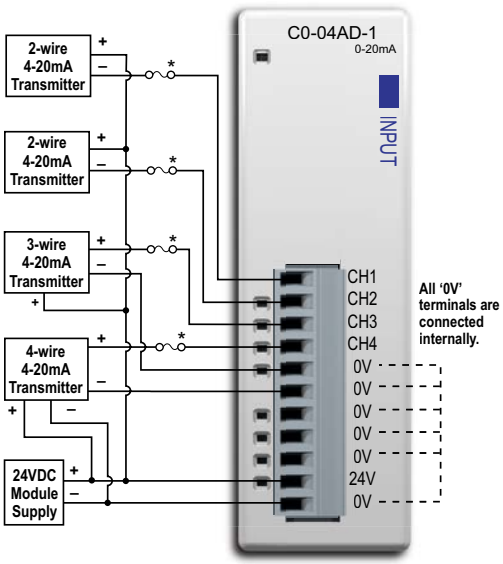


11-pin connector cable
ZL-C0-CBL11 (0.5 m length)
ZL-C0-CBL11-1 (1.0 m length)
ZL-C0-CBL11-2 (2.0 m length)

C0-04AD-1 – 4-Channel Analog Current Input Module

4-channel analog current sinking input module, 13-bit resolution, range: 0–20 mA. External 24VDC power required, removable terminal block included.

Wiring Diagram



NOTE: *When using this module you must also use CLICK programming software and PLC firmware version V1.40 or later.*

Input Specifications	
Inputs per Module	4
Input Range	0–20 mA (sink)
Resolution	13-bit, 2.44 uA/count
Input Type	Single ended (one common)
Maximum Continuous Overload	±44mA
Input Impedance	124Ω, 0.5 W current input
Filter Characteristics	Low pass, -3 dB at 120Hz
Sample Duration Time	2ms
All Channel Update Rate	25ms
Open Circuit Detection Time	Zero reading within 100ms
Accuracy vs. Temperature	±75 PPM/°C maximum
Maximum Inaccuracy	0.5% of range (including temperature changes)
Linearity Error (End to End)	±3 count maximum, monotonic with no missing codes
Input Stability and Repeatability	±2 count maximum
Full Scale Calibration Error (including Offset)	±8 count maximum
Offset Calibration Error	±8 count maximum
Maximum Crosstalk at DC, 50/60 Hz	±2 count maximum
Field to Logic Side Isolation	1800VAC for 1 sec.
Recommended Fuse (external)	AutomationDirect p/n S500-32-R (0.032A fuse)
External 24VDC Power Required	65mA
Bus Power Required (24VDC)	20mA
Terminal Block Replacement	AutomationDirect p/n C0-8TB
Weight	2.9 oz (82g)

***ZIP*Link Pre-Wired PLC Connection Cables and Modules for CLICK PLC**



ZL-RTB20 20-pin feed-through connector module

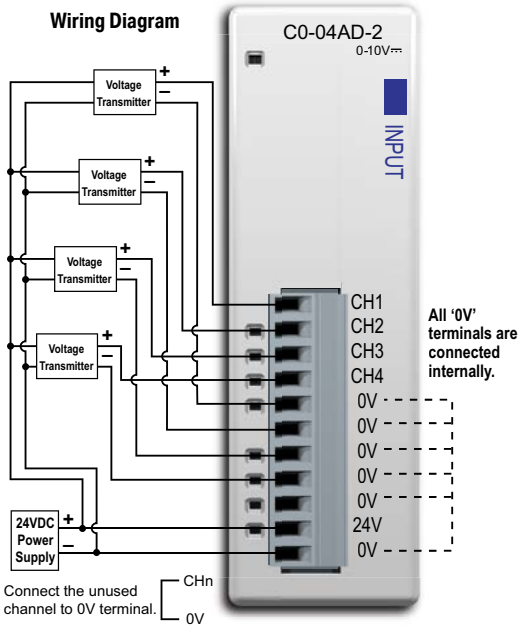


11-pin connector cable
ZL-C0-CBL11 (0.5 m length)
ZL-C0-CBL11-1 (1.0 m length)
ZL-C0-CBL11-2 (2.0 m length)

C0-04AD-2 – 4-Channel Analog Voltage Input Module

4-channel analog voltage input module, 13-bit resolution, range: 0–10V. External 24VDC power required, removable terminal block included.

Wiring Diagram



Input Specifications	
Inputs per Module	4
Input Range	0–10 V
Resolution	13-bit, 1.22 mV per count
Input Type	Single ended (one common)
Maximum Continuous Overload	±100VDC
Input Impedance	>150kΩ
Filter Characteristics	Low pass, -3 dB at 500Hz
Sample Duration Time	6.25 ms
All Channel Update Rate	25ms
Open Circuit Detection Time	Zero reading within 100 ms
Accuracy vs. Temperature	±75 PPM/°C maximum
Maximum Inaccuracy	0.5% of range (including temperature changes)
Linearity Error (End to End)	±3 count maximum, monotonic with no missing codes
Input Stability and Repeatability	±2 count maximum
Full Scale Calibration Error (Including Offset)	±8 count maximum
Offset Calibration Error	±8 count maximum
Maximum Crosstalk at DC, 50/60 Hz	±2 count maximum
Field to Logic Side Isolation	1800VAC for 1 sec.
External 24VDC Power Required	65mA
Base Power Required (24VDC)	23mA
Terminal Block Replacement	AutomationDirect p/n C0-8TB
Weight	2.9 oz (82g)

NOTE: When using this module you must also use CLICK programming software and PLC firmware version V1.40 or later.

***ZIP*Link Pre-Wired PLC Connection Cables and Modules for CLICK PLC**



ZL-RTB20 20-pin feed-through connector module

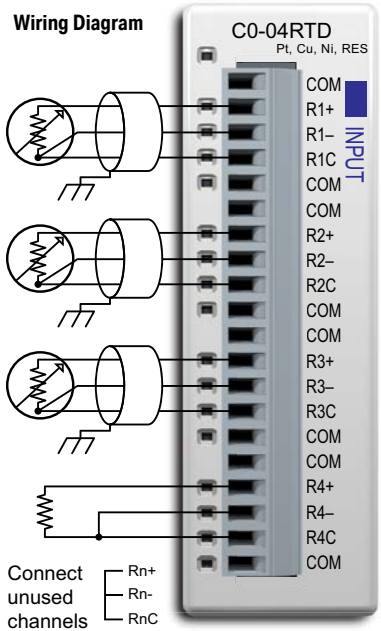
11-pin connector cable
ZL-C0-CBL11 (0.5 m length)
ZL-C0-CBL11-1 (1.0 m length)
ZL-C0-CBL11-2 (2.0 m length)



C0-04RTD – 4-Channel RTD Input Module

4-channel RTD input module, 16-bit resolution (±0.1 degrees Celsius or Fahrenheit), supports: Pt100, Pt1000, jPT100, Cu10, Cu25, Ni120. Resistive ranges also supported, removable terminal block included.

Wiring Diagram



General Specifications	
Field to Logic Side Isolation	No isolation
External DC Power Required	None
Bus Power Required (24VDC)	25mA
Thermal Dissipation	2.047 BTU per hour
Terminal Block Replacement	AutomationDirect p/n C0-16TB
Weight	3.1 oz (86g)

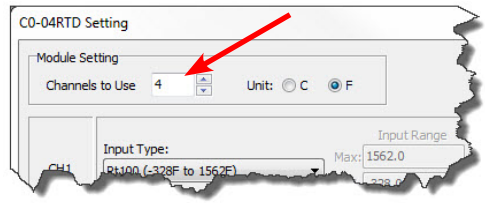
Input Specifications	
Inputs per Module	4
Common Mode Range	±2.5 V
Common Mode Rejection	100dB at DC and 100 dB at 50/60 Hz
Input Impedance	>5MΩ
Maximum Ratings	Fault protected inputs to ±50VDC
Resolution	±0.1°C or °F, 0.1 Ω or 0.01 Ω
Input Ranges*	Pt100: –200 to 850°C (–328 to 1562°F) Pt1000: –200 to 595°C (–328 to 1103°F) jPt100: –100 to 450°C (–148 to 842°F) 10Ω Cu: –200 to 260°C (–328 to 500°F) 25Ω Cu: –200 to 260°C (–328 to 500°F) 120Ω Ni: –80 to 260°C (–112 to 500°F) 0 to 3125.0 Ω : Resolution 0.1 Ω 0 to 1562.5 Ω : Resolution 0.1 Ω 0 to 781.2 Ω : Resolution 0.1 Ω 0 to 390.62 Ω : Resolution 0.01 Ω 0 to 195.31 Ω : Resolution 0.01 Ω
RTD Linearization	Automatic
Excitation Current (All Ranges)	210µA

* While it is possible to use different resistive ranges, we recommend using the narrowest range that covers the resistance being measured. For example, if measuring approximately 100 ohms resistance, use the 0 to 195.31 ohms range. While the resolution is the same as the 0 to 390.62 ohms range, output RMS noise will be lower and stability will be improved.

NOTE: *The C0-04RTD module cannot be used with thermistors.*

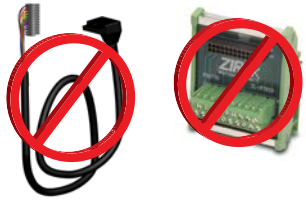
NOTE: *When using this module you must also use CLICK programming software and PLC firmware version V1.40 or later.*

If there are any unused channels, make sure to select the correct number of channels that you actually use in the **C0-04RTD Setting** window.



C0-04RTD – 4-Channel RTD Input Module (continued)

Input Specifications (continued)	
Accuracy vs. Temperature	±10ppm per °C maximum
RTD Input Maximum Inaccuracy	±3°C (excluding RTD error); ±5°C (ranges Cu10 and Cu25)
RTD Linearity Error (End to End)	±2°C maximum, ±0.5°C typical, monotonic with no missing codes
Resistance Input Maximum Zero Scale Error	±0.0015% of full scale range in ohms (negligible)
Resistance Input Maximum Full Scale Error	±0.02% of full scale range
Maximum Linearity Error	±0.015% of full scale range maximum at 25°C, monotonic with no missing codes
Resistance Maximum Input Inaccuracy	0.1% at 0 to 60°C (32° to 140° F), typical 0.04% at 25°C (77° F)
Warm Up Time	30 minutes for ±1C° repeatability
Single Channel Update Rate	240ms
All Channel Update Rate	Single Channel Update Rate times the number of enabled channels on the module
Open Circuit Detection Time	Positive full-scale reading within 2 seconds
Conversion Method	Sigma - Delta



Not Compatible with *ZIP*Link Pre-Wired PLC Connection Cables and Modules.

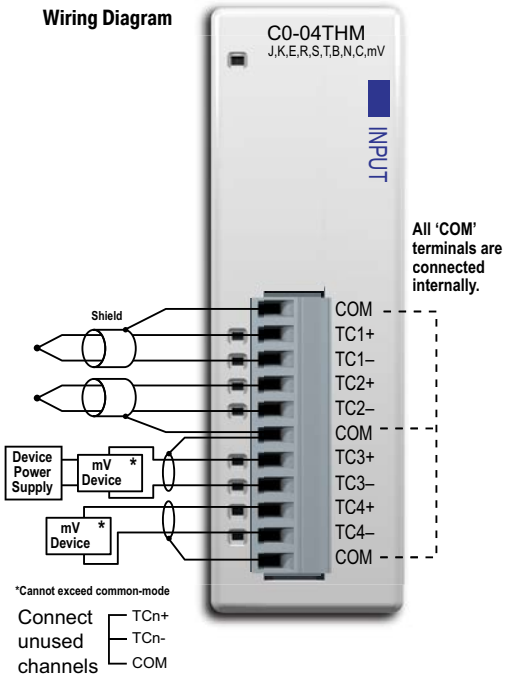
NOTE: *When this module is used in a CLICK PLC system, it takes up to 24 seconds for initialization after power-up. During this time period, the RUN LED on the PLC module blinks to indicate the initialization process.*

Initialization Time		
The Number of Channels Used	The same Input Type is selected for all Channels	Mixed Input Types are selected
1	4 sec	N/A
2	5 sec	May take up to 13 sec
3	6 sec	May take up to 18 sec
4	7 sec	May take up to 24 sec

C0-04THM – 4-Channel Thermocouple Input Module

4-channel thermocouple input module, 16-bit resolution (±0.1 degrees Celsius or Fahrenheit), Supports: J, K, E, R, S, T, B, N, C type thermocouples; voltages ranges also supported, removable terminal block included.

Wiring Diagram

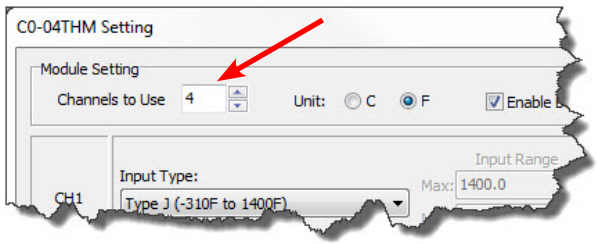


General Specifications	
Field to Logic Side Isolation	1800 VAC applied for 1 second (100% tested)
External DC Power Required	None
Bus Power Required (24VDC)	25mA
Thermal Dissipation	0.175 BTU per hour
Terminal Block Replacement	AutomationDirect p/n C0-8TB
Weight	3.1 oz (86 g)

Input Specifications	
Inputs per Module	4
Common Mode Range	-1.3 to +3.8 V
Common Mode Rejection	100dB at DC and 130dB at 60Hz
Input Impedance	>5MΩ
Maximum Ratings	Fault protected inputs to ±50VDC
Resolution	±0.1°C or °F, 16-bit
Input Ranges	Type J: -190 to 760°C (-310 to 1400°F) Type K: -150 to 1372°C (-238 to 2502°F) Type E: -210 to 1000°C (-346 to 1832°F) Type R: 65 to 1768°C (149 to 3214°F) Type S: 65 to 1768°C (149 to 3214°F) Type T: -230 to 400°C (-382 to 752°F) Type B: 529 to 1820°C (984 to 3308°F) Type N: -70 to 1300°C (-94 to 2372°F) Type C: 65 to 2320°C (149 to 4208°F) 0 to 39.0625 mV ±39.0625 mV ±78.125 mV 0 to 156.25 mV ±156.25 mV 0 to 1.25 V

NOTE: *When using this module you must also use CLICK programming software and PLC firmware version V1.40 or later.*

If there are any unused channels, make sure to select the correct number of channels that you actually use in the **C0-04THM Setting** window.



C0-04THM – 4-Channel Thermocouple Input Module (continued)

Input Specifications (continued)	
Cold Junction Compensation	Automatic
Thermocouple Linearization	Automatic
Accuracy vs. Temperature	±25 ppm per °C maximum
Linearity Error	±2°C maximum, ±1°C typical, monotonic with no missing codes
Maximum Inaccuracy	±3°C maximum (excluding thermocouple error)
Maximum Voltage Input Offset Error	0.05% at 0° to 55° C (32° to 131° F), typical 0.04% at 25° C (77° F)
Maximum Voltage Input Gain Error	0.06% at 25°C (77°F)
Maximum Voltage Input Linearity Error	0.05% at 0° to 55°C (32° to 131°F), typical 0.03% at 25°C (77°F)
Maximum Voltage Input Inaccuracy	0.1% at 0° to 55°C (32° to 131°F), typical 0.04% at 25°C (77°F)
Warm Up Time	30 minutes for ±1C° repeatability
Single Channel Update Rate	400ms
All Channel Update Rate	Single Channel Update Rate times the number of enabled channels on the module
Open Circuit Detection Time	Burn Out flag set and zero scale reading within 3 seconds
Conversion Method	Sigma - Delta

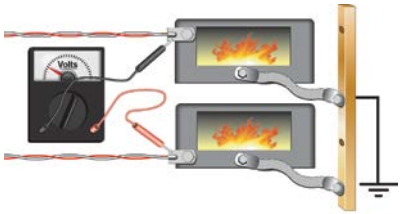
Not Compatible with *ZIP*Link Pre-Wired PLC Connection Cables and Modules.



NOTE: *When this module is used in a CLICK PLC system, it takes up to 11 seconds for initialization after power-up. During this time period, the RUN LED on the PLC module blinks to indicate the initialization process.*

Initialization Time	
The Number of Channels Used	**With any Configuration**
1	5 sec
2	7 sec
3	9 sec
4	11 sec

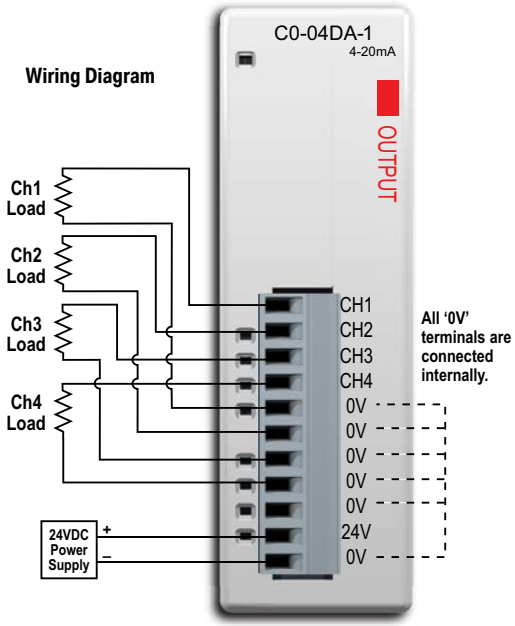
NOTE: *With grounded thermocouples, take precautions to prevent having a voltage potential between thermocouple tips. A voltage less than -1.3V or greater than +3.8V between tips will skew measurements.*



C0-04DA-1 – 4-Channel Analog Current Output Module

4-channel analog current sourcing output module, 12-bit resolution, range: 4–20 mA. External 24VDC power required, removable terminal block included.

Wiring Diagram



NOTE: *When using this module you must also use CLICK programming software and PLC firmware version V1.40 or later.*

Output Specifications	
Outputs per Module	4
Output Range	4–20 mA (source)
Resolution	12-bit, 3.9 uA per count
Output Type	Current sourcing at 20mA max.
Output Value in Fault Mode	Less than 4mA
Load Impedance	0-600Ω at 24VDC; minimum load: 0Ω 32° to 131°F (0° to 55°C) ambient temp.
Maximum Inductive Load	1mH
Allowed Load Type	Grounded
Maximum Inaccuracy	±1% of range
Max. Full Scale Calibration Error (Including Offset)	±0.2% of range maximum
Max. Offset Calibration Error	±0.2% of range maximum
Accuracy vs. Temperature	±75 PPM/°C maximum full scale calibration change (±0.005% of range/°C)
Max. Crosstalk at DC, 50/60 Hz	-72 dB, 1 LSB
Linearity Error (End to End)	±4 LSB max., (±0.1% of full scale)
Output Stability and Repeatability	±2% LSB after 10 minute warmup period typical
Output Ripple	±0.1% of full scale
Output Settling Time	0.3 ms maximum, 5µs min. (full scale range)
All Channel Update Rate	10ms
Max. Continuous Overload	Outputs open circuit protected
Field to Logic Side Isolation	1800VAC applied for 1 second (100% tested)
Type of Output Protection	Electronically limited to 20mA or less
Output Signal at Power Up and Power Down	4mA
External VDC Power Required	145mA
Base Power Required (24VDC)	20mA
Terminal Block Replacement	AutomationDirect p/n C0-8TB
Weight	2.9 oz (82g)

***ZIP*Link Pre-Wired PLC Connection Cables and Modules for CLICK PLC**



11-pin connector cable
ZL-C0-CBL11 (0.5 m length)
ZL-C0-CBL11-1 (1.0 m length)
ZL-C0-CBL11-2 (2.0 m length)

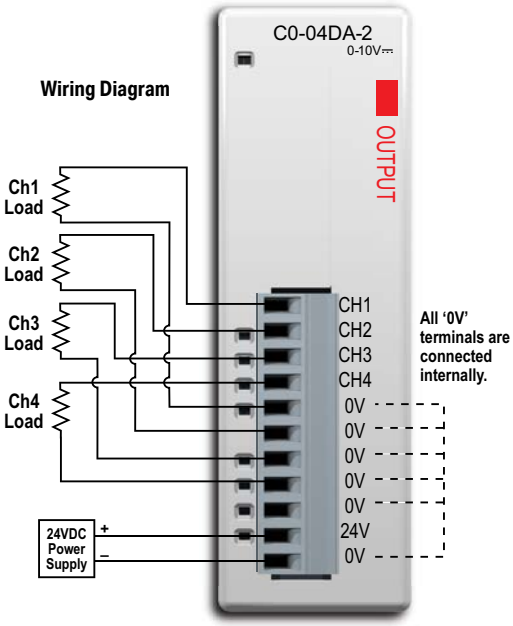


ZL-RTB20 20-pin feed-through connector module

C0-04DA-2 – 4-Channel Analog Voltage Output Module

4-channel analog voltage output module, 12-bit resolution, range: 0–10 V. External 24VDC power required, removable terminal block included.

Wiring Diagram



NOTE: *When using this module you must also use CLICK programming software and PLC firmware version V1.40 or later.*

Output Specifications	
Outputs per Module	4
Output Range	0–10 V
Resolution	12-bit, 2.44 mV per count
Output Type	Voltage sourcing at 10mA max. (One common)
Output Value in Program Mode	Determined by PLC
Output Value in Fault Mode	0 V
Output Impedance	0.2 Ω typical
Load Impedance	>1000Ω
Maximum Capacitive Load	0.01 uF maximum
Allowed Load Type	Grounded
Maximum Inaccuracy	0.5% of range
Max. Full Scale Calibration Error (Not including Offset)	±0.2% of range maximum voltage
Max. Offset Calibration Error	±0.2% of range maximum
Accuracy vs. Temperature	±75 PPM/°C maximum full scale calibration change (±0.0025% of range/°C)
Max. Crosstalk at DC, 50/60 Hz	-72 dB, 1 LSB
Linearity Error (End to End)	±4 LSB max., (±0.1% of full scale); monotonic with no missing codes
Output Stability and Repeatability	±2% LSB after 10 minute warmup period typical
Output Ripple	0.1% of full scale
Output Settling Time	0.3 ms maximum, 5 µs minimum (full scale range)
All Channel Update Rate	10ms
Max. Continuous Overload	Outputs current limited to 40mA typical; continuous overloads on multiple outputs can damage module.
Field to Logic Side Isolation	1800VAC applied for 1 second (100% tested)
Type of Output Protection	0.1 µF transient suppressor
Output Signal at Power Up and Power Down	0 V
External 24VDC Power Required	85mA
Base Power Required (24VDC)	20mA
Terminal Block Replacement	AutomationDirect p/n C0-8TB
Weight	2.9 oz (82g)

***ZIP*Link Pre-Wired PLC Connection Cables and Modules for CLICK PLC**



11-pin connector cable
ZL-C0-CBL11 (0.5 m length)
ZL-C0-CBL11-1 (1.0 m length)
ZL-C0-CBL11-2 (2.0 m length)

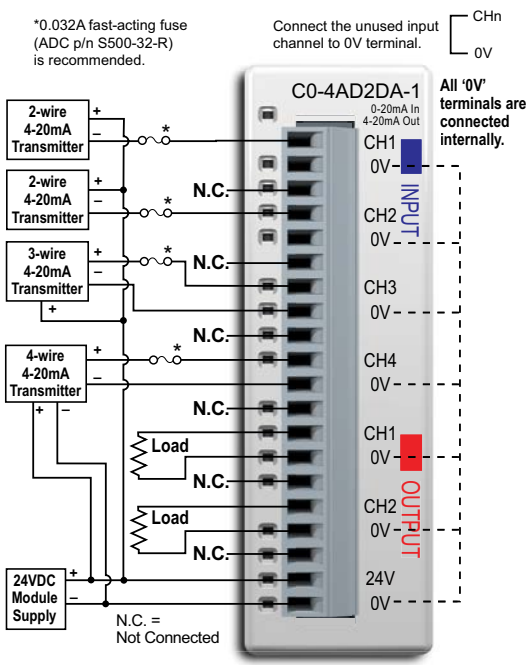


ZL-RTB20 20-pin feed-through connector module

C0-4AD2DA-1 – 4-Channel Analog Current Input and 2-Channel Analog Current Output Module

4-channel analog current sinking input (13-bit resolution) and 2-channel analog current sourcing output (12-bit resolution) module, range: 0–20 mA (inputs), 4–20 mA (outputs). External 24VDC power required, removable terminal block included.

Wiring Diagram



NOTE: When using this module you must also use CLICK programming software and PLC firmware version V1.40 or later.

***ZIP*Link Pre-Wired PLC Connection Cables and Modules for CLICK PLC**



20-pin connector cable
ZL-C0-CBL20 (0.5 m length)
ZL-C0-CBL20-1 (1.0 m length)
ZL-C0-CBL20-2 (2.0 m length)



ZL-RTB20 20-pin feed-through connector module

General Specifications	
Field to Logic Side Isolation	1800VAC for 1 sec.
External 24VDC Power Required	75mA
Bus Power Required (24VDC)	25mA
Recommended Fuse (External)	AutomationDirect p/n S500-32-R (0.032 A fuse)
Terminal Block Replacement	AutomationDirect p/n C0-16TB
Weight	3.1 oz (86g)

Input Specifications	
Inputs per Module	4
Input Range	0-20 mA (sink)
Resolution	13-bit, 2.44 uA per count
Input Type	Single ended (one common)
Maximum Continuous Overload	±44 mA
Input Impedance	124Ω, 0.5 W current input
Filter Characteristics	Low pass, -3 dB at 400 Hz
PLC Data Format	13-bit unsigned Integer, range is 0-8191
Sample Duration Time	5 ms
All Channel Update Rate	20 ms (input plus output maximum time)
Open Circuit Detection Time	Zero reading within 20 ms
Conversion Method	Successive approximation
Accuracy vs. Temperature	±75 PPM/°C maximum
Maximum Inaccuracy	0.5% of range (including temperature changes)
Linearity Error (End to End)	±3 count maximum, monotonic with no missing codes
Input Stability and Repeatability	±2 count maximum
Full Scale Calibration Error (Including Offset)	±8 count maximum
Offset Calibration Error	±8 count maximum
Maximum Crosstalk at DC, 50/60 Hz	±2 count maximum

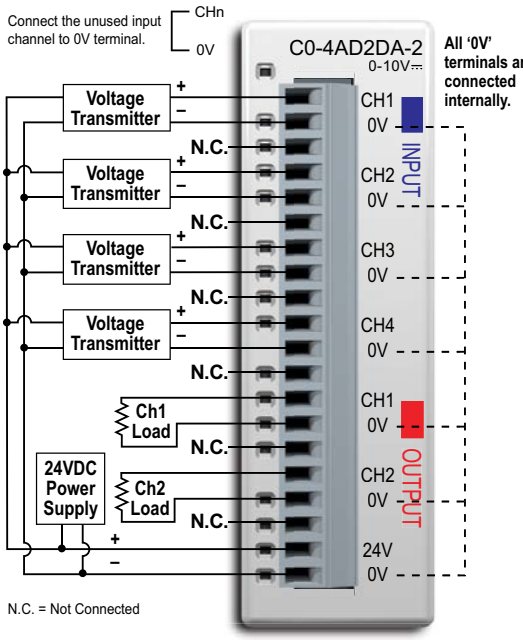
C0-4AD2DA-1 – 4-Channel Analog Current Input and 2-Channel Analog Current Output Module (continued)

Output Specifications	
Outputs per Module	2
Output Range	4–20 mA (source)
Resolution	12-bit, 3.9 uA per count
Output Type	Current sourcing at 20mA max. (One common)
PLC Data Format	12-bit unsigned integer, 0-4095 counts
Output Value in Fault Mode	Less than 4mA
Load Impedance	0–600 Ω at 24VDC; minimum load: 0Ω 32° to 113°F (0° to 45°C); 125Ω 113° to 131°F (45° to 55°C) ambient temp.
Maximum Inductive Load	1mH
Allowed Load Type	Grounded
Maximum Inaccuracy	±1% of range
Max. Full Scale Calibration Error (Including Offset)	±0.2% of range maximum
Max. Offset Calibration Error	±0.2% of range maximum
Accuracy vs. Temperature	±50 PPM/°C maximum full scale calibration change (±0.005% of range/°C)
Max. Crosstalk at DC, 50/60 Hz	-72 dB, 1 LSB
Linearity Error (End to End)	±4 LSB maximum, (±0.1% of full scale), monotonic with no missing codes
Output Stability and Repeatability	±2% LSB after 10 minute warmup period typical
Output Ripple	±0.1% of full scale
Output Settling Time	0.2 ms maximum, 5µs min. (full scale range)
All Channel Update Rate	20ms
Max. Continuous Overload	Outputs open circuit protected
Type of Output Protection	Electronically limited to 20mA or less
Output Signal at Power Up or Power Down	4mA

C0-4AD2DA-2 – 4-Channel Analog Voltage Input and 2-Channel Analog Voltage Output Module

4-channel analog voltage input (13-bit resolution) and 2-channel analog voltage output (12-bit resolution) module, range: 0-10V. External 24VDC power required, removable terminal block included.

Wiring Diagram



General Specifications	
Field to Logic Side Isolation	1800VAC for 1 sec.
External 24VDC Power Required	65mA
Base Power Required (24VDC)	20mA
Terminal Block Replacement	AutomationDirect p/n C0-16TB
Weight	3.1 oz (86g)

Input Specifications	
Inputs per Module	4
Input Range	0–10 V
Resolution	13-bit, 1.22 mV per count
Input Type	Single ended (one common)
Maximum Continuous Overload	±100VDC
Input Impedance	>150kΩ
Filter Characteristics	Low pass, -3dB at 500Hz
Sample Duration Time	5ms
All Channel Update Rate	20ms
Open Circuit Detection Time	Zero reading within 100ms
Conversion Method	Successive approximation
Accuracy vs. Temperature	±75 PPM/°C maximum
Maximum Inaccuracy	0.5% of range (including temperature changes)
Linearity Error (End to End)	±3 count maximum, monotonic with no missing codes
Input Stability and Repeatability	±2 count maximum
Full Scale Calibration Error (including Offset)	±8 count maximum
Offset Calibration Error	±8 count maximum
Maximum Crosstalk at DC, 50/60 Hz	±2 count maximum

NOTE: *When using this module you must also use CLICK programming software and PLC firmware version V1.40 or later.*

***ZIP*Link Pre-Wired PLC Connection Cables and Modules for CLICK PLC**



20-pin connector cable
ZL-C0-CBL20 (0.5 m length)
ZL-C0-CBL20-1 (1.0 m length)
ZL-C0-CBL20-2 (2.0 m length)



ZL-RTB20 20-pin feed-through connector module

C0-4AD2DA-2 – 4-Channel Analog Voltage Input and 2-Channel Analog Voltage Output Module (continued)

Output Specifications	
Outputs per Module	2
Output Range	0–10 V
Resolution	12-bit, 2.44 mV per count
Output Type	Voltage sourcing at 10mA max. (One common)
Output Value in Program Mode	Determined by PLC
Output Value in Fault Mode	0V
Output Impedance	0.2 Ω typical
Load Impedance	>1000Ω
Maximum Capacitive Load	0.01 µF maximum
Allowed Load Type	Grounded
Maximum Inaccuracy	1% of range
Max. Full Scale Calibration Error (Not including Offset)	±0.2% of range maximum voltage
Max. Offset Calibration Error	±0.2% of range maximum
Accuracy vs. Temperature	±75 PPM/°C maximum full scale calibration change (±0.0025% of range/°C)
Max. Crosstalk at DC, 50/60 Hz	-72dB, 1 LSB
Linearity Error (End to End)	±4 LSB maximum, (±0.1% of full scale); monotonic with no missing codes
Output Stability and Repeatability	±2% LSB after 10 minute warmup period typical
Output Ripple	0.5% of full scale
Output Settling Time	0.3 ms maximum, 5µs minimum (full scale range)
All Channel Update Rate	20ms
Max. Continuous Overload	Outputs current limited to 40mA typical; continuous overloads on multiple outputs can damage module.
Type of Output Protection	0.1 µF transient suppressor
Output Signal at Power Up or Power Down	0V

Power Supply Specifications

C0-00AC Power Supply



Limited auxiliary AC power supply allows you to power the CLICK PLC with 100-240 VAC supply power. The 0.5 A DC power supply is capable of controlling the PLC plus a limited configuration based on the power budget of each I/O module. The C0-00AC is a low-cost solution for applications requiring only minimal I/O and power consumption. This power supply will not support a fully-populated CLICK PLC system with all possible I/O module combinations.

C0-00AC Input Specifications	
Input Voltage Range	85–264 VAC
Input Frequency	47–63 Hz.
Input Current (typical)	0.3 A @ 100 VAC, 0.2 A @ 200VAC
Inrush Current	30A
Efficiency	80% typical

C0-00AC Output Specifications	
Output Voltage Range	23–25 VDC
Output Current	0.5 A
Ripple	200mV p-p max (0–55°C)
Ripple Noise	300mV p-p max (0–55°C)
Over Current Protection	@ 0.65 A (automatic recovery)
Over Voltage Protection	@ 27.6 V (clamped by Zener diode)
Start-up Time	1000ms max at rated input and load
Hold-up Time	10ms minimum at 85VAC, I=max

C0-00AC General Specifications	
Ambient Operating Temperature	32–131°F [0–55°C]
Storage Temperature	–4–158°F [–20–70°C]
Humidity	30–95%, non-condensing
Vibration Resistance	JIS C60068-2-6, sine wave vibration
Shock Resistance	JIS C60068-2-27
Voltage Withstand	
Input-Output	1500VAC, 5mA cutoff current
Input-Ground	1500VAC, 5mA cutoff current
Output-Ground	500VAC, 5mA cutoff current
Insulation Resistance	
Input-Output	10MΩ minimum, 500VDC
Input-Ground	10MΩ minimum, 500VDC
Output-Ground	5MΩ minimum, 500VDC
Noise Immunity	FCC Class A, EN55022:1998 Class A
Input/Output Interface	5P terminal block, Fujicon UF2362AX series or equivalent
Agency Approvals	UL508, UL1604, EN61010-1 (IEC 1010-1), CAN/CSA E60079-15:02, JIS C0025
Weight	5.3 oz [150g]

C0-01AC Power Supply



No-limit auxiliary AC power supply allows you to power the CLICK PLC with 100-240 VAC supply power. The 1.3 A DC power supply is capable of supporting a fully-populated CLICK PLC system with all possible I/O module combinations with no concerns of exceeding the power budget.

C0-01AC Input Specifications	
Input Voltage Range	85–264 VAC
Input Frequency	47–63 Hz.
Input Current (typical)	0.9 A @ 100 VAC, 0.6 A @ 200VAC
Inrush Current	30A
Efficiency	80% typical

C0-01AC Output Specifications	
Output Voltage Range	23–25 VDC
Output Current	1.3 A
Ripple	200mV p-p max (0–55°C)
Ripple Noise	300mV p-p max (0–55°C)
Over Current Protection	@ 1.6 A (automatic recovery)
Over Voltage Protection	@ 27.6 V (clamped by Zener diode)
Start-up Time	1000ms max at rated input and load
Hold-up Time	10ms minimum at 85VAC, I=max

C0-01AC General Specifications	
Ambient Operating Temperature	32–131°F [0–55°C]
Storage Temperature	–4–158°F [–20–70°C]
Humidity	30–95%, non-condensing
Vibration Resistance	JIS C60068-2-6, sine wave vibration
Shock Resistance	JIS C60068-2-27
Voltage Withstand	
Input-Output	1500VAC, 5mA cutoff current
Input-Ground	1500VAC, 5mA cutoff current
Output-Ground	500VAC, 5mA cutoff current
Insulation Resistance	
Input-Output	10MΩ minimum, 500VDC
Input-Ground	10MΩ minimum, 500VDC
Output-Ground	5MΩ minimum, 500VDC
Noise Immunity	FCC Class A, EN55022:1998 Class A
Input/Output Interface	5P terminal block, Fujicon UF2362AX series or equivalent
Agency Approvals	UL508, UL1604, EN61010-1 (IEC 1010-1), CAN/CSA E60079-15:02, JIS C0025
Weight	6.0 oz [170g]

PSP24-DC12-1 DC-DC Converter

With this DC-DC converter you can operate the CLICK PLC with 12VDC input power.



PSP24-DC12-1 DC-DC Converter Specifications	
Input Voltage Range	9.5–18 VDC
Input Power (no load)	1.0 W max.
Startup Voltage	8.4 VDC
Undervoltage Shutdown	7.6 VDC
Output Voltage Range	24–28 VDC (adjustable)
Output Current	1.0 A
Short Circuit Protection	Current limited at 110% typical
Weight	7.5 oz (213g)

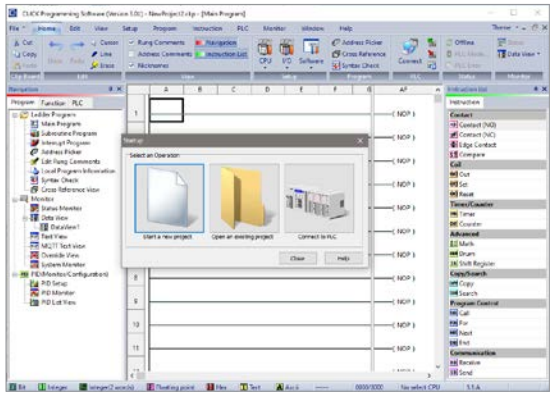
Please see this part at www.automationdirect.com/pn/PSP24-DC12-1 on our web store for full specifications.

Programming Software

The CLICK PLC Programming Software, which can be downloaded free from the Automationdirect.com web site (Downloads/Software), is designed to provide simple and fast application development of ladder logic programming.

These are some of the features that help make this happen:

- The Navigation window allows organization of the ladder logic programs used in your project and access to the functions, settings and configurations used to work with your project.
- The Instruction List window displays all available CLICK PLC instructions, allows you to drag and drop the instruction into your ladder logic program, and then enter any values and/or parameters required for the particular instruction.



- You can add Subroutine and Interrupt programs separately from the main ladder logic program. This allows you to manage your ladder logic programs in a simple, structured environment and, at the same time, aid in trouble-shooting your program.
- The Data View Monitor window configurations are saved with your project. This allows quick access to the same set of memory addresses that may have been set up for viewing during testing of your program.
- The graphical represented System Configuration dialog box allows checking the PLC system configuration. A Power Budget calculation feature is included. Refer to the Power Budgeting section later in this chapter for additional details.
- The Address Picker window allows quick selection of any memory address to be placed in the ladder logic program. Refer to the programming software online help for additional details.
- The PLC module Firmware can be updated from the programming software within 2 minutes.

PC Requirements

Check our online webstore for current operating system requirements:
http://www.automationdirect.com

Data Types, Memory, and Numbering System

The following section explains how the CLICK PLC handles the available data types, memory addressing, and I/O numbering.

Data Types

The CLICK PLC supports the following data types. On the CLICK PLC programming software, each data type is indicated with a small icon.

Data Type	S/W Icon	Data Ranges
Bit		0, 1
Integer (Single Word)		-32,768 to 32,767
Integer2 (Double Word)		-2,147,483,648 to 2,147,483,647
Floating Point		-3.4028235E+38 to 3.4028235E+38
HEX (Hexadecimal)		0000h to FFFFh (The HEX data type requires the 'h' after the value.)
Text (Single Character)		Single ASCII character (ASCII code: 00h to FFh.)
ASCII Code		ASCII code $00 to $FF (The ASCII Code data type requires the '$' before the value.)



NOTE: *The CLICK PLC does not support Octal or BCD numbering systems (data types).*

Memory Types

The following is the list of the memory types that the CLICK PLC system supports. See the memory map later in this chapter.

Memory Type	Symbol	Data Type	S/W Icon	Definition
Input Point	X	Bit		The Discrete Input points are represented by the "X" symbol.
Output Point	Y			The Discrete Output points are represented by the "Y" symbol.
Control Relay	C			The Control Relay bits are represented by the "C" symbol. These internal bits are typically used for ladder program control. They do not represent any real world inputs or outputs.
Timer	T			The Timers are represented by the "T" symbol. The Timer status bit is used to indicate when the Current Value of the timer equals its Preset Value.
Counter	CT			The Counters are represented by the "CT" symbol. The Counter status bit is used to indicate when the Current Value of the counter equals its Preset Value.
System Control Relay	SC			The internal System Control Relays, represented by the "SC" symbol, are pre-defined bits which represent the status of specific system functions.
Data Register	DS	Integer		Single word integer data registers are represented by the "DS" symbol.
	DD	Integer2		Double word integer data registers are represented by the "DD" symbol.
	DH	HEX		Single word Hex data registers are represented by the "DH" symbol.
	DF	Floating Point		Data Floating Point registers are IEEE format Real number values represented by the "DF" symbol as 32-bit words.
Input Register	XD	HEX		The Input Registers, represented by the "XD" symbol, contain groups of Discrete Input points in a 16-bit word format. XD0 is a Hexadecimal representation of X1-X16, XD1 of X101-X116, etc.
Output Register	YD			The Output Registers, represented by the "YD" symbol, contain groups of Discrete Output points in a 16-bit word format. YD0 is a Hexadecimal representation of Y1-Y16, YD1 of Y101-Y116, etc.
Timer Register	TD	Integer		The Timer Registers, represented by the "TD" symbol, contain the corresponding Timer's accumulative value in a 16-bit data register.
Counter Register	CTD	Integer2		The Counter Registers, represented by the "CTD" symbol, contain the corresponding Counter's accumulative value in a 32-bit data register.
System Data Register	SD	Integer		The internal System Data Registers, represented by the "SD" symbol, are pre-defined words which represent the status of specific system functions.
Text	TXT	Text		The Text data registers, represented by the "TXT" symbol, are used to store and manipulate ASCII text data.

Memory Types (cont'd)

Pointer Addressing

The CLICK PLUS PLC allows the use of Pointer Addressing for flexibility in programming. The Copy instruction supports Pointer Addressing in the single copy mode. The Pointer is always assigned as a DS memory type and is designated as a Pointer by placing the DS memory type in square brackets, such as [DS1]. Pointer Addressing uses the Pointer's data value to point to a memory location within the range of one of the eligible memory types. Pointer Addressing can be used with the C, DS, DD, DF, DH, XD, YD, TD, CTD and TXT data register memory types.

Pointer Addressing is also sometimes referred to as Indirect Addressing. One of the many uses for Pointer Addressing would be to perform lookup in tables. An application example might be determining the number of gallons in a horizontal tank when the liquid level is known. The gallons could be determined by a rather complex math formula, but a simpler approach would be to pre-calculate the number of gallons at several uniform levels, and place these values into a table of data registers that can be accessed using Pointer Addressing.

Pointer Addressing Example

DS1 = 100; data register DS1 is assigned the value of 100.

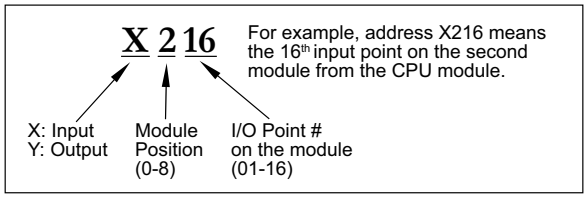
Then the use of DD[DS1] would be the same as showing DD100.

As the value in DS1 is changed, the result would then point to a different DD data register.

In the example, data register DS1 is called a Pointer. Only a DS memory type can be used as a pointer. As mentioned before, the use of the [square brackets] around DS1 in the data register reference DD[DS1] is how the Pointer Addressing is designated.

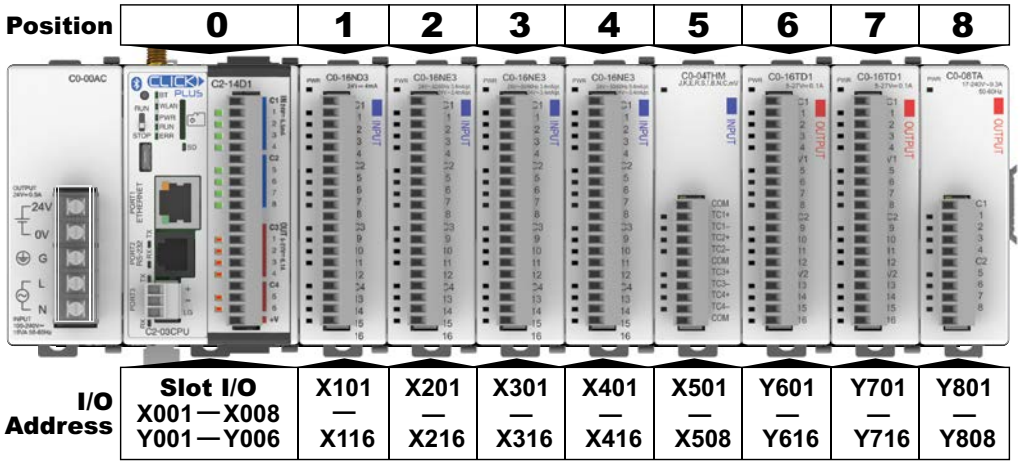
I/O Numbering System

The CLICK PLC uses decimal numbers for the input (X) and output (Y) addressing.

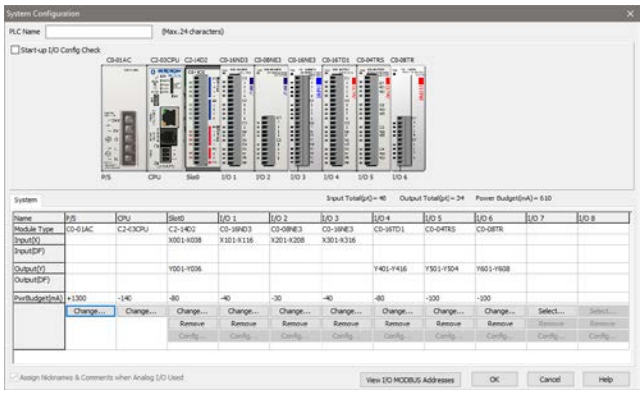


Module Location

Please refer to the following diagram to understand the module position and I/O numbering.



The I/O Addressing can be checked by using the System Configuration window from within the CLICK programming software. From the Setup pulldown menu, select System Configuration; otherwise, from the Navigation window select the Function tab, and under PLC configuration, double click on System Configuration.



PLC Operation

Introduction

Achieving proper control of your equipment or process requires a thorough understanding of how the CLICK PLUS PLC controls all aspects of system operation. There are three main areas to understand before you create your application program:

- PLC Operating System – the PLC manages all aspects of system control. A quick overview of all the steps are provided in the next section.
- PLC Operating Modes – The two primary modes of operation are Stop mode and Run mode.
- PLC Memory Map – CLICK PLCs offer a wide variety of resources, such as timers, counters, inputs, etc. The Memory Map section shows the organization and availability of these data types.

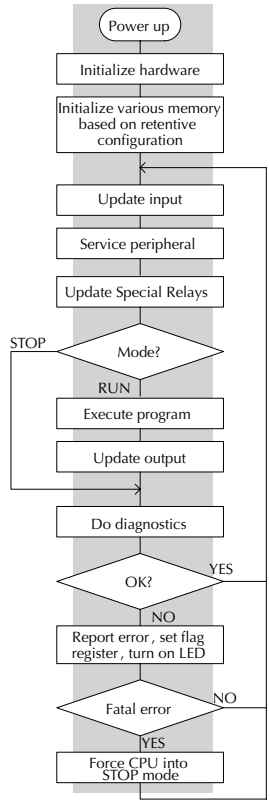
PLC Operating System

At powerup, the CLICK PLUS PLC initializes the internal electronic hardware. Memory initialization starts with examining the retentive memory settings. In general, the contents of retentive memory are preserved, and non-retentive memory is initialized to zero (unless otherwise specified).

After the one-time powerup tasks, the PLC begins the cyclical scan activity. The flowchart to the right shows how the tasks differ, based on the PLC mode and the existence of any errors. The "scan time" is defined as the average time around the task loop. Note that the PLC is always reading the inputs, even during Stop mode. This allows programming tools to monitor input status at any time.

The outputs are only updated in Run mode. In Stop mode, they are in the off state.

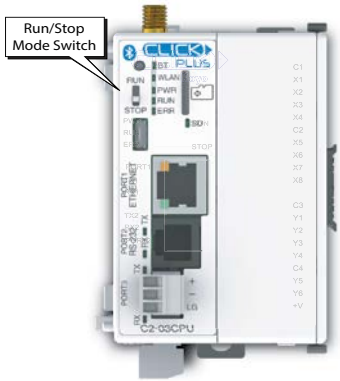
Error detection has two levels. Non-fatal errors are reported, but the PLC remains in its current mode. If a fatal error occurs, the PLC is forced into Stop mode and the outputs turn off.



PLC Operating Modes

Stop Mode

In Stop mode, the CLICK PLUS PLC does NOT execute the ladder logic program or update the output points. The primary use for Stop Mode is to enter or change a ladder logic program. You also use Stop mode to set up the PLC parameters, such as retentive memory areas, etc.



You can use CLICK Programming Software, or the CLICK PLUS PLC mode switch to place the PLC in Stop mode; however, the CLICK PLUS PLC mode switch will override the software mode condition. If the PLC mode switch is in the Stop position, the software is blocked from changing the PLC mode. When the PLC mode switch is in the Run position, the software may toggle the mode switch from Run to Stop at will.

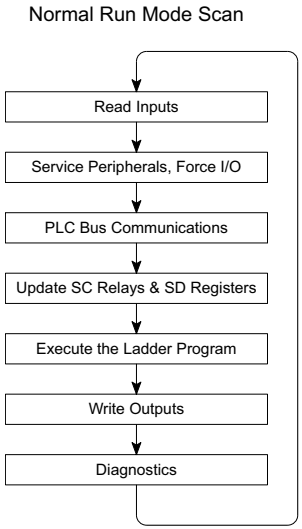
Run Mode

In Run mode, the PLC executes the application program and updates the I/O system. You can perform many operations during Run mode. Some of these include:

- Monitor and change I/O point status
- Change timer/counter preset values
- Change variable memory locations

The Run Mode can be divided into several key areas. For the vast majority of applications, some of these execution segments are more important than others. For example, you need to understand how the PLC updates the I/O points, handles forcing operations, and solves the application program. The remaining segments are not that important for most applications.

You can use CLICK Programming Software, or the CLICK PLUS PLC mode switch to place the PLC in Run mode.



NOTE: *The CLICK PLUS PLC will not go into RUN mode if it is in Low Power Mode as a result of powering only through the USB port.*

WARNING: Only authorized personnel fully familiar with all aspects of the application should make changes to the ladder logic program. Make sure you thoroughly consider the impact of any changes to minimize the risk of personal injury or damage to equipment.

Read Inputs

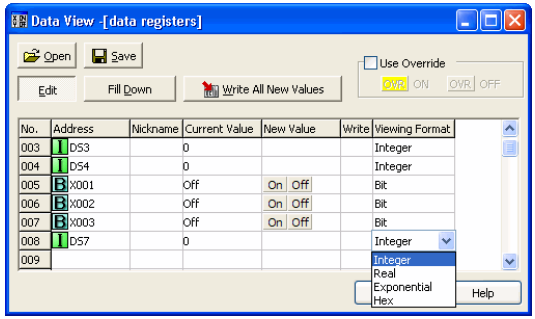
The CLICK PLUS PLC reads the status of all inputs, then stores it in the image register. Input image register locations are designated with an X followed by a memory location. Image register data is used by the PLC when it solves the application program.

Of course, an input may change after the PLC has just read the inputs. Generally, the PLC scan time is measured in milliseconds. If you have an application that cannot wait until the next I/O update, you can use Immediate Instructions. These do not use the status of the input image register to solve the application program. The Immediate instructions immediately read the input status directly from the I/O modules. However, this lengthens the program scan since the PLC has to read the I/O point status again.

Service Peripherals and Force I/O

After the CLICK PLUS PLC reads the inputs from the input modules, it reads any attached peripheral devices. This is primarily a communications service for any attached devices. For example, it would read a programming device to see if any input, output, or other memory type status needs to be modified. There are two basic types of forcing available with the CLICK PLC:

- Forcing from a peripheral – not a permanent force, good only for one scan
- Bit Override – holds the I/O point (or other bit) in the current state. Valid bits are X, Y, C, T nd CT. (These memory types are discussed in more detail earlier in this chapter).



Forcing and Bit Override are done through the Data View Monitor.

Regular Forcing: This type of forcing can temporarily change the status of a discrete bit. For example, you may want to force an input on, even though it is really off. This allows you to change the point status that was stored in the image register. This value will be valid until the image register location is written to during the next scan. This is primarily useful during testing situations when you need to force a bit on to trigger another event.

Bit override: This is a more forceful type of bit manipulation. When bit override is enabled, you can actually override the current status of a bit in the image register. This change will remain intact until you remove the override.



WARNING: Only authorized personnel fully familiar with all aspects of the application should make changes to the program. Make sure you thoroughly consider the impact of any changes to minimize the risk of personal injury or damage to equipment.

Update System Control (SC) Relays and System Data (SD) Registers

The CLICK PLUS PLC units have system memory locations that hold this information. This portion of the execution cycle ensures these locations get updated on every scan. Also, there are several different system control relays, such as diagnostic relays, etc., that are also updated during this segment.

Solve Application Program

The CLICK PLUS PLC evaluates each instruction in the application program during this segment of the scan cycle. The instructions define the relationship between the input conditions and the desired output response. The CLICK PLUS PLC uses the output image register area to store the status of the desired action for the outputs. Output image register locations are designated with a Y followed by a memory location. The actual outputs are updated during the write outputs segment of the scan cycle.

The internal control relays (C) and the data registers (DS, DD, DF and DH) are also updated in this segment.

You may recall that you can force various types of points in the system, discussed earlier in this chapter. If any I/O points or memory data have been forced, the output image register also contains this information.

Write Outputs

Once the application program has solved the instruction logic and constructed the output image register, the CLICK PLC writes the contents of the output image register to the corresponding output points. Remember, the PLC also ensured that any forcing operation changes were stored in the output image register, so the forced points get updated with the status specified earlier.

Diagnostics

During this part of the scan, the PLC performs all system diagnostics and other tasks such as calculating the scan time and resetting the watchdog timer. There are many different error conditions that are automatically detected and reported by the CLICK PLUS PLC. Chapter 6: ***Troubleshooting*** contains a listing of the various error codes with a description of the possible causes.

Probably one of the more important things that occurs during this segment is the scan time calculation and watchdog timer control. The CLICK PLUS PLC has a watchdog timer that stores the maximum time allowed for the PLC to complete the solve application part of the scan cycle. If this time is exceeded, the PLC will enter the Stop mode and turn off all outputs. An error is automatically reported. The default value of the watchdog timer is 200ms and can be adjusted between 5–10,000 ms. Refer to the online help available from the CLICK Programming Software, C0-PGMSW, for additional information in regards to the Watchdog Timer.

Accessories

C2-USER-M – CLICK PLUS PLC Hardware Users Manual



Manual covers all CLICK PLUS PLC & I/O Module installation & wiring, specifications, error codes & trouble shooting guide. The CLICK PLUS PLC Hardware User Manual can be downloaded free at the AutomationDirect Web site, **www.automationdirect.com**

C0-PGMSW – CLICK PLC Programming Software USB



CLICK PLC programming software Ladder Logic Editor for Windows PCs, includes the manual as a pdf file. Free download available from AutomationDirect online Web store: www.automationdirect.com. Alternatively the programming software USB may be purchased and shipped from the AutomationDirect online Web store: **www.automationdirect.com**

USB-CBL-AMICB6 – USB A to USB micro B Programming Cable Assembly



Programming cable, USB A to micro-B USB, 6ft cable length. For use with Productivity1000 and Productivity2000 CPUs, CLICK PLUS CPUs and most USB devices. The USB port supplies 5VDC to the CLICK PLUS CPU for programming.

EA-MG-PGM-CBL – PC to Panel Programming Cable Assembly for C-more Micro-Graphic Panels and CLICK/CLICK PLUS PLCs



6-ft cable assembly connects a personal computer to any C-more Micro-Graphic panel, CLICK PLC, or select CLICK PLUS PLC for setup and programming. Assembly includes standard USB A-type connector to B-type connector cable, custom converter, and a RS232C cable with RJ12 modular connector on each end

D2-DSCBL – PC Programming Cable for CLICK and *Direct*LOGIC PLCs



12ft (3.66 m) RS232 shielded PC programming cable for CLICK, DL05, DL06, DL105, DL205, D3-350, and D4-450 CPUs. 9-pin D-shell female connector to an RJ12 6P6C connector.

Cat5e – PC Programming Ethernet Cable for CLICK PLCs



3ft–50ft Cat5e STP Ethernet Patch Cable for PC programming of CLICK PLCs; RJ45 connector. Straight or Cross-over cable can be used.

Accessories (cont'd)



C2-FILL

CPU Option Slot Cover

Snap-on cover for CPU Option Slot in applications without an Option Slot module present.



MSD-SLC16G

16GB microSD card, industrial grade, 3D NAND Flash (with SLC Mode), 85°C [185°F] max operating temp.



SE-ANT210

Whip/straight 2.4 GHz antenna, IP65, connector mount.

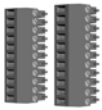


SE-ANT250

Dome 2.4 GHz antenna, IP67, panel mount, 9.8ft/3m cable length.

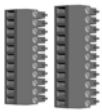
2.4 GHz WiFi Antenna Specifications		
	SE-ANT210	SE-ANT250
Antenna Connector	RP-SMA (M)	
Application	WLAN (802.11 b/g/n), Bluetooth (IEEE 802.15.1)	
Impedance	50Ω	
Antenna Type	whip, straight	dome
Cable Length	N/A	3m [9.8 ft]
Frequency Range	2.4–2.5 GHz	2.4–2.5 GHz
Gain	1.8 dBi	1.5 dBi
Height	1.2 in	1.89 in
IP Rating	IP65	IP67
Maximum Power	1W	5W
Mounting Screw Torque	NA	2.94 N·m

Accessories (cont'd)



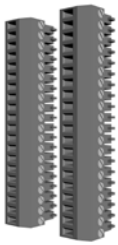
C0-8TB – Spare 8 Point I/O Terminal Block

Replacement terminal block for the 8 point I/O modules. Sold in packs of 2.



C0-8TB-1 – Spare 8 Point I/O Terminal Block

Replacement terminal block for the 8 point relay I/O modules. Sold in packs of 2.



C0-16TB – Spare 16 Point I/O Terminal Block

Replacement terminal block for the 16 point I/O modules & Option Slot I/O. Sold in packs of 2.



C0-3TB - Spare 3-Pole Terminal Block

Replacement 3-pole terminal block for the 3-wire, RS485 communications port on the C2-03CPU and C2-03CPU-02 PLCs.
Sold in packs of 2.



C0-4TB – Spare 24VDC Power Terminal Block

Replacement terminal block for the 24VDC supply power to the PLC. Sold in packs of 2.



C2-6TB - Spare 6-Pole Terminal Block

Replacement 6-pole terminal block for the C2-DCM.
Sold in packs of 2.



D0-MC-BAT – Battery

Replacement battery for CLICK PLUS PLC units.

***ZIP*Link Wiring Systems**





C-more and C-more Micro-Graphic Operator Interfaces





DN-WS – Wire Stripper



TW-SD-MSL-2 – Insulated Slotted Screwdriver 0.4 x 2.5 x 80 mm



DN-EB35MN – DINnectors End Bracket



Installation and Wiring



In This Chapter...

Safety Guidelines 3-2
Introduction to the CLICK PLUS PLC Mechanical Design 3-5
Mounting Guidelines 3-10
Installing the CLICK PLUS PLC 3-19
Wiring Guidelines 3-21
I/O Wiring Checklist 3-29
System Wiring Strategies 3-30
LAN Provisioning over Bluetooth 3-41
Option Slot Analog I/O Configuration 3-45
High-Speed Input/Output Configuration 3-52
Setting Up and Using an SD Card 3-57

Safety Guidelines



NOTE: *Products with CE marks perform their required functions safely and adhere to relevant standards as specified by CE directives, provided they are used according to their intended purpose and that the instructions in this manual are followed. The protection provided by the equipment may be impaired if this equipment is used in a manner not specified in this manual. A listing of our international affiliates is available on our Web site at http://www.automationdirect.com.*



WARNING: Providing a safe operating environment for personnel and equipment is your responsibility and should be your primary goal during system planning and installation. Automation systems can fail and may result in situations that can cause serious injury to personnel or damage to equipment. Do not rely on the automation system alone to provide a safe operating environment. You should use external electromechanical devices, such as relays or limit switches, that are independent of the PLC application to provide protection for any part of the system that may cause personal injury or damage. Every automation application is different, so there may be special requirements for your particular application. Make sure you follow all national, state, and local government requirements for the proper installation and use of your equipment.

Plan for Safety

The best way to provide a safe operating environment is to make personnel and equipment safety part of the planning process. You should examine every aspect of the system to determine which areas are critical to operator or machine safety. If you are not familiar with PLC system installation practices, or your company does not have established installation guidelines, you should obtain additional information from the following sources.

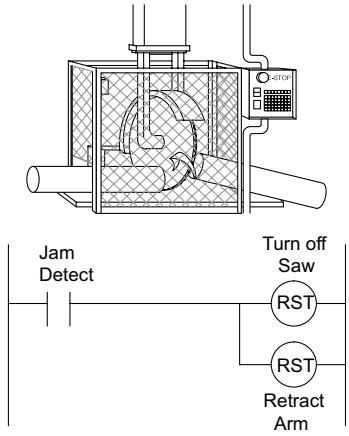
- NEMA — The National Electrical Manufacturers Association, located in Washington, D.C., publishes many different documents that discuss standards for industrial control systems. You can order these publications directly from NEMA. Some of these include:
  ICS 1, General Standards for Industrial Control and Systems
  ICS 3, Industrial Systems
  ICS 6, Enclosures for Industrial Control Systems
- NEC — The National Electrical Code provides regulations concerning the installation and use of various types of electrical equipment. Copies of the NEC Handbook can often be obtained from your local electrical equipment distributor or your local library.
- Local and State Agencies — many local governments and state governments have additional requirements above and beyond those described in the NEC Handbook. Check with your local Electrical Inspector or Fire Marshall office for information.

Three Levels of Protection

WARNING: The control program must not be the only form of protection for any problems that may result in a risk of personal injury or equipment damage.

The publications mentioned provide many ideas and requirements for system safety. At a minimum, you should follow these regulations. Also, you should use the following techniques, which provide three levels of system control.

1. Orderly system shutdown sequence in the PLC control program
2. Mechanical disconnect for output module power
3. Emergency stop switch for disconnecting system power



Orderly System Shutdown

The first level of fault detection is ideally the PLC control program, which can identify machine problems. These types of problems are usually things such as jammed parts, etc., that do not pose a risk of personal injury or equipment damage. However, respective shutdown sequences should be performed.

System Power Disconnect

You should also use electromechanical devices, such as master control relays and/or limit switches, to prevent accidental equipment startup at an unexpected time. These devices should be installed in a manner that will prevent any machine operations from occurring.

For example, if the machine in the illustration has a jammed part, the PLC control program can turn off the saw blade and retract the arbor. If the operator must open the guard to remove the part, you should also include a bypass switch that disconnects all system power any time the guard is opened.

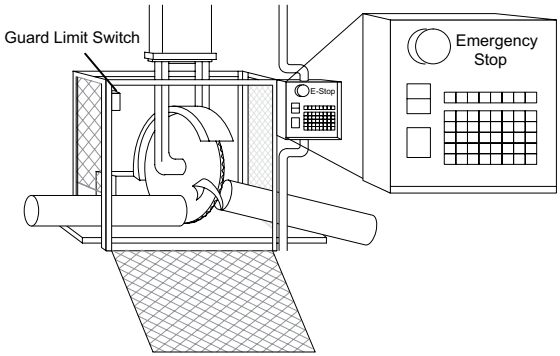
Emergency Stop Circuits

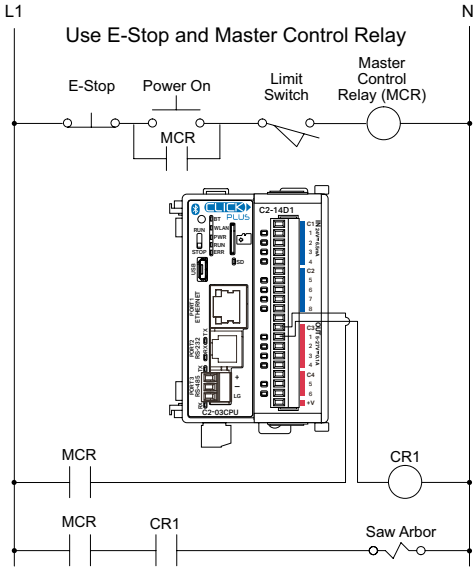
Emergency stop (E-Stop) circuits are a critical part of automation safety. For each machine controlled by a PLC, provide an emergency stop device that is wired outside the PLC and easily accessed by the machine operator.

E-stop devices are commonly wired through a master control relay (MCR) or a safety control relay (SCR) that will remove power from the PLC I/O system in an emergency.

MCRs and SCRs provide a convenient means for removing power from the I/O system during an emergency situation. By de-energizing an MCR (or SCR) coil, power to the input (optional) and output devices is removed. This event occurs when any emergency stop switch opens. However, the PLC continues to receive power and operate even though all its inputs and outputs are disabled.

The MCR circuit could be extended by placing a PLC fault relay (closed during normal PLC operation) in series with any other emergency stop conditions. This would cause the MCR circuit to drop the PLC I/O power in case of a PLC failure (memory error, I/O communications error, etc.).





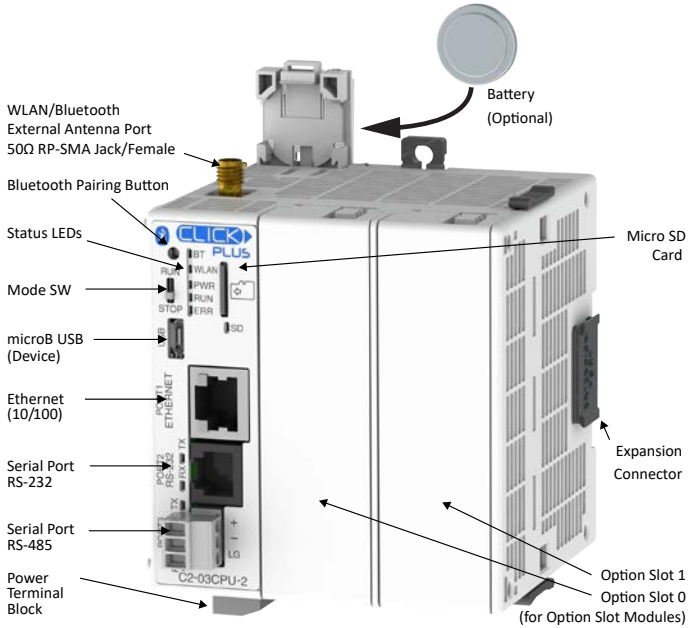
WARNING: For some applications, field device power may still be present on the terminal block even though the PLC is turned off. To minimize the risk of electrical shock, remove all field device power before you expose or remove PLC wiring. The connector is designed for easy removal by hand.

Introduction to the CLICK PLUS PLC Mechanical Design

CLICK PLUS PLC Units

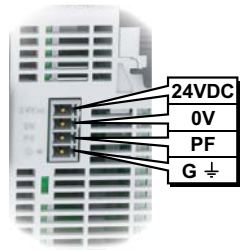
All CLICK PLUS PLCs are similar in appearance. Please see the diagrams below to familiarize yourself with the PLC features. The main components located on the front of the PLC are a Run/Stop switch, communications ports, micro SD card slot, LED status indicators and the Option Slot expansion port. A removable 4-pin 24VDC input power connector is located on the bottom of the PLC. Some models include an RP-SMA antenna port on the top of the PLC. The I/O module extension port is located on the right side of the PLC case. See Mounting Guidelines in this chapter for module dimensions and Chapter 2 for CLICK PLUS PLC specifications.

Component Locations on CLICK PLUS PLC Units



NOTE: High-speed Inputs and Outputs are only available on Slot 0.

CPU is shown with optional C2-FILL Option Slot Covers installed.



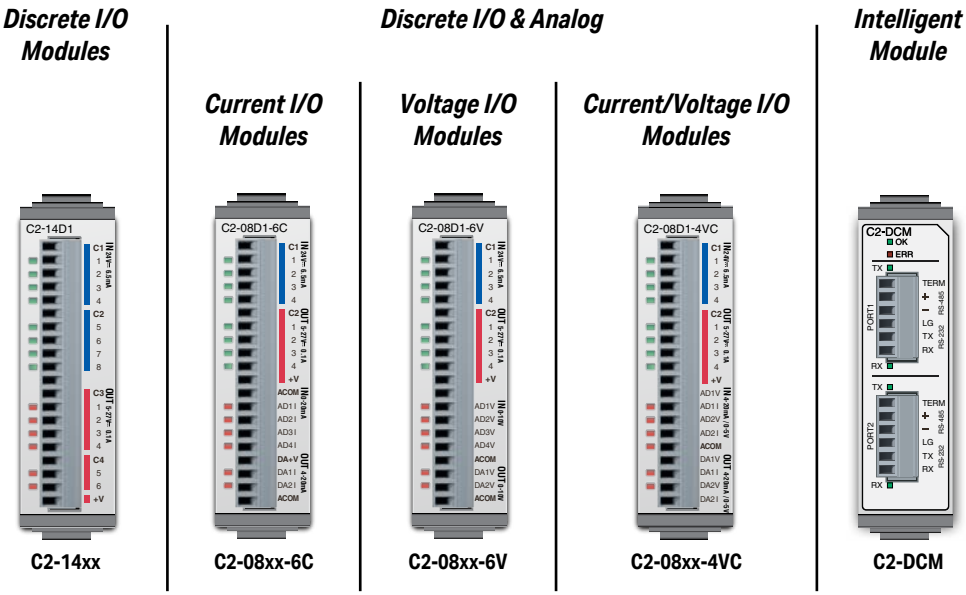
Bottom view same for all PLC's

CLICK PLUS Option Slot Modules

All CLICK PLUS PLCs include one or two built-in expansion slots, designated Option Slots. The first Option Slot (Slot 0) has access to the PLC's high-speed bus. One Intelligent Module and sixteen different Option Slot I/O modules are available, divided into four types, as shown below.

Discrete input sections of the modules are identified with a blue bar, and discrete output sections are identified with a red bar. Analog input and output terminals are identified by "AD" and "DA" prefixes to the terminal names, respectively.

See Mounting Guidelines in this chapter for module dimensions and Chapter 2 for CLICK Option Slot module specifications.

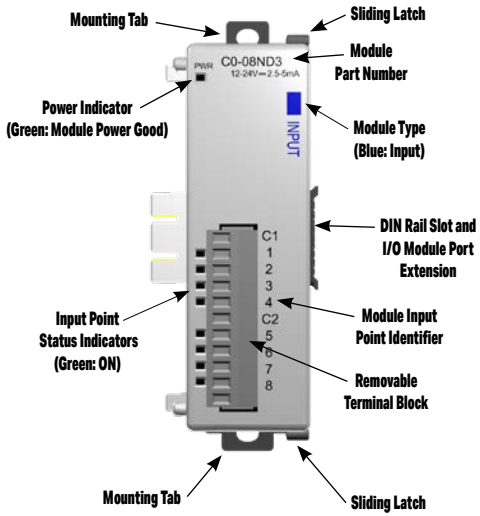


CLICK I/O Modules

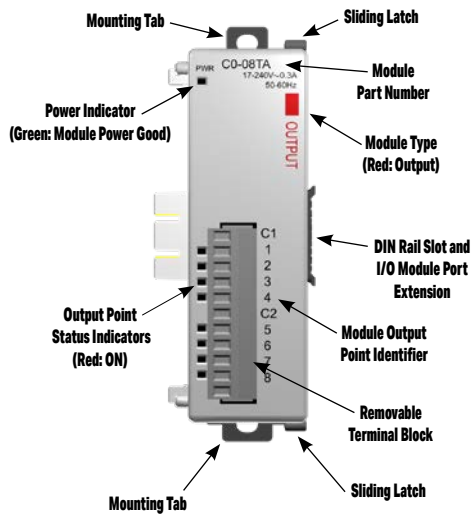
All CLICK PLC system input and output modules are compatible with the CLICK PLUS PLC. Several different types of I/O modules are available. Please see the diagrams below to familiarize yourself with the I/O module features.

Each I/O module is identified as an Input or Output module on its front panel using the color coding scheme listed below. Up to eight I/O option modules can be connected to a CLICK PLC. See Mounting Guidelines in this chapter for module dimensions and Chapter 2 for CLICK I/O module specifications.

Input Modules



Output Modules



CLICK Power Supplies

All CLICK PLUS PLCs require 24VDC input power from either a CLICK power supply or other suitable external power supply. Two models of CLICK power supplies are available to supply power to the PLC and I/O modules.

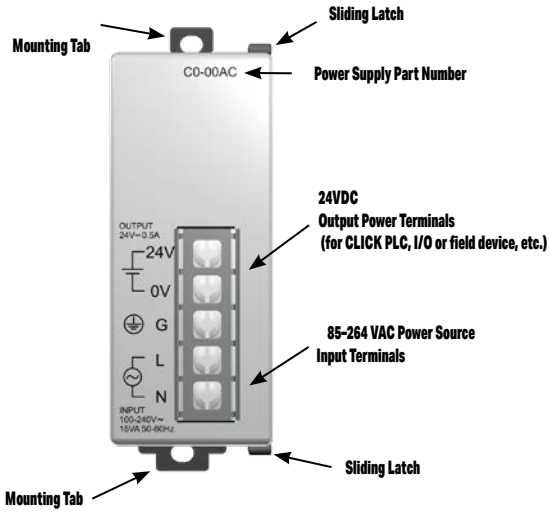
- C0-00AC - 0.5 A @ 24VDC output
- C0-01AC - 1.3 A @ 24VDC output

Select a power supply based on the power requirements of your system components. See Mounting Guidelines in this chapter for module dimensions and Chapter 2 for CLICK power supply specifications.

Power wires must be connected from the output terminals on the front of the power supply to the input power connector on the bottom of the CLICK PLUS PLC (There is no internal 24VDC power bus to the PLC.) See Mounting Guidelines for additional wiring information.

Only a single CLICK power supply can be attached directly to a CLICK PLUS PLC system. If multiple CLICK power supplies are used, or if other type of power supplies are used, mount them separately from the PLC. For example, the PSP24-DC12-1 DC-DC converter shown below must be mounted separately from the PLC.

C0-00AC and C0-01AC Power Supplies Component Locations





The PSP24-DC12-1 DC-DC converter must be mounted separately from the PLC.

Battery Backup

All of the CLICK PLUS PLC units have a super capacitor to maintain back up data in SRAM. The super capacitor should maintain a backup period of at least 1 hour.

If you need the CLICK PLC unit to maintain data in the SRAM for longer than the above period after the power is shut off, you must install a battery in the CLICK PLC unit.

Use battery part number D0-MC-BAT (not included with the PLC unit; order battery separately). Typical battery life is about 3 years, which includes PLC runtime and normal shutdown periods.

NOTE: *Please power off the PLC while installing and/or changing the battery.*

To install or replace the D0-MC-BAT battery:

1. Power up the CPU for at least 10 minutes to charge the CPU's capacitor prior to removing the battery. This will retain function memories. We recommend you backup data memory before replacing the battery. Plan to complete the battery replacement within 10 minutes of power off.
2. Power off the CPU.
3. Pull out the battery holder. (This may require a small screwdriver to push in the tab and lift it when the unit is mounted.)
4. Put in a new battery, with the positive (+) polarity side facing the battery holder.
5. Insert the battery holder into the CPU and push it all the way in.
6. Power on the CPU.
7. Make a note of the date the battery was installed. (Battery life is about 3 years.)



The battery backup is now available.

WARNING: Do not attempt to recharge the battery or dispose of it by fire. The battery may explode or release hazardous materials.

TIP: The CLICK PLUS PLC has a feature that indicates the pre-scheduled battery replacement date has passed. In the CLICK programming software, go to the pull-down menu: Setup > Battery backup Setup.

Mounting Guidelines

Environmental Specifications

The CLICK family of PLC products should be stored, installed, and used within their range of environmental specifications, such as storage temperature, operating temperature, humidity, environmental air, vibration, shock, and noise immunity. Certain output module circuit types may have derating curves depending on the ambient temperature and the number of outputs ON. Refer to the I/O module specifications in Chapter 2: *Specifications* for CLICK PLUS PLC environmental specifications and I/O module derating curves.

Agency Approvals

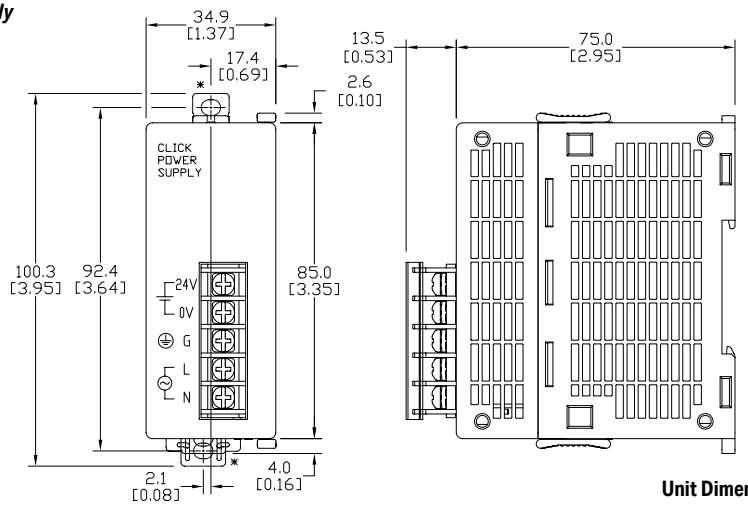
In addition to the panel layout guidelines, other specifications can affect the definition and installation of a PLC system. Always consider the following:

- Environmental Specifications
- Power Requirements
- Agency Approvals
- Enclosure Selection and Component Dimensions

CLICK Unit Dimensions

The following diagrams illustrate the dimensions of the CLICK power supply, CLICK PLUS PLC, Option Slot I/O modules and Stackable I/O modules. The CLICK PLC system is designed to be mounted on standard 35mm DIN rail, or it can be surface mounted. See the following pages for installations and mounting information, including "Mounting CLICK PLUS PLC System on DIN Rail" on page 3-20 for DIN rail and surface-mounting instructions.

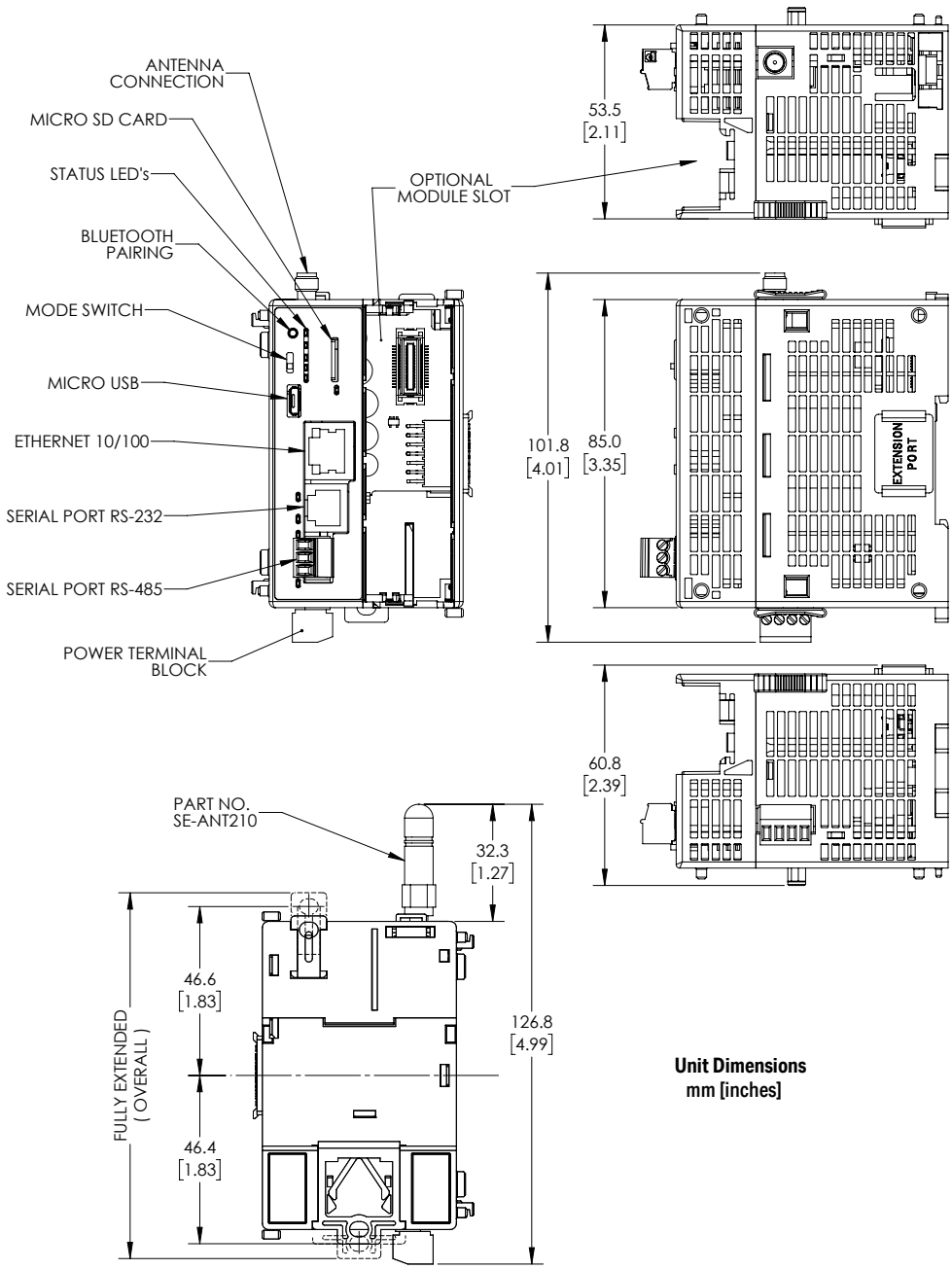
Power Supply



Unit Dimensions
mm [inches]

NOTE: *The dimensions for the C0-00AC and C0-01AC power supplies are the same.*

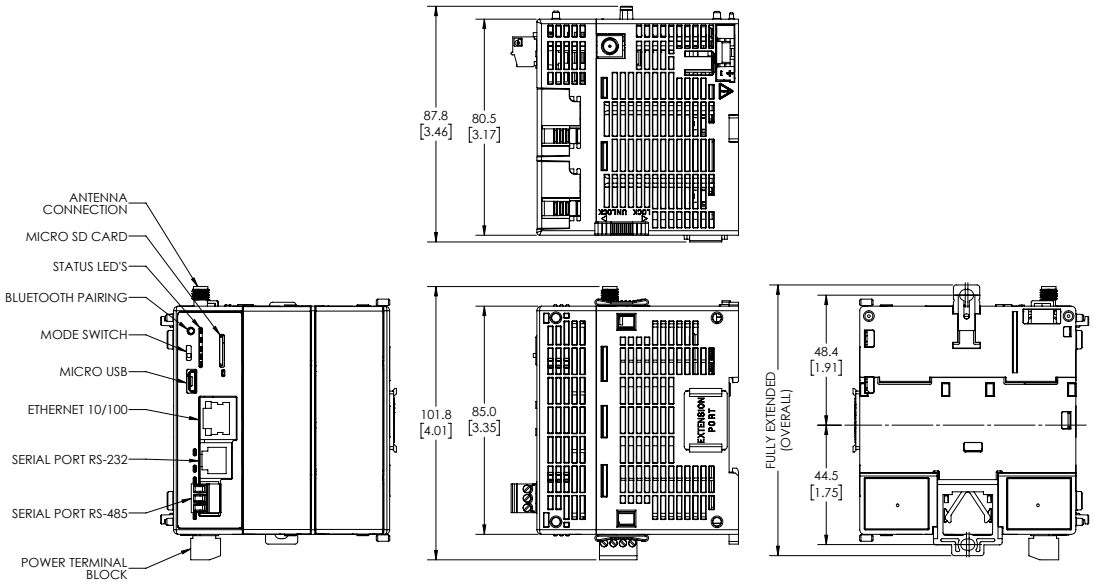
PLC Unit, C0-Series and Single-slot C2-Series



Unit Dimensions
mm [inches]

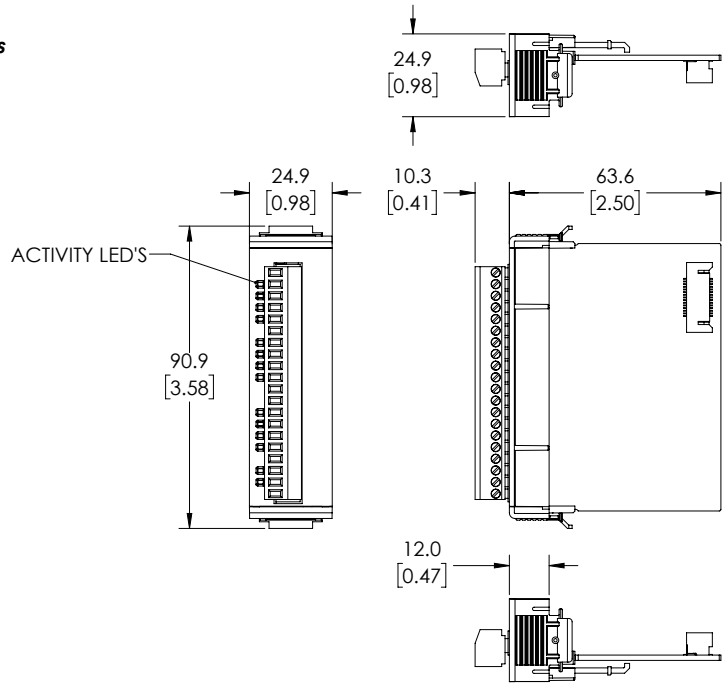
PLC Unit, Dual-slot C2-Series

Unit Dimensions
mm [inches]



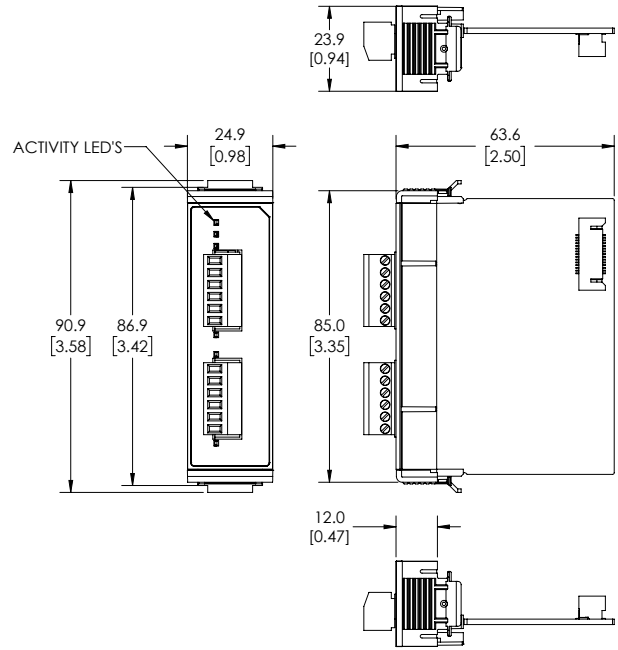
Option Slot I/O Modules

Unit Dimensions
mm [inches]

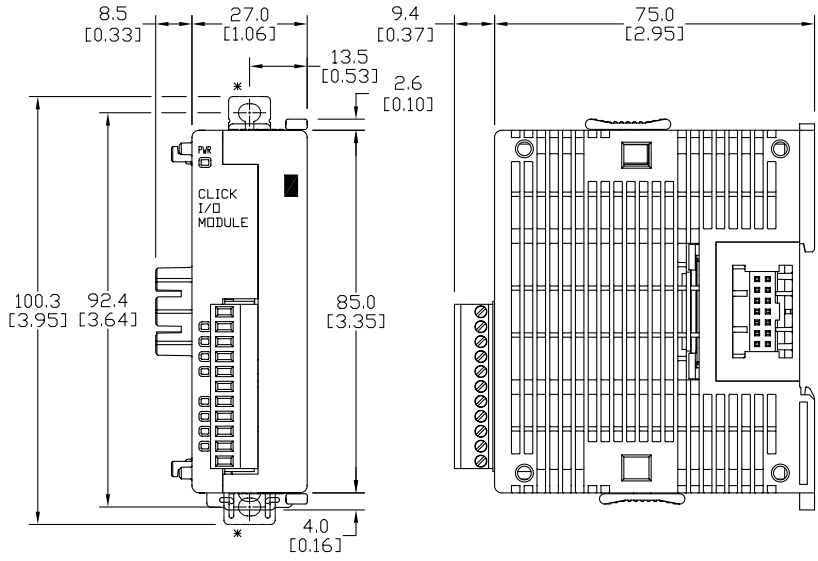


Option Slot C2-DCM Module

Unit Dimensions
mm [inches]

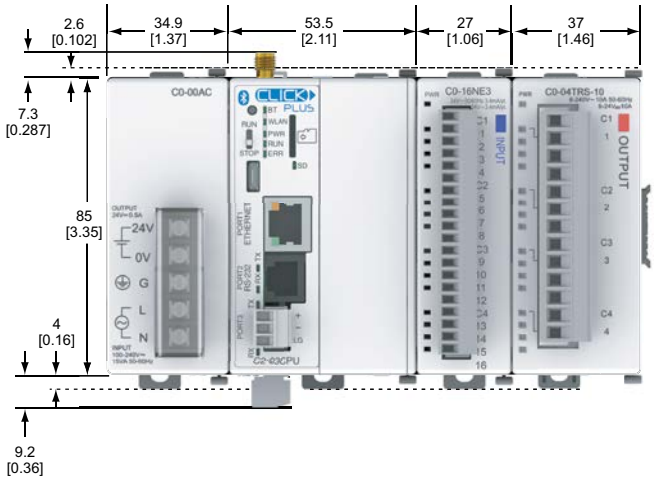


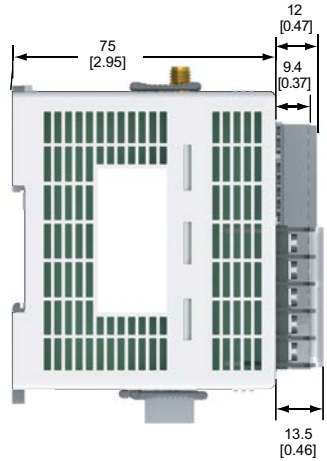
Stackable I/O Module



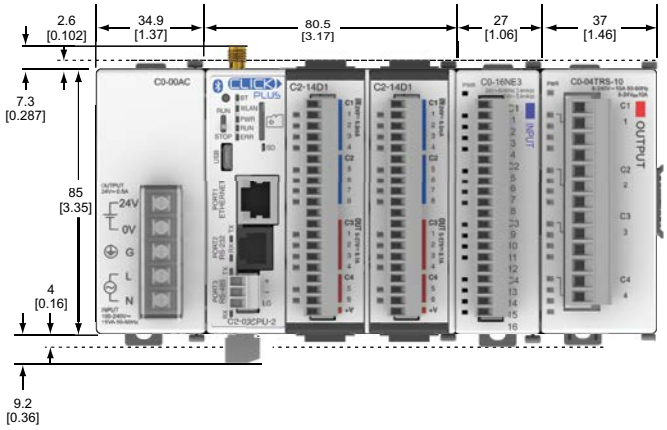
Unit Dimensions
mm [inches]

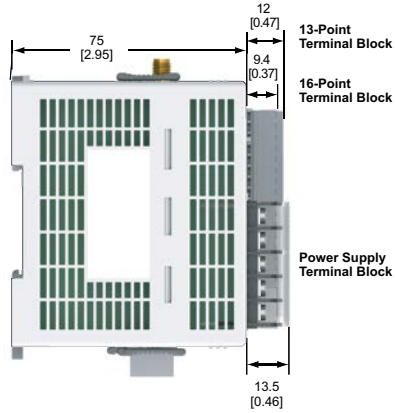
PLC Unit System





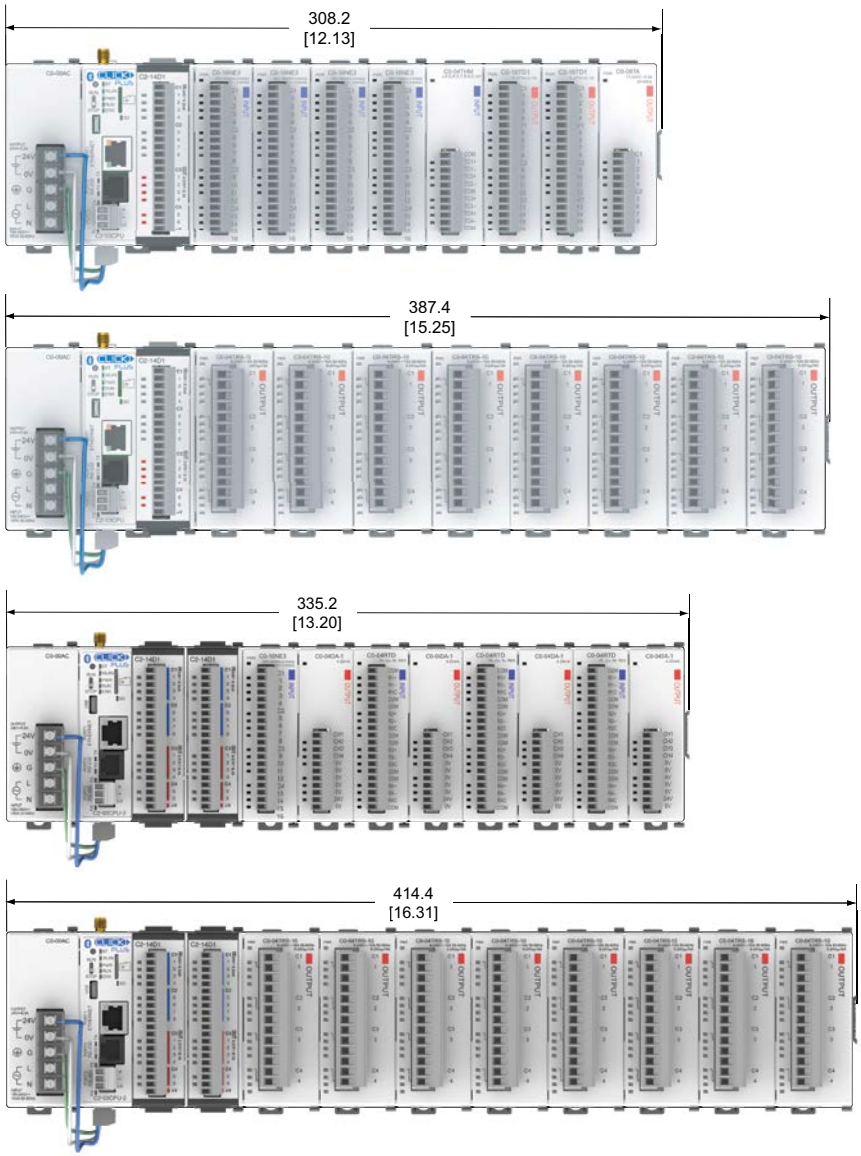
Unit Dimensions
mm [inches]





Maximum system: Power Supply + PLC + eight I/O modules.

Follow the installation guidelines to allow for proper spacing from other components within an enclosure. Note that the relay Stackable modules are each about 10mm wider than non-relay Stackable modules. The diagrams below indicate maximum system width with 8 relay modules and with 8 non-relay modules.



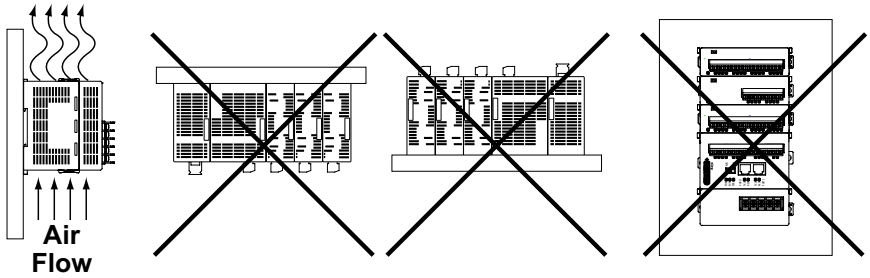
Enclosures

Your selection of a proper enclosure is important to ensure safe and proper operation of your CLICK PLUS PLC system. Control applications vary and yours may require additional considerations. At a minimum your enclosure should include:

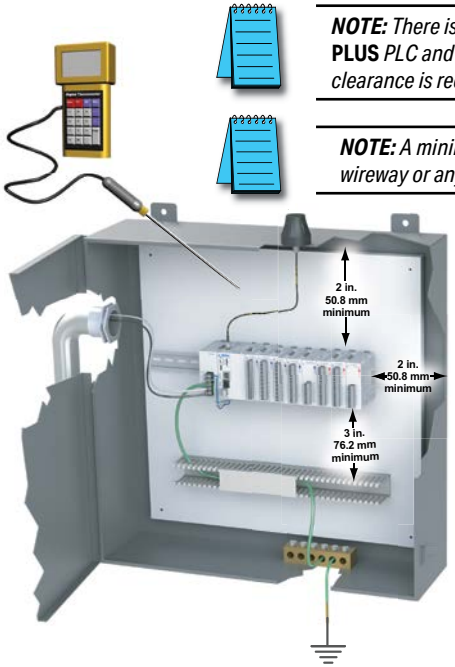
- Conformance to electrical standards
- Protection from the elements in an industrial environment
- Common ground reference
- Maintenance of specified ambient temperature
- Access to equipment
- Security or restricted access
- Sufficient space for proper installation and maintenance of equipment

Panel Layout and Clearances

1. Mount the CLICK PLUS PLC unit (system) horizontally as shown below to provide proper ventilation. Do not mount the CLICK PLUS PLC units upside down, on a horizontal surface or in a vertical arrangement. If you place more than one unit in a cabinet, there must be a minimum of 7.2" (183mm) between the units.

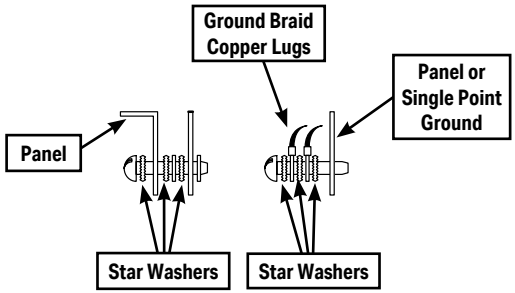


2. Provide a minimum clearance of 2" (50mm) between the unit and all sides of the cabinet. *NOTE*: Remember to allow clearance for any operator panels or other items mounted directly in front of the unit in the door.
3. There should also be at least 3" (78mm) of clearance between the unit and any wiring ducts that run parallel to the terminals.
4. The ground terminal on the CLICK PLUS PLC must be connected to a single point ground. Use copper stranded wire to achieve a low impedance. Copper eye lugs should be crimped and soldered to the ends of the stranded wire to ensure good surface contact.
5. There must be a single point ground (i.e. copper bus bar) for all devices in the panel requiring an earth ground return. The single point of ground must be connected to the panel ground termination. The panel ground termination must be connected to ground. Minimum wire sizes, color coding, and general safety practices should comply with appropriate electrical codes and standards for your area.



NOTE: *There is a minimum clearance requirement of 2" (51mm) between the* **CLICK PLUS** *PLC and the panel door or any devices mounted in the panel door. The same clearance is required between the PLC and surrounding enclosure.*

NOTE: *A minimum clearance of 3" (76mm) is required between the PLC and a wireway or any heat producing device.*



6. A good common ground reference (Earth ground) is essential for proper operation of the CLICK PLUS PLC. One side of all control and power circuits and the ground lead on flexible shielded cable must be properly connected to Earth ground. There are several methods of providing an adequate common ground reference, including:
   a) Tying to a ground rod installed as close as possible to the panel
   b) Connection to incoming power system ground
7. Evaluate any installations where the ambient temperature may approach the lower or upper limits of the specifications. If you suspect the ambient temperature will not be within the operating specification for the CLICK PLUS PLC system, measures such as installing a cooling/heating source must be taken to get the ambient temperature within the range of specifications.
8. CLICK PLUS PLC systems are modular and can be powered by any suitable 24VDC power supply. The optional CLICK power supply is designed to attach to the left side of the CLICK PLUS PLC case. CLICK power supplies accept 85-264 VAC and produce nominal 24VDC to power the CLICK PLUS PLC and I/O modules. Powerline filters are recommended for protecting the CLICK PLUS PLC from power surges and EMI/RFI noise. The AutomationDirect Powerline Filter, for use with 120VAC and 240VAC, 1–5 Amps, is an excellent choice (locate at **www.automationdirect.com**), however, you can use a filter of your choice. The filter units install easily between the AC power source and the PLC.

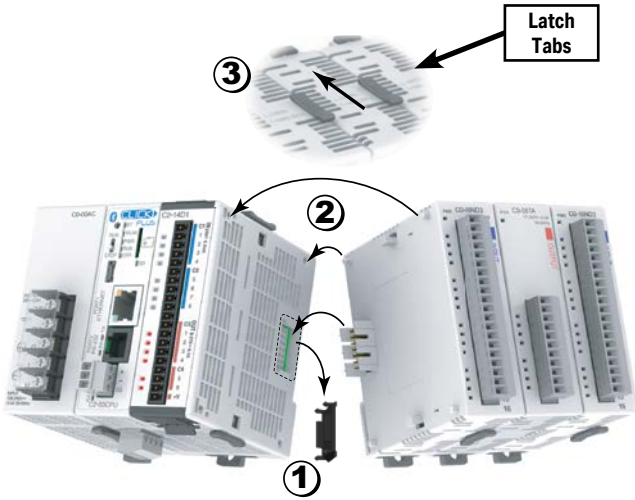
Installing the CLICK PLUS PLC

Connecting the Modules Together

CLICK PLUS PLCs and I/O modules connect together using the Extension Ports that are located on the side panels of the modules. The modules secure together by sliding LOCK/UNLOCK latch tabs located on the top and bottom panels of the modules. A PLC backplane or base is not required.

When connecting an I/O module to the PLC, first remove the Extension Port covers, slide the latches forward (unlock), align the module pins, and press the I/O module onto the PLC's right side. Slide the latches backward to lock the modules together.

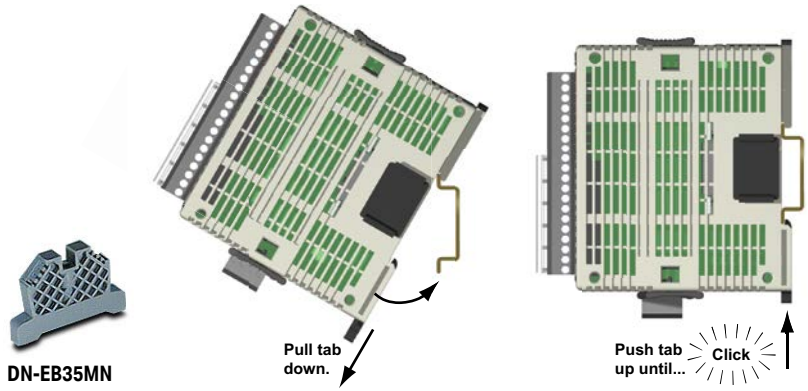
NOTE: *If you are using other components in your system, make sure you refer to the appropriate manual to determine how those units can affect mounting dimensions.*



1) Remove extension port covers and slide latch tabs forward.
2) Align the module pins and connection plug, and press the I/O module onto the right side of the PLC.
3) Slide the latch tabs backward to lock the modules together.

Mounting CLICK PLUS PLC System on DIN Rail

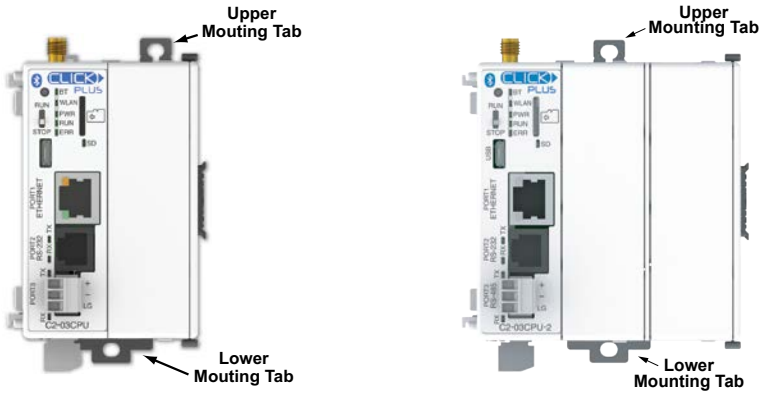
CLICK PLUS PLCs can be secured to a panel by using mounting rails. We recommend rails that conform to DIN EN standard 50 022. They are approximately 35mm high, with a depth of 7mm. If you mount the CLICK PLUS PLC on a rail, consider using end brackets on each side of the PLC. The end bracket helps keep the PLC from sliding horizontally along the rail, reducing the possibility of accidentally pulling the wiring loose. On the bottom of the PLC is a small retaining clip. To secure the PLC to a DIN rail, place it onto the rail and gently push up on the clip to lock it onto the rail. To remove the PLC, pull down on the retaining clip, lift up on the PLC slightly, then pull it away from the rail.



NOTE: *When mounting on DIN rail, using DINnectors end brackets at both ends is recommended (part number DN-EB35MN).*

Optional Mounting Method

The CLICK PLUS PLC system can be secured to the equipment panel or desired location using the mounting tabs located on the back panel of the PLC, I/O modules and power supplies. Extend the upper and lower retaining clips to the full out position. Mount using M4 screws in the center hole of the tabs.



Wiring Guidelines

Power Input Wiring to Click Power Supply

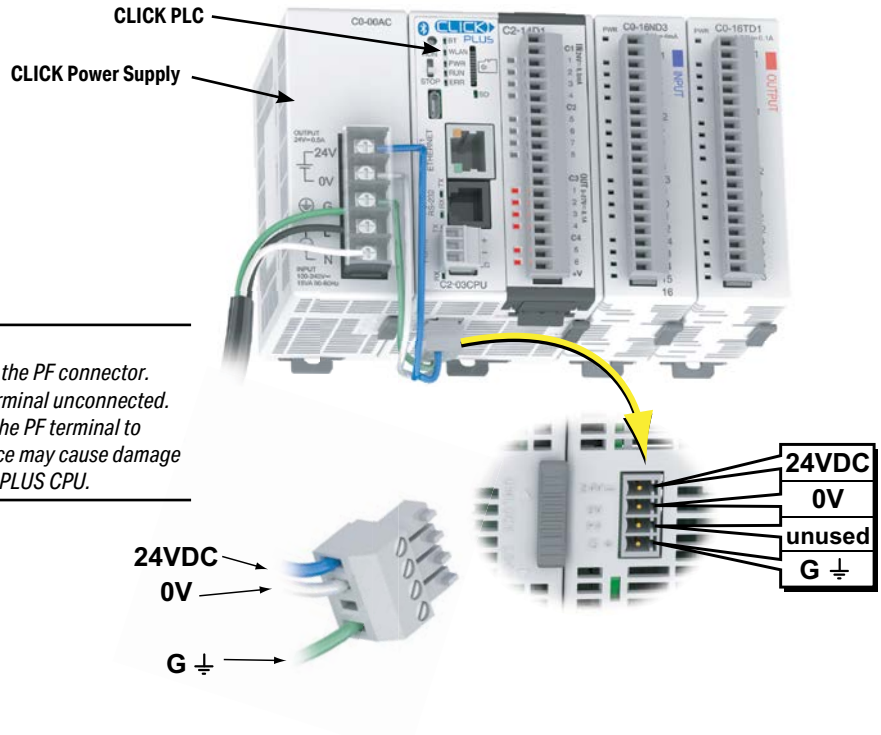
Connect the AC power source input wiring to the CLICK power supply (the CLICK power supply voltage and current requirements are listed in chapter 2). If you are not using a CLICK power supply, be sure that it meets CLICK PLUS PLC requirements.

Do not apply power at this time. Observe all precautions stated earlier in this manual.

WARNING: Once the power wiring is connected, secure the terminal block cover in the closed position. When the cover is open there is a risk of electrical shock if you accidentally touch the connection terminals or power wiring.

Power Input Wiring to CLICK PLUS PLC

Connect the 24VDC power source input wiring to the 4-pin 24VDC input connector located on the bottom panel of the CLICK PLUS PLC. Do not apply power at this time. Observe all precautions stated earlier in this manual.



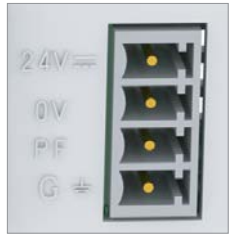
CAUTION:
DO NOT USE the PF connector. Leave this terminal unconnected. Connecting the PF terminal to another device may cause damage to the CLICK PLUS CPU.

Power Input Wiring to CLICK PLUS PLC, continued

Power Terminal Wiring Specifications	
Terminal Type	3.5 mm pitch pluggable terminal block
Wire Range	16–28 AWG
Wire Strip Length	7.0 mm
Wire Specification	Supported temperature: > 60°C Material: Copper
Screw Torque	2.0–2.2 lb-inch [0.22–0.25 N·m]
Screw Size	M2
Number of Pins	4-pin terminal block
Screwdriver Size	DN-SS1 or compatible (insulated slotted screwdriver 0.4 x 2.5 x 75 mm)

Note: C0-00AC or C0-01AC Power Supply recommended.

Power Terminal Pinout	
24V	24V Power supply in
0V	0V Power supply reference
PF	unused
G	Ground



USB Low Power Mode

The CLICK PLUS PLC can be powered over its USB port when no 24VDC power is applied. The following capabilities and restrictions apply to USB Low Power Mode.

Available:

- Programming over Port 1, Port 2, and Port 3
- Firmware update
- CLICK Factory Default and CLICK Project Loader Tools
- Modbus Server/Slave over Port 1, Port 2, and Port 3
- Option Slot module can be identified in software



Not Available:

- RUN mode is disabled
- WLAN and Bluetooth are disabled
- Access to the microSD Card from software is disabled
- Stackable I/O modules cannot be identified in software.

Fuse Protection

Fuse Protection for PLC Input Power

External circuit protection is needed to ensure the safety of service personnel and the safe operation of the equipment itself. To meet UL/CUL specifications, the input power must be fused. Fuse the AC side of the power supply that provides the 24VDC power to the CLICK PLC.

When operating the power supply from a 110/120 VAC system with a grounded neutral, it is only necessary to fuse the line (L) lead; it is not necessary to fuse the grounded neutral (N) lead. Select the fuse size based on the input current draw of the power supply. Refer to Chapter 2 of this manual for specifications of CLICK power supplies.

Fuse Protection for I/O Module Circuits

Input and Output circuits on CLICK PLUS PLCs do not have internal fuses. In order to protect your PLC, we suggest you add external fuses to your I/O wiring. A fast-blow fuse, with a lower current rating than the I/O bank's common current rating can be wired to each common. Or, a fuse with a rating of slightly less than the maximum current per output point can be added to each output. Refer to the I/O module specifications in Chapter 2 to find the maximum current per output point or per output common. Adding the external fuse does not guarantee the prevention of PLC damage, but it will provide added protection.



WARNING: The discrete inputs and outputs will be damaged if the signal exceeds the rated voltage.

Antenna Installation

Antenna Mounting (SE-ANT250 only)

The antenna should be bulkhead-mounted through the top of the enclosure, and will require a 15mm hole. Please follow mounting instructions found on the antenna datasheet, downloadable from https://www.automationdirect.com/pn/SE-ANT250.

RF Connection (SE-ANT210 or SE-ANT250)

Connect the antenna, either directly or via cable, to the RP-SMA connector at the top of the PLC as follows:

1. Ensure that both connectors are clean and dry.
2. Align and finger tighten the connectors.
3. Torque the connection to 3–5 in·lb.



NOTE: *The remote-mount antenna (SE-ANT250) is recommended for long-term use and increased performance. The direct-mount antenna (SE-ANT210) is not intended for use within a closed metal enclosure.*

Planning the I/O Wiring Routes

The following guidelines provide general information on how to wire the I/O connections to CLICK PLUS PLCs. For additional information about wiring a particular I/O type refer to the corresponding information in this chapter.

1. Each terminal connection of the CLICK PLUS PLC Option Slot I/O modules can accept one 16AWG wire or two 18AWG size wires. Do not exceed this recommended capacity. Refer to Chapter 2 *Specifications* for more detailed specifications of the terminal blocks.
2. Always use a continuous length of wire. Do not splice wires to attain a needed length.
3. Use the shortest possible wire length.
4. Use wire trays for routing where possible.
5. Avoid running lower voltage wires near higher voltage wiring.
6. Avoid running input wiring close to output wiring where possible.
7. To minimize voltage drops when wires must run a long distance, consider using multiple wires for the return line.
8. Avoid running DC wiring in close proximity to AC wiring where possible.
9. Avoid creating sharp bends in the wires.
10. Install the recommended powerline filter to reduce power surges and EMI/RFI noise.

Wiring I/O Modules

There are three sizes of I/O module terminal blocks used for field wiring connections (11pt, 13pt & 20pt). They can be removed from the module for wiring convenience. There are no clips or screws retaining the terminal block. Firmly grip the block and pull it away from the PLC or I/O module. The connector terminal points have recessed screws to help minimize the risk of someone accidentally touching active wiring. Make sure the terminal blocks are properly seated against the module when replacing them and wiring is properly constrained.

For your convenience we also have DINnectors, DIN-rail mounted terminal blocks. Refer to our website or catalog for a complete listing of all available products. We strongly recommend using our *ZIP*Links connections systems. See the following pages for *ZIP*Link compatibility and special pre-assembled cables, with the I/O connectors installed and wired.

***ZIP*Links Connection Systems**



***ZIP*Links Cables with Connectors**

***ZIP*Links Modules**

WARNING: For some modules, field device power may still be present on the terminal block even though the PLC system is turned off. To minimize the risk of electrical shock and equipment damage, check all field device power before you remove the connector.

ZIPLink Wiring System Compatibility Matrix for CLICK PLUS PLCs

Use the following tables to select your *ZIP*Link components. See our website, www.automationdirect.com, for more specifications and information on *ZIP*Links.

CLICK PLUS CPU Option Module *ZIP*Link Selector				
PLC		***ZIP*Link**		
CPU Option Module	**Terminals**	**Component**	**Module Part No.**	**Cable Part No.**
C2-14D1	20	Feedthrough	ZL-RTB20, ZL-RTB20-1	ZL-C0-CBL20*
C2-14D2				
C2-14DR				
C2-14AR				
C2-08D1-4VC	20	No *ZIP*Links are available for Analog Option Slot modules.		
C2-08D2-4VC				
C2-08DR-4VC				
C2-08AR-4VC				
C2-08D1-6C				
C2-08D2-6C				
C2-08DR-6C				
C2-08AR-6C				
C2-08D1-6V				
C2-08D2-6V				
C2-08DR-6V				
C2-08AR-6V				
C2-DCM	2x6	No *ZIP*Links are available.		

* Select the cable length by replacing the * with: Blank = 0.5 m, -1 = 1.0 m, or -2 = 2.0 m.

ZIPLink Wiring System Compatibility Matrix for CLICK PLCs (continued)

CLICK PLC Discrete Input Module *ZIP*Link Selector				
I/O Module		*ZIP*Link		
Input Module	Terminals	Component	Module Part No.	Cable Part No.
C0-08SIM	Not supported by ZIPLink			
C0-08ND3	11	Feedthrough	ZL-RTB20	ZL-C0-CBL11*
C0-08ND3-1				
C0-08NE3				
C0-08NA				
C0-16ND3	20	Feedthrough	ZL-RTB20	ZL-C0-CBL20*
		Sensor	ZL-LTB16-24-1	
C0-16NE3		Feedthrough	ZL-RTB20	
		Sensor	ZL-LTB16-24-1	

* Select the cable length by replacing the * with: Blank = 0.5 m, -1 = 1.0 m, or -2 = 2.0 m.

CLICK PLC Discrete Output Module *ZIP*Link Selector				
I/O Module		*ZIP*Link		
Output Module	Terminals	Component	Module Part No.	Cable Part No.
C0-08TD1	11	Feedthrough	ZL-RTB20	ZL-C0-CBL11*
C0-08TD2				
C0-08TR				
C0-08TR-3	Not supported by ZIPLink			
C0-08TA	11	Feedthrough	ZL-RTB20	ZL-C0-CBL11*
C0-16TD1	20	Feedthrough	ZL-RTB20	ZL-C0-CBL20*
		Fuse	ZL-RFU20[2]	
		Relay (sinking)	ZL-RRL16-24-1	
C0-16TD2		Feedthrough	ZL-RTB20	
		Fuse	ZL-RFU20[2]	
		Relay (sourcing)	ZL-RRL16-24-2	
C0-04TRS[1]		Feedthrough	ZL-RTB20	
C0-04TRS-10	Not supported by ZIPLink			

* Select the cable length by replacing the * with: Blank = 0.5 m, -1 = 1.0 m, or -2 = 2.0 m.

[1] NOTE: The C0-04TRS relay output is derated not to exceed 2A per point max. when used with the ZIPLink wiring system.

[2] NOTE: Fuses (5 x 20 mm) are not included. See Edison Electronic Fuse section for (5 x 20 mm) fuse. S500 and GMA electronic circuit protection for fast-acting maximum protection. S506 and GMC electronic circuit protection for time-delay performance. Ideal for inductive circuits.
To ensure proper operation, do not exceed the voltage and current rating of ZIPLink module. ZL-RFU20 = 2A per circuit.

ZIPLink Wiring System Compatibility Matrix for CLICK PLCs (continued)

CLICK PLC Combo I/O Module ZIPLink Selector				
I/O Module		ZIPLink		
Combo Module	# of Terms	Component	Module Part No.	Cable Part No.
C0-16CDD1	20	Feedthrough	ZL-RTB20	ZL-C0-CBL20*
C0-16CDD2				
C0-08CDR	11			ZL-C0-CBL11*

* Select the cable length by replacing the * with: Blank = 0.5m, -1 = 1.0m, or -2 = 2.0m.

CLICK PLC Analog I/O Module *ZIP*Link Selector				
I/O Module		*ZIP*Link		
Analog Module	# of Terms	Component	Module Part No.	Cable Part No.
C0-04AD-1	11	Feedthrough	ZL-RTB20	ZL-C0-CBL11*
C0-04AD-2	11			
C0-04RTD	20	No *ZIP*Links are available for RTD and thermocouple modules.		
C0-04THM	11			
C0-04DA-1	11	Feedthrough	ZL-RTB20	ZL-C0-CBL11*
C0-04DA-2	11			ZL-C0-CBL11*
C0-4AD2DA-1	20			ZL-C0-CBL20*
C0-4AD2DA-2	20			ZL-C0-CBL20*

* Select the cable length by replacing the * with: Blank = 0.5m, -1 = 1.0m, or -2 = 2.0m.

I/O Wiring Checklist

Use the following guidelines when wiring the I/O modules in your system.

1. There is a limit to the size of wire the modules can accept. The table below lists the suggested AWG. When making terminal connections, follow the suggested torque values.

Terminal Block AWG and Torque	
Connector Type (all)	Removable Terminal Block
Wire Range	28-16 AWG
Wire strip length	7.0 mm
Screw Size	M2.0
Screw Torque	Analog, analog combo I/O modules only: 1.7 lb·in; All other modules: 2.0 to 2.2 lb·in



NOTE: *Recommended wire is 16 AWG Type TFFN or Type MTW. Other types of 16 AWG may be acceptable, depending on the thickness and stiffness of the wire insulation. If the insulation is too thick or stiff, and a majority of the module's I/O points are used, then the plastic terminal cover may not close properly or the connector may pull away from the module. This applies especially for high temperature thermoplastic insulation material such as THHN.*

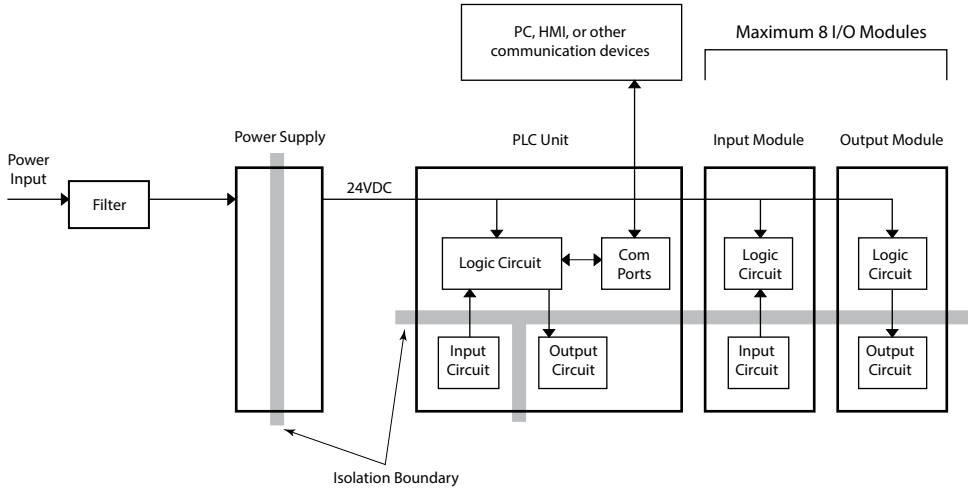
2. Always use a continuous length of wire, do not combine wires to attain a needed length.
3. Use the shortest possible wire length.
4. Use wire trays for routing where possible.
5. Avoid running wires near high energy wiring. Also, avoid running input wiring close to output wiring where possible.
6. To minimize voltage drops when wires must run a long distance, consider using multiple wires for the return line.
7. Avoid running DC wiring in close proximity to AC wiring where possible.
8. Avoid creating sharp bends in the wires.
9. To reduce the risk of having a module damaged, we suggest you add external fuses to your I/O wiring. A fast blow fuse, with a lower current rating than the I/O module fuse, can be added to each common, or a fuse with a rating of slightly less than the maximum current per output point can be added to each output. Refer to our catalog for a complete line of DINnectors, DIN-rail mounted fuse blocks.
10. If using relay outputs with inductive loads, consider using surge suppressors (see section on surge suppression later in this chapter).

System Wiring Strategies

The CLICK PLUS PLC system is very flexible and will work in many different wiring configurations. By studying this section before actual installation, you can find the best wiring strategy for your application. This will help to lower system cost and wiring errors, and avoid safety problems.

PLC Isolation Boundaries

PLC circuitry is divided into three main regions separated by isolation boundaries, shown in the drawing below. Electrical isolation provides safety, so that a fault in one area does not damage an adjacent area. A powerline filter will provide isolation between the power source and the power supply. The transformer in the power supply provides magnetic isolation between the primary and secondary sides. Optical isolators provide optical isolation in Input and Output circuits. These methods isolate logic circuitry from the field side, where factory machinery connects. The discrete inputs are isolated from the discrete outputs, because each is isolated from the logic side. Isolation boundaries protect devices such PC and HMI that are connected to the communication ports, from power input faults or field wiring faults. When wiring a PLC, it is extremely important to avoid making external connections that connect logic side circuits to more than one circuit.

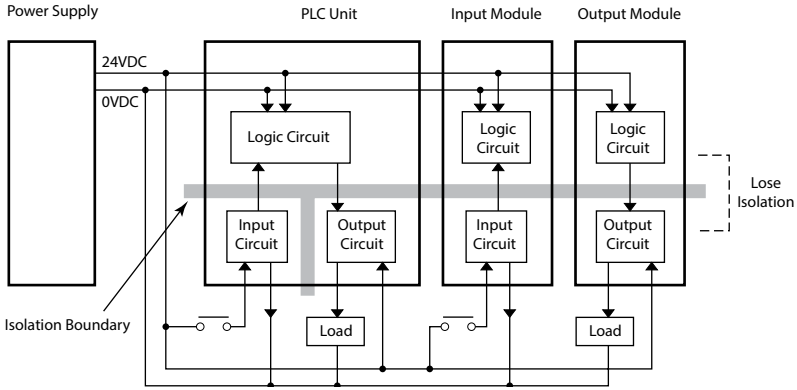


NOTE: *If you do not use one of the CLICK PLC power supplies C0-00AC and C0-01AC to provide 24VDC to the PLC module (and I/O modules), be sure the power supply you use has isolation with a transformer.*

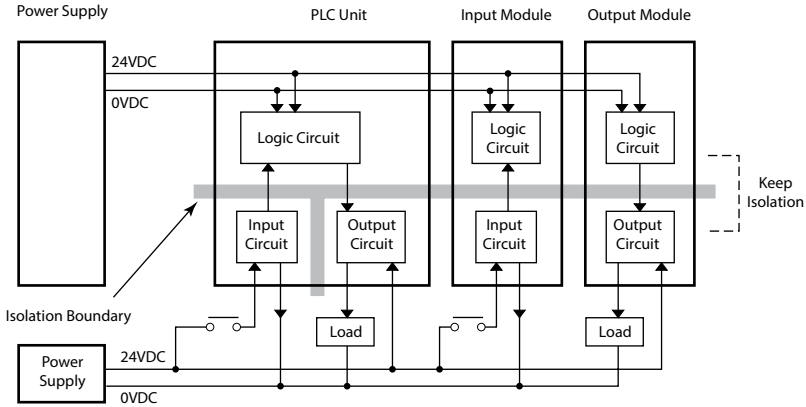
Powering I/O Circuits

In most applications, it will be necessary to power the input devices from one power source, and to power output loads from another source. Loads often require high-energy AC power, while input sensors use low-energy DC. If a machine operator is likely to come in close proximity to input wiring, then for safety reasons, high-energy output circuits would be isolated.

For the DC input/output circuits, you can use the same power source as the PLC module (and I/O modules). However, you lose the isolation between the logic circuits and the input/output circuits. For AC input/output circuits, you don't need to worry about sharing the 24VDC.



To keep the isolation between the logic circuits and the input/output circuits, we recommend using another power supply for the DC input and output circuits.

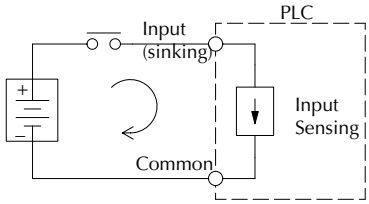


Sinking/Sourcing Concepts

Before wiring field devices to the PLC I/O, it's necessary to have a basic understanding of sinking and sourcing concepts. Use of these terms occurs frequently in input or output circuit discussions. The purpose of this section is to explain the terms. The short definitions are as follows:

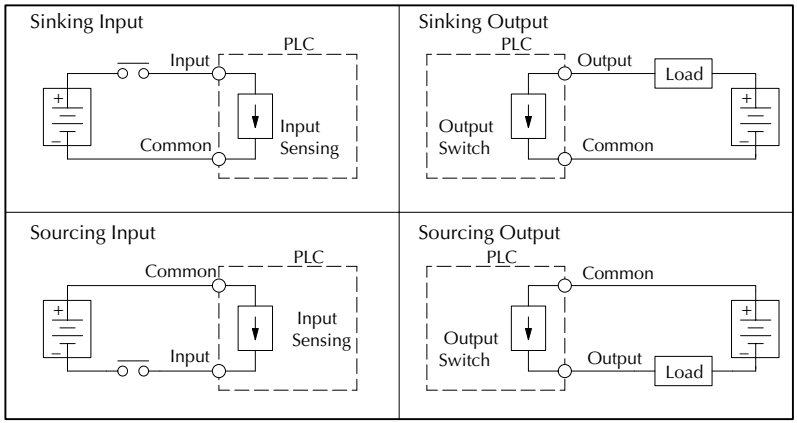
- Sinking = Path to supply ground (–) or switching ground
- Sourcing = Path to supply source (+) or switching +V

These terms only apply to DC circuits, not AC circuits. Input and output points that are either sinking or sourcing can conduct current in only one direction. This means it is possible to wire the external supply and field device to the I/O point with current trying to flow in the wrong direction, in which case the circuit will not operate.



The diagram on the left shows a sinking PLC input. To properly connect the external supply, connect it so the input provides a path to ground (–). Start at the PLC input terminal, follow through the input sensing circuit, exit at the common terminal, and connect the supply (–) to the common terminal.

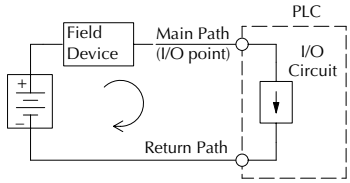
The switch between the supply (+) and the input completes the circuit. Current flows in the direction of the arrow when the switch is closed. By applying the circuit principle above to the four possible combinations of input/output sinking/sourcing types, we have the four circuits as shown below.

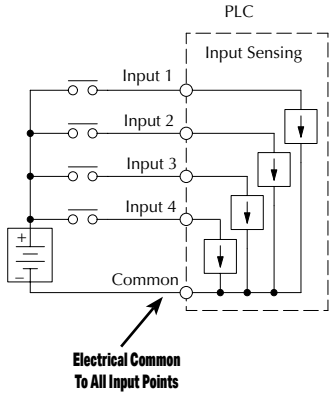


I/O "Common Terminal" Concepts

In order for a PLC I/O circuit to operate, current must enter at one terminal and exit at another. This means at least two terminals are associated with every I/O point. In the figure to the right, the input or output terminal is the main path for the current. One additional terminal must provide the return path to the power supply.

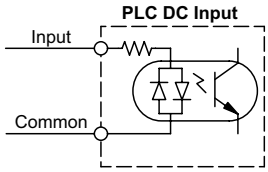
If there was unlimited module space, then every I/O point could have two dedicated terminals as the previous figure shows. Providing this level of flexibility is not practical or necessary for most applications. So, most I/O point groups share the return path (common) among two or more I/O points. The figure to the right shows a group (or bank) of 4 input points which share a common return path. In this way, the four inputs require only five terminals instead of eight.





NOTE: *In the circuit above, the current in the common path is equal to the sum of the energized channels. This is especially important in output circuits, where larger gauge wire is sometimes needed for the commons.*

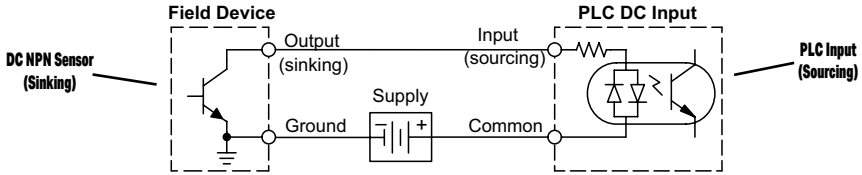
DC Input Wiring Methods



CLICK PLCs and I/O modules with DC inputs can be wired as either sinking or sourcing inputs. The dual diodes (shown in this diagram) allow current to flow in either direction. Inputs grouped by a common point must be either all sinking or all sourcing. DC inputs typically operate in the range of +12-24 VDC.

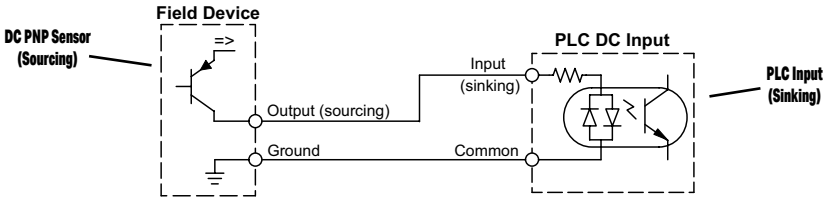
Sinking Input Sensor (NPN Type) to PLC Sourcing Input

In the following example, a field device has an open-collector NPN transistor output. When energized, it sinks current to ground from the DC input point. The PLC input current is sourced from the common terminal connected to power supply (+).



Sourcing Input Sensor (PNP Type) to PLC Sinking Input

In the following example, a field device has an open-emitter PNP transistor output. When energized, it sources current to the PLC input point, which sinks the current to ground. Since the field device loop is sourcing current, no additional power supply is required for the module.



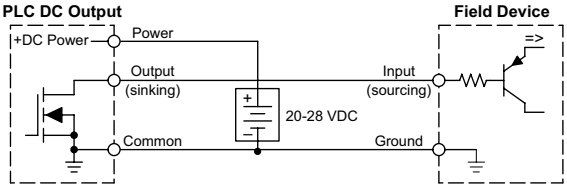
DC Output Wiring Methods

CLICK PLCs and I/O modules with DC output circuits are wired as all current sinking only or current sourcing only depending on which PLC or output module part number is used. DC outputs typically operate in the range of +5-24 VDC.

PLC Sinking Output to Sourcing Load Device

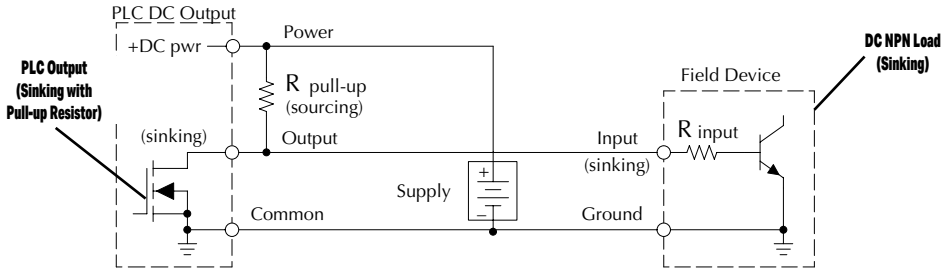
Many applications require connecting a PLC output point to a DC input on a field device load. This type of connection is made to carry a low-level DC signals.

In the following example, the PLC output point sinks current to ground (common) when energized. The output is connected to a field device load with a sourcing input.



PLC DC Sinking Output to Sinking Load Device

In the example below, a PLC sinking output point is connected to the sinking input of a field device load. In this case, both the PLC output and field device input are sinking type. Since the circuit must have one sourcing and one sinking device, we add sourcing capability to the PLC output by using a pull-up resistor. In the circuit below, we connect Rpull-up from the output to the DC output circuit power input.



NOTE 1: *DO NOT attempt to drive a heavy load (>25 mA) with this pull-up method.*

NOTE 2: *Using the pull-up resistor to implement a sourcing output has the effect of inverting the output point logic. In other words, the field device input is energized when the PLC output is OFF, from a ladder logic point-of-view. Your ladder program must comprehend this and generate an inverted output. Or, you may choose to cancel the effect of the inversion elsewhere, such as in the field device.*

It is important to choose the correct value of $R_{pull\text{-}up}$. In order to do so, we need to know the nominal input current to the field device (I_{input}) when the input is energized. If this value is not known, it can be calculated as shown (a typical value is 15 mA). Then use I_{input} and the voltage of the external supply to compute $R_{pull\text{-}up}$. Then calculate the power $P_{pull\text{-}up}$ (in watts), in order to size $R_{pull\text{-}up}$ properly.

$$I_{input} = \frac{V_{input\ (turn\text{–}on)}}{R_{input}}$$

$$R_{pull\text{-}up} = \frac{V_{supply} - 0.7}{I_{input}} - R_{input}$$

$$P_{pull\text{-}up} = \frac{V_{supply}^{2}}{R_{pull\text{-}up}}$$

Relay Outputs - Wiring Methods

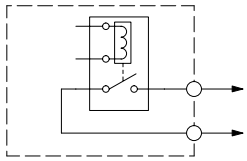
Relay outputs are available for the CLICK PLCs. Relays are best for the following applications:

- Loads that require higher currents than the solid-state outputs can deliver
- Cost-sensitive applications
- Some output channels need isolation from other outputs (such as when some loads require different voltages than other loads)

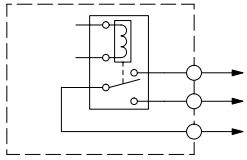
Some applications in which NOT to use relays:

- Loads that require currents under 10mA
- Loads which must be switched at high speed or heavy duty cycle

Relay with Form A contacts



Relay with Form C contacts



Relay outputs in the CLICK PLCs and modules are available in two contact arrangements. Form A type, or SPST (single pole, single throw) type. They are normally open and are the simplest to use. The Form C, or SPDT (single pole, double throw) type has a center contact which moves and a stationary contact on either side. This provides a normally closed contact and a normally open contact.

Some relay output module's relays share common terminals, which connect to the wiper contact in each relay of the bank. Other relay modules have relays which are completely isolated from each other. In all cases, the module drives the relay coil when the corresponding output point is on.

Relay Outputs – Transient Suppression for Inductive Loads in a Control System

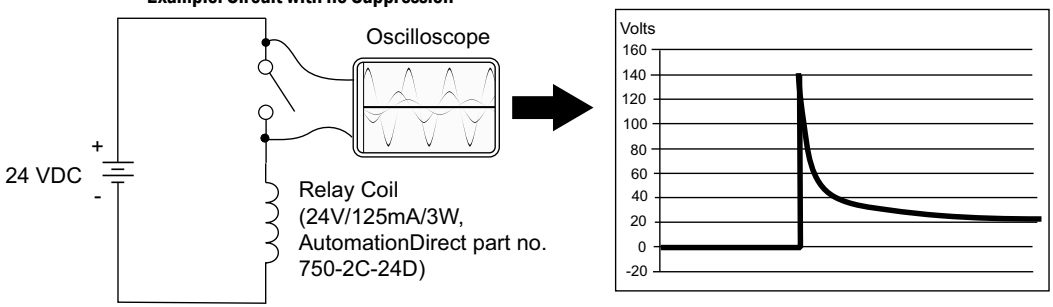
The following pages are intended to give a quick overview of the negative effects of transient voltages on a control system and provide some simple advice on how to effectively minimize them. The need for transient suppression is often not apparent to the newcomers in the automation world. Many mysterious errors that can afflict an installation can be traced back to a lack of transient suppression.

What is a Transient Voltage and Why is it Bad?

Inductive loads (devices with a coil) generate transient voltages as they transition from being energized to being de-energized. If not suppressed, the transient can be many times greater than the voltage applied to the coil. These transient voltages can damage PLC outputs or other electronic devices connected to the circuit, and cause unreliable operation of other electronics in the general area. Transients must be managed with suppressors for long component life and reliable operation of the control system.

This example shows a simple circuit with a small 24V/125mA/3W relay. As you can see, when the switch is opened, thereby de-energizing the coil, the transient voltage generated across the switch contacts peaks at 140V.

Example: Circuit with no Suppression



In the same circuit, replacing the relay with a larger 24V, 290mA, 7W relay will generate a transient voltage exceeding 800V (not shown). Transient voltages like this can cause many problems, including:

- Relay contacts driving the coil may experience arcing, which can pit the contacts and reduce the relay's lifespan.
- Solid state (transistor) outputs driving the coil can be damaged if the transient voltage exceeds the transistor rating. In extreme cases, complete failure of the output can occur the very first time a coil is de-energized.
- Input circuits, which might be connected to monitor the coil or the output driver, can also be damaged by the transient voltage.

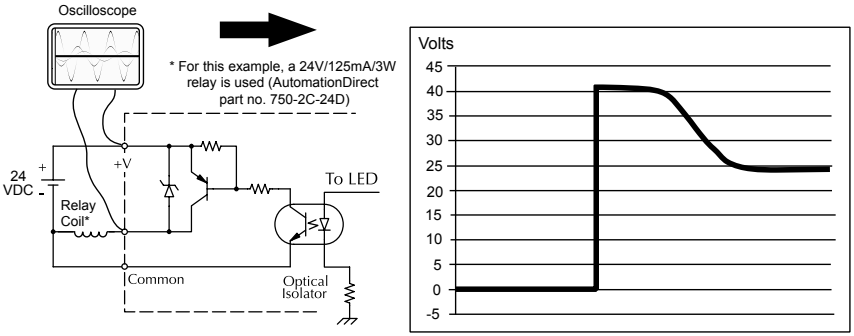
A very destructive side-effect of the arcing across relay contacts is the electromagnetic interference (EMI) it can cause. This occurs because the arcing causes a current surge, which releases RF energy. The entire length of wire between the relay contacts, the coil, and the power source carries the current surge and becomes an antenna that radiates the RF energy. It will readily couple into parallel wiring and may disrupt the PLC and other electronics in the area. This EMI can make an otherwise stable control system behave unpredictably at times.

PLC's Integrated Transient Suppressors

Although the PLC's outputs typically have integrated suppressors to protect against transients, they are not capable of handling them all. It is usually necessary to have some additional transient suppression for an inductive load.

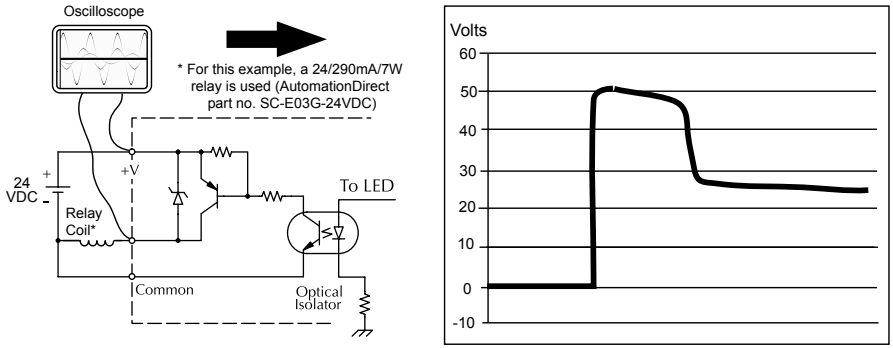
Here is another example using the same 24V, 125mA, 3W relay used earlier. This example measures the PNP transistor output of a D0-06DD2 PLC, which incorporates an integrated Zener diode for transient suppression. Instead of the 140V peak in the first example, the transient voltage here is limited to about 40V by the Zener diode. While the PLC will probably tolerate repeated transients in this range for some time, the 40V is still beyond the module's peak output voltage rating of 30V.

Example: Small Inductive Load with Only Integrated Suppression



The next example uses the same circuit as above, but with a larger 24V, 290mA, 7W relay thereby creating a larger inductive load. As you can see, the transient voltage generated is much worse, peaking at over 50V. Driving an inductive load of this size without additional transient suppression is very likely to permanently damage the PLC output.

Example: Larger Inductive Load with Only Integrated Suppression

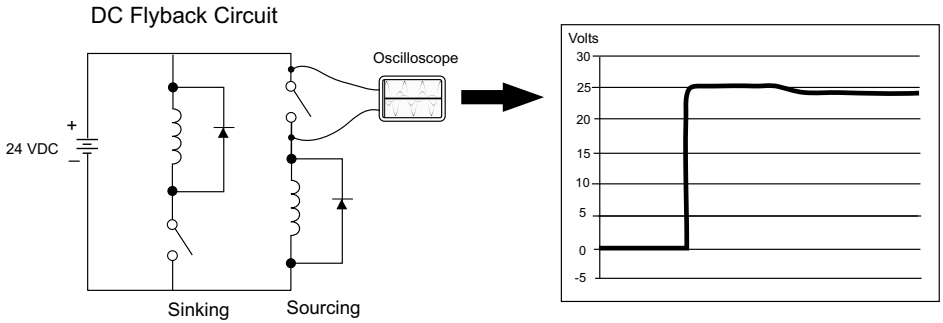


Additional transient suppression should be used in both these examples. If you are unable to measure the transients generated by the connected loads of your control system, using additional transient suppression on all inductive loads would be the safest practice.

Types of Additional Transient Protection

DC Coils:

The most effective protection against transients from a DC coil is a flyback diode. A flyback diode can reduce the transient to roughly 1V over the supply voltage, as shown in this example.



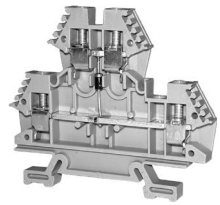
Many AutomationDirect socketed relays and motor starters have add-on flyback diodes that plug or screw into the base, such as the AD-ASMD-250 protection diode module and 784-4C-SKT-1 socket module shown below. If an add-on flyback diode is not available for your inductive load, an easy way to add one is to use an AutomationDirect DN-D10DR-A diode terminal block, a 600VDC power diode mounted in a slim DIN rail housing.



AD-ASMD-250
Protection Diode Module



784-4C-SKT-1
Relay Socket



DN-D10DR-A
Diode Terminal Block

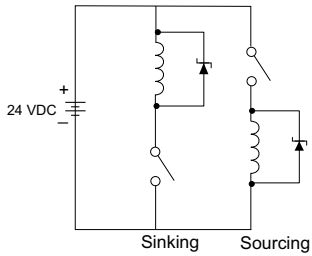
Two more common options for DC coils are Metal Oxide Varistors (MOV) or TVS diodes. These devices should be connected across the driver (PLC output) for best protection as shown below. The optimum voltage rating for the suppressor is the lowest rated voltage available that will NOT conduct at the supply voltage, while allowing a safe margin.

AutomationDirect's ZL-TSD8-24 transorb module is a good choice for 24VDC circuits. It is a bank of 8 uni-directional 30V TVS diodes. Since they are uni-directional, be sure to observe the polarity during installation. MOVs or bi-directional TVS diodes would install at the same location, but have no polarity concerns.



ZL-TSD8-24
Transorb Module

DC MOV or TVS Diode Circuit



AC Coils:

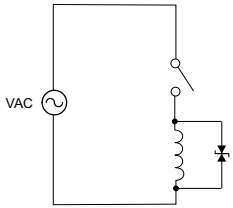
Two options for AC coils are MOVs or bi-directional TVS diodes. These devices are most effective at protecting the driver from a transient voltage when connected across the driver (PLC output) but are also commonly connected across the coil. The optimum voltage rating for the suppressor is the lowest rated voltage available that will NOT conduct at the supply voltage, while allowing a safe margin.

AutomationDirect's ZL-TSD8-120 transorb module is a good choice for 120VAC circuits. It is a bank of eight bi-directional 180V TVS diodes.



ZL-TSD8-120
Transorb Module

AC MOV or Bi-Directional Diode Circuit





NOTE: *Manufacturers of devices with coils frequently offer MOV or TVS diode suppressors as an add-on option which mount conveniently across the coil. Before using them, carefully check the suppressor ratings. Just because the suppressor is made specifically for that part does not mean it will reduce the transient voltages to an acceptable level.*

For example, a MOV or TVS diode rated for use on 24-48 VDC coils would need to have a high enough voltage rating to NOT conduct at 48V. That suppressor might typically start conducting at roughly 60VDC. If it were mounted across a 24V coil, transients of roughly 84V (if sinking output) or -60V (if sourcing output) could reach the PLC output. Many semiconductor PLC outputs cannot tolerate such levels.

LAN Provisioning over Bluetooth

Provisioning your Wireless CLICK PLUS PLC via Bluetooth (Models C2-02CPU and C2-03CPU only)

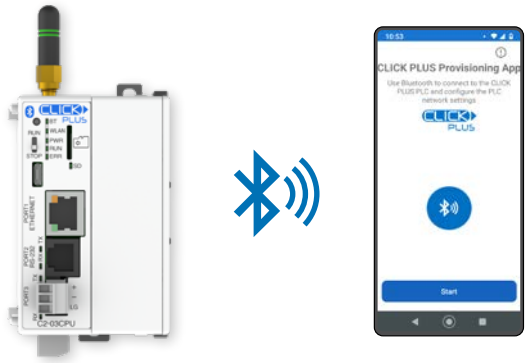
To improve the out-of-box experience, a new CLICK PLUS C2-02CPU or C2-03CPU has Bluetooth enabled by default and allows the user with the CLICK PLUS Provisioning App to connect and configure the needed Wi-Fi and network settings. This removes the need for cables with a new CLICK PLUS. Once the Wi-Fi is configured to connect to the local network access point, the user can then connect the Click Programming software via Wi-Fi to load and edit the project. The Temporary settings used for provisioning are stored in temporary memory and will be overwritten by the project settings when written to the PLC.

Install an external antenna

In order to connect to the CLICK PLUS PLC over Bluetooth or WLAN, you will need to install an external 2.4 GHz antenna. We recommend the remote-mounted AutomationDirect P/N SE-ANT250 for a permanent installation. The direct-mounted AutomationDirect P/N SE-ANT210 will also work, but is not intended for use inside a closed metal enclosure.

Prepare a Mobile Device for Connection

If you haven't already done so, install the CLICK PLUS Provisioning mobile app from the Apple App Store or Google Play Store (CLICK PLUS Provisioning, published by Automationdirect.com).

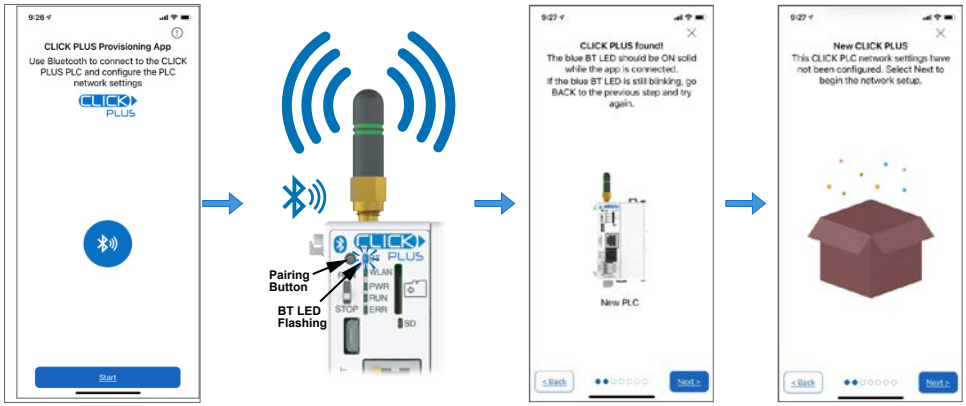


Provisioning your Wireless CLICK PLUS PLC via Bluetooth, (cont'd)

Find the New CPU

Connect to the CPU, as follows:

1. Open the CLICK PLUS Provisioning App.
2. Tap *Start* in the App.
3. Press the pairing button on the CLICK PLUS CPU for 1 second. The BT (Bluetooth) LED will start flashing. If the PLC is factory new, or you have Reset Factory Defaults, the BT LED will flash for 30 seconds after power up.
4. The App will find the CLICK PLUS PLC that is in Provisioning mode. The blue BT LED will be ON solid when the App is connected to the PLC. Tap *Next* in the App to continue.
5. If the App detects that the PLC is factory new and the network settings have not been configured, it will prompt you to Tap *Next* to begin the provisioning process.



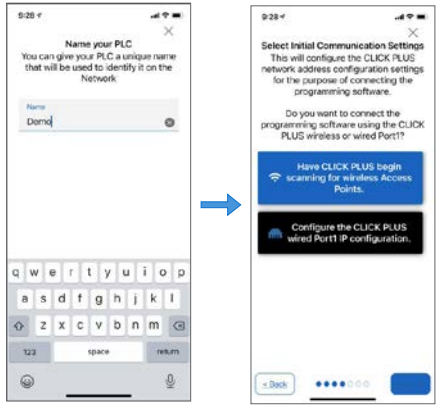


NOTE: *If you find that you need to change the settings in order to connect to the network. The PLC can be placed in pairing mode and the provisions app can be used to make needed changes.*

Provisioning your Wireless CLICK PLUS PLC via Bluetooth, (cont'd)

Name the CPU and select port to configure

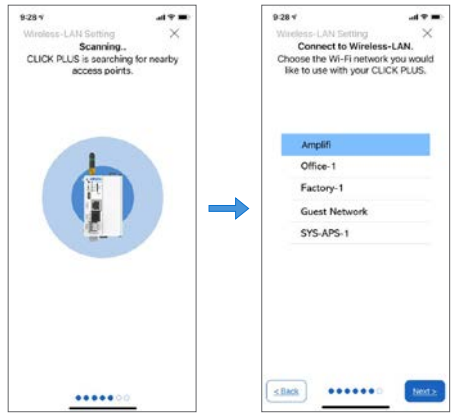
6. You will be requested to assign a name to the PLC. This name will be used to identify it on the network when using the programming software connection Ethernet browse tool. It is good practice to choose a unique name if there are other CLICK PLCs on the network. Enter a name for the PLC and tap *Next*.
7. Choose which network port to provision. This will configure the CLICK PLUS network address settings for the purpose of connecting the programming software.



Setup the Wireless LAN Connection (Skip for Wired Connection)

For this option you will need an active Network Access point available within range of the CLICK PLUS PLC, and know the password to allow the PLC to connect to the Network.

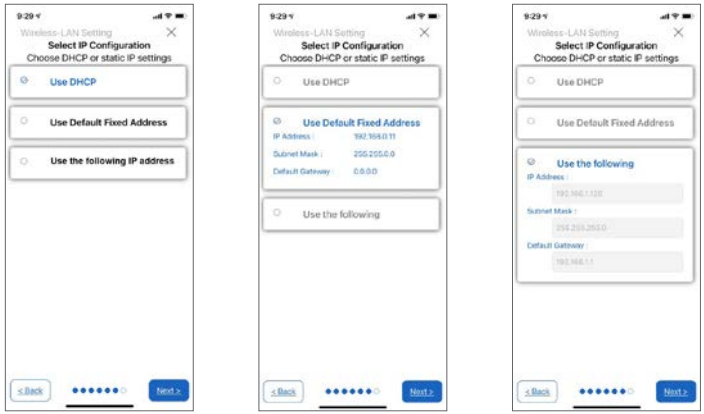
8. The CLICK PLC will scan for any access point within range and then display all access points that are available (you may need to scroll the list to find the desired Access Point). Select an Access Point and type in the correct password that the PLC will need to connect. If the incorrect password is entered, you will be prompted to correct it after the CLICK PLUS fails to connect.



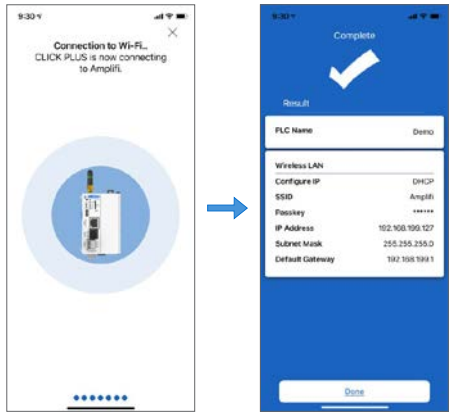
Provisioning your Wireless CLICK PLUS PLC via Bluetooth, (cont'd)

Setup the Network Parameters

9. Once the PLC is connected to the wireless access point or wired network, choose which IP address configuration to use.
   i. Use DHCP: Automatically assign a network IP address to the CLICK PLUS PLC. This is often the simplest way to connect. Tap *Next* to continue.
   ii. Use Default Fixed Address: The CLICK PLUS wireless LAN default IP address is 192.168.0.11. This can be selected if it is a valid IP address for your wireless network. Tap *Next* to continue.
   iii. Use the following IP address: Choose this option if you need to input a valid IP address for your network. Tap *Next* to continue



10. The CLICK PLUS will connect to the access point and exchange configuration information. If the settings are correct, the App will show the Completion screen and the network settings of the CLICK PLUS can be viewed. If using a wireless connection, the CLICK PLUS WLAN LED will also be ON. The PLC is now connected to the network and accessible to PC's running the CLICK Programming Software and connected to the same network.



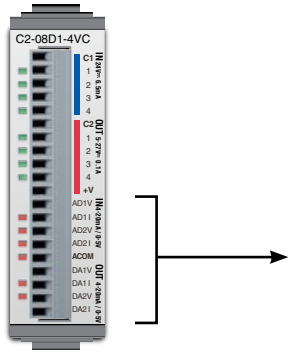
Option Slot Analog I/O Configuration

The following Option Slot Analog I/O modules are available. (Stackable Analog I/O modules are shown on following page.)

Option Slot Analog Units	Inputs	Outputs
C2-08D1-4VC	2 - Current/ Voltage, Selectable	2 - Current/ Voltage, Selectable
C2-08D2-4VC		
C2-08DR-4VC		
C2-08AR-4VC		
C2-08D1-6C	4 - Current only	2 - Current only
C2-08D2-6C		
C2-08DR-6C		
C2-08AR-6C		
C2-08D1-6V	4 - Voltage only	2 - Voltage only
C2-08D2-6V		
C2-08DR-6V		
C2-08AR-6V		

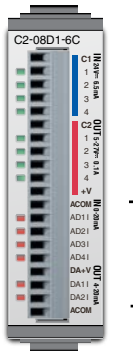
Terminal Block Wiring - Analog Option Slot Units

The C2-08xx-4VC Analog Option Slot modules have two analog inputs and two analog outputs. You can select analog voltage or analog current for each analog I/O separately. As shown below, you must use the proper terminal when using analog voltage or analog current.



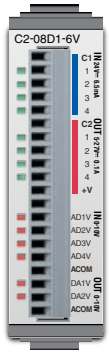
C2-08xx-4VC Analog Terminals	
Terminal Name	**Terminal Description**
AD1V	Analog voltage input
AD1I	Analog current input
AD2V	Analog voltage input
AD2I	Analog current input
ACOM	Common for all analog inputs and outputs
DA1V	Analog voltage output
DA1I	Analog current output
DA2V	Analog voltage output
DA2I	Analog current output

The C2-08xx-6C Analog Option Slot modules have four analog current inputs and two analog current outputs.



C2-08xx-6C Analog Terminals	
Terminal Name	**Terminal Description**
ACOM	Common for analog inputs
AD1I– AD4I	Analog current input
DA+V	Analog voltage source
DA1I– DA2I	Analog current output
ACOM	Common for analog outputs

The C2-08xx-6V Analog Option Slot modules have four analog voltage inputs and two analog voltage outputs.



C2-08xx-6V Analog Terminals	
Terminal Name	**Terminal Description**
AD1V– AD4V	Analog voltage input
ACOM	Common for analog inputs
DA1V– DA2V	Analog voltage output
ACOM	Common for analog outputs

Terminal Block Wiring - Stackable Analog I/O Modules

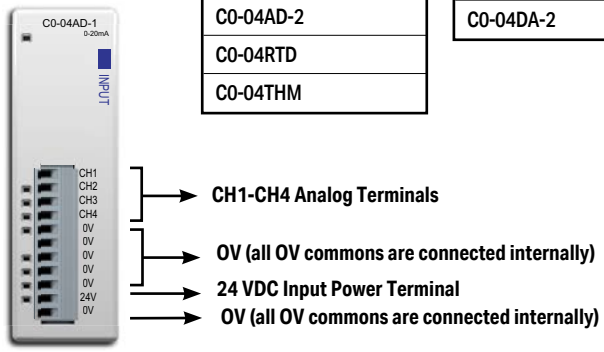
The terminal block wiring will vary depending on which analog I/O module is being used. For example, the C0-04AD-1 module shown here has four analog terminals, CH1 through CH4, which are all current inputs.

See Chapter 2. Specifications for terminal block wiring diagrams and specifications for all the analog I/O modules.

Analog Input Modules
C0-04AD-1
C0-04AD-2
C0-04RTD
C0-04THM

Analog Output Modules
C0-04DA-1
C0-04DA-2

Analog Combo I/O Modules
C0-4AD2DA-1
C0-4AD2DA-2



C0-04AD-1

Configuration in the CLICK Programming Software

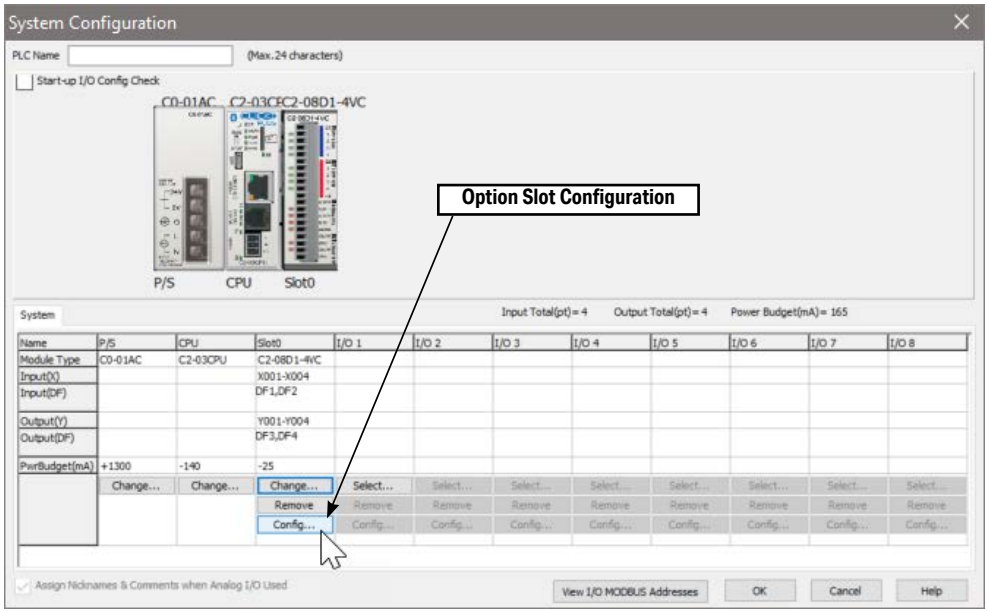
All analog I/O points can be configured in the CLICK Programming Software. There is no jumper switch in these modules.

CLICK PLUS Option Slot Analog Modules

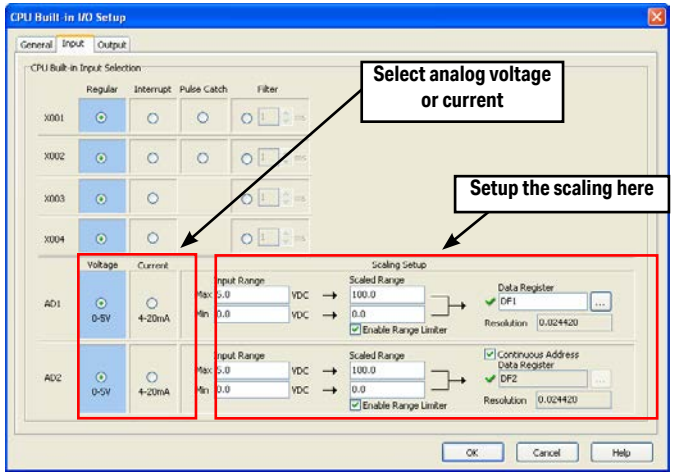
The Option Slot analog modules cannot detect which terminal is used between the analog voltage and analog current, so you must configure which analog type is used for each analog I/O in the CLICK programming software.

Connect the CLICK programming software to the CLICK PLUS PLC unit, then open the System Configuration window as shown below.

(Pull-down menu: Setup > System Configuration)



Click the Input tab to configure the analog inputs and/or click the Output tab to configure the analog outputs. The Input tab is shown below, but the Output tab looks very similar.



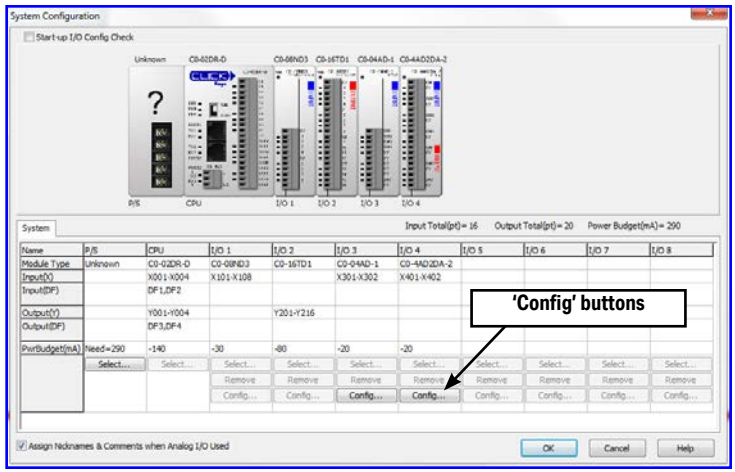
You can select the analog voltage or analog current with the radio buttons. Also use this screen to set the scaling for each Analog I/O. Click the Help button on the right bottom to learn about the scaling feature.

After you configure the Analog I/O, download the project into the Analog PLC module.

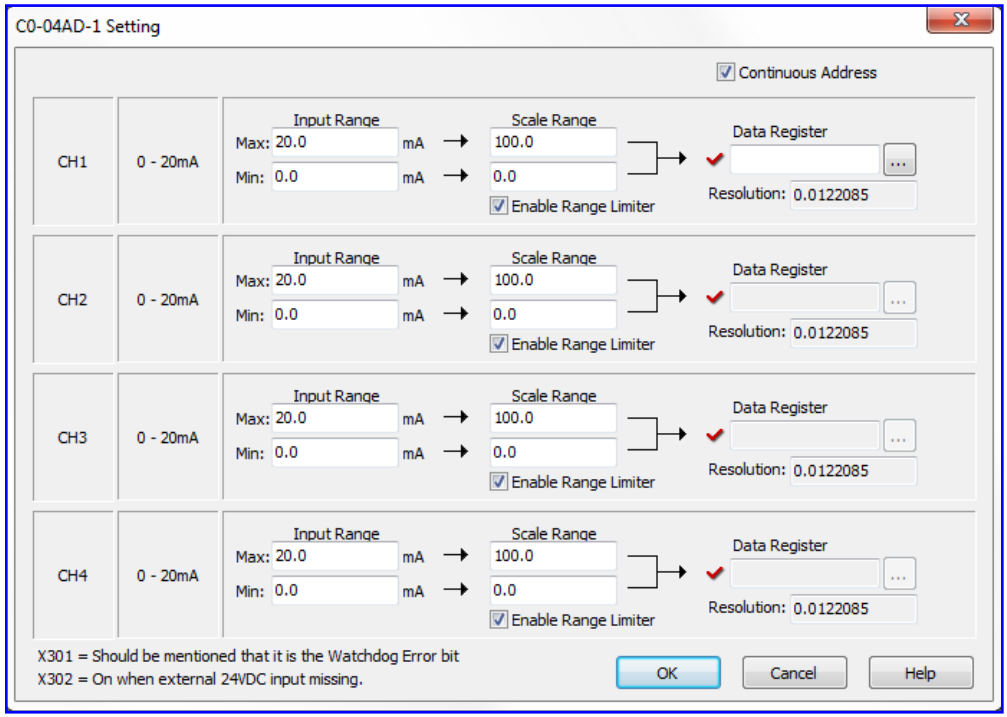
Analog I/O Modules

To configure an Analog I/O module, connect the CLICK programming software to the CLICK PLC including the Analog I/O module, then open the System Configuration window as shown below (Pull-down menu: Setup > System Configuration).

Click the 'Config…' button to open the configuration window to configure each analog I/O module.



The following is the configuration window for the C0-04AD-1 current input I/O module.

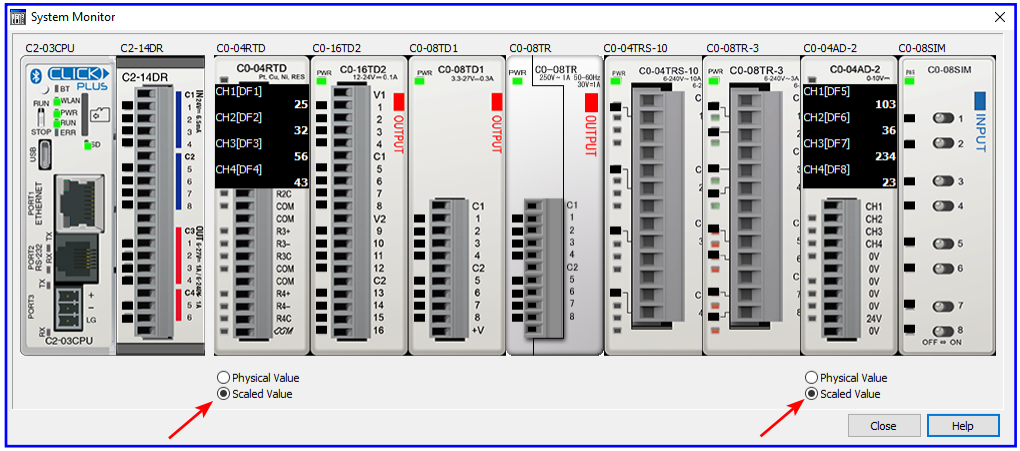


In the CLICK PLC, all analog data is stored in the DF memory addresses. Assign DF memory addresses to the Data Register fields. You can also set up the scaling in this configuration window. For more detailed explanation about this configuration window, refer to the help topic by clicking the Help button on the bottom right corner.

After configuring all the analog I/O modules, download the CLICK project into the CLICK PLC.

Analog I/O Monitoring

To monitor the current analog I/O values, you can use the System Monitor window as shown below (Pull-down menu: Monitor > System Monitor).



You can switch the displayed values between the Physical Value and Scaled Value with the radio buttons below the respective graphic.

High-Speed Input/Output Configuration

CLICK PLUS Option Slot modules that have digital inputs and outputs with High-Speed capability are shown below. The maximum number of available Single Input Counters will depend on the combination of features used.

Module Part Number	High-Speed Input Points	High-Speed Counters (Max.)	High-Speed Output Points	High-Speed Outputs (Max.)
C2-14D1	8	6	3	3
C2-14D2				
C2-14DR			N/A	N/A
C2-14AR	N/A	N/A		
C2-08D1-4VC	4	4	2	2
C2-08D2-4VC				
C2-08DR-4VC			N/A	N/A
C2-08AR-4VC	N/A	N/A		
C2-08D1-6C	4	4	2	2
C2-08D2-6C				
C2-08DR-6C			N/A	N/A
C2-08AR-6C	N/A	N/A		
C2-08D1-6V	4	4	2	2
C2-08D2-6V				
C2-08DR-6V			N/A	N/A
C2-08AR-6V	N/A	N/A		



NOTE: *The Option Slot Module must be installed in Option Slot 0 to use High-Speed Input/Output functions.*

Each Input Mode consumes the available number of High-Speed Inputs. The Reset and Enable features can use High-Speed Inputs, Digital Input Modules, or Control Relays (Internal Bits). The transition delay (latency) is longer for Input Modules and Control Relays since these are scan based.

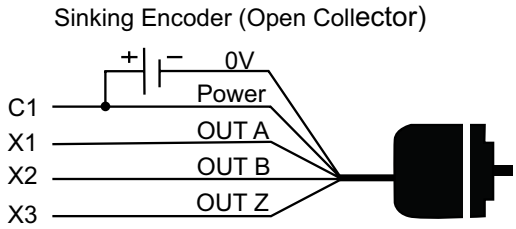
High-Speed Mode	Input Type	High-Speed Inputs Required	Reset Input	Enable Input
High-Speed Count (HSC)	Up Count	1	Optional	Optional
	Down Count			
	Up and Down Counts	2		
	Pulse and Direction			
	Quadrature (A and B)			
	Quadrature (A and B with Z)	3	N/A	
Interval Measurement (ITV)	Single Input	1	Optional	
	Dual Inputs	2		
Duration Measurement (DUR)	Single Input	1		
Frequency Measurement (FRQ)	Single Input	1	N/A	N/A
	Quadrature (A and B)	2		

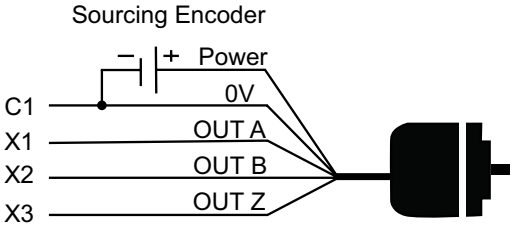
High-Speed Mode	Output Type	High-Speed Outputs Required	Limit Switches
Pulse Train Output (PTO)	Pulse	1	Optional
	Direction	Optional	
Pulse Width Modulation (PWM)	Pulse	1	N/A

Due to internal resource limitations, there is a limit to the number of settings that can be made when using the high-speed counter function and the PTO function simultaneously. The CLICK software High Speed Configuration will automatically limit the selections based on already configured points and the specific Slot I/O Module.

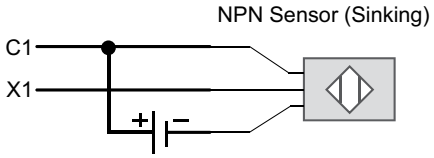
Wiring Examples: High-Speed Inputs

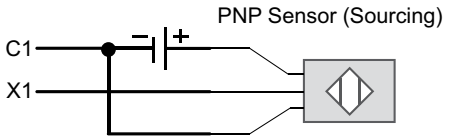
Quadrature with Reset (Z-Pulse):





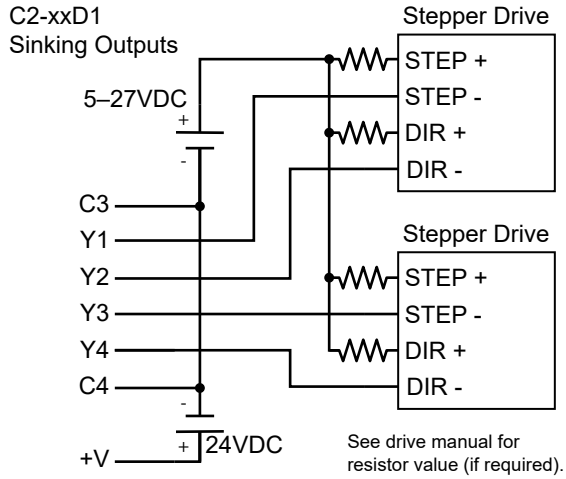
3-Wire Sensors

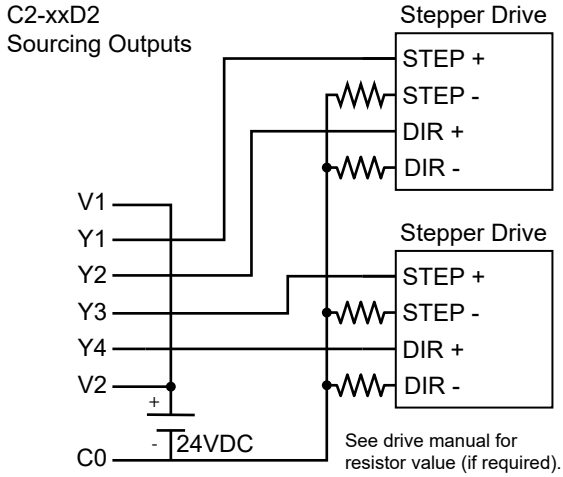




Wiring Examples: High-Speed Outputs

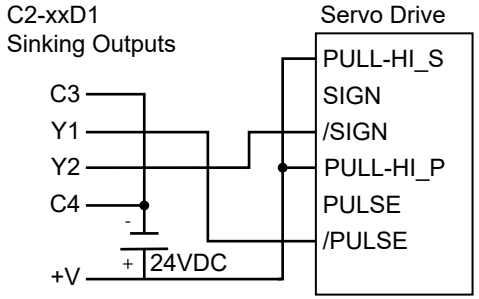
Stepper Motor Drive

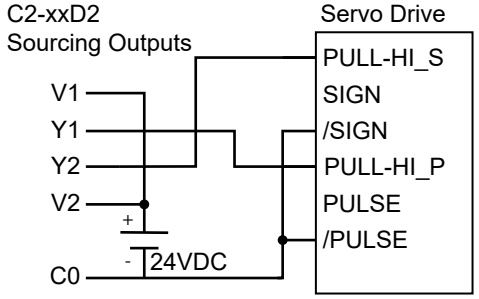




Wiring Examples: High-Speed Outputs

Servo Motor Drive





Setting Up and Using an SD Card

Writing to SD Card Devices

Up to 16 addresses of any type may be configured in the CLICK programming software to log data. Along with the 16 address limit, available storage is subject to the memory capacity of the SD card. A new log file can be created based on a time period or an event trigger.

Memory Devices should be formatted according to the following guidelines to insure best performance and integrity of logged data.

SD Card Type	Capacity	Supported Formatting
SD	Not Supported	
SDHC	4GB to 32GB	FAT32
SDXC	Not Supported	

SD cards must be formatted using the SD formatter provided by the SD Association at www.sdcard.org using the standard allocation unit size for best performance.

Minimizing Data Errors

To minimize data errors when logging data to external memory, consider the following:

- Do not turn off power to the PLC while the SD card is being accessed.
- Do not remove the SD card while the device is being accessed by the PLC.

The following addresses should be used to monitor, access and safely remove an SD card:

Address	Description	Read/Write
SC65	SD Eject	R/W
SC66	SD Delete All	R/W
SC67	SD Copy System	R/W
SC68	SD Ready To Use	R
SC69	SD Write Status	R
SC70	SD Error	R

- Be sure to backup the memory device at regular intervals.
- If you suspect the SD card is bad, you may want to use a PC to re-format the device, or use a known good SD card.
- The number of times the SD card can be written to is limited. Consequently, logging frequently may shorten the service life of the SD card. Using slower sample rates will increase the life of the SD card.



***NOTE:** An SD card with SLC mode, such as AutomationDirect #MSD-SLC16G, is strongly recommended for increased maximum lifetime write cycles.*

Monitoring Available Memory

Each external memory device can be monitored and events can be configured to alert the user when available memory is approaching the maximum capacity of the external memory device. The following internal tags allow external memory devices data to be monitored:

Address	Description	Read/Write
SD63	SD Total Memory Low byte	R
SD64	SD Total Memory High byte	R
SD65	SD Free Memory Low byte	R
SD66	SD Free Memory High byte	R
SD67	SD Used Memory Low byte	R
SD68	SD Used Memory High byte	R
SD69	SD Error Information	R
SD70	SD Log File Number	R

Refer to the CLICK programming software online help files for additional information on system tags and managing data logging devices.

File Name Limitations

There is a limit of 999 log files stored on the SD card. As new log files are created based on a set time or trigger event, these files count against the maximum of 999 files. Consider the rate of new file generation when setting the conditions to start a new file, and monitor the current number of stored files to avoid data loss.

PLC Communications



In This Chapter...

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Introduction

This chapter explains the communications ability of the CLICK PLUS PLC system for exchanging data between the PLC unit and other connected serial devices. It covers:

- Electrical connections used for communications
- Networking routing between the PLC and other devices,
- Setting the port communication parameters,
- Selecting the protocols and the available data addressing types to use, and
- Ladder logic program instructions that make it all work together.

All CLICK PLUS PLCs have a built-in microB USB port for programming.

The C2-01CPU and C2-03CPU have an RS-232 port, designated Port 2. The port uses a 6-pin RJ12 phone type jack. It is a general purpose port, user configurable, with its communication parameters within CLICK Programming Software, C0-PGMSW. Port 2 can be used as a Modbus RTU master or slave protocol device, or handle ASCII data In or Out (ASCII stands for American Standard Code for Information Interchange and defines a character encoding method for text that is used in computers and other communication devices. Details can be found by doing a search for ASCII on the internet).

The C2-03CPU also has a 3-pin RS-485 port, designated Port 3. Like Port 2, Port 3 is a general purpose port with its communication parameters being user configurable from the programming software. Port 3 can be used as a Modbus RTU master or slave protocol device, or handle ASCII data In or Out.

The C2-01CPU and C2-03CPU have a built-in Ethernet communications port.

The C2-02CPU and C2-03CPU have an antenna port capable of both Bluetooth and WLAN communications.

The CLICK PLUS PLCs can be networked to other CLICK PLCs, data input devices (barcode readers, weight scales, etc.), and/or data output devices (serial printers, serial text displays, etc.). It is also possible to network the CLICK PLUS PLC to other 3rd party PLCs and devices that have the ability to communicate using the Modbus RTU and TCP protocols.

The final part of the PLC Communications chapter contains explanations and examples of the various ways the Send and Receive programming instructions can be used to perform Modbus RTU protocol and ASCII data communications between devices.

There are three different data addressing types that can be selected when using the Modbus RTU protocol from the Send and Receive instructions. They are, CLICK addressing, Modbus 984 addressing, or Modbus HEX addressing. The CLICK addressing makes it convenient to exchange data between CLICK PLCs. The other addressing choices are selected based on the Modbus protocol addressing the networked devices are using. For details on the Modbus protocol, visit www.modbus.org.

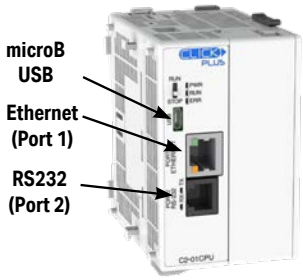


NOTE: *The Modbus RTU Master is identified as the device that controls the exchange of data between itself and any connected slave device. There can only be one master on the network. When the CLICK PLC is the master, it is easily identified. It will be the PLC in the network with the Send and/or Receive instructions using the Modbus protocol in its ladder logic program.*

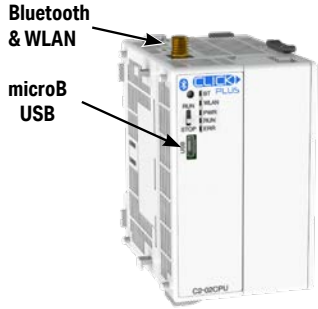
PLC Communication Ports Specifications

The CLICK PLUS PLC units have several built-in communications ports, as shown below.

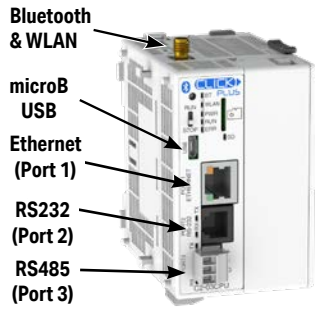
C2-01CPU



C2-02CPU



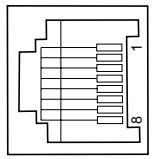
C2-03CPU



Com Port 1 Specifications
Use: Programming and Ethernet Communication
Physical: 8 pin, RJ45, Ethernet
Communication Speed (Mbps): 10/100
Protocol: Modbus TCP (client/server), EtherNet/IP Implicit and Explicit (adapter server), DNS, DHCP, NTP, MQTT

Port 1

8 pin RJ45 Phone Type Jack

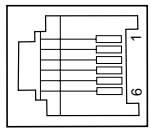


Port 1 Pin Descriptions		
1	TX+	Transmit Data (+)
2	TX-	Transmit Data (-)
3	RX+	Receive Data (+)
4	NC	Not connected
5	NC	Not connected
6	RX-	Receive Data (-)
7	NC	Not connected
8	NC	Not connected

Com Port 2 Specifications	Default
Use: Serial Communication	-
Physical: 6 pin, RJ12, RS-232	-
Communication speed (baud): 2400, 4800, 9600, 19200, 38400, 57600, 115200	38400
Parity: odd, even, none	Odd
Station Address: 1 to 247	1
Data length: 8 bits (Modbus RTU) or 7, 8 bits (ASCII)	8 bits
Stop bit: 1,2	1
Protocol: Modbus RTU (master/slave) or ASCII in/out	Modbus RTU

Port 2

6 pin RJ12 Phone Type Jack

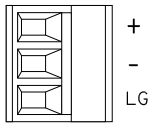


Port 2 Pin Descriptions		
1	0V	Power (-) connection (GND)
2	5V	Power (+) connection
3	RXD	Receive data (RS-232)
4	TXD	Transmit data (RS-232)
5	RTS	Request to send
6	0V	Power (-) connection (GND)

Com Port 3 Specifications	Default
Use: Serial Communication	-
Physical: 3 pin, RS-485	-
Communication speed (baud): 2400, 4800, 9600, 19200, 38400, 57600, 115200	38400
Parity: odd, even, none	Odd
Station Address: 1 to 247	1
Data length: 8 bits (Modbus RTU) or 7, 8 bits (ASCII)	8 bits
Stop bit: 1,2	1
Protocol: Modbus RTU (master/slave) or ASCII in/out	Modbus RTU

Port 3

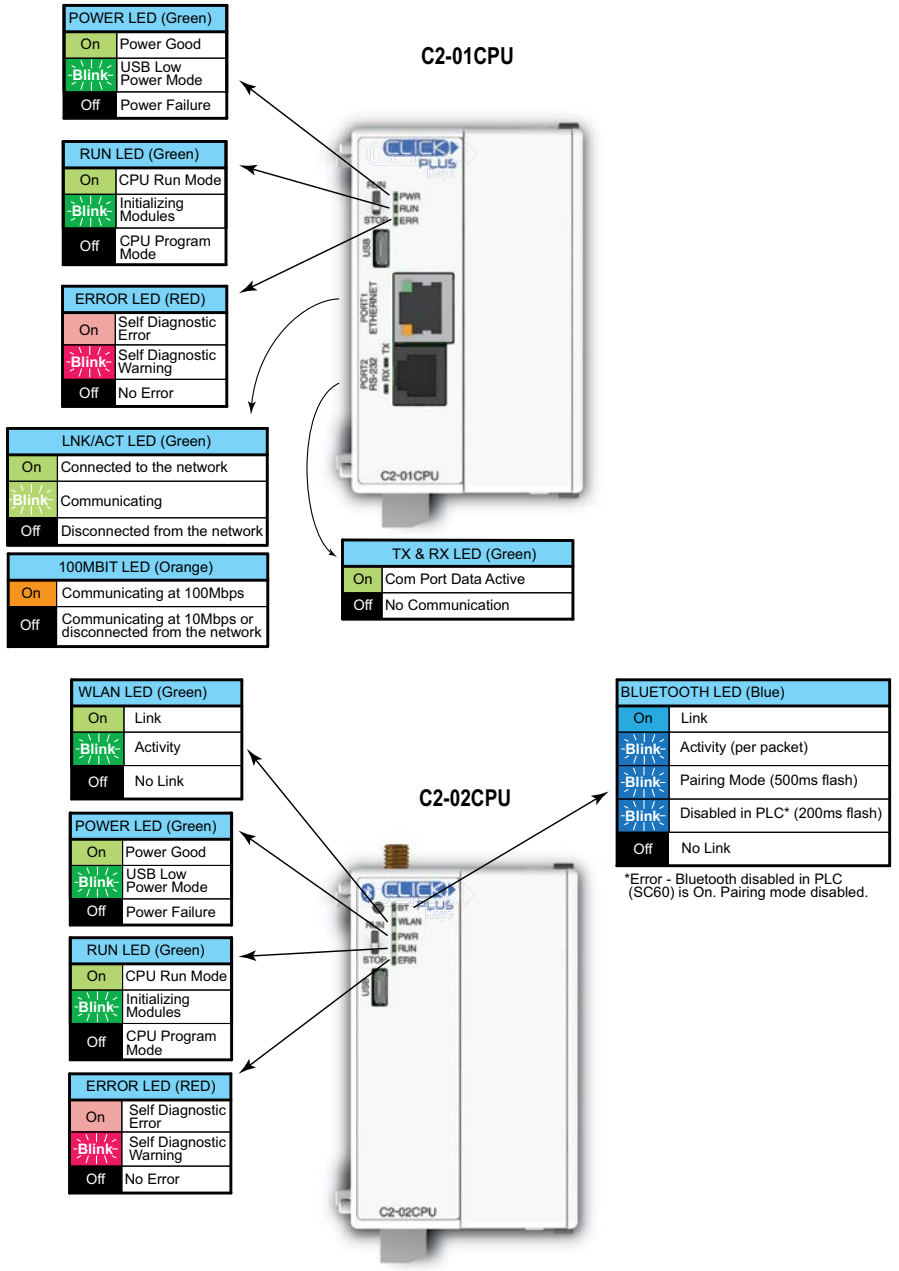
3 Pin Terminal Block



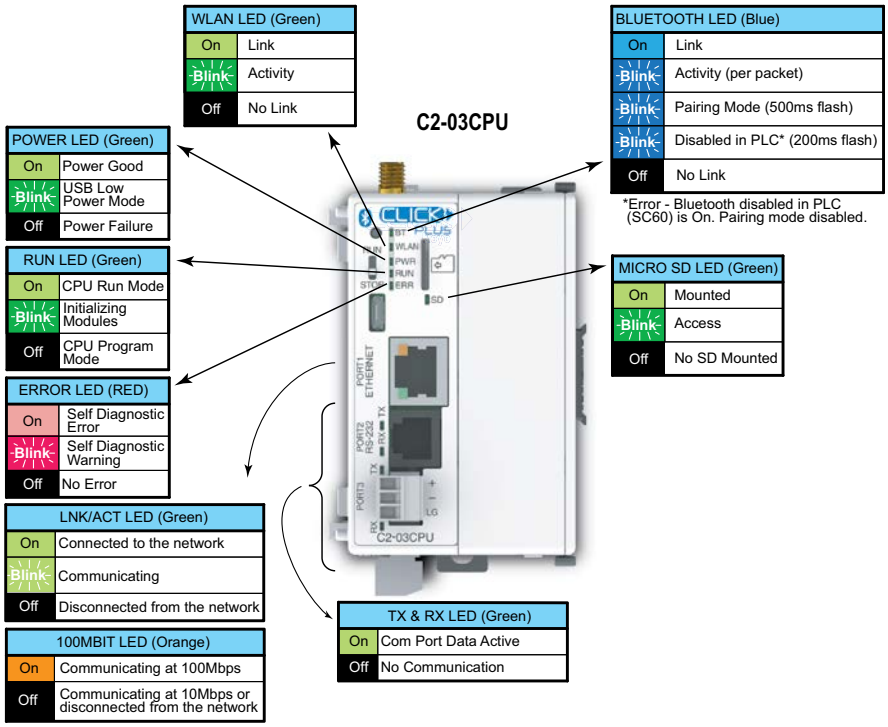
Port 3 Pin Descriptions		
1	+ (plus)	Signal A (RS-485)
2	– (minus)	Signal B (RS-485)
3	LG	Logic Ground(0 V)

See Chapter 2: *Specifications* for the microB USB port and antenna port specifications.

LED Status Indicators



LED Status Indicators (continued)



DirectLogic Devices That Do Not Work With CLICK PLCs

The CLICK PLUS PLC does not support K-sequence protocol, so the following DirectLogic devices do not work with the CLICK PLUS PLC:



D2-HPP



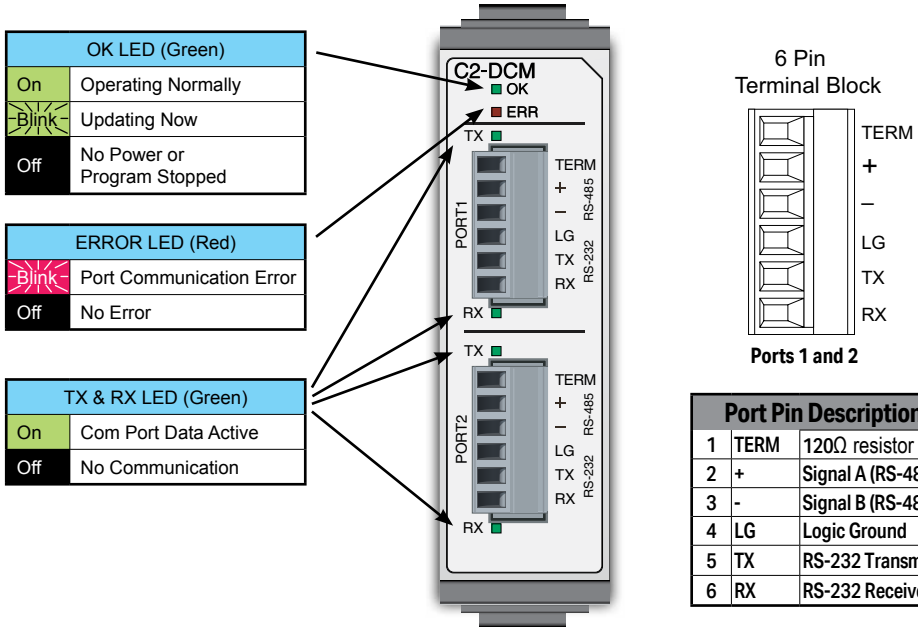
D4-HPP-1



DV-1000

C2-DCM Intelligent Module Communication Ports Specifications

The C2-DCM Option Slot module has two serial communications ports, as shown below.



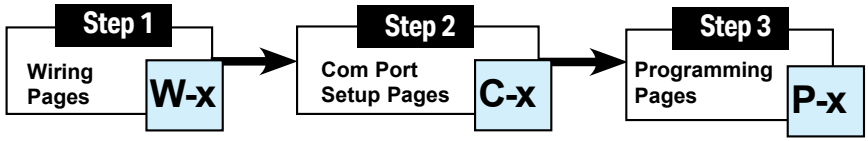
Port Pin Descriptions		
1	TERM	120Ω resistor
2	+	Signal A (RS-485)
3	-	Signal B (RS-485)
4	LG	Logic Ground
5	TX	RS-232 Transmit
6	RX	RS-232 Receive

Port Specifications	
Number of Ports	2
Port Types	RS-232, RS-485 (2-wire)
Supported Protocols	Modbus RTU, ASCII (user-defined)
Communications Parameters	• Baud rate: 2400, 4800, 9600, 19200, 38400, 57600, 115.2k bps • Data bit: 7 bits, 8 bits • Parity: None, Odd, Even • Stop bit: 1 bit, 2 bits • Flow Control: None
RS-485 Terminating Resistor	120Ω, Internal
Status Indicator LEDs	OK, ERR, TX (per port), RX (per port)

Terminal Block Specifications	
Connector Type	Pluggable Terminal Block
Number of Pins	6 (x2 terminal blocks)
Pitch	3.50 mm
Wire Size Range	16–28 AWG
Stripping Length	7.0 mm
Wire Specification	Lead-free, heat resistant, polyvinyl chloride insulated copper wire, rated over 80°C
Screw Thread	M2.0
Tightening Torque	2.0 – 2.2 lb-inch [0.22 – 0.25 N·m]
Recommended Cable	Shielded cable (AutomationDirect Q8105-1 or Q8302-1 recommended)

3 Steps to Using the CLICK PLC Communications

We offer an easy 3-step method for using the communication features of the CLICK PLC.



The following pages show the devices that you may connect to the CLICK PLC Com ports. Use the table below to locate information on communications for your particular application. As you can see in the table, each step has subcategories. For each step, find the subcategory description that best describes your application. Use the subcategory references (W-x, C-x, and P-x.) to find more information on these topics in this chapter. See the example below.

CLICK PLC Communications			
Step	**Subcategory Reference**	**Subcategory Description**	**Page**
Step 1 Wiring	**W-1**	USB	4-12
	W-2	Com port 2 (RS-232)	4-13
	W-3	Com port 1 (Ethernet)	4-17
	W-4	Com port 3 (RS-485)	4-19
	W-5	C2-DCM Port 1 or 2 (RS-232)	4-20
	W-6	C2-DCM Port 1 or 2 (RS-485)	4-21
Step 2 Com Port Setup	**C-1**	USB setup	4-22
	C-2	Com port 1 (Ethernet) setup	4-23
	C-3	WLAN setup	4-24
	C-4	Bluetooth setup	4-25
	C-5	Com port 2 setup (Modbus RTU)	4-26
	C-6	Com port 2 setup (ASCII)	4-27
	C-7	Com port 3 setup (Modbus RTU)	4-28
	C-8	Com port 3 setup (ASCII)	4-29
	C-9	C2-DCM Port 1 or 2 setup (RS-232)	4-30
	C-10	C2-DCM Port 1 or 2 setup (RS-485)	4-31
Step 3 Programming	**P-1**	Modbus Slave (Server) programming	4-32
	P-2	Modbus Master programming (Modbus RTU)	4-36
	P-3	Modbus Client programming (Modbus TCP)	4-41
	P-4	ASCII Receive programming	4-47
	P-5	ASCII Send programming	4-50

Example:

To connect a barcode reader that sends ASCII data to Com Port 2:



Refer to these three reference page sections.

W-2 **C-6** **P-4**

Typical Communication Applications

The diagrams on the following four pages illustrate the typical uses for the CLICK PLUS PLC's communication ports. Typical serial communication applications are continued on the next three pages.

Port 2 (RS-232) – Modbus RTU Slave Mode Only



CLICK PLUS PLCs

Port 2



PC



Another CLICK PLC



C-more and *C-more* Micro-Graphic Panel

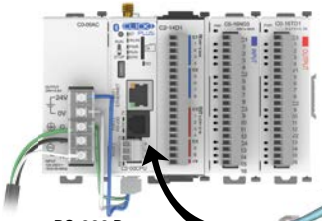
Other Devices Supporting Modbus RTU Master Mode

W-2 C-5 P-1

TIP: *C-more Micro-Graphic panels (monochrome models only) can get 5VDC power from RS-232 Port.*

***C-more* Micro-Graphic** Panel (Monochrome models only)

Example



RS-232 Port

Port 1

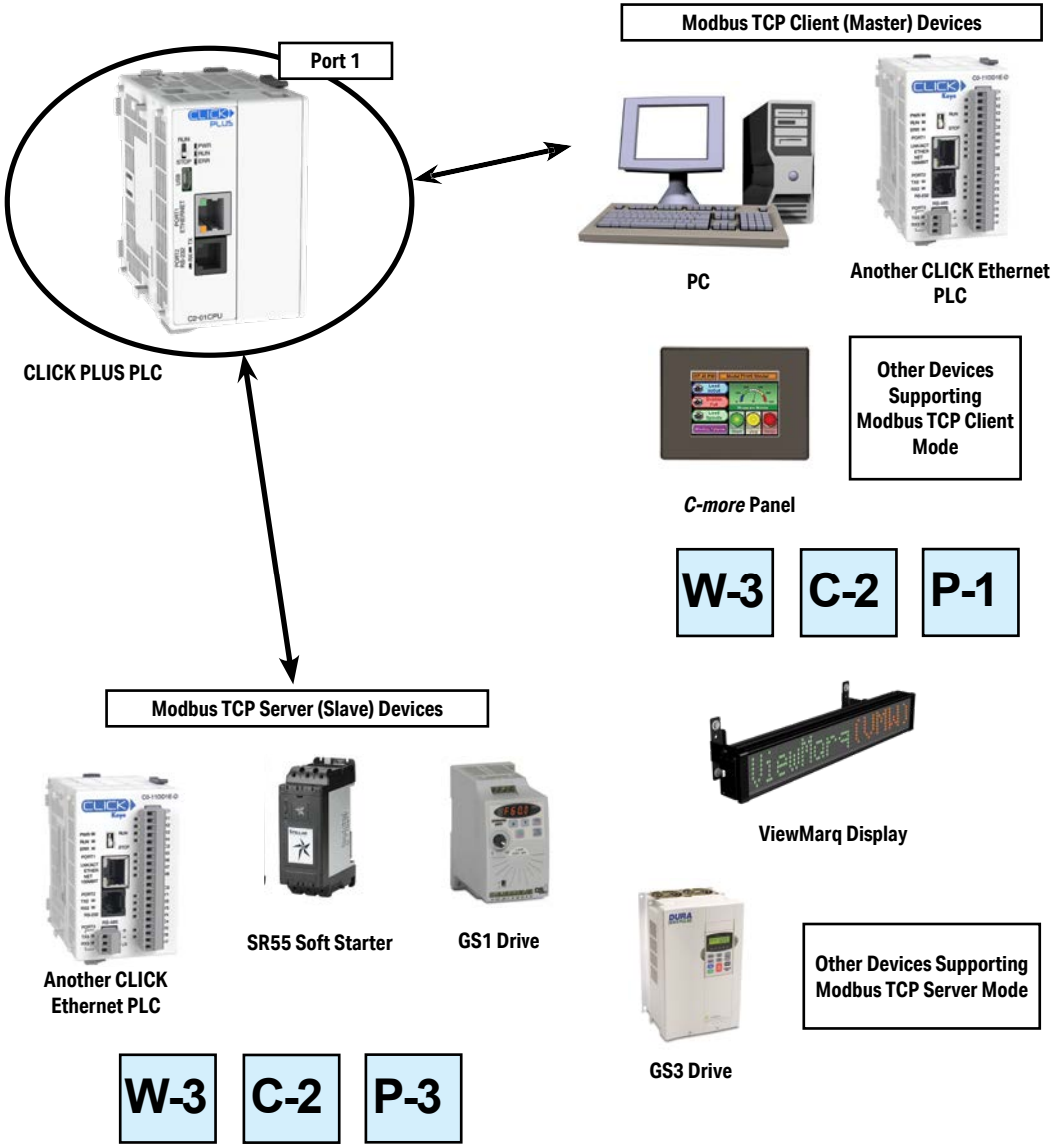
DV-1000CBL serial cable



The Color Micro-Graphic panel or the second Monochrome Micro-Graphic panel needs a separate 24VDC power source (see the note below).

NOTE: *CLICK's RS-232 port can provide 5VDC to power one monochrome Micro-Graphic panel. If two C-more Micro-Graphic panels are connected to both ports, then at least one of the panels must be powered by a C-more Micro DC power adapter, EA-MG-P1 or EA-MG-SP1, or another 24VDC power source. Color C-more Micro-Graphic panels must also be powered from a separate 24VDC source.*

Port 1 (Ethernet) – Modbus TCP



Port 2 (RS-232) – Modbus RTU or ASCII

Port 2



CLICK PLUS PLCs

Modbus RTU

Modbus RTU Master Devices



PC



Another CLICK PLC



See Note on previous page about connecting a C-more Micro-Graphic panel to RS-232 Port.

C-more and *C-more* Micro-Graphic Panel

Other Devices Supporting Modbus RTU Master Mode

W-2 C-5 P-1

ASCII

Devices that SEND ASCII messages



Barcode Reader



Weight Scale

Other devices that can send ASCII data.

W-2 C-6 P-4

Modbus RTU Slave Devices



Another CLICK PLC

Other Devices Supporting Modbus RTU Slave Mode

W-2 C-5 P-2

Devices that RECEIVE ASCII messages



Serial Printer



Serial Text Display

Other devices that can receive ASCII data.

W-2 C-6 P-5

Port 3 (RS-485 – Modbus RTU or ASCII)

Port 3



CLICK PLUS PLCs

Modbus RTU

Modbus RTU Master Devices



PC



Another CLICK PLC



C-more and *C-more* Micro-Graphic Panel

Other Devices Supporting Modbus RTU Master Mode

W-4 C-7 P-1

ASCII

Devices that SEND ASCII messages



Barcode Reader



Weigh Scale

Other devices that can send ASCII data.

W-4 C-8 P-4

Devices that RECEIVE ASCII messages



Serial Printer



Serial Text Display

Other devices that can receive ASCII data.

W-4 C-8 P-5

Modbus RTU Slave Devices



Another CLICK PLC



SOLO Temperature Controller

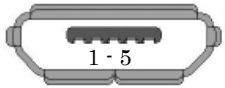
Other Devices Supporting Modbus RTU Slave Mode

W-4 C-7 P-2

W-1: USB Port Wiring

USB Port wiring pinout is shown below.

USB Port Pin Descriptions		
1	VBUS	5V Power supply in
2	D-	Differential signal -
3	D+	Differential signal +
4	NC	Not connected (ID not used)
5	GND	Ground

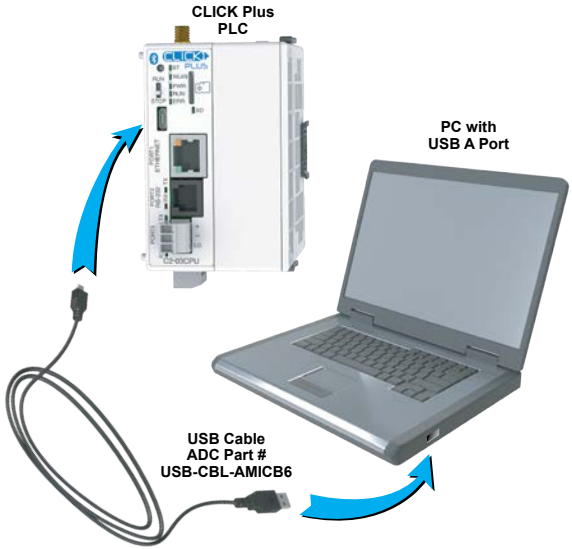


Wiring Strategy

Connect any CLICK PLUS CPU to a USB A port on a Windows PC, using cable USB-CBL-AMICB6 or equivalent.

NOTE: *The CLICK PLUS CPU can be supplied 5VDC power from a PC over the USB port when no 24VDC power is applied, with the following capabilities and restrictions*

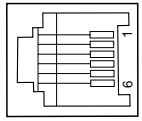
Available:	*Not Available:*
• *Programming over Port 1, Port 2, and Port 3* • *Firmware update* • *CLICK Factory Default and CLICK Project Loader Tools* • *Modbus Server/Slave over Port 1, Port 2, and Port 3* • *Option Slot module can be identified in software*	• *RUN mode is disabled* • *WLAN and Bluetooth are disabled* • *Access to the microSD Card from software is disabled*



W-2 W-2: Com Port 2 (RS-232) Wiring

Com Port 2 wiring pinout is shown below.

6 pin RJ12 Phone Type Jack



Port 2 Pin Descriptions		
1	0V	Power (-) connection (GND)
2	5V	Power (+) connection
3	RXD	Receive data (RS-232)
4	TXD	Transmit data (RS-232)
5	RTS	Request to send
6	0V	Power (-) connection (GND)

NOTE: *Com port 2 can provide 5VDC; however, the 5VDC power can be used only for the C-more Micro-Graphic panel. AutomationDirect does not guarantee that the CLICK PLUS PLC will work correctly when any other device uses 5VDC from these Com ports. Please also remember these Com ports can provide enough power only for one C-more Micro-Graphic panel.*

Wiring Strategy

The following pages cover five case scenarios for connecting com port 2:

Case 1: Connect Com Port 2 to a PC.

Case 2: Connect Com Port 2 to another CLICK PLC.

Case 3: Connect Com Port 2 to a C-more or C-more Micro-Graphic panel.

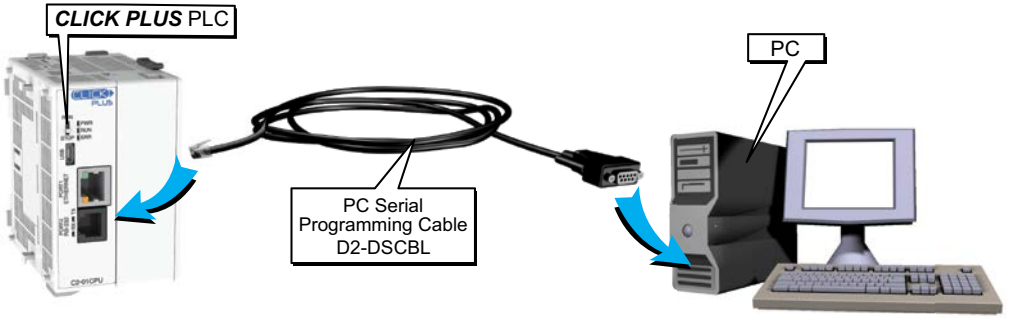
Case 4: Connect Com Port 2 to an RS-422 or RS485 port on another device(s).

Case 5: Connect Com Port 2 to an RS-232 port on another device.

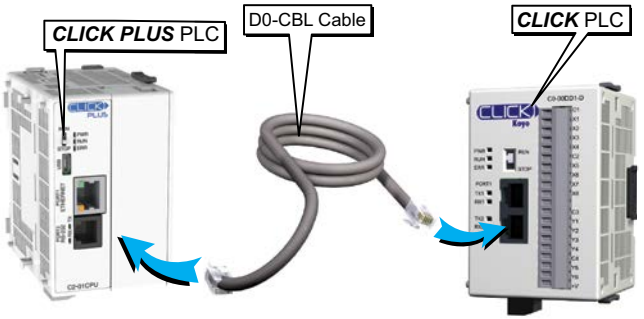
Case 1: Connect Com Port 2 to a PC.

You can connect Com Port 2 to a serial com port or USB port on the PC.

1. Connect to a serial port



Case 2: Connect Com Port 2 to another CLICK PLC



You can use cable D0-CBL.

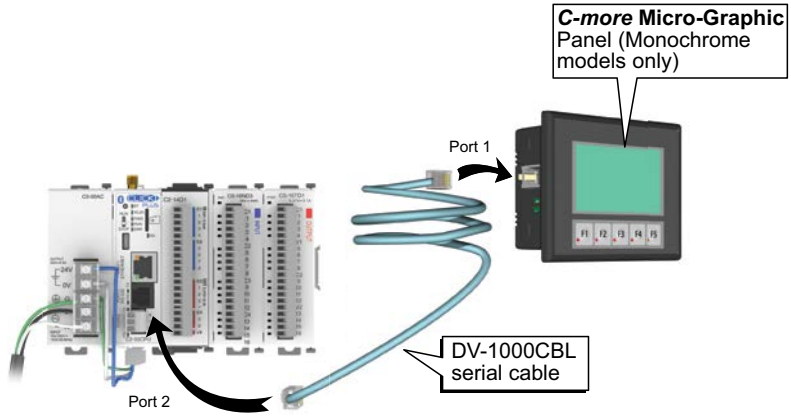
In this configuration, one of the CLICK/CLICK PLUS PLC units needs to be the network master and the other is the network slave. Connect the D0-CBL on Com Port 2 on the master PLC unit side.

WARNING: *The ZL-RJ12-CBL-2 cable cannot be used for this purpose.*

Case 3: Connect Com Port 2 to a C-more or C-more Micro-Graphic panel

Please use the following cables to make your connections.

C-more Graphic Panel	Cable Part Number
C-more Touch panels	EA-2CBL (3m) or OP-2CBL (2m)
C-more Micro-Graphic Panels	DV-1000CBL if the panel receives 5VDC power from the CLICK PLC com port. (Monochrome panels only; color panels must be powered from a separate 24VDC power source. Please refer to the note on page 4-6 for details.)
	EA-2CBL (3m) or OP-2CBL (2m) if the panel receives 24VDC power from other source.



Case 4: Connect Com Port 2 to an RS-422 or RS485 port on another device(s).

You need a RS-232 to RS-422/485 converter in this case. We recommend our FA-ISOCON as the converter.

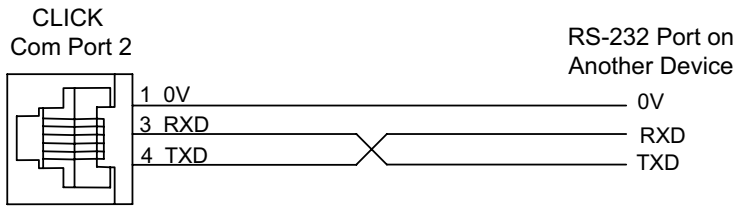


The recommended cables to connect the FA-ISOCON to other devices:

- Belden 8103 for the RS-422
- Belden 9842 for 2-wire RS-485
- Belden 9843 for 4-wire RS-485

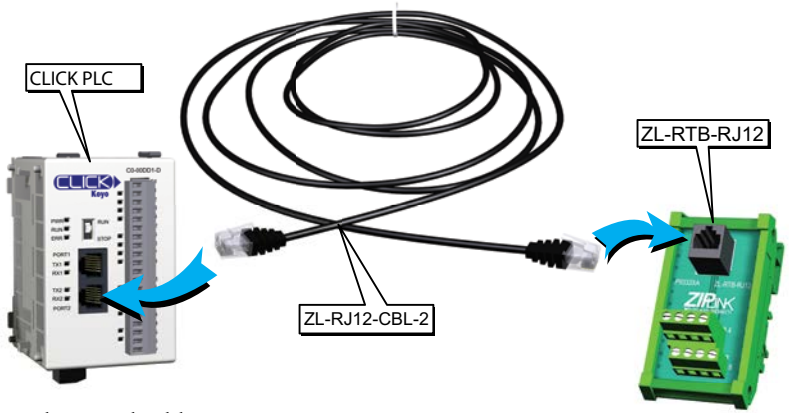
Case 5: Connect Com Port 2 to an RS-232 port on another device

You need to cross the RTD and TXD signal lines and connect 0V on both com ports.

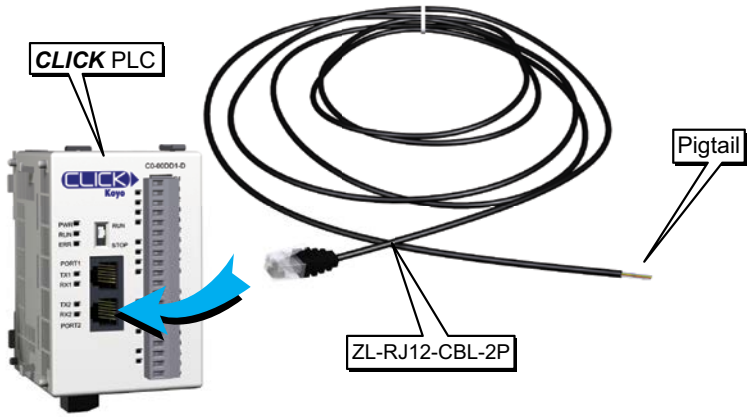


You can make your own cable. However, we offer two products that make your wiring much easier:

1. *ZIP*Link feed-through module and cable

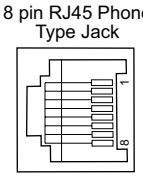


2. *ZIP*Link pig-tail cable



W-3: Com Port 1 (Ethernet) Wiring

Com Port 1 (Ethernet) supports 10/100 Base-T Ethernet with an RJ-45 style connector.



Port 1 Pin Descriptions		
1	TX+	Transmit Data (+)
2	TX-	Transmit Data (-)
3	RX+	Receive data (+)
4	NC	Not connected
5	NC	Not connected
6	RX-	Receive Data (-)
7	NC	No connection
8	NC	No connection

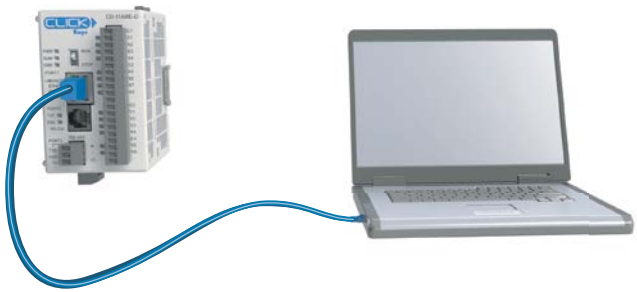
You can use both straight and cross over cables with Com Port 1.

Wiring Strategy

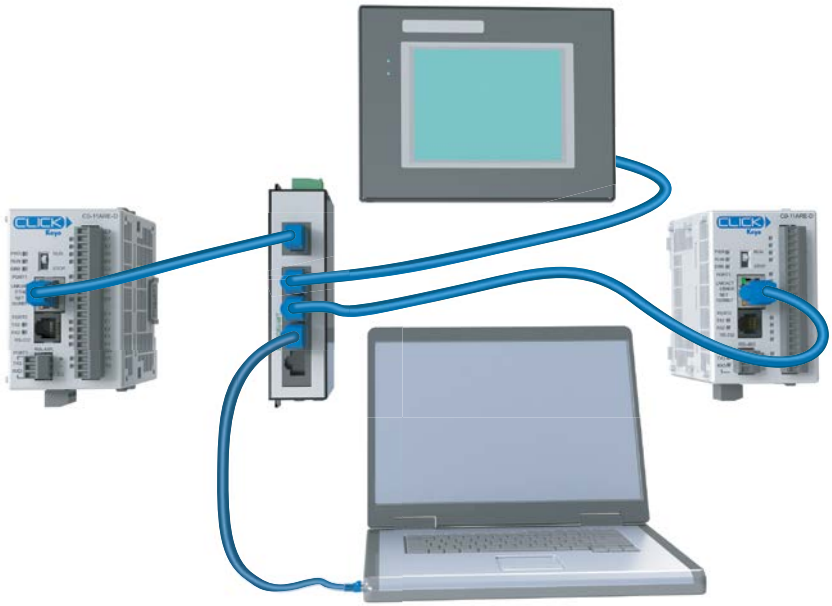
- There are two wiring methods to connect to devices which support Modbus TCP protocol.
- Case 1: Connect Com Port 1 to a device that supports Modbus TCP protocol directly such as a PC.
- Case 2: Connect Com Port 1 to other devices that support the Modbus TCP protocol via a switch or hub.

Case 1: Connect Com Port 1 to a device that supports the Modbus TCP protocol directly such as a PC.

In this illustration a PLC unit is connected directly to a PC.



Case 2: Connect Com Port 1 to other devices that support the Modbus TCP (client/server) protocol via a switch or hub.

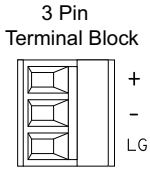


NOTE: *Com Port 1 can communicate with any number of servers (slaves) using the Receive and/or Send instructions. However, Com Port 1 can communicate with up to 4 servers at the same time. If the ladder program has sent a message to 4 different servers and tries to send a message to another server, the CLICK PLUS PLC unit disconnects the first server and establishes a connection with the new server, maintaining a total of 4 servers.*

NOTE: Com Port 1 can communicate with up to 3 clients (masters). If a client attempts to establish communication with Com Port 1 while it is communicating with 3 clients, the CLICK PLUS PLC unit replies with an error to the fourth client.

W-4: Com Port 3 Wiring

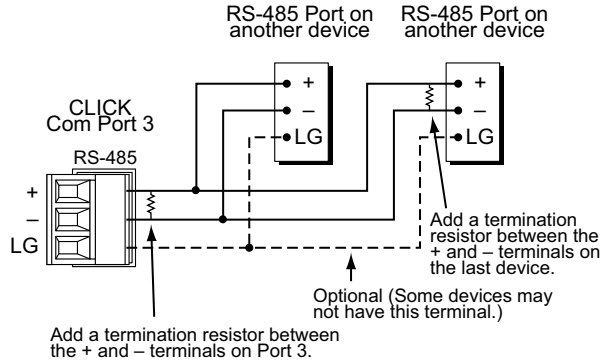
Com Port 3 supports 2-wire RS-485.



Port 3 Pin Descriptions		
1	+ (Plus)	Signal A (RS-485)
2	- (Minus)	Signal B (RS-485)
3	LG	Logic Ground (0 V)

Wiring Strategy

You need to connect all + signal terminals in the network together. You will also need to connect all – signal terminals together. It is optional to connect the logic ground.

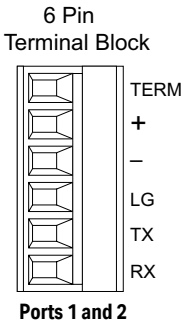


NOTE: *The resistance of the termination resistors needs to match the impedance of the communication cable.*

NOTE: *Use a repeater if connecting more than 32 slaves to Port 3.*

W-5: C2-DCM Com Port RS-232 Wiring

C2-DCM Com Port wiring pinout is shown below.

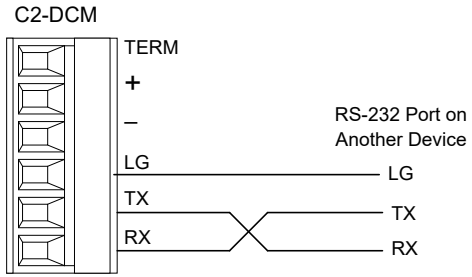


C2-DCM Port Pin Descriptions		
1	TERM	not used for RS-232
2	+ (Plus)	not used for RS-232
3	- (Minus)	not used for RS-232
4	LG	Logic Ground (0 V)
5	TX	RS-232 Transmit
6	RX	RS-232 Receive

Wiring Strategy

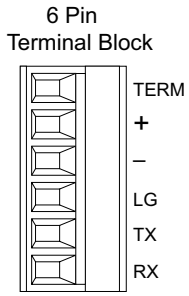
You need to cross the RX and TX signal lines and connect 0V on both com ports.

You can make your own cable. However, we offer pigtail cables with prewired connectors for many AutomationDirect products. Please check www.automationdirect.com for compatible cables.



W-6: C2-DCM Com Port RS-485 Wiring

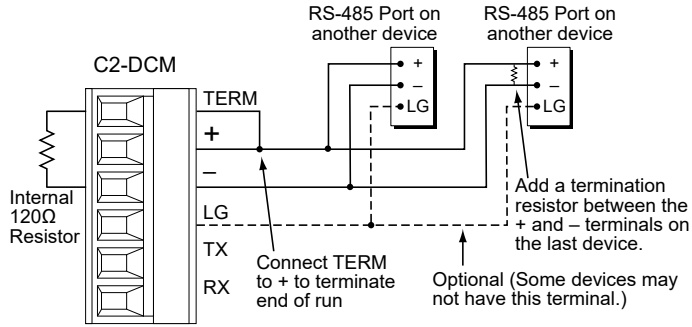
The C2-DCM com ports support 2-wire RS-485.



C2-DCM Port Pin Descriptions		
1	TERM	120Ω resistor
2	+ (Plus)	Signal A (RS-485)
3	- (Minus)	Signal B (RS-485)
4	LG	Logic Ground (0 V)
5	TX	not used for RS-485
6	RX	not used for RS-485

Wiring Strategy

You need to connect all + signal terminals in the network together. You will also need to connect all – signal terminals together. It is optional to connect the logic ground.



NOTE: *The C2-DCM ports include an internal 120Ω internal resistor between TERM and - (Minus). When the C2-DCM is at the end of an RS-485 run, connect TERM and + (Plus) to terminate the line.*

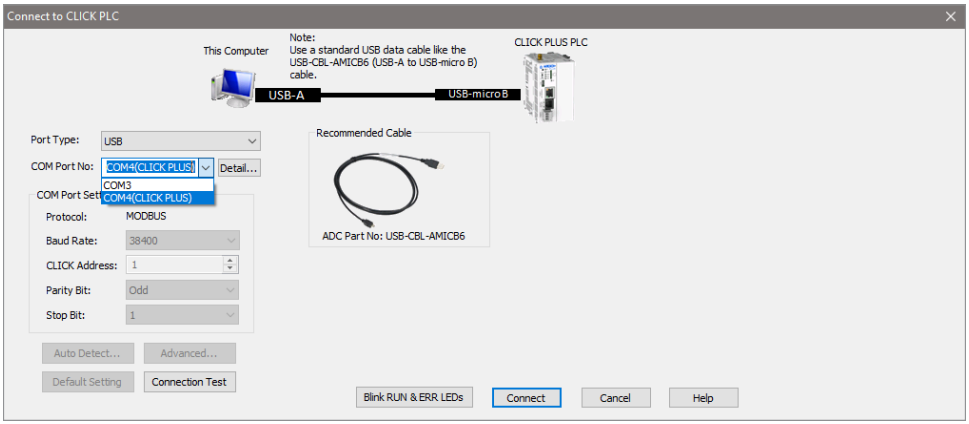
NOTE: *The resistance of the termination resistors needs to match the impedance of the communication cable.*

NOTE: *Use a repeater if connecting more than 32 slaves.*

C-1 C-1: USB Port Setup

The CLICK PLUS USB port is only used to connect to the CLICK programming software. When a CLICK PLUS device is first connected to a USB port on a Windows PC, a driver is loaded to allow the CLICK PLUS device to emulate a standard serial port. The CLICK PLUS will show up as a USB Serial Device in under Ports in Windows Device Manager.

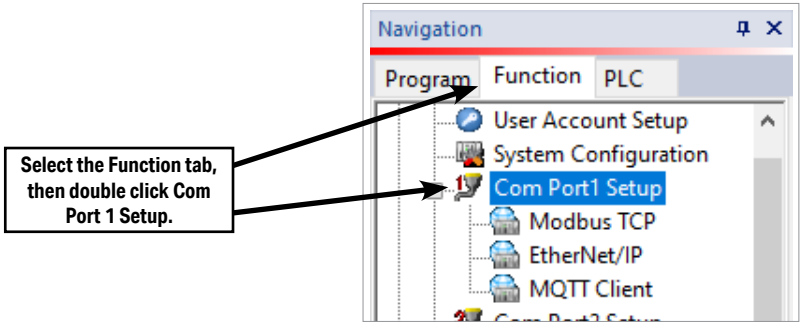
To connect via USB port, click Connect in the PLC menu, then select USB as the port type. Select the COM port assigned to the USB Serial Device. All other parameters can be left at their default settings.

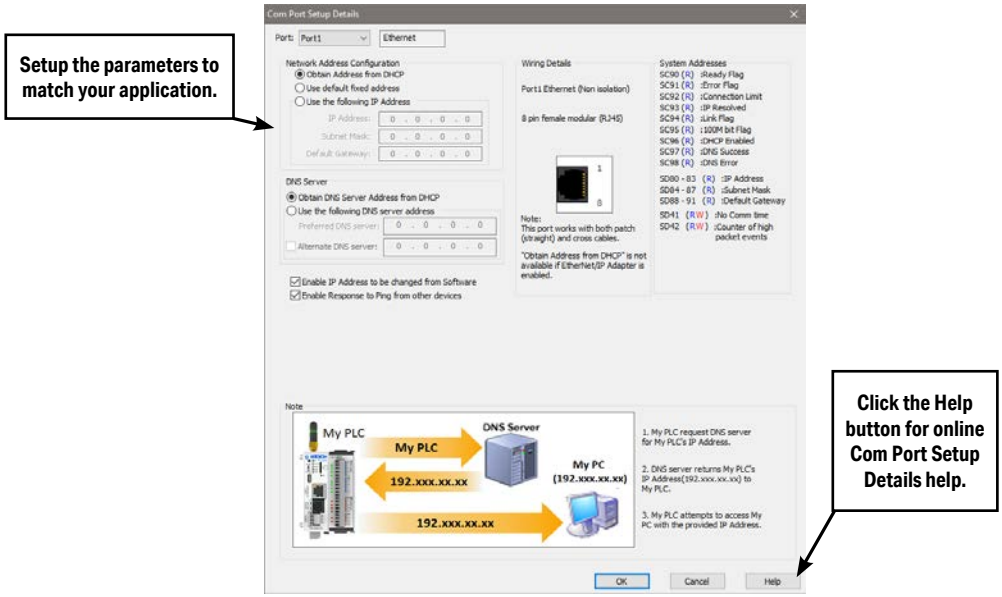


C-2 C-2: Com Port 1 (Ethernet) Setup

Select the **Function** tab located in the Navigation window of the CLICK Programming Software and double click "Com Port 1 Setup" as shown below.

The **Com Port Setup Details** dialog box will come into view as shown below.



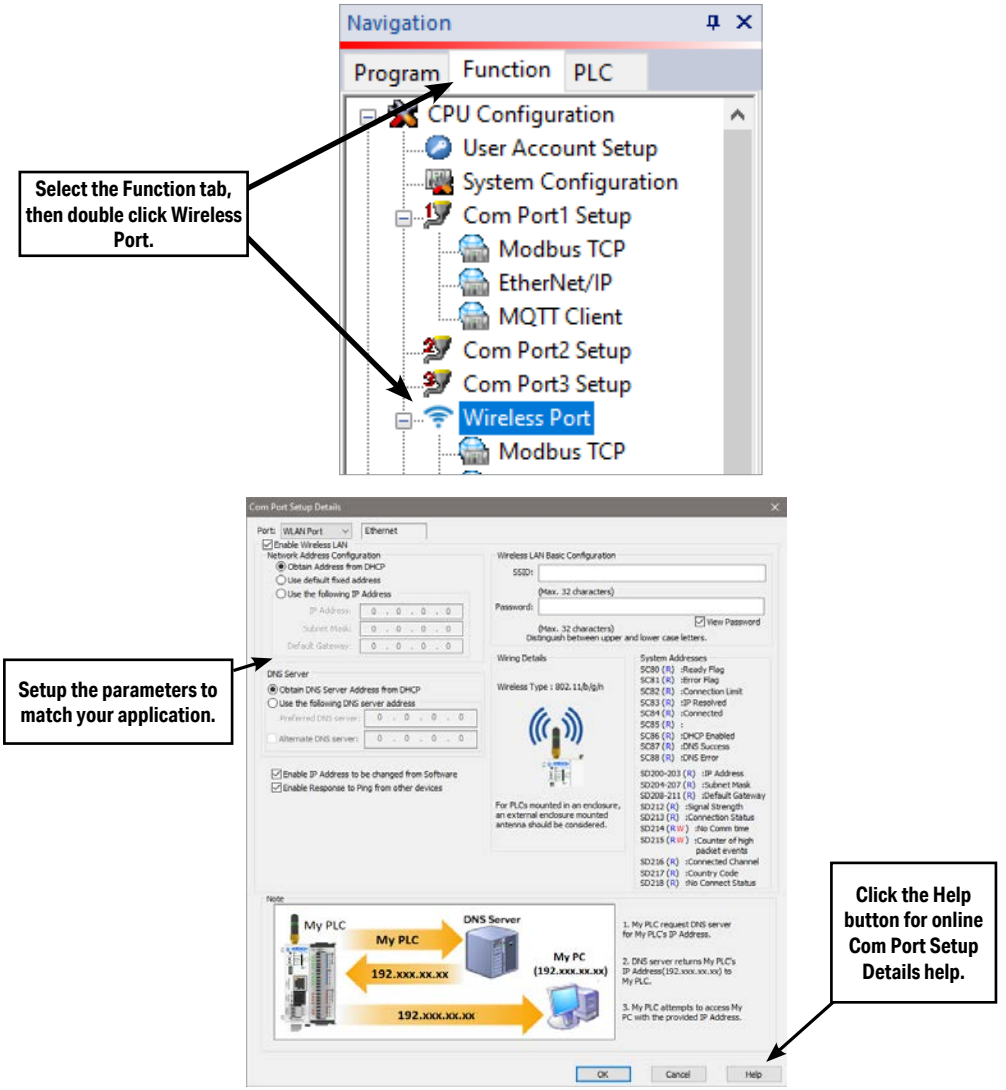


NOTE: *The communication port settings are saved in the project file. The project must be transferred to the CLICK PLUS PLC in order for any port setting changes to take effect.*

C-3 C-3: Wireless LAN (WLAN) Setup

Select the **Function** tab located in the Navigation window of the CLICK Programming Software and double click "Com Port 1 Setup" as shown below.

The **Com Port Setup Details** dialog box for the WLAN will come into view as shown below.



NOTE: *The communication port settings are saved in the project file. The project must be transferred to the CLICK PLUS PLC in order for any port setting changes to take effect.*

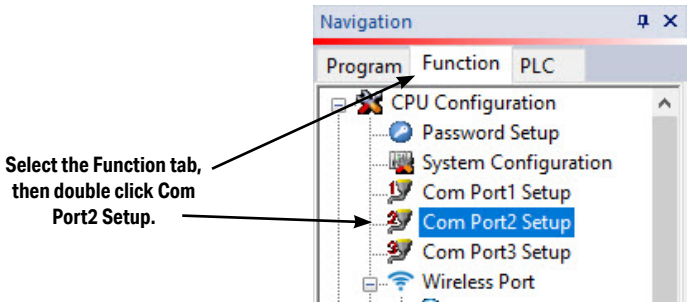
C-4 C-4: Bluetooth Setup

The Bluetooth connection available on certain CLICK PLUS CPUs is used for initial setup and provisioning of a wireless network connection. It provides a method to get a CLICK PLUS CPU connected to a wireless network so that the CLICK programming software on a PC can find the device, finish the setup and load a project.

The process for Bluetooth connection and WLAN provisioning is discussed in Chapter 1, Getting Started. For further information, please see the Bluetooth help topic in the CLICK programming software.

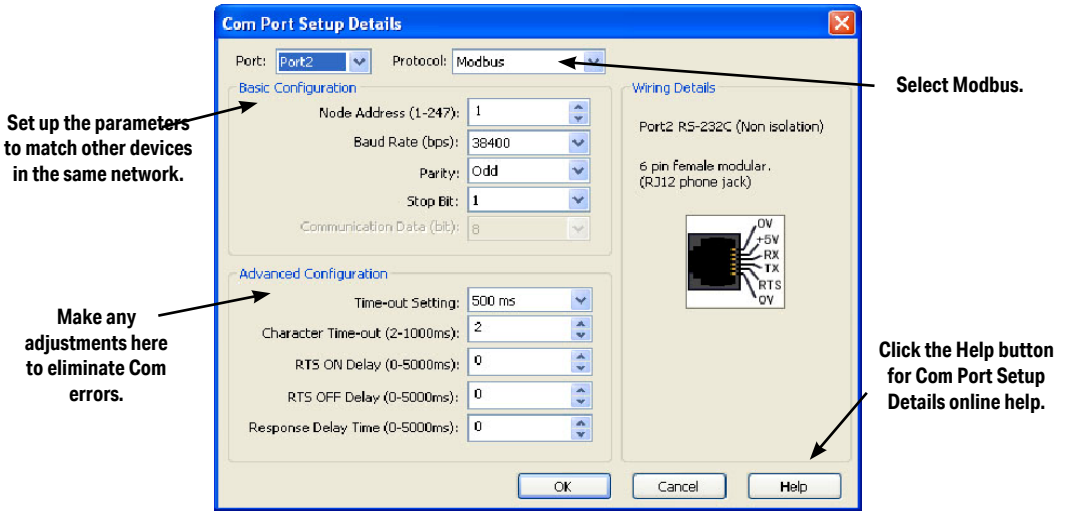
C-5 C-5: Com Port 2 Setup (Modbus RTU)

Select the Function tab located in the Navigation window and double click **Com Port2 Setup** as shown below.



The Com Port Setup Details dialog box will come into view as shown below.

Find the Basic Configuration section in the dialog box and set up the parameters to match other devices in the same network. The dialog box also has a section named Advanced Configuration.



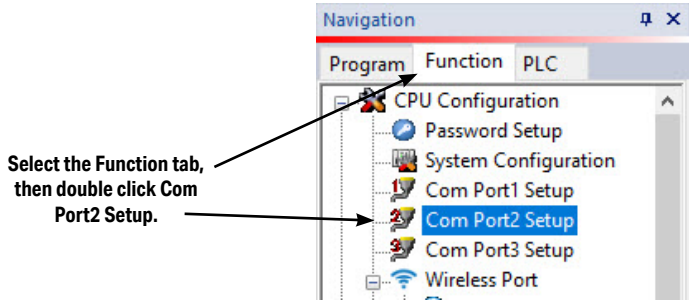
You may need to make adjustments to these parameters to overcome communication errors which may occur.



TIP : *The communication port settings are saved in the project file. The project must be transferred to the CLICK PLUS PLC in order for any port setting changes to take effect.*

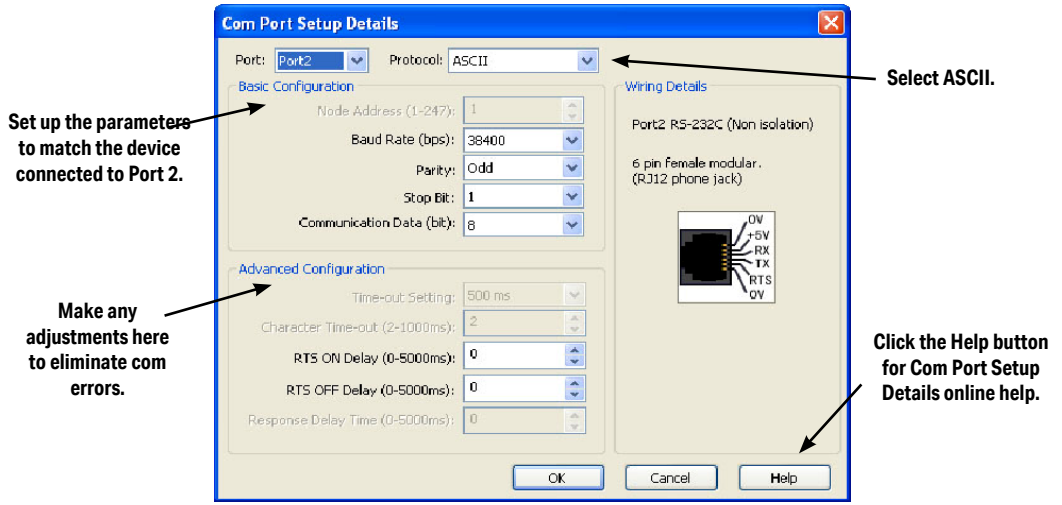
C-6 C-6: Com Port 2 Setup (ASCII)

Select the Function tab located in the Navigation window and double click **Com Port2 Setup** as shown below.



The Com Port Setup Details dialog box will come into view as shown below.

Find the Basic Configuration section in the dialog box and set up the parameters to match the



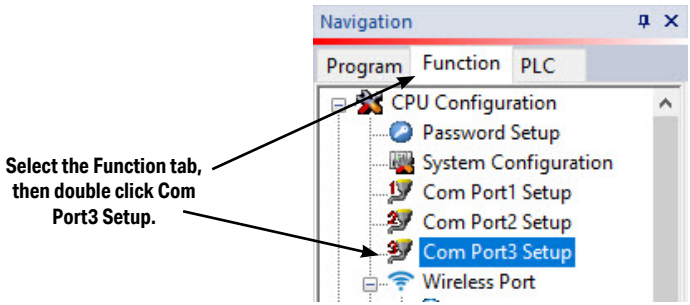
device connected to Port 2. The dialog box also has a section named Advanced Configuration. You may need to make adjustments to these parameters to overcome communication errors which may occur.



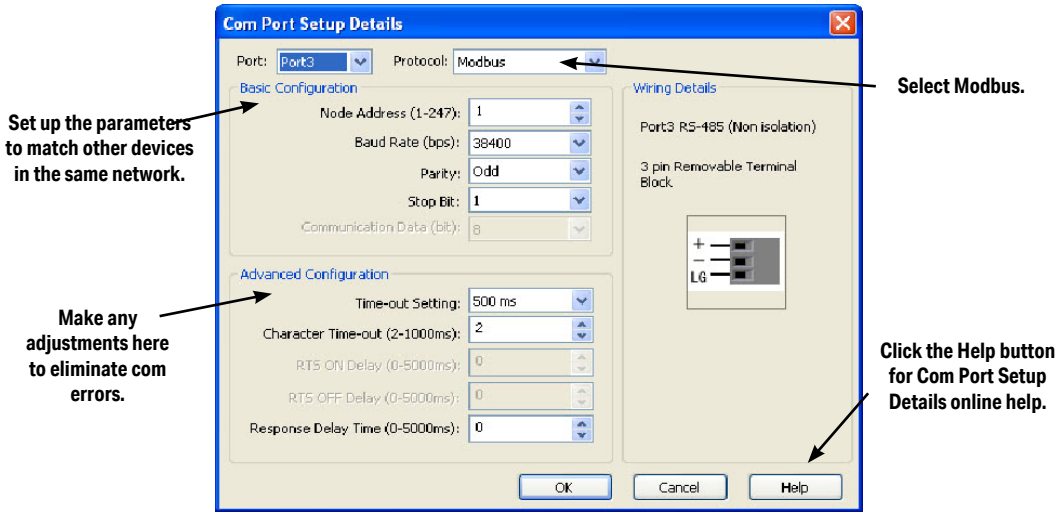
TIP: *The communication port settings are saved in the project file. The project must be transferred to the CLICK PLUS PLC in order for any port setting changes to take effect.*

C-7: Com Port 3 Setup (Modbus RTU)

Select the Function tab located in the Navigation window and double click **Com Port3 Setup** as shown below.



The Com Port Setup Details dialog box will come into view as shown below.



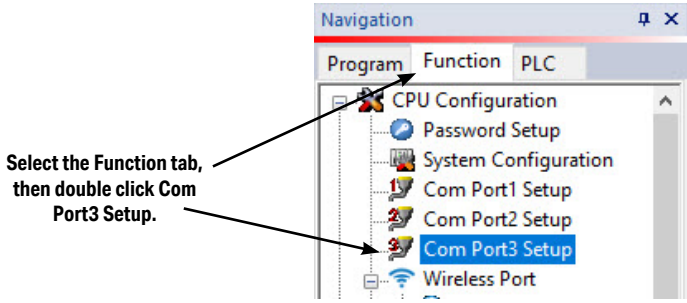
Find the Basic Configuration section in the dialog box and set up the parameters to match other devices in the same network. The dialog box also has a section named Advanced Configuration. You may need to make adjustments to these parameters to overcome communication errors which may occur.



TIP: *The communication port settings are saved in the project file. The project must be transferred to the CLICK PLUS PLC in order for any port setting changes to take effect.*

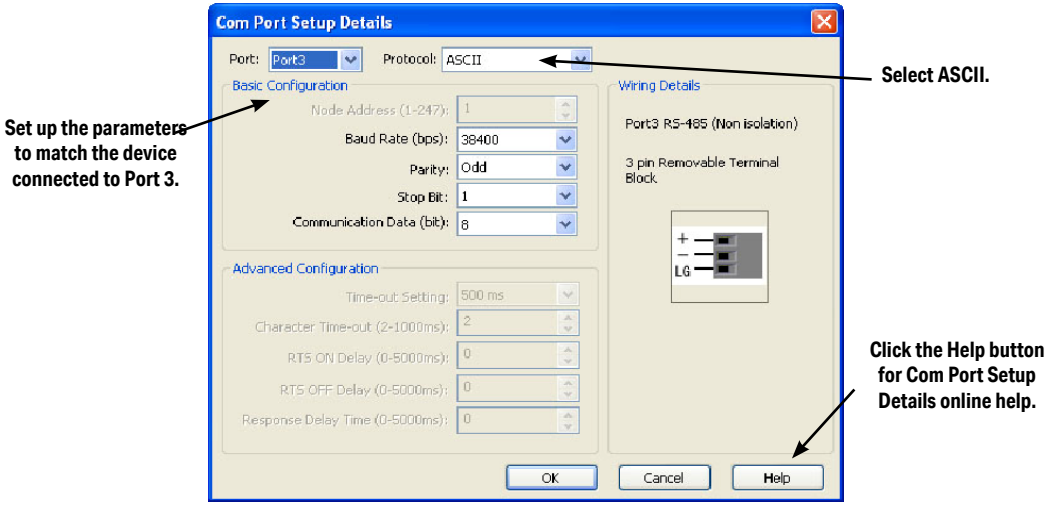
C-8: Com Port 3 Setup (ASCII)

Select the Function tab located in the Navigation window and double click **Com Port3 Setup** as shown below.



The Com Port Setup Details dialog box will come into view as shown below.

Find the Basic Configuration section in the dialog box and set up the parameters to match the device connected to Port 3.

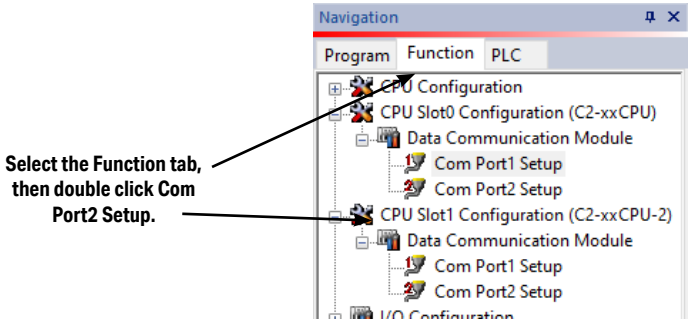




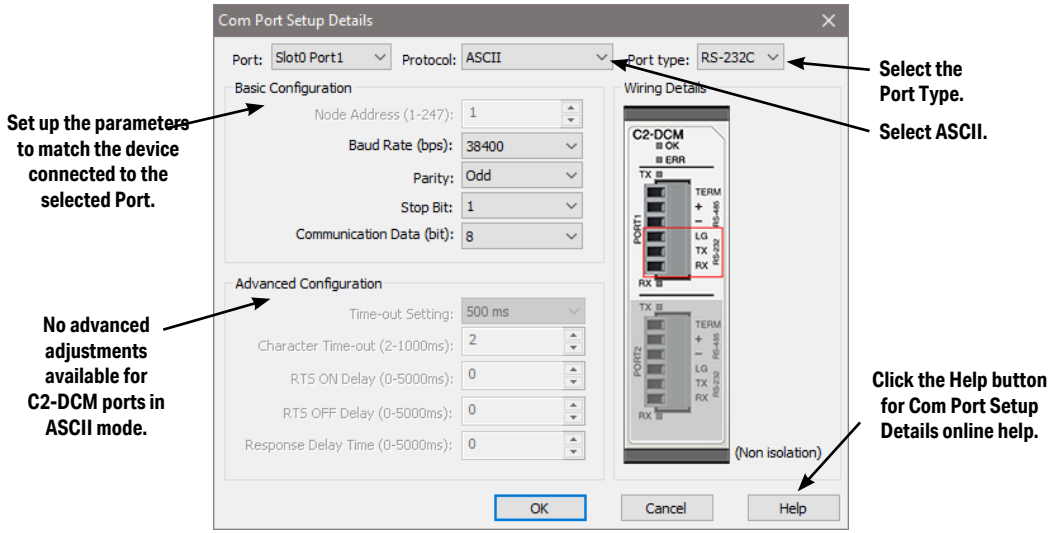
TIP: *The communication port settings are saved in the project file. The project must be transferred to the CLICK PLUS PLC in order for any port setting changes to take effect.*

C-9: C2-DCM Com Port 1 or 2 Setup (ASCII)

Select the Function tab located in the Navigation window and double click **Com Port1 Setup** or Com Port2 Setup under the Slot0 or Slot1 Data Communication Module, as shown below.



The Com Port Setup Details dialog box will come into view as shown below.



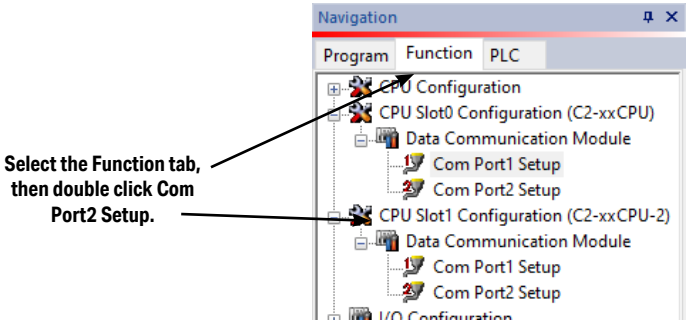
Select your Port type and Protocol. Find the Basic Configuration section in the dialog box and set up the parameters to match the device connected to the port. The dialog box also has a section named Advanced Configuration, but no advanced configuration parameters are available in ASCII mode.



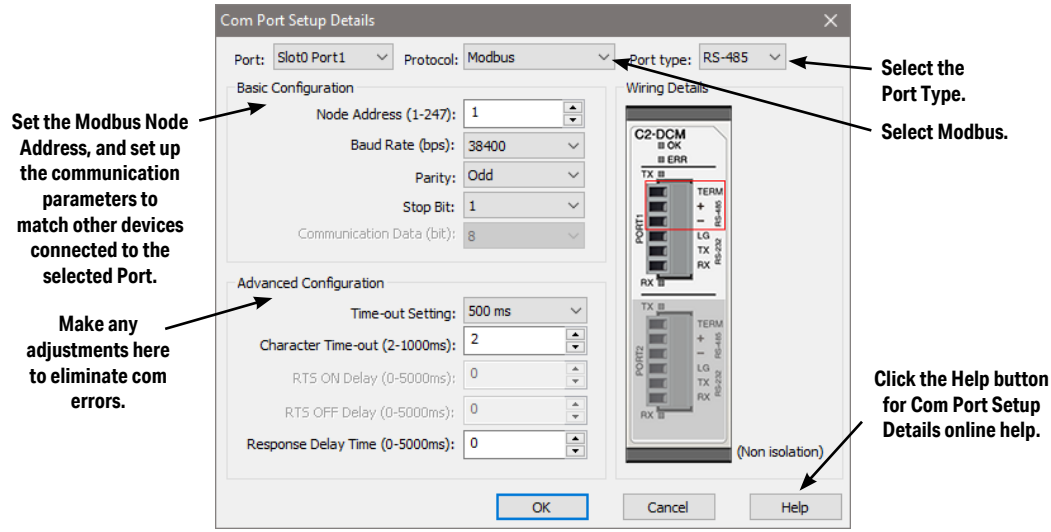
TIP: *The communication port settings are saved in the project file. The project must be transferred to the CLICK PLUS PLC in order for any port setting changes to take effect.*

C-10 C-10: C2-DCM Com Port 1 or 2 Setup (Modbus RTU)

Select the Function tab located in the Navigation window and double click **Com Port1 Setup** or Com Port2 Setup under the Slot0 or Slot1 Data Communication Module, as shown below.



The Com Port Setup Details dialog box will come into view as shown below.



Select your Port type and Protocol. Find the Basic Configuration section in the dialog box and set up the parameters to match other devices in the same network. The dialog box also has a section named Advanced Configuration. You may need to make adjustments to these parameters to overcome communication errors which may occur.



TIP: *The communication port settings are saved in the project file. The project must be transferred to the CLICK PLUS PLC in order for any port setting changes to take effect.*

P-1: Modbus Slave (Server) Programming

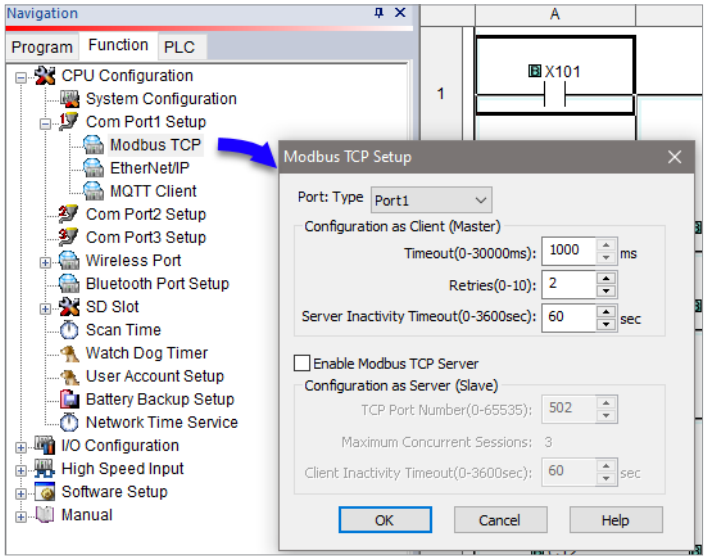
Ladder Program

To use a CLICK PLUS PLC as a Serial Modbus slave, you don't need any special ladder program. Set up the communication port properly and you just need an End instruction in the ladder program to put the PLC in Run mode.



To use CLICK PLUS PLC as a Modbus Ethernet Client, the Modbus TCP Server must be enabled.

To enable the Modbus TCP Server, select the **Function** tab located in the Navigation window and expand "Com Port 1 Setup" and double click on Modbus TCP as shown below.



You can add any additional ladder program to let the slave CLICK PLUS PLC control something by itself. For instance, you may want to shut down the outputs on the slave (server) CLICK PLUS PLC should it lose communication with the Modbus master (client).

NOTE: *The Modbus master can communicate with the Modbus slave CLICK PLUS PLC without any ladder program. However, output points on the Modbus slave CLICK PLUS PLC cannot be turned on if the PLC is not in the Run mode. Because of this, we recommend having at least one End instruction and to put the PLC in Run mode.*

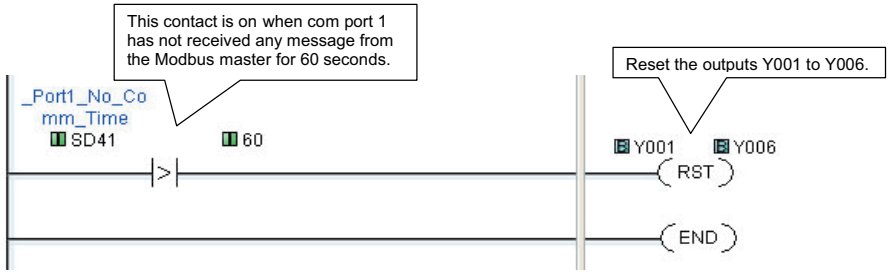
Lost Communication Situation

You may want to detect if there is something happening at the Modbus master side that stops communication with the Modbus slaves. Or, the communication cable might have been disconnected. In this situation, you may want the Modbus slaves to take an action. For instance, you may want to shut down the outputs on the slave CLICK PLUS PLC when the communication with the Modbus master is lost. We offer an easy method to accomplish this.

The CLICK keeps counting how long it has been since each com port received a message from the Modbus master, and enters the time duration in the following system data registers.

System Data Registers		
System Data Register	**Nickname**	**Range**
SD41	_Port1_No_Comm_Time	0 - 32767 (sec)
SD51	_Port2_No_Comm_Time	0 - 32767 (sec)
SD61	_Port3_No_Comm_Time	0 - 32767 (sec)
SD214	_WLAN_No_Comm_Time	0 - 32767 (sec)

Each register is reset to zero automatically when the com port receives a message from the Modbus master. Then its value increments by 1 per second until the com port receives another message from the Modbus master. If one of these registers has 60 as its value, it means the com port has not received any message from the Modbus master for 60 seconds. You can use this info to shut down the outputs on the slave CLICK PLUS PLC. Here is an example program.

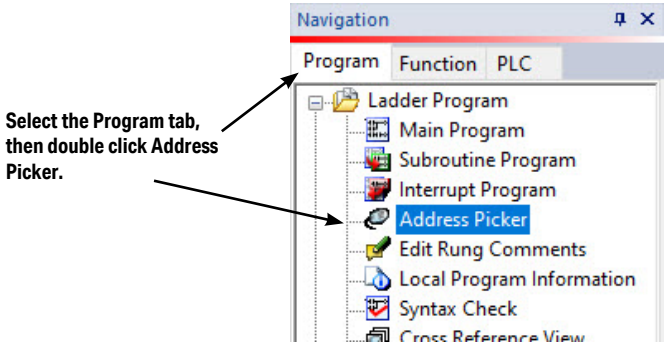


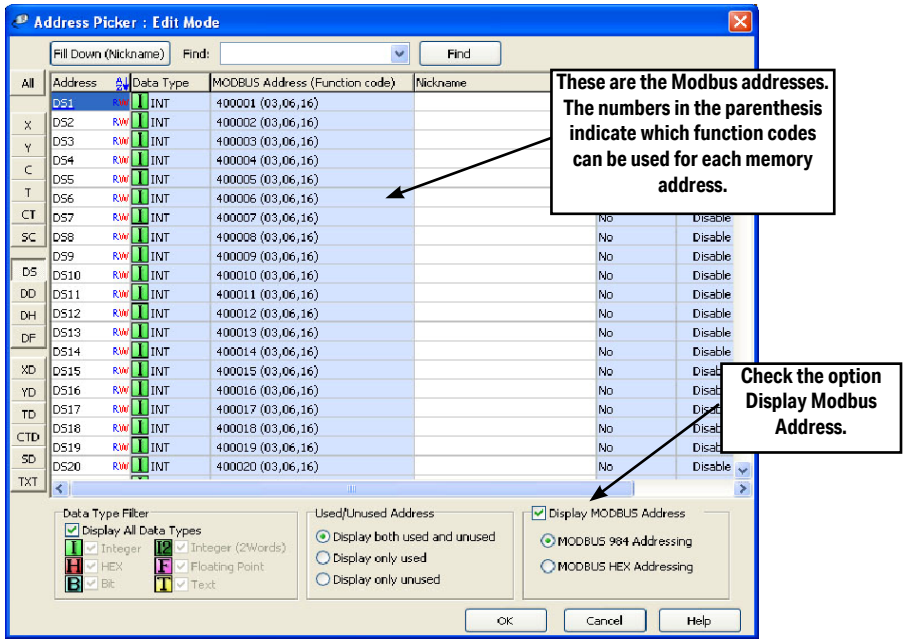
Modbus Addressing

Each of the memory addresses in the CLICK (X1, DS1, etc.) has a unique Modbus address. This means the network master in the Modbus network can access any memory address in the slave CLICK PLUS PLC. The best way to check which Modbus address is assigned to a particular CLICK memory address is to use the CLICK programming software.

Click the Program tab located in the Navigation window and double click Address Picker as shown below.

After the Address Picker window opens, check the option Display MODBUS Address on the right bottom.





Exception Response (Exception Code)

When the slave CLICK PLUS PLC receives a request from the Modbus master that it cannot respond to, the slave CLICK PLUS PLC sends an exception response to the Modbus master. The CLICK PLUS PLC supports the following Exception Responses.

Exception Response (Exception Code)		
Code	**Name**	**Details of Exception Response**
01	Illegal Function	The CLICK PLUS PLC does not support the function code received from the MODBUS master.
02	Illegal Data Address	The MODBUS master tried to access to an invalid address.
03	Illegal Data Value	The data length is zero or exceeds the maximum size.
		The data for Write Single Coil is not FF00h (ON) or 0000h (OFF).
		The PLC mode change request from the MODBUS master is not valid.
04	Slave Device Failure	Password is locked.
		When the PLC mode switch is in STOP position, the MODBUS master requested to switch to RUN mode.
		When the PLC mode switch is in RUN position, the MODBUS master requested to switch to the Firmware Update mode.

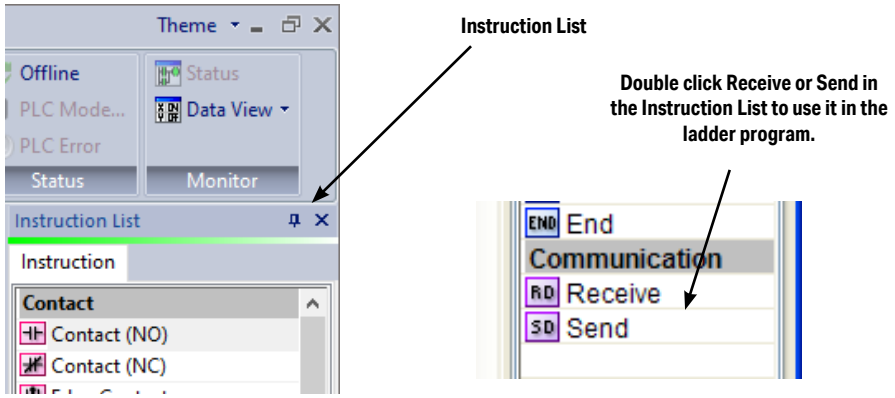
P-2: Modbus Master Programming (Modbus RTU)

Instructions

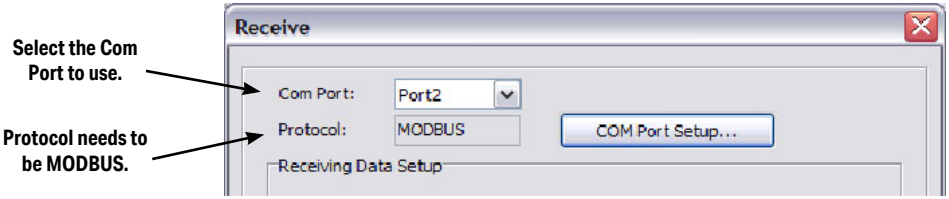
The CLICK PLUS PLC has two instructions to exchange data with external Modbus devices through the com ports; the Receive and Send instructions.

- Receive instruction: Read data from an external Modbus device.
- Send instruction: Write data to external Modbus device(s).

To use these instructions, double click Receive or Send in the Instruction List window as shown below.



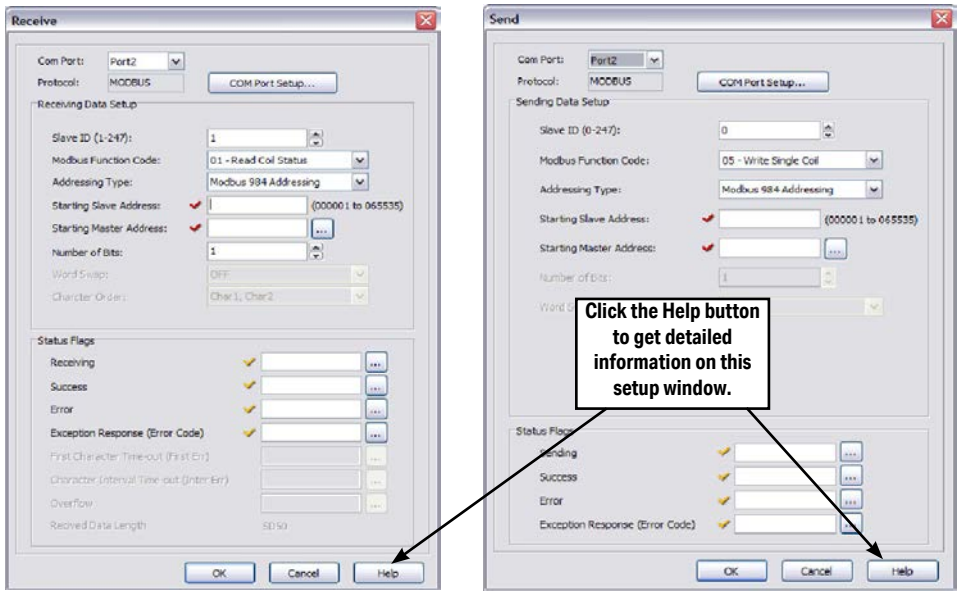
Select the Com Port that you are going to use and confirm the Protocol is MODBUS.



If the Protocol is not MODBUS, click the Com Port Setup button to open the Com Port Setup Details window and change the Protocol to MODBUS. If the Protocol selection is grayed out as shown below, it means the Com Port is used by another Receive and/or Send instruction in the ladder program. You cannot change the Protocol setup until you delete those instructions.



When you open the Receive or Send instruction in the Modbus mode, their windows should look like this. For the explanation of each setup parameter, please click the Help button on the bottom right.



Com Port Status Indicators

The CLICK PLC has the following System Control Relays to indicate the status of the Com Ports. If monitoring these bits in ladder, they should be monitored at a ladder location prior to the Receive or Send instructions for the port.

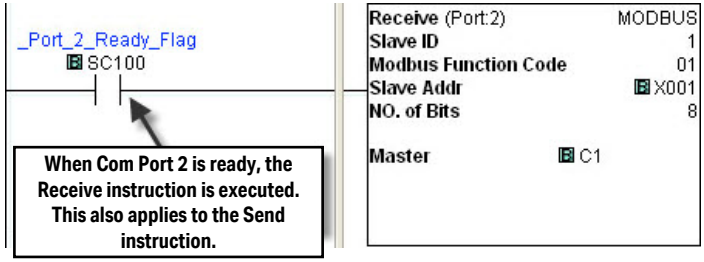
System Control Relays		
Address	**Nickname**	**Description**
SC100	_Port_2_Ready_Flag	On when Port 2 is ready.
SC101*	_Port_2_Error_Flag	On when Port 2 has a communication error.
SC102	_Port_3_Ready_Flag	On when Port 3 is ready.
SC103*	_Port_3_Error_Flag	On when Port 3 has a communication error.

* Errors that will cause SC101 or SC103 error flag to turn on:

- Parity Error
- Frame Error
- Time Out
- CRC Error
- Modbus Exception Response

Example Program

The ladder program to use these Receive and Send instructions are easy. You just need one NO (Normally Open) contact instruction to check if the com port is ready to receive or send data.

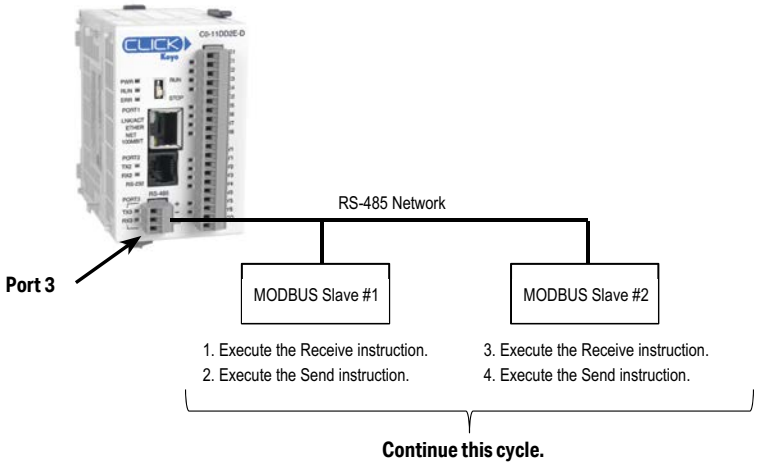


Interlocking

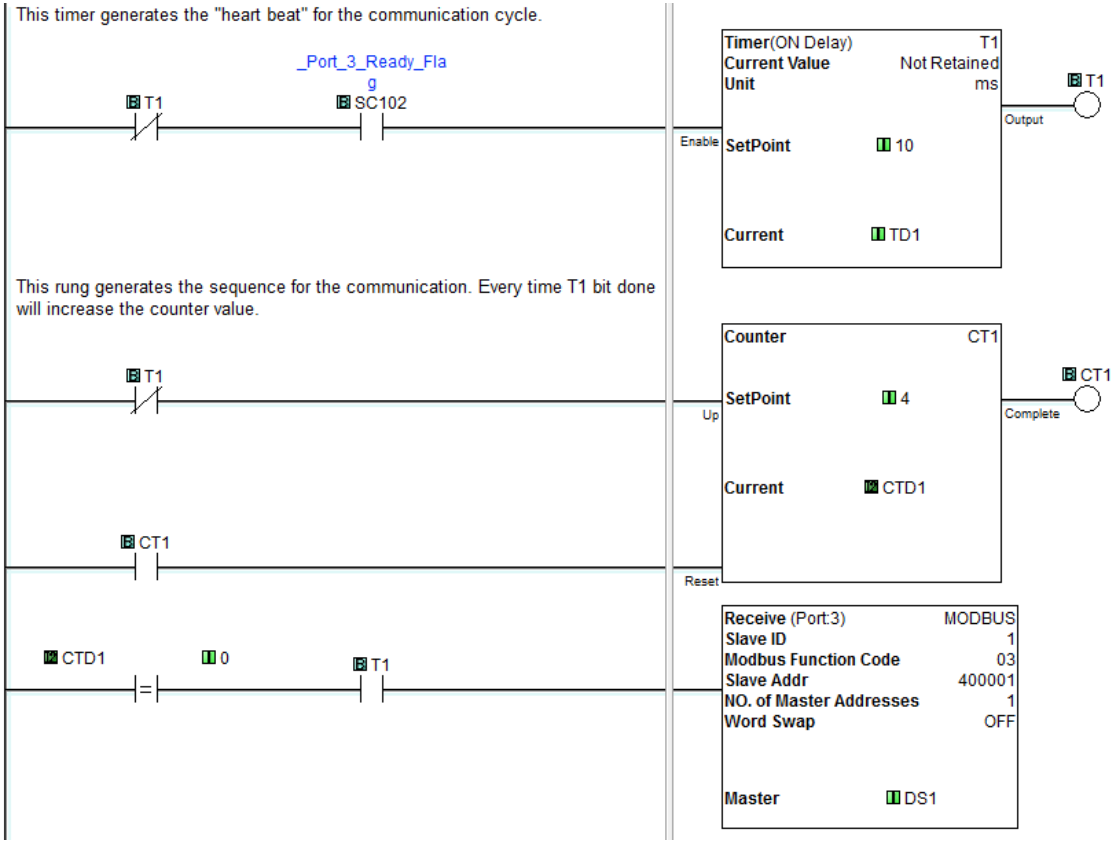
If you are going to use more than one Receive and/or Send instruction with a serial communication port, you need to be sure only one of the instructions is enabled at any point during the operation. The technique to execute more than one Receive and/or Send instructions in order is called 'Interlocking'. When the Interlocking sample program below is executed, the two Receive instructions and two Send instructions are executed one by one.

Example Program: Interlocking with Two Slaves

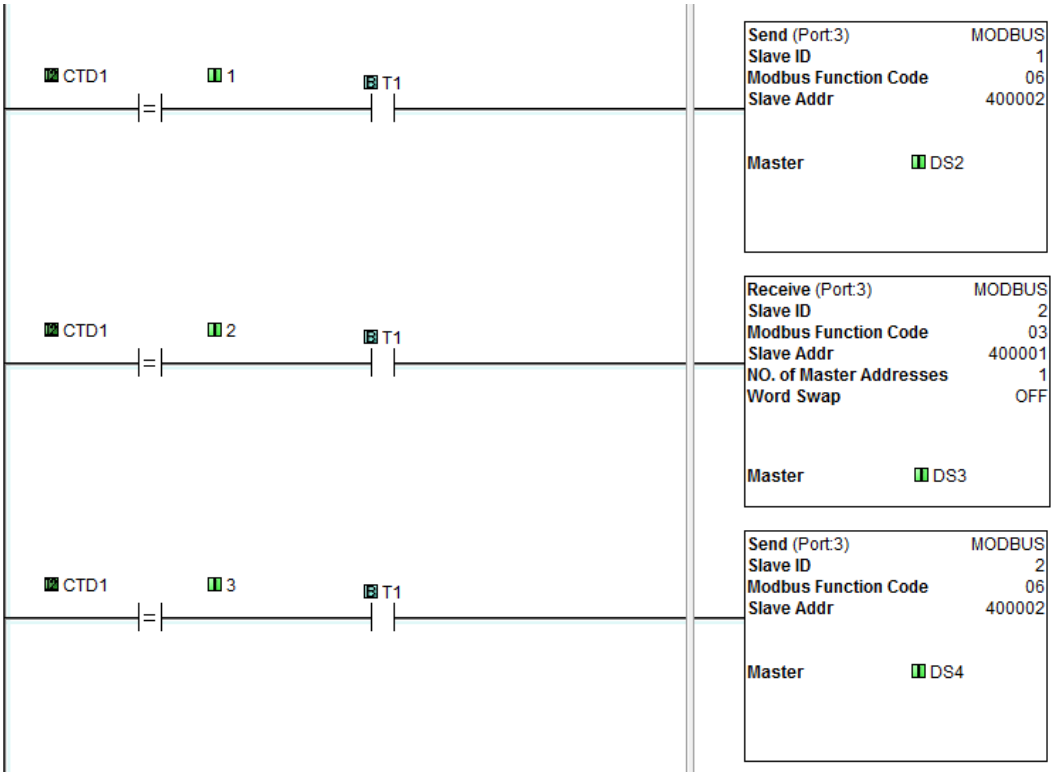
In this example, Port 3 on the CLICK PLC unit communicates with two MODBUS slaves. The slave IDs (node numbers) are 1 and 2. The CLICK PLC unit executes one Receive instruction and one Send instruction with each MODBUS slave.



Example Program: Interlocking with Two Slaves (Continued)



Example Program: Interlocking with Two Slaves (Continued)



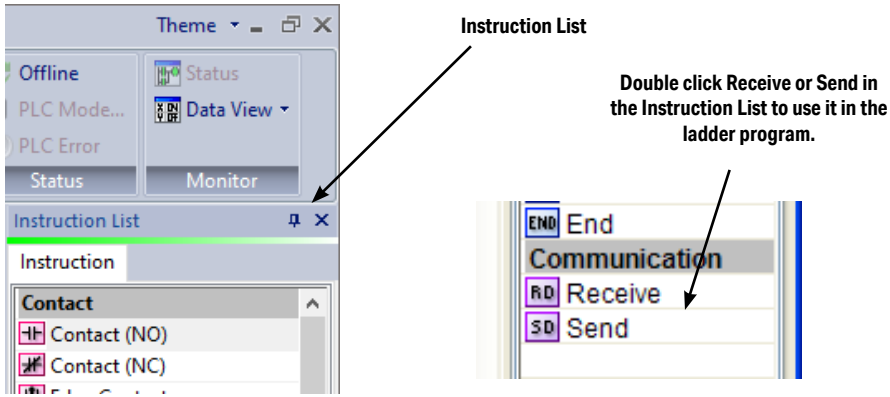
P-3 P-3: Modbus Client (Modbus TCP) Programming

Instructions

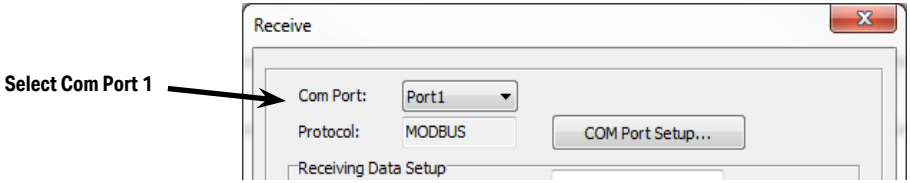
The CLICK PLC has two instructions to exchange data with Modbus servers through the Com Port 1; the Receive and Send instructions.

- **Receive** instruction: Read data from external Modbus server.
- **Send** instruction: Write data to external Modbus server(s).

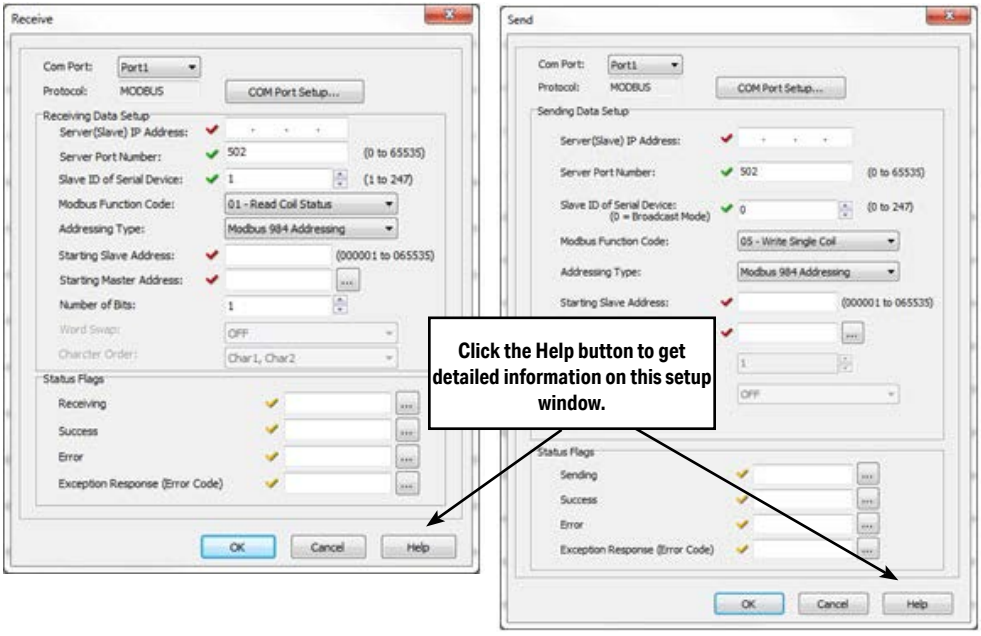
To use these instructions, double click Receive or Send in the Instruction List window as shown below.



Select Com Port 1 that you are going to use.



When you open the Receive or Send instruction in the Modbus mode, their windows should look like this. For the explanation of each setup parameter, please click the Help button on the bottom right.



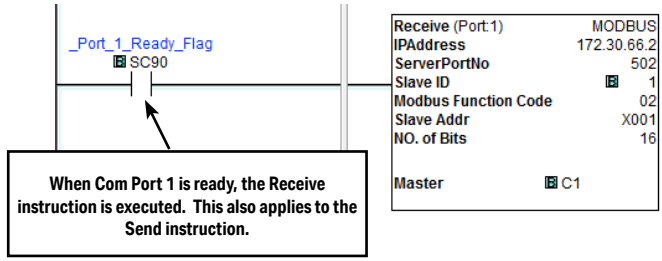
Com Port Status Indicators

The CLICK PLUS PLC has the following System Control Relays to indicate the status of Com Port 1 and the WLAN port.

System Control Relays		
Address	**Nickname**	**Description**
SC80	_WLAN_Ready_Flag	ON when WLAN is Ready, does not indicate Busy Status
SC81	_WLAN_Error_Flag	ON when there is a WLAN error. SD213 will contain the error information.
SC82	_WLAN_Connection_Limit	ON when all of WLAN server connections are busy.
SC83	_WLAN_IP_Resolved	ON when WLAN IP Address is assigned
SC84	_WLAN_Connected	ON when WLAN is connected to the access point.
SC86	_WLAN_DHCP_Enabled	ON when WLAN is configured for DHCP.
SC87	_WLAN_DNS_Success	ON when WLAN DNS Lookup was successful.
SC88	_WLAN_DNS_Error	ON when WLAN DNS Lookup was an error.
SC90	_Port_1_Ready_Flag	ON when Port 1 is ready.
SC91	_Port_1_Error_Flag	ON when Port 1 has a communication error.
SC92	_Port_1_Clients_Limit	ON when Port 1 is communicating with 3 clients.
SC93	_Port_1_IP_Resolved	ON when Port 1 obtains an IP address.
SC94	_Port_1_Link_Flag	ON when Port 1 is connected to an Ethernet network.
SC95	_Port_1_100MBIT_Flag	ON when Port 1 is communicating at 100Mbps.

Example Program

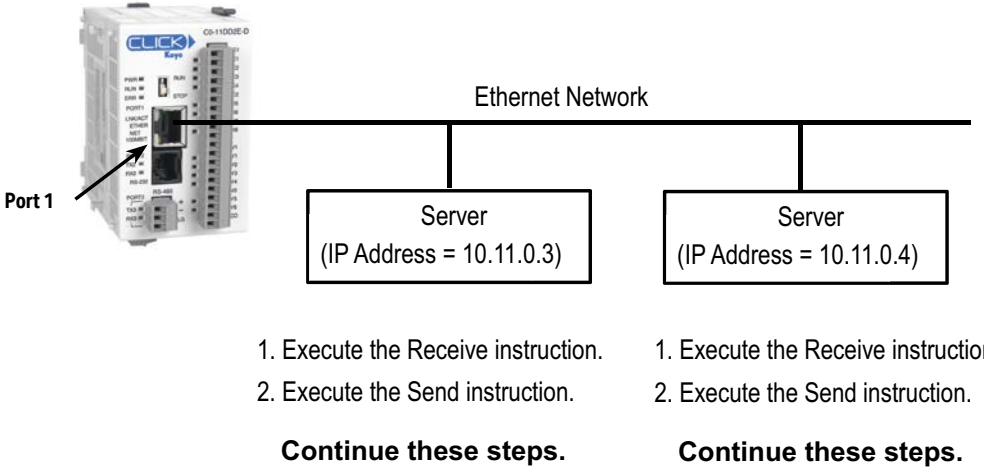
The ladder program to use these Receive and Send instructions are easy. You just need one NO (Normally Open) contact instruction to check if the com port is ready to receive or send data.



Interlocking

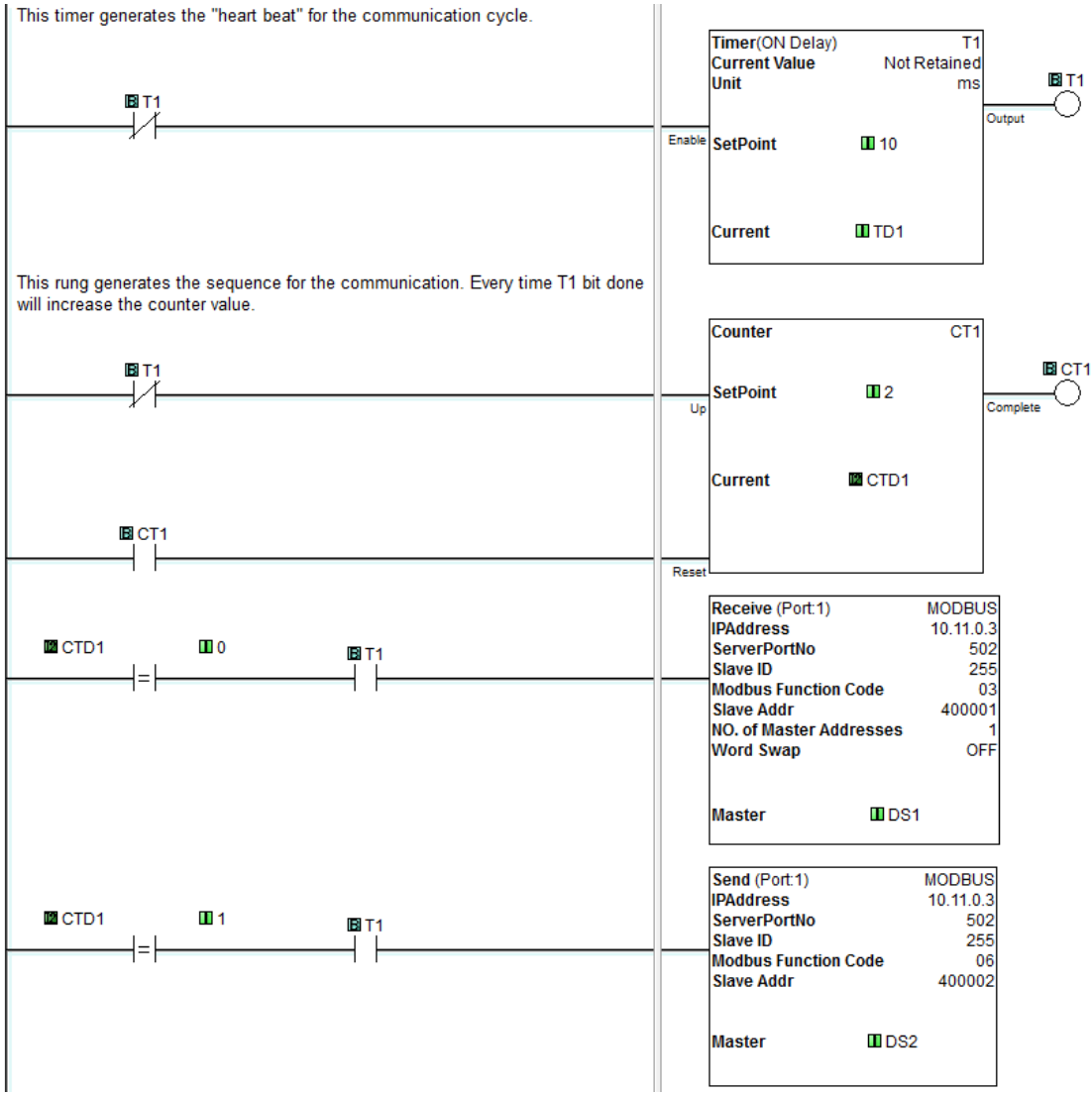
If you are going to use more than one Receive and/or Send instruction with the same server(slave), you need to be sure only one of the instructions is enabled at any point during the operation. The technique to execute more than one Receive and/or Send instructions in order is called 'Interlocking'. When the Interlocking sample program below is executed, one Receive instruction and one Send instruction is executed one-by-one for each server.

Example Program: Interlocking with Two Servers

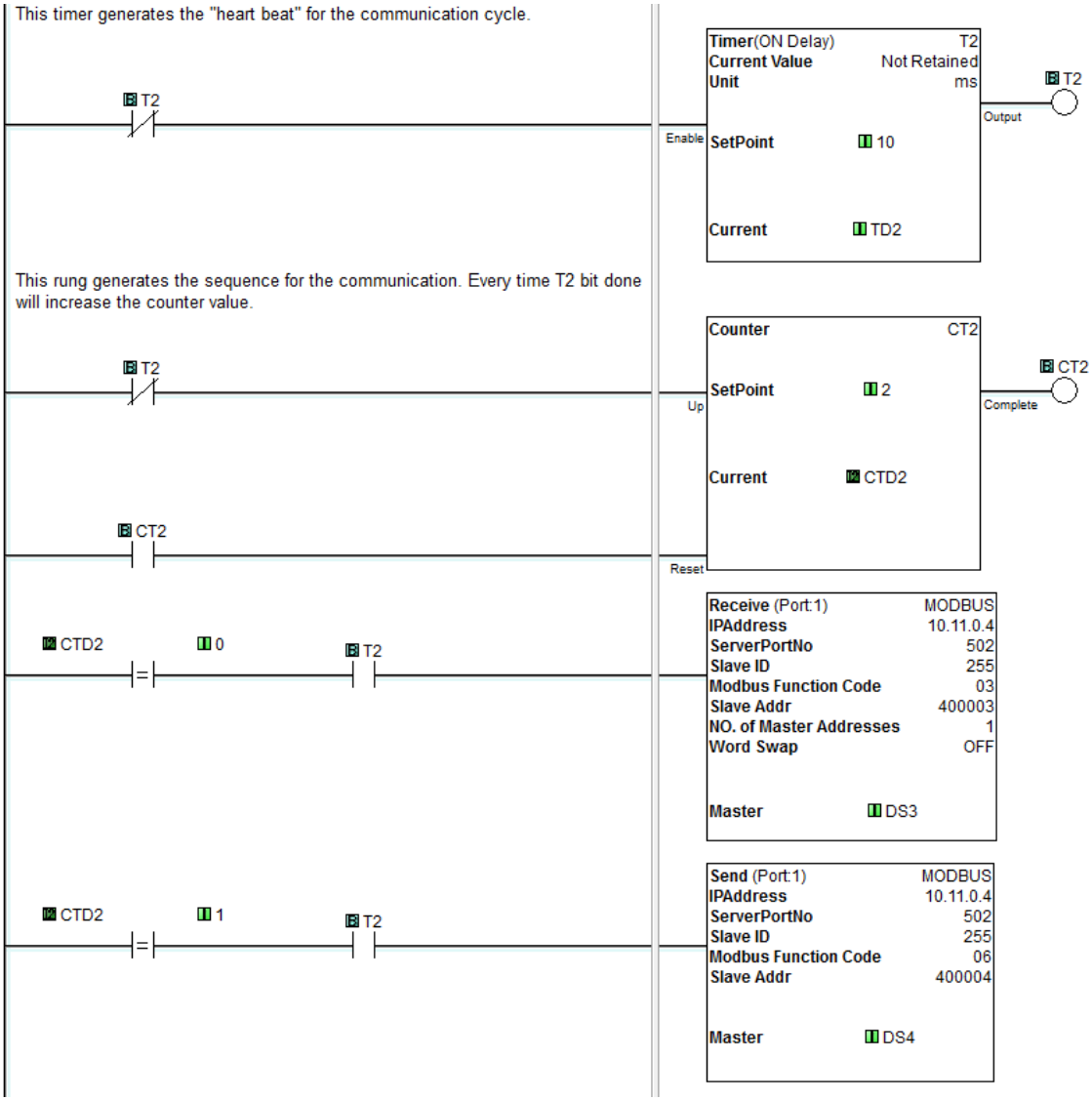


NOTE: *Port 1 can establish the connection with up to 4 servers at the same time.*

Example Program: Interlocking with a Server (Continued)



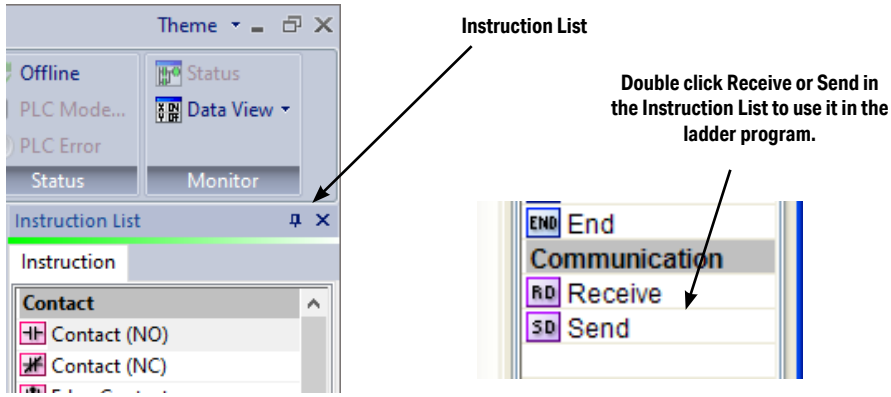
Example Program: Interlocking with a Server (Continued)



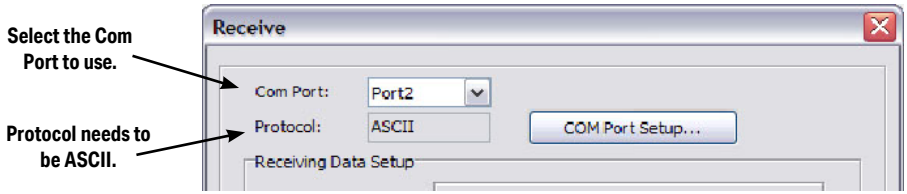
P-4 P-4: ASCII Receive Programming

Instruction

The Receive instruction allows the CLICK PLC to read ASCII message from an external device. To use this instruction, double click Receive in the Instruction List window as shown below.



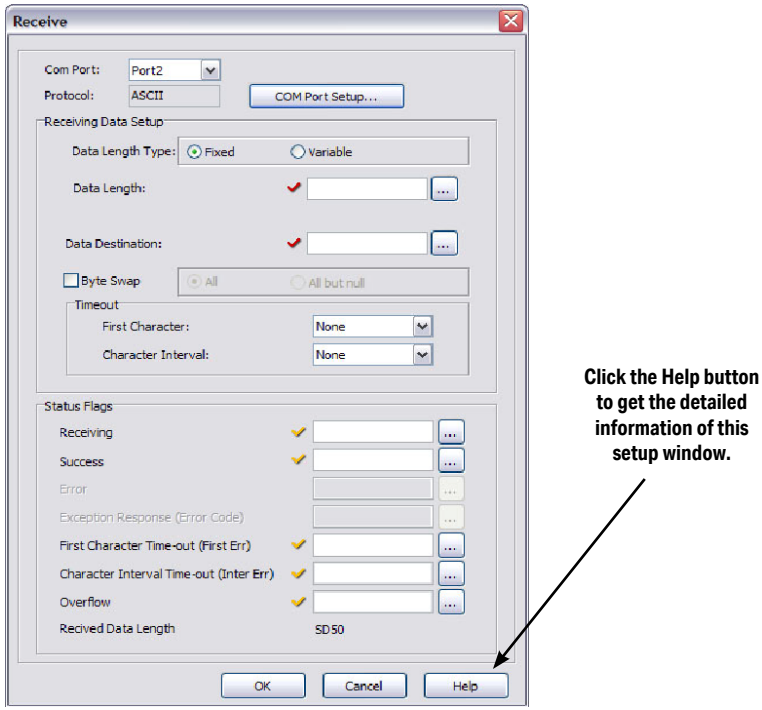
Select the Com Port that you are going to use and confirm the Protocol is ASCII.



If the Protocol is not ASCII, click the Com Port Setup button to open the Com Port Setup Details window and change the Protocol to ASCII. If the Protocol selection is grayed out as shown below, it means the Com Port is used by another Receive and/or Send instruction in the ladder program. You cannot change the Protocol setup until you delete those instructions.

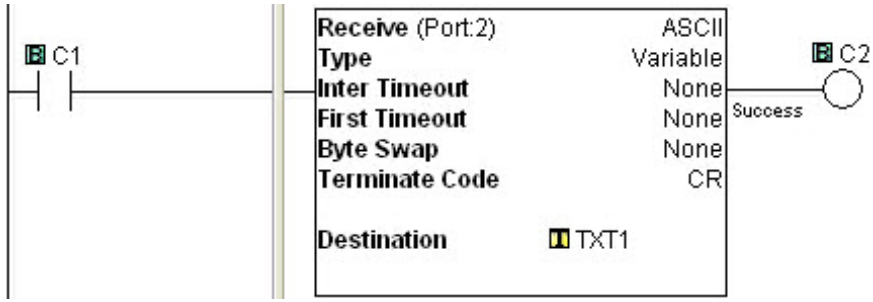


When you open the Receive instruction in the ASCII mode, the window should look like this. For the explanation of each setup parameter, please click the Help button on the bottom right

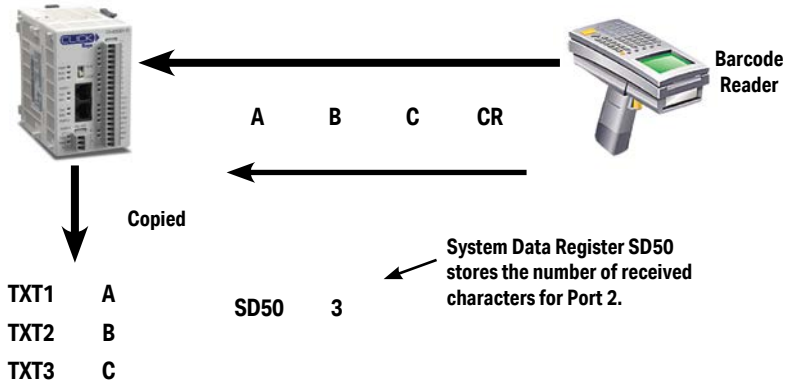


Example 1: Read ASCII message from a barcode reader.

With the following example program, when C1 is ON, the Receive instruction is activated and Com Port 2 waits for an ASCII message from the barcode reader. When Com Port 2 receives an ASCII message and it includes the termination character (CR = Carriage Return in this example), C2 is turned on and the received ASCII message is copied to TXT1 address.

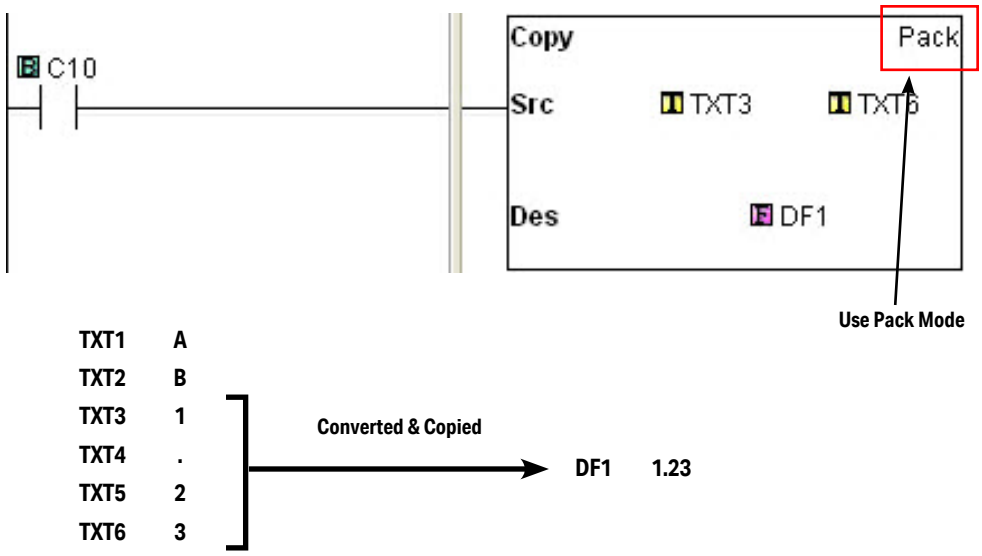


Example 2: Retrieve numerical data from the received ASCII message.



When numerical data is included in the received ASCII message, you may want to retrieve the numerical data and copy into a data register. The Copy instruction can be used for this purpose.

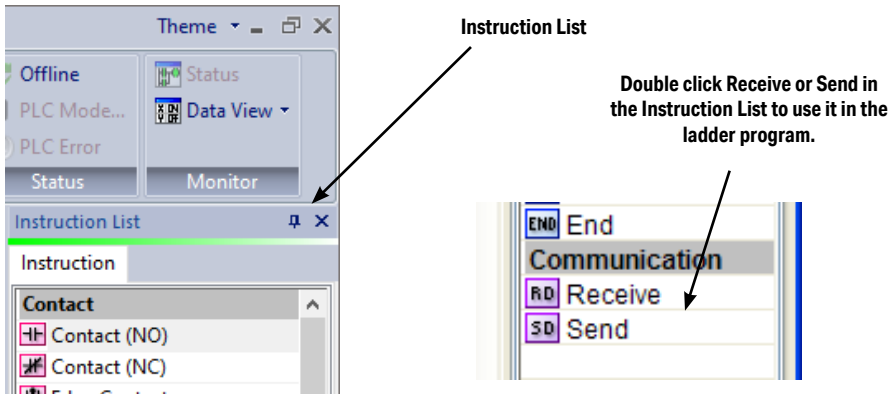
In this example, received ASCII message is stored in TXT1 to TXT6. This ASCII message includes numerical data '1.23' as ASCII characters from TXT3 to TXT6. The Copy instruction converts those ASCII characters into the equivalent numerical data and copies into data register DF1.



P-5: ASCII Send Programming

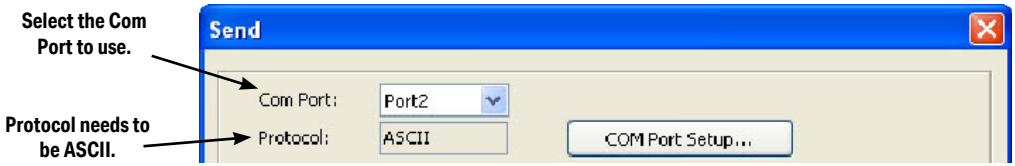
Instruction

The Send instruction allows the CLICK PLC to send ASCII messages to an external device. To use this instruction, double click Send in the Instruction List window as shown below.



Select the Com Port that you are going to use and confirm the Protocol is ASCII.

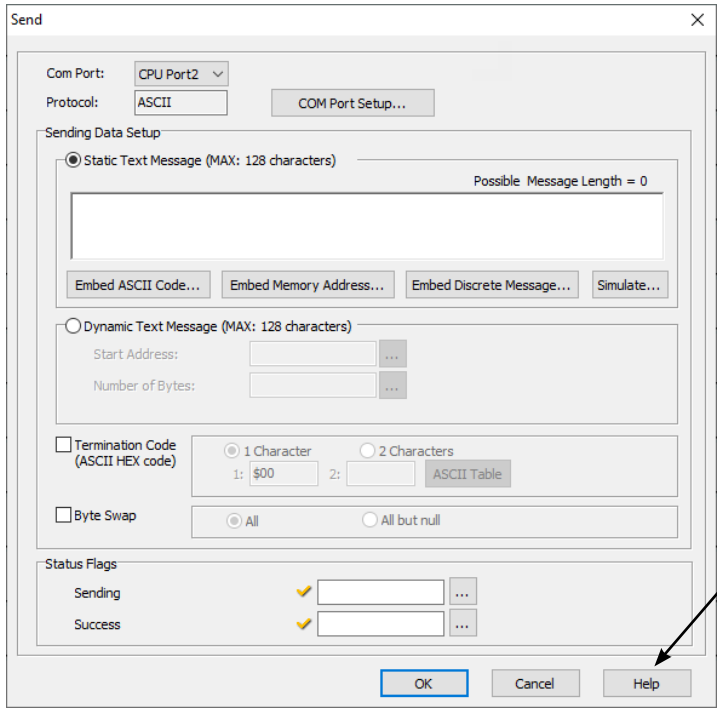
If the Protocol is not ASCII, click the Com Port Setup button to open the Com Port Setup



Details window and change the Protocol to ASCII. If the Protocol selection is grayed out as shown below, it means the Com Port is used by another Receive and/or Send instruction the ladder program. You cannot change the Protocol setup until you delete those instructions.

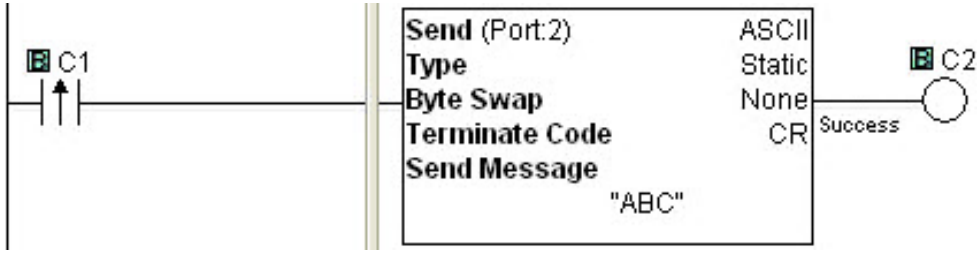


When you open the Send instruction in the ASCII mode, the window should look like this. For the explanation of each setup parameter, please click the Help button on the bottom right.



Example: Send ASCII message to a serial printer.

With the following example program, when status of C1 changes from OFF to ON, the Send instruction sends ASCII message 'ABC' and the termination character (CR = Carriage Return in this example). C2 is turned on when sending the ASCII message is completed.



Maintenance



In This Chapter...

PLC Maintenance 5–2

PLC Maintenance

Although the CLICK PLUS PLC requires very little maintenance, setting up a routine maintenance schedule will ensure the longevity of the PLC in your application. We suggest checking the following items as part of a quarterly or bi-annual preventative maintenance schedule.

Check LED Indicators

Check the PWR and ERR LED indicators on the PLC and I/O modules. If the PWR LED indicator is off or flickering, or if the ERR indicator is on or flickering, refer to Chapter 6: *Troubleshooting* for more information.

Project Backup

Saving a copy of the project file during routine maintenance ensures that you will have a fairly up-to-date backup copy of the PLC program. Although the CLICK PLUS PLC programming software can upload the complete project from the PLC anytime the PLC is operable, it is wise to maintain a project backup in case the PLC becomes inoperable and has to be replaced. The backup file of the project can then be downloaded into the new PLC.

Check Operating Environment

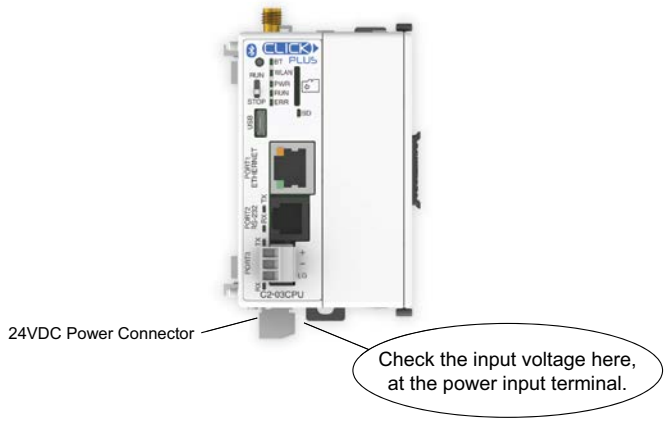
Make sure that the CLICK PLUS PLC is operating within the proper temperature range (0–55°C; 32–131°F).

Make sure that the CLICK PLUS PLC is operating within the proper humidity range (30–95% RH, non-condensing).

Make sure that the CLICK PLUS PLC operating environment is free of corrosive gases.

Check Operating Voltage

Check the input voltage that is powering the CLICK PLUS PLC to make sure that the voltage is within the appropriate range (20–28 VDC).



Check the input voltage for the I/O module terminal blocks. Refer to Chapter 2: *Specifications* for the voltage specifications of the various I/O modules.

Check Physical Condition

Check the PLC and modules for distorted, warped, or discolored cases and burnt odors that could indicate overheated components.

Check to ensure that none of the PLC and module cooling vents are clogged or blocked by dust or debris. Make sure that there is sufficient unobstructed heat dissipation space around the PLC as shown in *Chapter 3: Installation and Wiring*.

Ensure that all of the CLICK PLC modules are connected together tightly. Also make sure that all communication cables, wiring, and terminal blocks are connected properly.



WARNING: The CLICK PLUS PLC does not have hot swap capability. Do not disconnect or replace any I/O modules without first shutting off power to the PLC unit.

Check Project Functionality

During routine maintenance, check the functionality of your project (PLC program). Make sure the system or equipment that is being controlled is operating as intended.

Check the PLC Program from the CLICK Programming Software

You can read the following PLC information from the CLICK programming software:

- System configuration.
  Check whether or not the PLC unit is recognizing the actual I/O configuration correctly.
- Error history.
  Check whether or not any errors occurred recently.
- Scan time.
  Check whether or not the scan time is normal, and if the minimum and maximum scan times are reasonable. Refer to Chapter 2: Specifications for information regarding scan times.

Troubleshooting

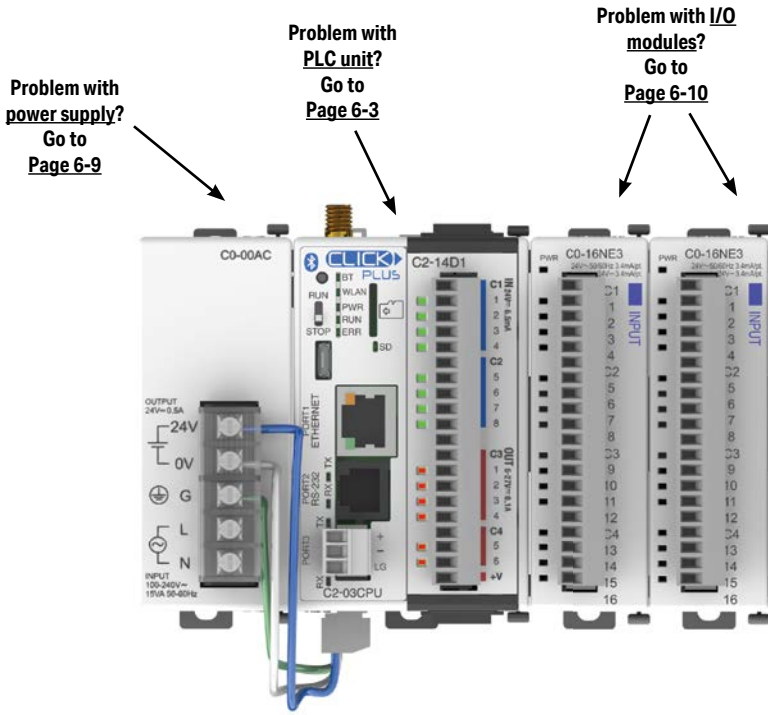


In This Chapter...

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Bluetooth Troubleshooting 6-5
Wireless LAN Troubleshooting 6-6
USB Troubleshooting 6-7
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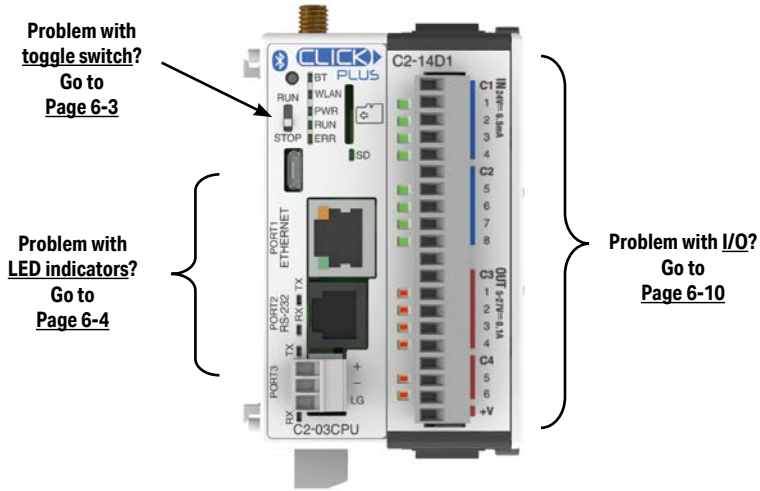
Troubleshooting Direction

Use this section to figure out where to start when troubleshooting CLICK PLUS PLC problems.



PLC unit Troubleshooting

PLC unit issues are grouped according to their function. Use the illustration below to find the appropriate document page numbers for issues with different PLC unit functions.



Toggle Switch

Switch is in RUN position

When the toggle switch is in the RUN position, the PLC unit should normally be in Run mode (indicated by the RUN LED being ON), unless the PLC has been placed in Stop mode by a peripheral device through one of the communication ports. To put the PLC unit in Run mode, move the toggle switch to the STOP position and then switch it back again to the RUN position. If the RUN LED then remains off, check the PWR and ERR LED indicators per the chart shown below.

LED	Status*	Necessary action
PWR	OFF	There is insufficient power for the PLC unit. Check the power cable and input voltage.
ERR	ON	There is an error in the PLC unit. Connect the CLICK programming software to read the error information. See the "Error Codes" section at the end of this chapter for error message instructions.
** If you see LED indications different from the ones shown in this table, refer to the "LED Indicators Troubleshooting" section for further explanations.*		

Switch is in STOP position

When the toggle switch is in STOP position, the PLC unit should be in Stop mode (indicated by the RUN LED being OFF). Cycle power to the PLC. If the PLC unit starts up in Run mode, with toggle switch in STOP position, it means the PLC unit does not recognize the toggle switch position correctly. Please replace the PLC unit.

LED Indicators

The CLICK PLUS PLC performs many pre-defined diagnostic routines with every PLC scan, using onboard diagnostics that can detect various errors or failures in the PLC. LEDs on the face of the PLC will indicate for specific errors.

The 3 LEDs located next to the RUN/STOP switch power, (PWR, RUN and ERR) indicate the status of the PLC unit. The remainder of the LED indicators are discussed in later sections of Chapter 2.

LED	Status	Meaning	Necessary action
PWR	On	The PLC is powered correctly.	No action is necessary.
	Blinking	USB Low Power Mode, or the PLC input power is not sufficient.	If the PLC is connected to the PC via USB and has no other power source, no action is needed. If the PLC is connected to a power supply, check the voltage on the terminal located on the bottom of the PLC. The input voltage should be 20-28 VDC. Also check the power input wiring & terminal connections. The power supply may need to be replaced.
	Off	There is no power to the PLC.	Check the voltage on the terminal located on the bottom of the PLC. The input voltage should be 20-28 VDC. Also check the power input wiring & terminal connections. The power supply may need to be replaced.
RUN	On	The PLC is in RUN mode.	If the toggle switch next to the LED indicators is in RUN position, no action is necessary. If the toggle switch is in STOP position, cycle power the PLC. If the PLC unit starts up in Run mode, it means that the PLC unit does not recognize the toggle switch position correctly, and the PLC unit must be replaced.
	Blinking	The PLC is initializing the C0-04RTD or C0-04THM.	When a C0-04RTD or C0-04THM is installed in the CLICK PLC system, the RUN LED blinks for up to 11 seconds to indicate that the PLC unit is initializing the analog input module after power-up. If the RUN LED keeps blinking after the initial 11 seconds, power cycle the CLICK PLC system. If the symptom remains, replace the PLC unit and/or the analog input module.
	Off	The PLC is in STOP mode.	If the toggle switch next to the LED indicators is in STOP position, no action is necessary. If the switch is in RUN position and you want to put the PLC unit in Run mode, toggle the switch to STOP position and then back to RUN position. If the RUN LED stays off, connect the CLICK programming software to read the error information. See the "Error Codes" section at the end of this chapter for error message instructions.
ERR	On	There is an error.	Connect the CLICK programming software to check the error. See the "Error Codes" section at the end of this chapter for error message instructions.
	Blinking	There is a warning.	Warnings do not prevent the PLC unit from running. However, you should check what warnings are active. Connect the CLICK programming software to read the warning information. See the "Error Codes" section at the end of this chapter for error message instructions.
	Off	There is no error.	No action is necessary.

Errors (ERR LED on)

Errors which may cause the system to function improperly, perhaps causing a safety problem. The PLC will automatically switch from RUN Mode to STOP Mode. (In STOP Mode all outputs are turned off.) If the PLC is already in STOP Mode when an error is detected, the PLC will not allow a transition to RUN Mode until the error has been corrected.

Examples of errors:

- I/O module error
- System configuration error
- Memory check error
- Project file error

Warnings (ERR LED blinking)

Warnings that require attention, but do not cause improper operation. They do not cause or prevent any PLC mode transitions. The application program can use system control bits to detect warnings, and even take the system to an orderly shutdown or switch the PLC to STOP Mode if desired. Examples of warnings:

- Lost SRAM data
- Battery low voltage
- Battery Replacement Notification date has passed, if enabled in Battery Backup Setup

Bluetooth Troubleshooting

Check System Control relays and Data Registers in DataView and make sure Pairing is not disabled, or that the PLC is already paired. (SC60-SC63).

When pairing is started the Bluetooth LED blinks rapidly 8 times and then stays off

Cause

Bluetooth is disabled in the project. Or, Bluetooth is enabled in the project, but SC60 BT_Disable_Pairing may be turned On.

Corrective Action

Bluetooth is enabled when the PLC is in a Factory Default state. But Bluetooth is disabled in the default PLC project. If Bluetooth was not enabled when the project was created, downloaded and the PLC put in Run mode, the Bluetooth will be disabled.

To enable Bluetooth, go to the Bluetooth Port Setup and select Enable Bluetooth and enter a password. Download the project. If the project was downloaded in Stop Mode, the new setting will not take effect until the PLC is put in Run mode.

Cannot Pair the mobile App with the PLC

Cause

In general, Bluetooth devices need to be within at least 20 feet line of site with each other to connect reliably.

Corrective Action

Bring the devices closer together.

If the antenna is inside an enclosure, you will need to open the door on the enclosure or install an external antenna such as the SE-ANT250.

Cause

Mobile Device app is not functioning properly.

Corrective Actions

Reset iOS or Android device - Turn the devices off or perform a hard reset.

Check that the app is the newest version available.

Reset Factory Defaults on PLC

Wireless LAN Troubleshooting

Check System Control relays and Data Registers in DataView and make sure Wi-Fi is not disabled or in an error state. (SC80-SC84, SD212-SD218)

Wi-Fi SSID is not listed in app

Cause

SSID broadcast is not enabled in Wi-Fi router.

Corrective action

Make sure that SSID Broadcast is Enabled in the router.

Cycle Power on Router

Check and see if SSID shows up on Mobile Device available Wi-Fi networks. If the network is listed, then perform a hard reset on the mobile device.

PLC does not connect to Wi-Fi

Cause

Electrically noisy environment

Corrective Action

802.11 Wi-Fi is susceptible to other radio signals or electrical noise produced by other electrical equipment such as other radios, variable frequency drives, high power equipment.

Use DataView to see the current value of SD218 WLAN_No_Connect_Status and check the helpfile for more information.

Take PLC and mobile device to an electrically quiet area and test. If devices connect, electrical noise source in the installation environment will need to be identified and the noise eliminated.

Cause

Distance to Wi-Fi Router/ Low Signal Strength

Corrective Actions

Wi-Fi distances are typically 150 to 300 meters depending on how open the area is. Electrical noise will reduce this distance. Bring the devices closer together.

If the antenna is inside an enclosure, you will need to open the door on the enclosure or install an external antenna such as the SE-ANT250.

Cause

Beyond the connection limit of the router.

Corrective actions

Reconfigure the router for more connections or disconnect some devices.

Cause

Router does not accept connections.

Corrective Action

Reconfigure Router to accept connections.

Disable MAC Filtering or add the new MAC into the whitelist.

USB Troubleshooting

Cannot connect PC to PLC over USB

Cause

Driver not installed on PC.

Corrective Action

Go to the Device Manager on the PC and make sure there is a listing for CLICK PLUS (COMx) under Ports (COM & LPT).

If it is just listed as USB Serial Device (COMx) then the CLICK driver is not installed properly.

- Disconnect the USB cable from the PC.
- Find and execute CLICK_USBDriver.exe on in the original download or on the original installation USB.
- Reconnect the USB cable.

If there is not a connection listed in the device manager, the cable could be defective or the USB port on the PC or PLC could be defective.

- Try a different cable
- Try a different port on the PC
- Replace the PLC

SD Card Troubleshooting

Check System Control relays and Data Registers in DataView and make sure the SD Card is Ready to Use and does not have an error or reached a file limit. (SC65-SC70, SD69)

SD Card Ready LED does not light up/Cannot log to SD Card

Cause
SD Card is Write Protected.

Corrective Action
Change Write Protection

Cause
SD Card Formatting and File allocation size are incorrect or SD Card size is too large.

Corrective Action
Make sure the SD Card meets the specifications in Chapter2 - Micro SD Card Slot Specifications

Cause
Defective SD Card

Corrective Action
Replace SD Card

Power Supply Troubleshooting

When the PWR LED is ON, the CLICK PLUS PLC is receiving enough power for operation. Verify the power input voltage at the bottom connector on the PLC unit; the input voltage should be 20–28 VDC.

The input voltage measures less than 20VDC

Remove the bottom connector from the CLICK PLUS PLC unit and measure the voltage again. If the voltage at the connector then measures more than 20VDC, the power supply cannot provide enough current for the CLICK PLUS PLC. Replace the power supply with a higher output current power supply. Check the power budget to determine the current required from the power supply (see below).

If the voltage still measures less than 20VDC with the connector removed from the PLC, and the power supply voltage is not adjustable, then the power supply cannot be used for the CLICK PLUS PLC. Replace the power supply with another one.

The input voltage measures greater than 28VDC

If the output current of the power supply is adjustable, decrease the output voltage. If the output voltage cannot be lowered to less than 28VDC, replace the power supply with another one.

How to check the power budget

You can use the programming software to check the power budget of the CLICK PLUS PLC:

- Connect the PLC to a computer running the CLICK programming software.
- From the software menus, connect the software to the PLC by selecting PLC and Connect...
- From the software menus, select Setup and System Configuration...
- The System Configuration Setup window opens, and displays the Power Budget in milliamps (mA) required by the PLC system. The PLC power supply must be capable of providing more current than the Power Budget amount.

I/O Module Troubleshooting

First, check the status of the PWR LED indicators on the I/O modules. If the PWR LED on the PLC unit is on, but there are I/O modules which have PWR LEDs that are off, check the connections between the modules. If the I/O module PWR LEDs remain off, replace those modules.

Troubleshooting input modules is slightly different from troubleshooting output modules. Please refer to the proper subsection:

- Input module troubleshooting
- Output module troubleshooting

Input Module Troubleshooting

The input modules (including the PLC built-in inputs) can have the following symptoms:

Symptom	Necessary Action
Input signal is on, but the LED indicator on the module is off.	Check the external power input voltage on the terminal block.
	Check whether the terminal block is attached correctly.
	If the input voltage is correct but the LED indicator is still off, replace the input module.
The LED indicator is on, but the PLC does not work as expected.	Check whether the PLC unit RUN LED is ON. If not, put the PLC in RUN mode.
	Check the I/O configuration with the programming software. (See "How to Check the I/O Configuration" on the next page.)
	Connect the programming software and check the X bit related to the input point that is on. (See "How to Check the I/O Status" later in this section for instructions.) If the X bit is off, replace the input module.

Output Module Troubleshooting

The output modules (including the PLC built-in outputs) can have the following symptoms:

Symptom	Necessary Action
The module LED indicator is ON, but there is no output.	Check the external power input voltage on the terminal block.
	Check whether the terminal block is attached correctly.
	If it is a DC sinking, relay, or AC output, check the voltage between the output and the common. If the output is working correctly, the voltage should be close to zero.
	If it is a sourcing output, check the voltage between the output and the 24 VDC input. If the output is working correctly, the voltage should be close to zero.
	If the LED indicator is ON, but the output voltage is not correct, replace the output module.
The module LED indicator is OFF, even though the output status bit (Y---) is supposed to be ON.	Check whether the PLC unit RUN LED is ON. If not, put the PLC in RUN mode.
	Check the I/O configuration with the programming software. (See "How to Check the I/O Configuration" below.)
	Connect the programming software and check whether the Y bit related to the output point is ON.
	If the Y bit is not actually ON, use the override feature to manually turn the Y bit ON. (See "How to Check the I/O Status" on the next page.)
	If the Y bit is ON, but the output is OFF, replace the output module.
The module LED indicator is OFF, but the output is sending an ON signal to the field device.	Leakage current can be a problem when connecting field devices to I/O modules. False input signals can be generated when the leakage current of the output point is great enough to turn on the connected input device. To correct this issue, install a resistor in parallel with the input or output of the circuit. The value of this resistor will depend on the amount of leakage current and the voltage applied, but usually a 10k to 20k ohm resistor will work. Ensure that the wattage rating of the resistor is correct for your application.

How to Check the I/O Configuration

You can use the CLICK programming software to check the I/O configuration that the PLC is recognizing:

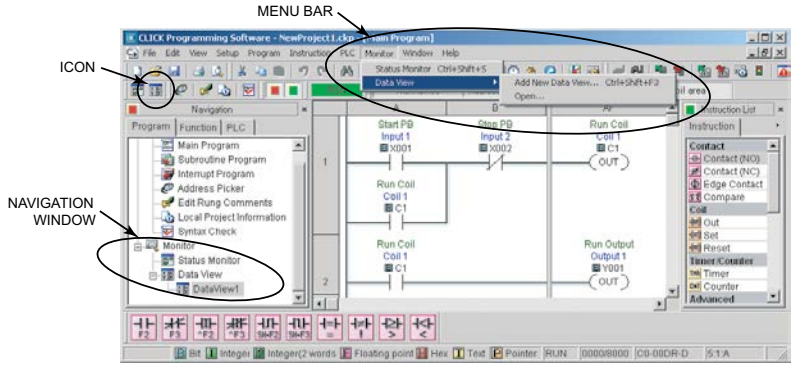
- Connect the PLC to a computer running the CLICK programming software.
- From the software menus, connect the software to the PLC by selecting PLC and Connect...
- From the software menus, select Setup and System Configuration...
- The System Configuration Setup window opens, and displays all of the CLICK module types the PLC recognizes that are connected in the PLC system.

How to Check the I/O Status

You can use CLICK programming software Data View window to check the I/O status in the PLC unit.

WARNING: Only authorized personnel fully familiar with all aspects of the application should make changes to the program. Make sure that you thoroughly consider the impact of any changes to minimize the risk of personal injury or damage to equipment. Specifically, forcing inputs and outputs to their ON state will cause externally connected equipment to operate.

Open or create a data view window by selecting Monitor and Data View from either the menu bar, the Navigation window, or the Data View icon.

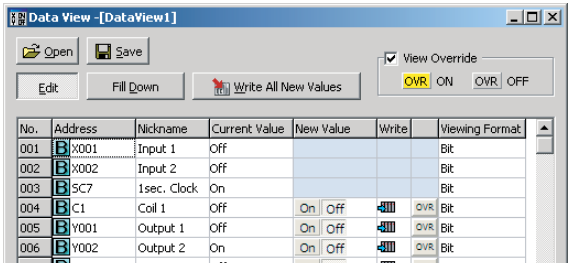


To add new memory addresses to a Data View window:

- Click on an empty Address field to bring up a small browser button.
- Click the browser button to open the Address Picker window.



- From the Address Picker window, click the Pickup Mode button, select the desired I/O or memory location, and then click OK to add that address into the data view.



To troubleshoot I/O from the Data View window:

- Connect to PLC unit
- Force outputs on/off, then check actual outputs to see whether they are actually on or off.
- Edit, Write All New Values, or double click individual output Write icon.
- Externally turn inputs on or off, then check their status in data view. Inputs cannot be forced from Data View.

Replacement of I/O modules



WARNING: The CLICK PLUS PLC does not have hot swap capability. Do not disconnect or replace any I/O modules without first shutting off power to the PLC unit.

Before replacing an I/O module, please consider the cause of the module problem. If you suspect that another device may have caused the failure in the module, that device may also cause the same failure in the replacement module. As a precaution, you may want to check power supplies or other devices connected to the failed module before replacing it.

Resetting to Factory Defaults

The CLICK PLUS CPU can be reset to factory default by any of the following methods, depending on device capabilities.

1) Use the Bluetooth Pairing Button on Bluetooth Capable PLC's

On the C2-02CPU and C2-03CPU, use the BT button on the PLC. To Reset the PLC to its factory default state press and hold in the BT Pairing Button on the front of the PLC for 5-6 seconds, until the BT LED begins flashing very fast.

2) Use CLICK Factory Default Tool

The CLICK Factory Default Tool is a separate software app installed with CLICK Programming Software v3.00 or later. It can be opened from the Start Menu of your PC.

In order to use the Factory Default tool, you must use a local USB connection.

This tool can be used with:

- C2-x - CLICK PLUS series
- C0-1x - Click Ethernet series

See the Help Files for more details on using the CLICK Factory Default tool.

3) Use CLICK Programming Software

See the Help File on details of using the CLICK Programming Software to Reset to Factory Defaults.

4) Use the Run/Stop Switch

- Power On the PLC with the RUN/STOP Switch in the STOP Position.
- Within 30 seconds, move RUN/STOP Switch from STOP to RUN three times then back to STOP.

STOP→RUN→STOP→RUN→STOP→RUN→STOP

Troubleshooting Electrical Noise Problems

Electrical Noise Problems

Noise is one of the most difficult problems to diagnose. Electrical noise can enter a system in many different ways and can fall into one of two categories, conducted noise or radiated noise. It may be difficult to determine how the noise is entering the system, but the corrective actions are similar for both types of noise problems.

- Conducted noise is electrical interference introduced into the system by way of an attached wire, panel connection, etc. The interference may enter through an I/O circuit, a power supply connection, the communication ground connection, or the chassis ground connection.
- Radiated noise is electrical interference introduced into the system without a direct electrical connection, much in the same manner as radio waves.

Reducing Electrical Noise

Although electrical noise cannot be completely eliminated, it can be reduced to a level that will not adversely affect the system.

- Most noise problems result from improper grounding of the system. A good earth ground can be the single most effective way to correct noise problems. If a ground is not available, install a ground rod as close to the system as possible. Ensure that all ground wires are single point grounds, and are not daisy chained from one device to another. Ground other metal enclosures near the system. A loose wire can act as a large antenna, introducing noise into the system; so, tighten all connections in your system. Loose ground wires are more susceptible to noise than the other wires in your system. Review *Chapter 3: Installation and Wiring*, if you have questions regarding how to ground your system.
- Electrical noise can enter the system through the power source for the PLC and I/O circuits. Installing an isolation transformer for all AC sources can correct this problem. DC sources should be well-grounded, good quality power supplies.
- Separate input wiring from output wiring. Never run low-voltage I/O wiring close to high voltage wiring.

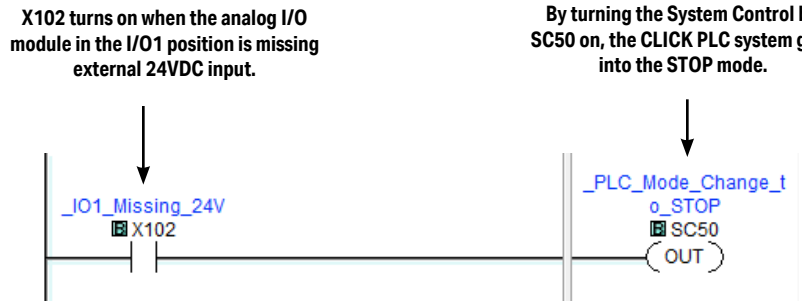
Error Codes

When there is an Error or Warning, the error code is stored in the System Data register SD1.

When an Error occurs during the operation, the CLICK PLUS PLC system goes to the STOP mode immediately and the ERR LED on the PLC unit turns on. On the other hand, when a Warning occurs during the operation, the CLICK PLUS PLC system stays in RUN mode and the ERR LED on the PLC unit starts blinking.

In the error code tables that follow, the Category column indicates whether the error code is an Error or a Warning. If any of the Warnings listed is critical for your control system, add an additional ladder program to put the CLICK PLUS PLC system in STOP mode when that specific Warning occurs. Here is an example.

Example



PLC Error Codes					
Error Code	**Status Flag***	**Error Name**	**Category**	**Causes**	**Solutions**
001	N/A	Power Fail	Error	Input Voltage is less than 20VDC.	Provide the correct nominal voltage of 24VDC. Recalculate the power budget and compare to your power supply available current.
101	SC20	I/O Module Error	Error	There are more than 8 I/O modules.	A CLICK PLUS PLC system can support up to 8 I/O modules. Remove any excessive I/O modules.
				At least one I/O module was added to the CLICK PLC during operation.	Power off the CLICK PLUS PLC and check the connection of the I/O modules. Then power on the PLC again. If the problem remains, connect the CLICK software to the PLC and check the System Configuration. If there is any I/O module that is not shown in the System Configuration, replace it.
				An I/O module has failed.	Connect the CLICK software to the CLICK PLUS PLC and check the system configuration. If there is any I/O module that is used in the PLC system but not shown in the System Configuration window, replace the I/O module.
102	SC21	System Config Error	Error	The current system configuration does not match the configuration saved in the project file.	Connect the CLICK software to the CLICK PLUS PLC and open the System Configuration window. Modify the current configuration of the PLC to match the configuration in the project file, or uncheck the 'Start-up I/O Config Check' option if you want to use the current configuration.
** The Status Flags are turned ON when the related errors occur.*					

Error code table continued on next page.

Error Codes (continued)

PLC Error Codes					
Error Code	**Status Flag***	**Error Name**	**Category**	**Causes**	**Solutions**
103	SC22	I/O Config Error	Error	At least one I/O module was removed from the CLICK PLC during operation.	Power off the CLICK PLUS PLC and check the connection of the I/O modules. Then power on the PLC again. If the problem remains, connect the CLICK software to the PLC and check the System Configuration. If there is any I/O module that is not shown in the System Configuration, replace it.
				The PLC unit can not access one or more I/O modules.	Connect the CLICK software to the CLICK PLUS PLC and open the System Configuration window. If there is any I/O module that is used in the PLC system but not shown in the System Configuration window, replace the I/O module.
104	SC23	Memory Check Error	Error	There is a memory check error.	Power cycle the CLICK PLUS PLC. If the same error occurs again, download the project again and/or try the 'Reset to Factory Default' command. If the same error still occurs, replace the PLC unit.
105	SC24	Project File Error	Error	There is no project file in the CLICK PLC.	Download a project file into the CLICK PLUS PLC.
				The project file stored in the CLICK PLC is corrupted.	Download the project file into the CLICK PLUS PLC again.
106	SC25	Firmware Version Error	Error	The project file was written on a newer version of CLICK software. The firmware in the CLICK PLC is too old to execute the project.	Connect the CLICK software to the CLICK PLUS PLC and update the firmware of the PLC unit.
107	SC26	Watchdog Timer Error	Error	The PLC scan time exceeded the watchdog timer setup.	Connect the CLICK software to the PLC and check the maximum PLC scan time and the watchdog timer setup.
108	SC26	Interrupt Watchdog Timer Error	Error	The PLC scan time exceeded the watchdog timer setup.	The watchdog timer was exceeded while executing an Interrupt Program. Reduce the occurrences of Interrupts, or reduce the executing time of the Interrupt Programs to prevent this error.
109	SC31	Sub-processor Firmware Version Error	Error	The sub-processor contains a firmware version which does not match the main processor.	Connect the CLICK software to the CLICK PLC and update the firmware of the CPU module.
201	SC27	Lost SRAM Data	Warning	The data in the SRAM was lost while the CLICK PLC was powered off.	The Basic PLC units do not have a battery back-up, but they have a capacitor that will hold memory for a few days. The data in the SRAM is lost if the CLICK PLUS PLC is powered off for long enough for the capacitor to discharge. In this case, the PLC initializes the data in the SRAM automatically. This also applies to Standard and Analog PLC units if a battery is not installed.
202	SC28	Battery Low Voltage	Warning	Battery voltage is too low to retain data in the SRAM.	Replace the battery (ADC part #: D0-MC-BAT). Also, set the new battery installation date and the anticipated replacement date in the CLICK programming software if the Battery Replacement Notification option is selected. (Pull-down menu: Setup > Battery Backup Setup)
203	SC29	Battery Replace-ment	Warning	The anticipated battery replacement date has passed.	Replace the battery (ADC part #: D0-MC-BAT). Also, set the new battery installation date and the anticipated replacement date in the CLICK programming software. (Pull-down menu: Setup > Battery Backup Setup)

**** The Status Flags are turned ON when the related errors occur.***

Error code table continued on next page.

Error Codes (continued)

PLC Error Codes					
Error Code	Status Flag*	Error Name	Category	Causes	Solutions
204	SC30	Run Edit Project Error	Warning	The RUN Time Edit program download failed.	The program download was not completed. The PLC will continue in RUN with the previous program.
205	SC32	C2-DCM FW Version Error	Warning	The C2-DCM contains a firmware version that is incompatible the main processor.	Connect the CLICK software to the CLICK PLC and update the firmware of the CPU module.
301	X101	IO1 Module Error	Error	The analog I/O module in I/O1 position is not functioning.	Power cycle the CLICK PLUS PLC. If the same error occurs again, replace the analog I/O module.
302	X201	IO2 Module Error	Error	The analog I/O module in I/O2 position is not functioning.	Power cycle the CLICK PLUS PLC. If the same error occurs again, replace the analog I/O module.
303	X301	IO3 Module Error	Error	The analog I/O module in I/O3 position is not functioning.	Power cycle the CLICK PLUS PLC. If the same error occurs again, replace the analog I/O module.
304	X401	IO4 Module Error	Error	The analog I/O module in I/O4 position is not functioning.	Power cycle the CLICK PLUS PLC. If the same error occurs again, replace the analog I/O module.
305	X501	IO5 Module Error	Error	The analog I/O module in I/O5 position is not functioning.	Power cycle the CLICK PLUS PLC. If the same error occurs again, replace the analog I/O module.
306	X601	IO6 Module Error	Error	The analog I/O module in I/O6 position is not functioning.	Power cycle the CLICK PLUS PLC. If the same error occurs again, replace the analog I/O module.
307	X701	IO7 Module Error	Error	The analog I/O module in I/O7 position is not functioning.	Power cycle the CLICK PLUS PLC. If the same error occurs again, replace the analog I/O module.
308	X801	IO8 Module Error	Error	The analog I/O module in I/O8 position is not functioning.	Power cycle the CLICK PLUS PLC. If the same error occurs again, replace the analog I/O module.
310	X102	IO1 Missing 24V	Warning	The analog I/O module in I/O1 position is missing external 24VDC input.	Apply 24VDC to the analog I/O module.
311	X103	IO1 CH1 Burnout	Warning	CH1 on the analog I/O module in I/O1 position senses burnout or open circuit.	Check the wiring for CH1. Replace the sensor if it is broken.
312	X106	IO1 CH2 Burnout	Warning	CH2 on the analog I/O module in I/O1 position senses burnout or open circuit.	Check the wiring for CH2. Replace the sensor if it is broken.
313	X109	IO1 CH3 Burnout	Warning	CH3 on the analog I/O module in I/O1 position senses burnout or open circuit.	Check the wiring for CH3. Replace the sensor if it is broken.
314	X112	IO1 CH4 Burnout	Warning	CH4 on the analog I/O module in I/O1 position senses burnout or open circuit.	Check the wiring for CH4. Replace the sensor if it is broken.
320	X202	IO2 Missing 24V	Warning	The analog I/O module in I/O2 position is missing external 24VDC input.	Apply 24VDC to the analog I/O module.

** The Status Flags are turned ON when the related errors occur.*

Error code table continued on next page.

Error Codes (continued)

PLC Error Codes					
Error Code	Status Flag*	Error Name	Category	Causes	Solutions
321	X203	IO2 CH1 Burnout	Warning	CH1 on the analog I/O module in I/O2 position senses burnout or open circuit.	Check the wiring for CH1. Replace the sensor if it is broken.
322	X206	IO2 CH2 Burnout	Warning	CH2 on the analog I/O module in I/O2 position senses burnout or open circuit.	Check the wiring for CH2. Replace the sensor if it is broken.
323	X209	IO2 CH3 Burnout	Warning	CH3 on the analog I/O module in I/O2 position senses burnout or open circuit.	Check the wiring for CH3. Replace the sensor if it is broken.
324	X212	IO2 CH4 Burnout	Warning	CH4 on the analog I/O module in I/O2 position senses burnout or open circuit.	Check the wiring for CH4. Replace the sensor if it is broken.
330	X302	IO3 Missing 24V	Warning	The analog I/O module in I/O3 position is missing external 24VDC input.	Apply 24VDC to the analog I/O module.
331	X303	IO3 CH1 Burnout	Warning	CH1 on the analog I/O module in I/O3 position senses burnout or open circuit.	Check the wiring for CH1. Replace the sensor if it is broken.
332	X306	IO3 CH2 Burnout	Warning	CH2 on the analog I/O module in I/O3 position senses burnout or open circuit.	Check the wiring for CH2. Replace the sensor if it is broken.
333	X309	IO3 CH3 Burnout	Warning	CH3 on the analog I/O module in I/O3 position senses burnout or open circuit.	Check the wiring for CH3. Replace the sensor if it is broken.
334	X312	IO3 CH4 Burnout	Warning	CH4 on the analog I/O module in I/O3 position senses burnout or open circuit.	Check the wiring for CH4. Replace the sensor if it is broken.
340	X402	IO4 Missing 24V	Warning	The analog I/O module in I/O4 position is missing external 24VDC input.	Apply 24VDC to the analog I/O module.
341	X403	IO4 CH1 Burnout	Warning	CH1 on the analog I/O module in I/O4 position senses burnout or open circuit.	Check the wiring for CH1. Replace the sensor if it is broken.
342	X406	IO4 CH2 Burnout	Warning	CH2 on the analog I/O module in I/O4 position senses burnout or open circuit.	Check the wiring for CH2. Replace the sensor if it is broken.
343	X409	IO4 CH3 Burnout	Warning	CH3 on the analog I/O module in I/O4 position senses burnout or open circuit.	Check the wiring for CH3. Replace the sensor if it is broken.
344	X412	IO4 CH4 Burnout	Warning	CH4 on the analog I/O module in I/O4 position senses burnout or open circuit.	Check the wiring for CH4. Replace the sensor if it is broken.
350	X502	IO5 Missing 24V	Warning	The analog I/O module in I/O5 position is missing external 24VDC input.	Apply 24VDC to the analog I/O module.
** The Status Flags are turned ON when the related errors occur.*					

Error code table continued on next page.

Error Codes (continued)

PLC Error Codes					
Error Code	Status Flag*	Error Name	Category	Causes	Solutions
351	X503	IO5 CH1 Burnout	Warning	CH1 on the analog I/O module in I/O5 position senses burnout or open circuit.	Check the wiring for CH1. Replace the sensor if it is broken.
352	X506	IO5 CH2 Burnout	Warning	CH2 on the analog I/O module in I/O5 position senses burnout or open circuit.	Check the wiring for CH2. Replace the sensor if it is broken.
353	X509	IO5 CH3 Burnout	Warning	CH3 on the analog I/O module in I/O5 position senses burnout or open circuit.	Check the wiring for CH3. Replace the sensor if it is broken.
354	X512	IO5 CH4 Burnout	Warning	CH4 on the analog I/O module in I/O5 position senses burnout or open circuit.	Check the wiring for CH4. Replace the sensor if it is broken.
360	X602	IO6 Missing 24V	Warning	The analog I/O module in I/O6 position is missing external 24VDC input.	Apply 24VDC to the analog I/O module.
361	X603	IO6 CH1 Burnout	Warning	CH1 on the analog I/O module in I/O6 position senses burnout or open circuit.	Check the wiring for CH1. Replace the sensor if it is broken.
362	X606	IO6 CH2 Burnout	Warning	CH2 on the analog I/O module in I/O6 position senses burnout or open circuit.	Check the wiring for CH2. Replace the sensor if it is broken.
363	X609	IO6 CH3 Burnout	Warning	CH3 on the analog I/O module in I/O6 position senses burnout or open circuit.	Check the wiring for CH3. Replace the sensor if it is broken.
364	X612	IO6 CH4 Burnout	Warning	CH4 on the analog I/O module in I/O6 position senses burnout or open circuit.	Check the wiring for CH4. Replace the sensor if it is broken.
370	X702	IO7 Missing 24V	Warning	The analog I/O module in I/O7 position is missing external 24VDC input.	Apply 24VDC to the analog I/O module.
371	X703	IO7 CH1 Burnout	Warning	CH1 on the analog I/O module in I/O7 position senses burnout or open circuit.	Check the wiring for CH1. Replace the sensor if it is broken.
372	X706	IO7 CH2 Burnout	Warning	CH2 on the analog I/O module in I/O7 position senses burnout or open circuit.	Check the wiring for CH2. Replace the sensor if it is broken.
373	X709	IO7 CH3 Burnout	Warning	CH3 on the analog I/O module in I/O7 position senses burnout or open circuit.	Check the wiring for CH3. Replace the sensor if it is broken.
374	X712	IO7 CH4 Burnout	Warning	CH4 on the analog I/O module in I/O7 position senses burnout or open circuit.	Check the wiring for CH4. Replace the sensor if it is broken.
380	X802	IO8 Missing 24V	Warning	The analog I/O module in I/O8 position is missing external 24VDC input.	Apply 24VDC to the analog I/O module.

** The Status Flags are turned ON when the related errors occur.*

Error code table continued on next page.

Error Codes (continued)

PLC Error Codes					
Error Code	Status Flag*	Error Name	Category	Causes	Solutions
381	X803	IO8 CH1 Burnout	Warning	CH1 on the analog I/O module in I/O8 position senses burnout or open circuit.	Check the wiring for CH1. Replace the sensor if it is broken.
382	X806	IO8 CH2 Burnout	Warning	CH2 on the analog I/O module in I/O8 position senses burnout or open circuit.	Check the wiring for CH2. Replace the sensor if it is broken.
383	X809	IO8 CH3 Burnout	Warning	CH3 on the analog I/O module in I/O8 position senses burnout or open circuit.	Check the wiring for CH3. Replace the sensor if it is broken.
384	X812	IO8 CH4 Burnout	Warning	CH4 on the analog I/O module in I/O8 position senses burnout or open circuit.	Check the wiring for CH4. Replace the sensor if it is broken.
** The Status Flags are turned ON when the related errors occur.*					

Security Considerations for Control Systems Networks



In This Appendix...

Security Considerations for Control Systems Networks.....A-2

Security Considerations for Control Systems Networks

Manufacturers are realizing that to stay competitive, their Automation and Control Systems need to be more integrated within their plant. The systems often need to be integrated with upstream Enterprise Data Systems, and even further integrated to allow information to be accessible across multiple plants, or even through the Internet. This convergence of the IT world with the Automation World creates challenges in maintaining secure systems and protecting your investments in processes, personnel, data and intellectual property.

While Automation Networks and Systems have built-in password protection schemes, this is only one very small step in securing your systems. Automation Control System Networks need to incorporate data protection and security measures that are at least as robust as a typical business computer system. We recommend that users of PLCs, HMI products and SCADA systems perform your own network security analysis to determine the proper level of security required for you application. However, the Department of Homeland Security's National Cybersecurity and Communications Integration Center (NCCIC) and Industrial Control Systems Cyber Emergency Response Team (ICS-CERT) has provided direction related to network security and safety under an approach described as "Defense in Depth", which is published at https://www.us-cert.gov/sites/default/files/recommended_practices/NCCIC_ICS-CERT_Defense_in_Depth_2016_S508C.pdf.

This comprehensive security strategy involves physical protection methods, as well as process and policy methods. This approach creates multiple layers and levels of security for industrial automation systems. Such safeguards include the location of control system networks behind firewalls, their isolation from business networks, the use of intrusion detection systems, and the use of secure methods for remote access such as Virtual Private Networks (VPNs). Further, users should minimize network exposure for all control system devices and such control systems, and these systems should not directly face the internet. Following these procedures should significantly reduce your risks both from external sources as well as internal sources, and provide a more secure system.

It is the user's responsibility to protect such systems, just as you would protect your computer and business systems. AutomationDirect recommends using one or more of these resources in putting together a secure system:

- ICS-CERT's Control Systems recommended practices at the following web address: https://ics-cert.us-cert.gov/Recommended-Practices
- Special Publication 800-82 of the National Institute of Standards and Technology – Guide to Industrial Control Systems (ICS) Security: https://csrc.nist.gov/publications/detail/sp/800-82/rev-2/final
- ISA99, Industrial Automation and Control Systems Security: https://www.isa.org/standards-and-publications/isa-standards/isa-standards-committees/isa99 (please note this is a summary and these standards have to be purchased from ISA)

The above set of resources provides a comprehensive approach to securing a control system network and reducing risk and exposure from security breaches. Given the nature of any system that accesses the internet, it is incumbent upon each user to assess the needs and requirements of their application, and take steps to mitigate the particular security risks inherent in their control system.

UL 489 or UL 1077?
What are your Circuit Protection Requirements?

An understanding of circuit types and circuit protection products is critical to ensure their proper application.
See NEC Sections 100, 430 and 409 for definitions.

The proper sizing of an overcurrent protection device is the responsibility of the customer and should be determined using the application standards of the NEC (National Electric Code), CEC (Canadian Electrical Code) or other applicable standards. Per fine print note of 2008 NEC Section 100 "A current in excess of rating may be accommodated by certain equipment and conductors for a given set of conditions. Therefore, the rules for overcurrent protection are specific for particular situations."

UL 489
Branch Protection









UL 1077
Supplementary Protection





What You Need to Know and Look For In Specifications
Certifications – Standards – Acceptance

UL 489 Branch Protection	UL 1077 Supplementary Protection
• UL 489 Listed or Recognized • CSA C22.2 No. 5 • International ratings available depending on breaker type	• UL Recognized under UL 1077 • CSA 22.2 No. 285 • IEC 60947-2 or IEC 898
Function	
• Opens automatically on Overload and Short Circuit when properly applied within its ratings • Protects wire and cable against Overload and Short Circuit	• Opens automatically on Overload and Short Circuit • Provides additional equipment protection where branch circuit protection is already provided or not required • Not suitable for the protection of branch circuit conductors
Applications	
• Branch circuit protection in control panels, panelboards, switchboards and motor control centers • Motor overload and motor short circuit protection (UL 489 Recognized motor circuit protectors) for control panels and motor control centers	• Used within appliances or other electrical equipment such as control circuits, control power transformers, relays, PLC I/O points and lighting circuits • Ideal replacement for fuses that are applied as supplementary protection
Features	
• Bolted down or DIN rail mounted • External handle mechanisms available • Field mounted accessories • Stand alone branch circuit protection • Various levels of protection (curve type) • High voltage and interruption levels (up to 100 kAIC @ 480V)	• DIN rail mounted • Field mounted accessories • Various levels of protection (curve type) • 10 kAIC @ 240 VAC • 10 kAIC @ 277 VAC and 5 kAIC @ 480VAC • 10 kAIC @ 48VDC

kAIC = thousands of Amps interrupt capacity

Summary
A Supplementary Protector can't be used for Branch Circuit Protection.
Understanding the difference between Branch Circuit Protection and Supplementary Protection helps to ensure their proper use.

Gladiator from AutomationDirect Miniature Circuit Breakers (UL 489)



Single-Pole



Two-Pole



Three-Pole

Overview

Gladiator miniature circuit breakers offer optimum and efficient protection for branch and control circuits up to 63 amps. The Gladiator series is available with B, C or D trip characteristics in accordance with UL 489. The Gladiator series units are DIN rail mountable and can be used in feeder and branch circuit applications.

Listings

- UL Listed under UL 489 Category DIVQ E503708
- Category DIHS E509077
- CE LVD 2014/35/EU
- IEC/EN 60947-2

Features and Benefits

- Dual rated for AC or DC applications
- Complete range of UL 489 listed DIN rail mounted miniature circuit breakers up to 63 amp current rating
- Single-pole, two-pole and three-pole models
- Suitable for reverse feed applications
- Suitable for branch circuit device protection
- Thermal-magnetic overcurrent protection – three levels of short circuit protection, categorized by B, C and D curves
- B-curve magnetic trip point: 3 to 5 times the rated current, typically used for resistive loads such as conductors or heaters.
- C-curve magnetic trip point: 5 to 10 times the rated current, typically used for small transformers, pilot devices, etc.
- D-curve magnetic trip point: 10 to 20 times the rated current, typically used for transformers or very high inductive loads.
- Trip-free design – breaker cannot be defeated by holding the handle in the "ON" position
- Captive screws cannot be lost
- Can also be used in applications for which UL 1077 or CSA C22.2 No.235 are also allowed
- Field installable shunt trip and auxiliary switches, side mountable
- Module width of only 18mm [0.71 in] (per pole)
- Contact position indicator (red / green)
- 35mm DIN rail mountable, utilizing spring clip

Full Line of Field Installable Accessories

- Auxiliary switch
- Alarm/auxiliary switch
- Shunt trip
- Padlock provision

Applications

- Feeder and Branch Circuit Protection
- PLC I/O points
- Motor control circuits
- Control instrumentation
- Power supplies
- Relays
- Convenience receptacle circuits (internal / external)
- Load circuits leaving the equipment (external)
- Computers
- UPS
- HACR Equipment (Heating Air Conditioning, Refrigeration)
- Power conditioners

Gladiator from AutomationDirect Miniature Circuit Breakers

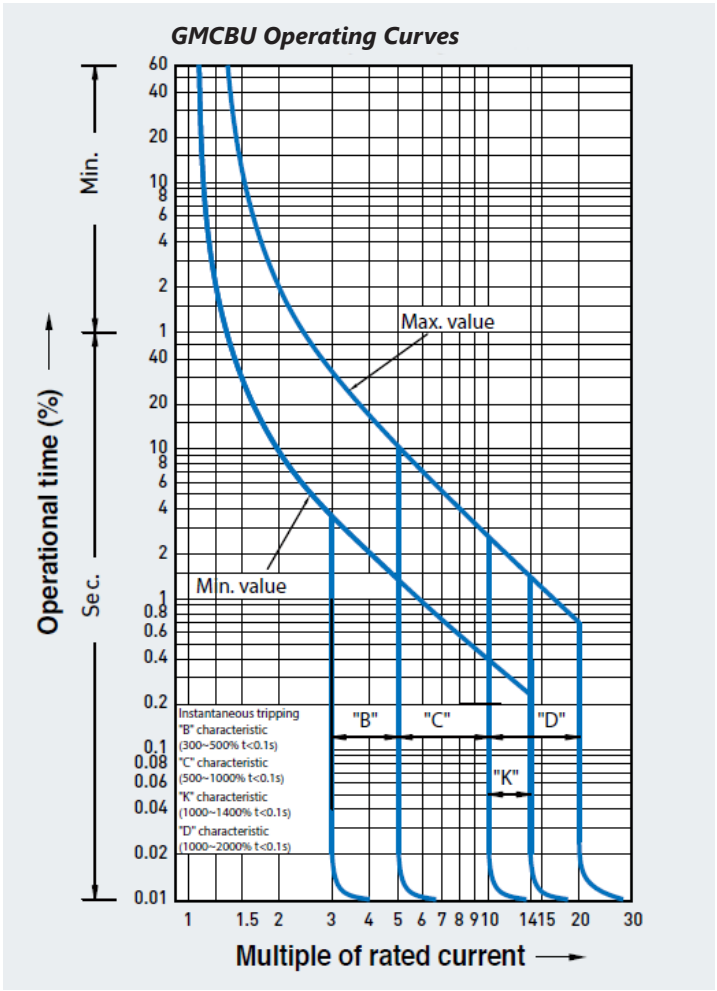
Tripping Characteristics

Gladiator miniature circuit breakers are available with "B" or "C" or "D" tripping characteristics.

Type B trip curve
(3 to 5 times In)
B-curve devices are suitable for resistive loads such as conductors or heaters.

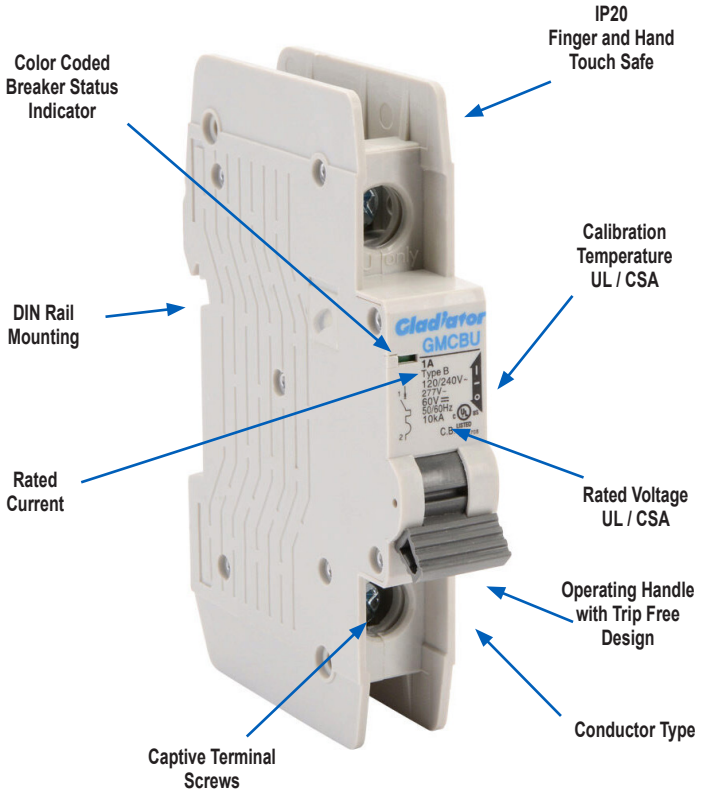
Type C trip curve
(5 to10 times In)
C-curve devices are suitable for applications where medium levels of inrush current are expected. Applications include small transformers, lighting, pilot devices, control circuits and coils. C-curve devices provide a medium magnetic trip point.

Type D trip curve
(10 to 20 times In)
D-curve devices are suitable for applications where high levels of inrush current are expected. The high magnetic trip point prevents nuisance tripping in high inductive applications such as motors, transformers and power supplies.



Labeling

The front of each Gladiator miniature circuit breaker is labeled for positive identification.



Gladiator® from AutomationDirect Miniature Circuit Breakers (UL 489)



Single-Pole

Gladiator UL 489 Single-Pole 277 VAC Selection Guide						
Ampere Rating	B-Curve Part Number	Price	C-Curve Part Number	Price	D-Curve Part Number	Price
1	GMCBU-1B-1	$16.00	GMCBU-1C-1	$16.00	GMCBU-1D-1	$16.00
2	GMCBU-1B-2	$16.00	GMCBU-1C-2	$16.00	GMCBU-1D-2	$16.00
3	GMCBU-1B-3	$16.00	GMCBU-1C-3	$16.00	GMCBU-1D-3	$16.00
4	GMCBU-1B-4	$16.00	GMCBU-1C-4	$16.00	GMCBU-1D-4	$16.00
5	GMCBU-1B-5	$16.00	GMCBU-1C-5	$16.00	GMCBU-1D-5	$16.00
6	GMCBU-1B-6	$16.00	GMCBU-1C-6	$16.00	GMCBU-1D-6	$16.00
8	GMCBU-1B-8	$16.00	GMCBU-1C-8	$16.00	GMCBU-1D-8	$16.00
10	GMCBU-1B-10	$16.00	GMCBU-1C-10	$16.00	GMCBU-1D-10	$16.00
15	GMCBU-1B-15	$16.00	GMCBU-1C-15	$16.00	GMCBU-1D-15	$16.00
16	GMCBU-1B-16	$16.00	GMCBU-1C-16	$16.00	GMCBU-1D-16	$16.00
20	GMCBU-1B-20	$16.00	GMCBU-1C-20	$16.00	GMCBU-1D-20	$16.00
25	GMCBU-1B-25	$16.00	GMCBU-1C-25	$16.00	GMCBU-1D-25	$16.00
Gladiator UL 489 Single-Pole 120/240 VAC Selection Guide						
30	GMCBU-1B-30	$16.00	GMCBU-1C-30	$16.00	GMCBU-1D-30	$16.00
32	GMCBU-1B-32	$16.00	GMCBU-1C-32	$16.00	GMCBU-1D-32	$16.00
40	GMCBU-1B-40	$16.00	GMCBU-1C-40	$16.00	GMCBU-1D-40	$16.00
50	GMCBU-1B-50	$18.00	GMCBU-1C-50	$18.00	GMCBU-1D-50	$18.00
63	GMCBU-1B-63	$18.00	GMCBU-1C-63	$18.00	GMCBU-1D-63	$18.00



Two-Pole

Gladiator UL 489 Two-Pole 480Y/277 VAC Selection Guide						
Ampere Rating	B-Curve Part Number	Price	C-Curve Part Number	Price	D-Curve Part Number	Price
1	GMCBU-2B-1	$31.00	GMCBU-2C-1	$31.00	GMCBU-2D-1	$31.00
2	GMCBU-2B-2	$31.00	GMCBU-2C-2	$31.00	GMCBU-2D-2	$31.00
3	GMCBU-2B-3	$31.00	GMCBU-2C-3	$31.00	GMCBU-2D-3	$31.00
4	GMCBU-2B-4	$31.00	GMCBU-2C-4	$31.00	GMCBU-2D-4	$31.00
5	GMCBU-2B-5	$31.00	GMCBU-2C-5	$31.00	GMCBU-2D-5	$31.00
6	GMCBU-2B-6	$31.00	GMCBU-2C-6	$31.00	GMCBU-2D-6	$31.00
8	GMCBU-2B-8	$31.00	GMCBU-2C-8	$31.00	GMCBU-2D-8	$31.00
10	GMCBU-2B-10	$31.00	GMCBU-2C-10	$31.00	GMCBU-2D-10	$31.00
15	GMCBU-2B-15	$31.00	GMCBU-2C-15	$31.00	GMCBU-2D-15	$31.00
16	GMCBU-2B-16	$31.00	GMCBU-2C-16	$31.00	GMCBU-2D-16	$31.00
20	GMCBU-2B-20	$31.00	GMCBU-2C-20	$31.00	GMCBU-2D-20	$31.00
25	GMCBU-2B-25	$31.00	GMCBU-2C-25	$31.00	GMCBU-2D-25	$31.00
Gladiator UL 489 Two-Pole 240VAC Selection Guide						
30	GMCBU-2B-30	$31.00	GMCBU-2C-30	$31.00	GMCBU-2D-30	$31.00
32	GMCBU-2B-32	$31.00	GMCBU-2C-32	$31.00	GMCBU-2D-32	$31.00
40	GMCBU-2B-40	$31.00	GMCBU-2C-40	$31.00	GMCBU-2D-40	$31.00
50	GMCBU-2B-50	$36.00	GMCBU-2C-50	$36.00	GMCBU-2D-50	$36.00
63	GMCBU-2B-63	$36.00	GMCBU-2C-63	$36.00	GMCBU-2D-63	$36.00

Gladiator® from AutomationDirect Miniature Circuit Breakers (UL 489)



Three-Pole

Gladiator UL 489 Three-Pole 480Y/277 VAC Selection Guide						
Ampere Rating	B-Curve Part Number	Price	C-Curve Part Number	Price	D-Curve Part Number	Price
1	GMCBU-3B-1	$46.50	GMCBU-3C-1	$46.50	GMCBU-3D-1	$46.50
2	GMCBU-3B-2	$46.50	GMCBU-3C-2	$46.50	GMCBU-3D-2	$46.50
3	GMCBU-3B-3	$46.50	GMCBU-3C-3	$46.50	GMCBU-3D-3	$46.50
4	GMCBU-3B-4	$46.50	GMCBU-3C-4	$46.50	GMCBU-3D-4	$46.50
5	GMCBU-3B-5	$46.50	GMCBU-3C-5	$46.50	GMCBU-3D-5	$46.50
6	GMCBU-3B-6	$46.50	GMCBU-3C-6	$46.50	GMCBU-3D-6	$46.50
8	GMCBU-3B-8	$46.50	GMCBU-3C-8	$46.50	GMCBU-3D-8	$46.50
10	GMCBU-3B-10	$46.50	GMCBU-3C-10	$46.50	GMCBU-3D-10	$46.50
15	GMCBU-3B-15	$46.50	GMCBU-3C-15	$46.50	GMCBU-3D-15	$46.50
16	GMCBU-3B-16	$46.50	GMCBU-3C-16	$46.50	GMCBU-3D-16	$46.50
20	GMCBU-3B-20	$46.50	GMCBU-3C-20	$46.50	GMCBU-3D-20	$46.50
25	GMCBU-3B-25	$46.50	GMCBU-3C-25	$46.50	GMCBU-3D-25	$46.50
Gladiator UL 489 Three-Pole 240VAC Selection Guide						
30	GMCBU-3B-30	$46.50	GMCBU-3C-30	$46.50	GMCBU-3D-30	$46.50
32	GMCBU-3B-32	$46.50	GMCBU-3C-32	$46.50	GMCBU-3D-32	$46.50
40	GMCBU-3B-40	$46.50	GMCBU-3C-40	$46.50	GMCBU-3D-40	$46.50
50	GMCBU-3B-50	$54.00	GMCBU-3C-50	$54.00	GMCBU-3D-50	$54.00
63	GMCBU-3B-63	$54.00	GMCBU-3C-63	$54.00	GMCBU-3D-63	$54.00

Gladiator® from AutomationDirect

Miniature Circuit Breakers (UL 489) Technical Specifications

Gladiator Miniature Circuit Breakers – UL 489				
		B-Curve	***C-Curve***	***D-Curve***
Short Circuit Trip Response		3-5 x In	5-10 x In	10-20 x In
Current Rating		1, 2, 3, 4, 5, 6, 8, 10 ,15, 16, 20 ,25, 30, 32, 40, 50, 63A		
Maximum Voltage Ratings UL / CSA	***1-63 A, AC***	1P: 120/240V 2P:240V 3P: 240V		
	1-25 A, AC	1P: 277V 2P:480Y/277V 3P: 480Y/277V		
	1-63 A, DC	1P: 60V 2P:125V 3P: 125V		
Thermal Tripping Characteristics (Temperature)	***Single-pole***	104°F [40°C]		
	Multi-pole			
Interrupting Ratings (@ maximum voltage)	***1-pole***	AC: 10kA @ 120/240VAC, 10kA @ 277VAC (1~25A),10kA @ 120/240VAC (30~63A) DC: 10kA @ 60VDC		
	2-pole	AC: 10kA @ 240VAC, 480Y/277 VAC(1~25A), 10kA@240VAC (30~63A) DC: 10kA @ 125VDC		
	3-pole			
Rated Frequency		50/60 Hz		
Agency Approvals		UL, CB		

Notes: Line voltage connection suitable for reverse feed
To obtain the most current agency approval information, see the Agency Approval Checklist section on the specific part number's web page.

Gladiator Miniature Circuit Breaker - IEC				
		B-Curve	C-Curve	D-Curve
Short Circuit Trip Response		3-5 x In	5-10 x In	10-20 x In
Current Rating		1, 2, 3, 4, 5, 6, 8, 10 ,15, 16, 20 ,25, 30, 32, 40, 50, 63A		
Maximum Voltage Ratings - IEC/EN 60947-2	***1-pole***	500VAC		
	2-pole / 3-pole			
	2 poles in series			
Thermal Tripping Characteristics (Temperature)	***Single-pole***	104°F [40°C]		
	Multi-pole			
Interrupt Ratings (At Max Voltage) Uimp		6kV		
Rated Frequency		50/60 Hz		

General Specifications		
Lifespan / Endurance		6,000 operations electrical
Operating Temperature		23°F to 104°F [-5°C to 40°C]
Housing Material		Engineering plastic
Mounting Position		On 35mm DIN rail (vertical)
Weight	***1-pole***	0.28 lb [130g]
	2-pole	0.58 lb [260g]
	3-pole	0.86 lb [390g]
Wire Size		
Conductor Size Copper Only, 149°F [65°C]		Lug type 14-4 AWG
Tightening Torque		
Tightening Torque		35 lb•in [3.9 N•m]

Gladiator® from AutomationDirect Series Technical Data (UL 489)

Temperature Derating (UL 489)

Temperature Derating for UL 489
Influence of Ambient Temperature T on Load Carrying Capacity (UL 489)

Device Current Rating in Amps at 104°F [40°C]	In (A) at Higher Ambient Temperature											
	-40°F [-40°C]	-22°F [-30°C]	-4°F [-20°C]	14°F [-10°C]	32°F [0°C]	50°F [10°C]	68°f [20°C]	86°F [30°C]	104°F [40°C]	122°F [50°C]	140°F [60°C]	158°F [70°C]
1	1.5	1.4	1.3	1.3	1.2	1.2	1.1	1.1	1.0	0.9	0.8	0.8
2	3.0	2.8	2.7	2.6	2.4	2.3	2.2	2.1	2.0	1.8	1.7	1.5
3	4.4	4.2	4.0	3.8	3.6	3.5	3.3	3.2	3.0	2.8	2.5	2.3
4	5.9	5.6	5.4	5.1	4.9	4.6	4.4	4.2	4.0	3.7	3.4	3.1
5	7.4	7.0	6.7	6.4	6.1	5.8	5.5	5.3	5.0	4.6	4.2	3.9
6	8.9	8.4	8.0	7.7	7.3	6.9	6.6	6.3	6.0	5.5	5.0	4.6
8	11.8	11.3	10.7	10.2	9.7	9.3	8.8	8.4	8.0	7.3	6.7	6.2
10	14.8	14.1	13.4	12.8	12.2	11.6	11.0	10.5	10.0	9.2	8.4	7.7
15	22.2	21.1	20.1	19.1	18.2	17.4	16.5	15.8	15.0	13.8	12.6	11.6
16	23.6	22.5	21.4	20.4	19.4	18.5	17.6	16.8	16.0	14.7	13.5	12.3
20	29.5	28.1	26.8	25.5	24.3	23.2	22.1	21.0	20.0	18.3	16.8	15.4
25	36.9	35.2	33.5	31.9	30.4	28.9	27.6	26.3	25.0	22.9	21.0	19.3
30	44.3	42.2	40.2	38.3	36.5	34.7	33.1	31.5	30.0	27.5	25.2	23.1
32	47.3	45.0	42.9	40.8	38.9	37.0	35.3	33.6	32.0	29.3	26.9	24.7
40	59.1	56.3	53.6	51.1	48.6	46.3	44.1	42.0	40.0	36.7	33.6	30.8
50	73.9	70.4	67.0	63.8	60.8	57.9	55.1	52.5	50.0	45.9	42.0	38.6
63	93.1	88.6	84.4	80.4	76.6	72.9	69.5	66.2	63.0	57.8	53.0	48.6

Power Loss at I_n (UL 489)

Power Loss at I_n
Characteristic B

I_n [A]	1p P[W]	2p P[W]	3p P[W]
1	1.2	1.5	3.2
2	1.4	3.2	3.5
3	1.2	2.9	3.9
4	1.3	3.1	4.3
5	1.6	3.2	3.5
6	1.3	2.6	3.9
8	1.5	3.1	4.3
10	1.6	3.7	5.3
15	1.9	4.4	5.2
16	1.9	4.3	6.1
20	2.5	5.3	8.6
25	3.2	6.1	9.3
30	3.6	6.5	9.6
32	3.5	7.0	10.5
40	4.2	8.2	12.4
50	5.5	10.2	15.5
63	6.3	12.6	19.1

Power Loss at I_n
Characteristic C

I_n [A]	1p P[W]	2p P[W]	3p P[W]
1	1.1	1.8	3.2
2	1.3	2.2	4.2
3	1.1	2.1	3.7
4	1.2	2.8	4.0
5	1.5	3.0	3.7
6	1.2	2.3	3.5
8	1.4	3.1	4.2
10	1.5	2.8	4.3
15	1.8	3.3	4.8
16	1.8	3.6	5.4
20	2.7	4.8	8.2
25	3.1	5.9	9.1
30	3.3	6.4	9.5
32	3.7	7.1	10.7
40	4.0	7.9	12.3
50	4.8	9.7	15.1
63	6.1	12.1	18.5

Power Loss at I_n
Characteristic D

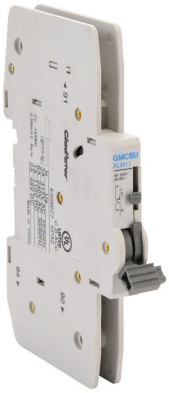
I_n [A]	1p P[W]	2p P[W]	3p P[W]
1	1.5	2.1	2.8
2	1.2	2.3	3.3
3	1.3	2.4	3.9
4	1.1	2.3	3.8
5	1.4	2.5	3.8
6	1.4	2.4	3.7
8	1.9	2.9	3.2
10	1.5	2.7	4.2
15	1.6	2.9	4.3
16	1.7	3.1	4.5
20	2.0	3.3	4.9
25	2.7	5.4	7.3
30	3.0	5.9	8.8
32	3.3	5.9	9.8
40	3.7	7.2	10.7
50	4.8	9.2	14.1
63	6.0	11.6	17.9

Gladiator® from AutomationDirect — Miniature Circuit Breakers Accessories (UL 489)

Gladiator Miniature Circuit Breakers Accessories										
Part Number	***Price***	***Description***	***For Use With***	***Rating***	***Control Voltage (U_e)***	***Operation Voltage***	***Trip Voltage***	***VA/Watt***	***Operating Time***	***Dimensions in [mm]***
GMCBU-AUX11	$14.00	Auxiliary contact	UL 489 models	6A @ 240VAC 3A @ 415VAC 1A @ 110VDC 2A @ 48VDC	–	–	–	–	–	0.35x4.13x2.60 [9x105x66]
GMCBU-ALM11	$16.00	Alarm contact	UL 489 models							
GMCBU-SH110-380VAC	$22.50	Shunt trip	UL 489 models	–	110-380 VAC 60-220 VDC	80-110% U_e	–	70	300ms	0.71x4.13x2.60 [18x105x66]
GMCBU-UV110-120VAC	$28.00	Undervoltage trip	UL 489 models	–	110-120 VAC 220-240 VAC	–	35-70% Ue	1	2s	0.71x4.13x2.60 [18x105x66]
GMCBU-UV220-240VAC	$28.00	Undervoltage trip	UL 489 models	–				3.5	2s	



GMCBU-AUX11



GMCBU-ALM11



GMCBU-SH110-380VAC



GMCBU-UV110-120VAC
GMCBU-UV220-240VAC

Gladiator Miniature Circuit Breakers Locking Device						
Part Number	***Price***	***Description***	***For use with***	***Lock opening diameter***	***Weight***	***To operate***
GMCBU-LOCK	$6.50	Locking device	UL 489 and UL 1077 models	0.28 in [7.0]	Not less than 4.23 oz [120g	Press button and insert into the handle

Note: Do not overpull by 10kg F.



GMCBU-LOCK



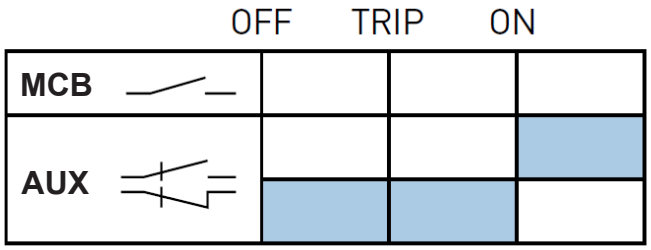
Press button and insert into handle



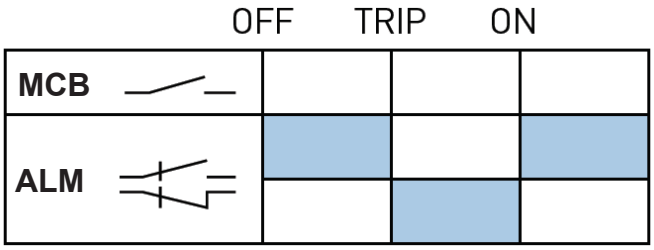
Gladiator® from AutomationDirect Miniature Circuit Breakers Accessories (UL 489)

Contact Diagrams

GMCBU-AUX11



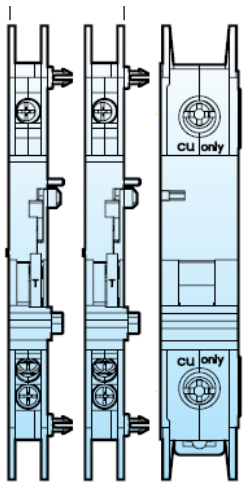
GMCBU-ALM11



Connecting Accessories

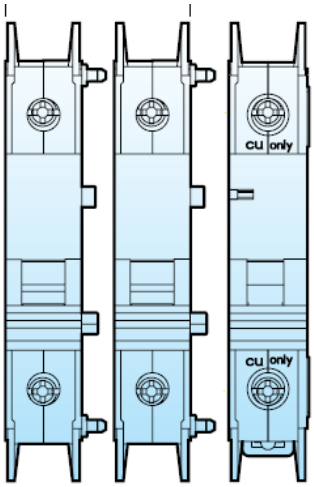
Auxiliary contacts

Up to 0.71 in [18mm]



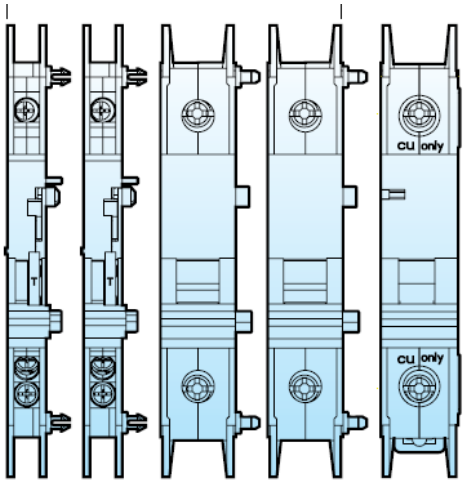
Tripping devices

Up to 1.42 in [36mm]



Both auxiliary contacts and tripping devices

Up to 2.13 in [54mm]



CWB Series Contactors

Overview

Developed according to IEC 60947 and UL 508 international standards, the new WEG CWB line of contactors meets the requirements of a wide range of industrial applications. The CWBs are designed with the visual pattern and identity of WEG, a brand recognized worldwide for its quality.

Features

- "Zero-width" mechanical interlock
- Simple and compact mounting of surge suppressor blocks
- Available with AC or DC coils
- Simple and organized control circuits
- Additional contact blocks
- Easy access power and control terminals



CWB9-11-30D15



CWB25-11-30D15



CWB80-11-30D15

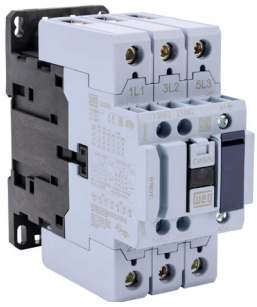
UL File No. E202315



CWB9-11-30C03



CWB25-11-30C03



CWB80-11-30C03

CWB Contactor Catalog Number Sequence

CWB	12	-	11	-	30	D15

Contactor Series
CWB-IEC

Current Rating (IEC)
9: 9A
12: 12A
18: 18A
25: 25A
32: 32A
38: 38A
40: 40A
50: 50A
65: 65A
80: 80A

Auxiliary Contacts
11: 1NO+1NC

Power Poles
30: 3 NO Power Poles

Voltage Code

AC Voltage	*DC Voltage*
D15: 120V	C03: 24V
V24: 208-240V	
D39: 480V	

Table intended as reference only and not to create part numbers.

CWB Series Contactors

WEG CWB Series Three-Pole Contactors – AC Coil – Selection Guide

Part Number	Price	Coil Voltage (VAC)	Ie Max (Ue ≤ 440V)	Maximum UL Horsepower						Built-In Auxiliary Contacts Per Contactor				Dimensional Drawing
				Single-Phase		Three-Phase								
			AC-3 (A)	115V	230V	200V	230V	480V	575V	N.O.		N.C.		
CWB9-11-30D15	$29.50	120	9	0.75	1.5	3	3	5	7.5	1		1		PDF
CWB9-11-30V24	$29.50	208-240												PDF
CWB9-11-30D39	$29.50	480												PDF
CWB12-11-30D15	$33.00	120	12	0.75	2	3	3	7.5	10	1		1		PDF
CWB12-11-30V24	$33.00	208-240												PDF
CWB12-11-30D39	$33.00	480												PDF
CWB18-11-30D15	$40.50	120	18	1	3	5	5	10	15	1		1		PDF
CWB18-11-30V24	$40.50	208-240												PDF
CWB18-11-30D39	$40.50	480												PDF
CWB25-11-30D15	$47.00	120	25	2	5	7.5	7.5	15	15	1		1		PDF
CWB25-11-30V24	$47.00	208-240												PDF
CWB25-11-30D39	$47.00	480												PDF
CWB32-11-30D15	$56.00	120	32	3	5	10	10	20	25	1		1		PDF
CWB32-11-30V24	$56.00	208-240												PDF
CWB32-11-30D39	$56.00	480												PDF
CWB38-11-30D15	$65.00	120	38	3	7.5	10	10	25	25	1		1		PDF
CWB38-11-30V24	$64.00	208-240												PDF
CWB38-11-30D39	$65.00	480												PDF
CWB40-11-30D15	$66.00	120	40	3	7.5	10	15	30	30	1		1		PDF
CWB40-11-30V24	$66.00	208-240												PDF
CWB40-11-30D39	$66.00	480												PDF
CWB50-11-30D15	$88.00	120	50	3	10	15	15	40	40	1		1		PDF
CWB50-11-30V24	$88.00	208-240												PDF
CWB50-11-30D39	$88.00	480												PDF
CWB65-11-30D15	$101.00	120	65	5	10	20	20	50	50	1		1		PDF
CWB65-11-30V24	$101.00	208-240												PDF
CWB65-11-30D39	$101.00	480												PDF
CWB80-11-30D15	$107.00	120	80	7.5	15	20	25	50	60	1		1		PDF
CWB80-11-30V24	$107.00	208-240												PDF
CWB80-11-30D39	$107.00	480												PDF

WEG CWB Series Three-Pole Contactors – DC Coil – Selection Guide

Part Number	Price	Coil Voltage (VDC)	Ie Max (Ue ≤ 440V)	Maximum UL Horsepower						Built-In Auxiliary Contacts Per Contactor				Dimensional Drawing
				Single-Phase		Three-Phase								
			AC-3 (A)	115V	230V	200V	230V	480V	575V	N.O.		N.C.		
CWB9-11-30C03	$35.00	24	9	0.75	1.5	3	3	5	7.5	1		1		PDF
CWB12-11-30C03	$41.00		12	0.75	2	3	3	7.5	10	1		1		PDF
CWB18-11-30C03	$49.00		18	1	3	5	5	10	15	1		1		PDF
CWB25-11-30C03	$50.00		25	2	5	7.5	7.5	15	15	1		1		PDF
CWB32-11-30C03	$71.00		32	3	5	10	10	20	25	1		1		PDF
CWB38-11-30C03	$79.00		38	3	7.5	10	10	25	25	1		1		PDF
CWB40-11-30C03	$85.00		40	3	7.5	10	15	30	30	1		1		PDF
CWB50-11-30C03	$121.00		50	3	10	15	15	40	40	1		1		PDF
CWB65-11-30C03	$139.00		65	5	10	20	20	50	50	1		1		PDF
CWB80-11-30C03	$165.00		80	7.5	15	20	25	50	60	1		1		PDF

CWB Series Contactors Accessories



BFB-11



BLB-11



BFB-20



BFB-22



BFB-40



BFB-04

WEG CWB Series Contactors Accessories – Front Mounted Auxiliary Contact Blocks Selection Guide

Part Number	Price	For Use With	Max. number of additional contacts/contactor	Auxiliary contacts		Weight g [oz]	Dimensional Drawing
				NO	NC		
BFB-11	$8.00	CWB9 through CWB80	4	1	1	63 [2.22]	PDF
BFB-20	$8.25			2	0	63 [2.22]	PDF
BFB-22	$12.50			2	2	63 [2.22]	PDF
BFB-40	$12.50			4	0	63 [2.22]	PDF
BFB-04	$12.50			0	4	63 [2.22]	PDF

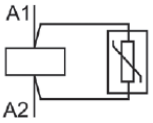
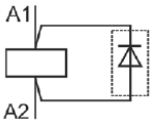
NOTES: The maximum number of auxiliary contacts assembled on the contactor is 4.

WEG CWB Series Contactors Accessories – Side Mounted Auxiliary Contact Blocks Selection Guide

Part Number	Price	For Use With	Max. Number of Additional Contacts/Contactor	Auxiliary Contacts		Weight g [oz]	Dimensional Drawing
				NO	NC		
BLB-11	$8.75	CWB9 through CWB80	4	1	1	34 [1.20]	PDF

NOTE: The maximum number of auxiliary contacts assembled on the contactor is 4.

WEG CWB Series Contactors Accessories – Plug-In Surge Suppressors Selection Guide

Part Number	Price	For Use With	Voltage	Diagram	Weight g [oz]	Dimensional Drawing
VRB-E34	$12.50	CWB9 through CWB80	50-127 VAC 50/60 Hz 60-180 VDC		8 [0.28]	PDF
VRB-E50	$12.50		130-250 VAC 50/60 Hz 180-300 VDC		8 [0.28]	PDF
VRB-D73	$12.50		400-510 VAC 50/60 Hz		8 [0.28]	PDF
DIB-C33	$12.50		12-600 VDC		8 [0.28]	PDF



DIB-C33



VRB-E34

CWB Series Contactors Accessories and Spare Parts

IM1

WEG CWB Series Contactors Accessories – Mechanical Interlock Selection Guide

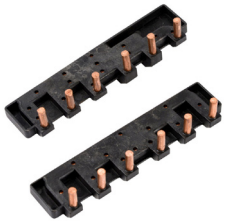
Part Number	Price	For Use With	Description	Dimensional Drawing
IM1	$5.25	CWB9 through CWB 38	Mounting set for interlocking two contactors with the same frame type. Fitting through snaps without tools.	PDF
IM2	$6.50	CWB40 through CWB80		PDF



IM2



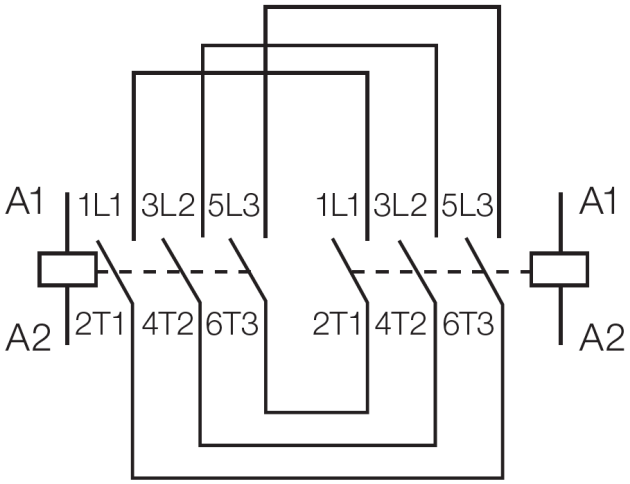
EC-R1



EC-R2

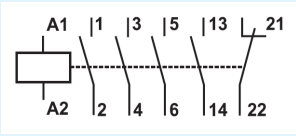
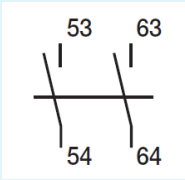
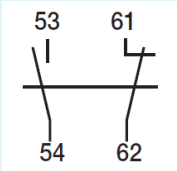
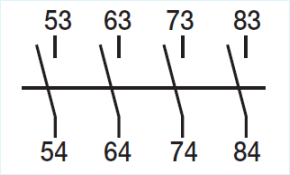
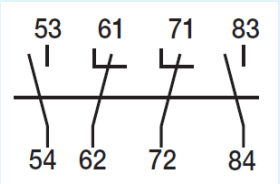
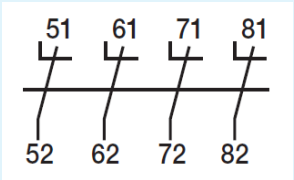
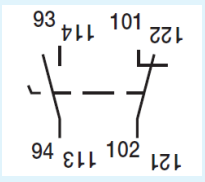
WEG CWB Series Contactors Accessories Easy-Connection Reversing Bar Connection Kit for Reversing Starters – Selection Guide

Part Number	Price	For Use With	Hp Values Declared on Direct and Reversing Starters Per UL 60947-4-1, Test Cycles. Three-Phase Voltage (V)		Weight g [oz]	Dimensional Drawing
		K1=K2	220-240 V (hp)	440-480 V (hp)		
EC-R1	$24.00	CWB9	3	5	2.83 [0.10]	PDF
		CWB12	3	7.5		PDF
		CWB18	5	10		PDF
		CWB25	7.5	15		PDF
		CWB32	10	20		PDF
		CWB38	10	25		PDF
EC-R2	$29.50	CWB40	15	30	7.09 [0.25]	PDF
		CWB50	15	40		PDF
		CWB65	20	50		PDF
		CWB80	25	50		PDF



Electric Diagram

CWB Series Contactors

Terminal Markings According to IEC/EN 60947				
Diagram	*Configuration*	*Auxiliary Contacts*		*Reference Code*
		NO	*NC*	
3-Pole Contactors With Built-In Auxiliary Contacts				
	11	1	1	CWB9-11-30 CWB12-11-30 CWB18-11-30 CWB25-11-30 CWB32-11-30 CWB38-11-30 CWB40-11-30 CWB50-11-30 CWB65-11-30 CWB80-11-30
Front Mounted Auxiliary Contact Blocks				
	20	2	0	BFB-20
	11	1	1	BFB-11
	40	4	0	BFB-40
	22	2	2	BFB-22
	04	0	4	BFB-04
Side Mounted Auxiliary Contact Block				
	11	1	1	BLB-11

CWB Series Contactors

WEG CWB Series Contactors Specifications – General Specifications

		CWB9	CWB12	CWB18	CWB25	CWB32	CWB38	CWB40	CWB50	CWB65	CWB80
Compliance		IEC/EN 60947-1, IEC/EN 60947-4-1, IEC/EN 60947-5-1, UL 508									
Rated Insulation Voltage U (Pollution Degree 3)	IEC/EN 60947-4-1	690V						1000V			
	UL, CSA	600V									
Rated Impulse-Withstand Voltage U_{imp}	IEC/EN 60947-1	6kV									
Frequency Limits		25-400 Hz									
Mechanical Lifespan	AC Coil (million cycles)	10						6			
	DC Coil (million cycles)	10						6			
Electrical Lifespan	I_e AC-3 (million cycles)	2.0	2.0	1.8	1.6	1.6	1.2	1.6	1.6	1.6	1.2
Degree of protection (IEC/EN 60529)	Main Terminals	IP10 (front)									
	Coil and Auxiliary Contacts	IP20 (front)									
Mounting		With screws or DIN 35mm rail (EN 50022)									
Coil Connection Points	Contactors With AC Coil	2									
	Contactors With DC Coil	2									
Vibration resistance (IEC/EN 60068-2-6)	Open Contactor	4g									
	Closed Contactor	4g									
Resistance to mechanical shocks (½ sine wave=11ms - IEC/EN 60068-2-27)	Open Contactor	10g									
	Closed Contactor	15g									
Ambient Temperature	Operating	-25ºC to +55ºC [-13ºF to +131ºF]									
	Storage	-55ºC to +80ºC [-67ºF to +176ºF]									
Maximum Operation Altitude Without Modification of Rated Values[1]		3000m [9843ft]									

[1] For altitudes of 3000-4000 m [9843-13123 ft] (0.90 x Ie and 0.80 x Ui) and 4000-5000 m [13123-16404 ft] (0.80 x Ie and 0.75 x Ui).

WEG CWB Series Contactors Specifications – Control Circuit (AC)

		CWB9	CWB12	CWB18	CWB25	CWB32	CWB38	CWB40	CWB50	CWB65	CWB80
Compliance		IEC/EN 60947-1, IEC/EN 60947-4-1, IEC/EN 60947-5-1, UL 508									
Rated Insulation Voltage U (Pollution Degree 3)	IEC/EN 60947-4-1	690V						1000V			
	UL, CSA	600V						600V			
Standard Voltages at 50/60 Hz		12 to 600 V						24 to 600 V			
Coil Operating Limits		0.8 to 1.1 xUs						0.8 to 1.1 xUs			
Coil 50/60 Hz	Pick Up	0.5 to 0.8 xUs						0.5 to 0.8 xUs			
	Drop Out	0.2 to 0.6 xUs						0.2 to 0.6 xUs			
Average Consumption (50Hz/60Hz)	Magnetic Circuit Closed	9 / 7.5 VA						27 / 17.2 VA			
	Power Factor Switching On (cos φ)	0.8 / 0.7						0.56 / 0.55			
	Power Factor Switched On (cos φ)	0.24 / 0.27						0.25 / 0.28			
	Thermal Power Dissipation	5-7 / 5-7 W						3.7-6.3 / 3.7-6.3 W			
	Closing the Magnetic Circuit	90 / 75 VA						202 / 185 VA			
Operation Average Time of NO Contacts (Closing/Opening)		15 to 25 ms / 8 to 12 ms						10 to 15 ms / 8 to 12 ms			

WEG CWB Series Contactors Specifications – Control Circuit (DC)

		CWB9	CWB12	CWB18	CWB25	CWB32	CWB38	CWB40	CWB50	CWB65	CWB80
Compliance		IEC/EN 60947-1, IEC/EN 60947-4-1, IEC/EN 60947-5-1, UL 508									
Rated Insulation Voltage U (Pollution Degree 3)	IEC/EN 60947-4-1	690V						1000V			
	UL, CSA	600V						600V			
Standard Voltages		12 to 500 V						12 to 500 V			
Coil Operating Limits		0.8 to 1.1 xUs						0.8 to 1.1 xUs			
	Pick Up	0.5 to 0.8 xUs						0.5 to 0.8 xUs			
	Drop Out	0.1 to 0.4 xUs						0.1 to 0.4 xUs			
Average Consumption (50Hz/60Hz)		1.0x use the coil cold						1.0x use the coil cold			
	Magnetic Circuit Closed	5.8 W						14.5 W			
	Closing the Magnetic Circuit	5.8 W						105W			
Operation Average Time of NO Contacts (Closing/Opening)		35 to 45 ms / 8 to 12 ms						20 to 30 ms / 4 to 8 ms			
Thermal Power Dissipation		5 to 7 W						12 to 16 W			

CWB Series Contactors

WEG CWB Series Contactors Specifications – Main Contacts

			CWB9	CWB12	CWB18	CWB25	CWB32	CWB38	CWB40	CWB50	CWB65	CWB80
Rated operational current I_e	AC-3 (U_e ≤440 V)	A	9	12	18	25	32	38	40	50	65	80
	AC-4 (U_e ≤440 V)	A	4.4	5.8	8.5	10.4	13.7	13.7	18.5	18.5	26	32
	AC-1 θ≤55 °C, U_e ≤690 V)	A	25	25	32	40	50	50	60	90	110	110
Rated operational voltage U_e	IEC/EN 60947-4-1	V	690V							1000V		
	UL, CSA	V	600V									
Conventional thermal current I_{th} (θ≤55 °C)		A	25	25	32	40	50	50	60	90	110	110
Making capacity – IEC/EN 60947		A	250	250	300	450	550	550	550	1000	1000	1000
Breaking capacity – IEC/EN 60947	U_e ≤400 V)	A	250	250	300	450	550	550	550	1000	1000	1000
	U_e = 500 V)	A	220	220	250	350	450	450	480	880	880	880
	U_e = 690 V)	A	150	150	180	250	350	350	350	640	640	640
Acceptable short-time current (no current flowing during recovery time of 15min and θ≤40°C)	1s	A	210	210	240	380	400	430	720	820	900	900
	10s	A	105	105	145	240	260	310	320	400	520	640
	1min	A	60	60	80	120	130	150	165	230	340	360
	10min	A	30	30	40	50	60	60	85	110	130	130
Short circuit protection of the main contacts Fuse (RK5)	@600 V - UL/CSA	kA	5									
	Coordination type 1	A	25	40	50	63	63	63	80	100	125	160
	Coordination type 2	A	20	20	25	35	50	50	63	80	100	125
Impedance per pole		mΩ	2.5	2.5	2.5	2	2	2	1.6	1.6	1.6	1.6
Average power dissipation per pole	AC-1	W	1.5	1.5	2.5	3.2	5	5	6	13	19	19
	AC-3	W	0.2	0.4	0.8	1.2	2	3	3	4	7	10
Utilization category AC-3												
Rated operational current I_e (θ≤55 °C)	U_e ≤440 V	A	9	12	18	25	32	38	40	50	65	80
	U_e ≤500 V	A	9	12	15.8	23	28.5	28.5	35	45	55	75
	U_e ≤690 V	A	7	9	12.8	16.5	21	21	32	35	40	50
Orientative rated operational power Three-phase induction motors (50/60 Hz) IV poles - 1,800 rpm	220/240 V	kW	2.2	3	4.5	6.5	7.5	9.2	11	15	18.5	22
		hp	3	4	6	8.7	10	12.5	15	20	25	29
	380/400 V	kW	4	5.5	7.5	12.5	15	18.5	18.5	22	30	37
		hp	5.5	7.5	10	16.8	20	25	25	29	40	50
	415/440 V	kW	4.5	6.5	9.2	12.5	15	18.5	22	30	37	45
		hp	6	8.7	12.5	16.8	20	25	29	40	50	60
	500V	kW	5.5	7.5	10	15	18.5	18.5	22	30	37	55
		hp	7.5	10	13.4	20	25	25	29	40	50	74
	660/690 V	kW	5.5	7.5	11	15	18.5	18.5	30	33	37	45
		hp	7.5	10	15	20	25	25	40	44	50	60
Maximum percentage	600 ops/h	%	100	100	100	100	100	100	100	100	100	100
Utilization category AC-4												
Rated operational current I_e	(U_e ≤440 V)	A	4.4	5.8	8.5	10.4	13.7	13.7	18.5	18.5	26	32
	(U_e ≤500 V)	A	3.9	5.1	7.5	12	13.9	13.9	17.5	23.5	28.5	33
	(U_e ≤690 V)	A	2.8	3.7	5.4	12	12.8	12.8	14	18	22	26
Orientative rated operational power Three-phase induction motors (50/60 Hz) IV poles - 1,800 rpm (200,000 operations)	220/240 V	kW	1.5	1.5	2.2	3	4	4	4.5	5.5	7.5	11
		hp	2.0	2.0	2.9	4.0	5.4	5.4	6.0	7.4	10.1	14.7
	380/400 V	kW	2.2	3.7	4	5.5	7.5	7.5	9.2	11	15	18.5
		hp	2.9	5.0	5.4	7.4	10.1	10.1	12.3	14.7	20.1	24.8
	415/440 V	kW	2.2	3	3.7	5.5	7.5	7.5	11	11	15	22
		hp	2.9	4.0	5.0	7.4	10.1	10.1	14.7	14.7	20.1	29.5
	500V	kW	2.2	3	5	7.5	9	9	11	15	18.5	22
		hp	2.9	4.0	6.7	10.1	12.1	12.1	14.7	20.1	24.8	29.5
	660/690 V	kW	2.2	3	5	10	11	11	12.5	15	20	25
		hp	2.9	4.0	6.7	13.4	14.7	14.7	16.8	20.1	26.8	33.5

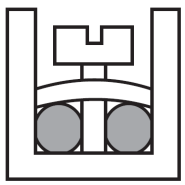
CWB Series Contactors

WEG CWB Series Contactors Specifications – Main Contacts											
			CWB9	CWB12	CWB18	CWB25	CWB32	CWB38	CWB40	CWB50	CWB65	CWB80
Utilization category AC-1 (3P NO)												
Conventional thermal current I_{th} (θ≤55 °C)		A	25	25	32	40	50	50	60	90	110	110
Maximum orientative operational current according to ambient temperature	θ≤60°C U_e≤690V)	A	25	25	32	40	50	50	60	90	110	110
Max Operational Power θ≤55°C (Three-Phase Resistors)	220/230 V	kW	9.5	9.5	12	15	19	19	22.5	34	42	42
	380/400 V	kW	16.5	16.5	21	26	33	33	39.5	59	72.5	72.5
	415/440 V	kW	19	19	24.5	30.5	38	38	45.5	68.5	84	84
	500V	kW	21.5	21.5	27.5	34.5	43	43	52	77	95	95
	660/690 V	kW	28.5	28.5	36.5	45.5	57	57	66	100	125	125
Current Values for Connection	2 poles in parallel		I_e x 1.7									
	3 poles in parallel		I_e x 2 .4									
	4 poles in parallel		–									
Percentage of maximum operational current	600 ops/h	%	100	100	100	100	100	100	100	100	100	100

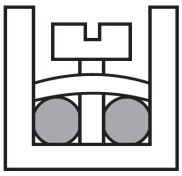
WEG CWB Series Contactors Specifications – Auxiliary Contacts											
		CWB9	CWB12	CWB18	CWB25	CWB32	CWB38	CWB40	CWB50	CWB65	CWB80
Utilization category AC-1 (3P NO)											
Compliance	60947-5-1	IEC/EN									
Rated Insulation Voltage U_i (Pollution Degree 3)	IEC/EN 60947-4-1, VDE 0660	V	690								
	UL, CSA	V	600								
Rated Operational Voltage U_e	IEC/EN 60947-4-1, VDE 0660	V	690								
	UL, CSA	V	600								
Conventional Thermal Current I_{th} (θ≤55°C)		A	10								
Rated Operational Current I_e											
AC-15 (IEC/EN 60947-5-1)	220/230 V	A	10								
	380/400 V	A	4								
	500V	A	2.5								
	660/690 V	A	1.5								
DC-13 (IEC/EN 60947-5-1)	24V	A	4								
	48V	A	2								
	110V	A	0.7								
	220V	A	0.3								
	440V	A	0.15								
Making Capacity	U_e≤690V 50/60 Hz – AC-15	A	10 x Ie								
Breaking Capacity	U_e≤400V 50/60 Hz – AC-15	A	1 x Ie								
Short Circuit Protection With Fuse (RK5)		A	10								
Control Circuit Reliability		V/mA	17 / 5								
Electrical Lifespan	Million cycles		1								
Mechanical Lifespan	Million cycles		10								
Non-Overlapping Time Between NO and NC Contacts		ms	1.5								
Impedance of Contacts		mΩ	2.5								

CWB Series Contactors

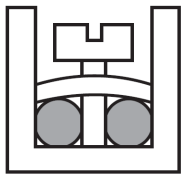
WEG CWB Series Contactors Specifications – Terminal Capacity and Tightening Torque

			Power Circuit									
			CWB9	CWB12	CWB18	CWB25	CWB32	CWB38	CWB40	CWB50	CWB65	CWB80
Mounting System Screw Type			Phillips Number 2			Phillips Number 2			Allen (4mm)			
Flexible Conductor Without Terminal	AWG		1 x 16-10 2 x 16-10			1 x 16-10 2 x 16-10			1 x 14-3 2 x 14-3			
Flexible Conductor With Terminal	AWG		1 x 16-10 2 x 16-12			1 x 16-8 2 x 16-10			1 x 14-3 2 x 14-3			
Solid Wire	AWG		1 x 16-10 2 x 16-10			1 x 14-18 2 x 14-18			1 x 14-3 2 x 14-3			
Tightening Torque	N•m [lb•ft]		1.7 [1.25]			2.5 [1.84]			5.0 [3.69]			

Control and Auxiliary Circuit – Terminal Capacity and Tightening Torque

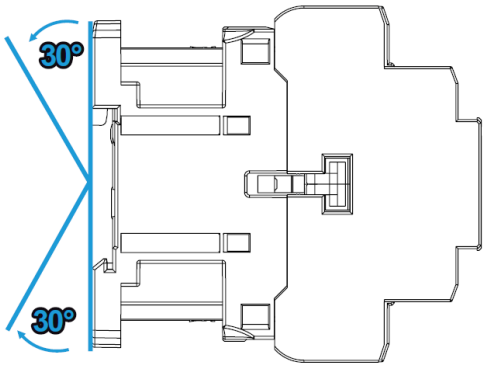
			CWB9	CWB12	CWB18	CWB25	CWB32	CWB38	CWB40	CWB50	CWB65	CWB80
Mounting System Screw Type			Phillips Number 2						Phillips Number 2			
Flexible Conductor Without Terminal	AWG		1 x 16-12 2 x 16-12						1 x 16-12 2 x 16-12			
Flexible Conductor With Terminal	AWG		1 x 16-12 2 x 16-14						1 x 16-12 2 x 16-14			
Solid Wire	AWG		1 x 16-12 2 x 16-12						1 x 16-12 2 x 16-12			
Tightening Torque	N•m [lb•ft]		1.0 [0.74]						1.0 [0.74]			

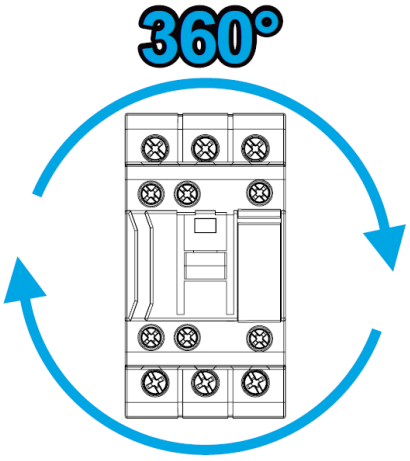
Auxiliary Contact Blocks – Terminal Capacity and Tightening Torque

			BFB (Front)	BLB (Side)
Mounting System Screw Type			Phillips Number 2	
Flexible Conductor Without Terminal	AWG		1 x 16-14 2 x 16-14	
Flexible Conductor With Terminal	AWG		1 x 16-14 2 x 16-14	
Solid Wire	AWG		1 x 16-14 2 x 16-14	
Tightening Torque	N•m [lb•ft]		1.0 [0.74]	

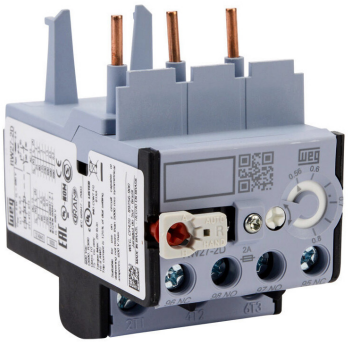
CWB Series Contactors

Mounting Position (CWB9 through CWB80)

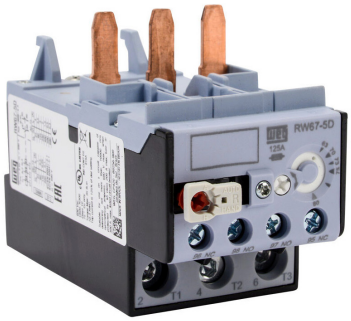




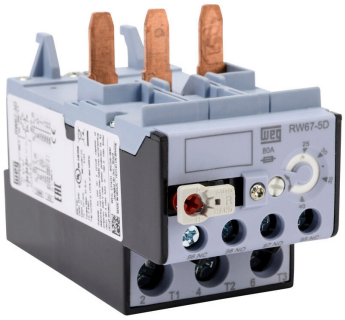
Thermal Overload Relays RW Series – Bi-Metallic



RW27-2D3-D008



RW67-5D3-U080



RW67-5D3-U040

Overview

An extended operational service life is one of the main features you'll find in RW overload relays. WEG's RW Thermal Overload Relays are designed for use with, and as perfect complement to, WEG contactors. RW overload relays can be mounted directly under WEG contactors, assuring electrical and mechanical operation as an open across-the-line starter. Accessories are also available for separate mounting.

Features

- 3-pole version available
- Direct mounting to WEG contactors with no accessory required (accessories also available for separate mounting)
- Phase-loss and current unbalance sensitivity protection
- Class 10 trip characteristics
- Selectable RESET button (auto or manual)
- Isolated 1NO and 1NC auxiliary contacts

UL File No. E189202

RW Series Contactor Catalog Number Sequence

RW	27-2D	3	-	U004

Overload Relay Series

RW: Thermal Overload Relay

Power Poles

3: 3 NO Power Poles

Frame Size and Terminal Type

27-2D: To use with CWB9 through CWB38
67-5D: To use with CWB40 through CWB80

Overload Setting Current	
RW27	D004: 0.28-0.40 A
RW67	U040: 25-40 A U080:63-80 A

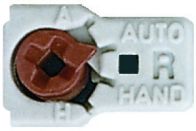
Table intended as reference only and not to create part numbers.
For complete list of overload setting ranges, refer to selection guide tables.

Thermal Overload Relays RW Series – Bi-Metallic

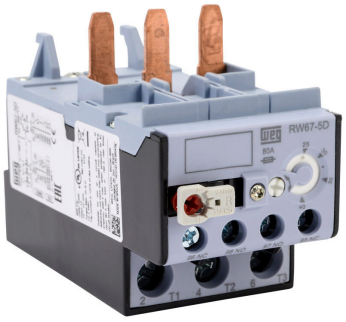
Multifunction Reset/Test Button

The thermal overload relay has a multifunction RESET/TEST button that can be set in four different positions:

A - Automatic RESET only
AUTO - Automatic RESET / TEST
HAND - Manual RESET / TEST
H - Manual RESET only



In HAND and AUTO positions, when the RESET button is pressed, both NO (97-98) and NC (95-96) contacts change states.



RW67-5D3-U040

Operation

In the H (manual RESET only) or A (automatic RESET only) position, the test function is blocked. However, in the HAND (manual RESET/TEST) or AUTO (automatic RESET/TEST) positions it is possible to simulate the test and the trip functions by pressing the RESET button.

When set in the H or HAND position, the RESET button must be pressed manually to reset the overload relay after a tripping event. On the other hand, when set in A or AUTO position, the overload relay will reset automatically after a tripping event.

The H, HAND, AUTO or A function settings are selected by rotating without pressing the red button and placing it in the desired position.

When changing from HAND to AUTO, the RESET button must be slightly pressed while the red button is rotated.

Function	H	HAND	AUTO	A
Relay Reset	Manual1	Manual1	Automatic	Automatic
Auxiliary Contact Trip Test 95-96 (NC)	Function is disabled	Test is allowed	Test is allowed	Function is disabled
Auxiliary Contact Trip Test 97-98 (NO)	Function is disabled	Test is allowed	Test is allowed	Function is disabled

Note: A recovery time of a few minutes is necessary before resetting the thermal overload relay.

Recovery Time

The RW thermal overload relays have thermal memory. After tripping due to an overload, the relay requires a certain period of time (the "recovery time") for the bimetal strips to cool down. The relay can only be reset once it has cooled down. The recovery time depends on the characteristic tripping curves and the level of the tripping current. After tripping due to overload, the recovery time allows the load to cool down.

Operation in the Output Side of Frequency Inverters

The RW27-2D thermal overload relays are designed for operation on 50/60 Hz up to 400Hz, and the tripping values are related to the heating by currents within this frequency range. Depending on the design of the frequency inverter, the switching frequency can reach several kHz and generate harmonic currents at the output that result in additional temperature rise in the bimetal strips. In such applications, the temperature rise depends not only on the rms value of the current but also on the induction effects of the higher frequency currents in the metal parts of the device (skin effect caused by eddy currents). Due to these effects, the current settings on the overload relay should be higher than the motor rated current.

Dial FLA Setting

The trip current is set via a continuously adjustable dial designed with the motor's full load current (FLA) in mind.

Temperature compensation

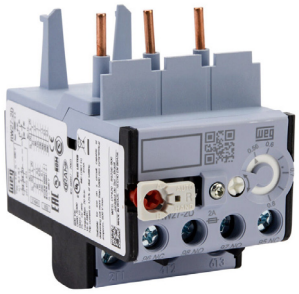
Because RW thermal overload relays include a forth bimetallic strip in addition to the three that are directly heated by the motor current, ambient temperature variations in the range of -4°F to +140°F [-20°C to +60°C] are no obstacle for accurate protection of your motors even in the toughest conditions.

Phase Failure Sensitivity

WEG overload relays include phase failure sensitivity protection as a standard. This feature ensures fast tripping in case of phase-loss, protecting your motor and avoiding expensive repairs/corrective maintenance.

Thermal Overload Relays RW Series – Bi-Metallic

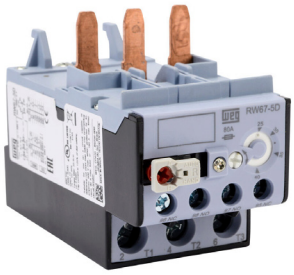
Three-Pole Thermal Overload Relay Class 10 For Use With CWB Contactors



RW27-2D3-D008



RW67-5D3-U080



RW67-5D3-U040

Features

- Adjustable trip current
- Phase-loss sensitivity
- Trip Class 10
- Built-in auxiliary contacts: 1 NO and 1 NC
- Ambient temperature compensation
- (-4°F to +140°F [-20°C to +60°C])
- Multi-function button: Hand/ Auto/Reset

RW Series Bi-Metallic Thermal Overload Relays Selection Guide

Part Number	Price	Matching Contactor	Setting Range (A)		Max. Fuse (A)	Dimensional Drawing
			Minimum	Maximum		
RW27-2D3-D008	$28.00	CWB9 CWB12 CWB18 CWB25 CWB32 CWB38	0.56	0.80	15	PDF
RW27-2D3-D012	$28.00		0.80	1.20	15	PDF
RW27-2D3-D018	$28.00		1.20	1.80	15	PDF
RW27-2D3-D028	$28.00		1.80	2.80	15	PDF
RW27-2D3-U004	$28.00		2.80	4.00	15	PDF
RW27-2D3-D063	$28.00		4.00	6.30	25	PDF
RW27-2D3-U008	$28.00		5.60	8.00	30	PDF
RW27-2D3-U010	$28.00		7.00	10.0	40	PDF
RW27-2D3-D125	$28.00		8.00	12.5	50	PDF
RW27-2D3-U017	$28.00		11.0	17.0	60	PDF
RW27-2D3-U023	$28.00		15.0	23.0	90	PDF
RW27-2D3-U032	$28.00		22.0	32.0	90	PDF
RW27-2D3-U040	$31.50		32.0	40.0	90	PDF
RW67-5D3-U040	$54.00	CWB40 CWB50 CWB65 CWB80	25.0	40.0	90	PDF
RW67-5D3-U050	$54.00		32.0	50.0	125	PDF
RW67-5D3-U057	$54.00		40.0	57.0	150	PDF
RW67-5D3-U063	$54.00		50.0	63.0	150	PDF
RW67-5D3-U070	$63.00		57.0	70.0	175	PDF
RW67-5D3-U080	$63.00		63.0	80.0	200	PDF

Thermal Overload Relays
RW Series – Bi-Metallic

Separate Mounting Bracket



BF27-2D

RW Series Bi-Metallic Thermal Overload Relays Mounting Bracket Selection Guide				
Part Number	***Price***	***Description***	***Mounting on Overload Relays (2- or 3-Pole)***	***Dimensional Drawing***
BF27-2D	$8.50	Enables overload relay to be directly mounted to a back panel via screws or DIN rail	RW27-2D	PDF
BF67-5D	$15.00	Enables overload relay to be directly mounted to a back panel via screws or DIN rail	RW67-5D	PDF

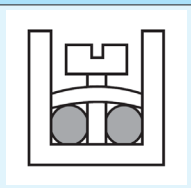
Thermal Overload Relays
RW Series – Bi-Metallic

RW Series Bi-Metallic Thermal Overload Relays Specifications – General Data and Main Contacts				
			RW27	RW67
Standards			IEC 60947 / UL 508	
Setting Current		A	0.28-40	25-80
Tripping Class			10	
Temperature Compensation			Continuous	
Rated Insulation Voltage U_i (Pollution Degree 3)	IEC 60947	V	690	
	UL/CSA	V	600	
Rated Impulse Withstand Voltage U_{imp}		kV	6	
Rated Operational Frequency		Hz	0-400	
Degree of protection Protection against direct contact from the front when actuated by a perpendicular test finger (IEC 536)			IP20 Finger and back-of-hand proof	
Ambient Temperature	Operating temperature		-25°C to +60°C [-13°F to +140°F]	
	Storage temperature		-40°C to +70°C [-40°F to +158°F]	
Environmental Testing (IEC 60 068-2-3, IEC 60 068-2-30)			Damp heat. Constant	
Current Heat Loss				
Lower Value of Setting Range		W	0.9	1.5
Higher Value of Setting Range		W	1.7	4.7

RW Series Bi-Metallic Thermal Overload Relays Specifications – Auxiliary Contacts				
			RW27	RW67
Standards			IEC 60947-4-1, UL 508	
Rated Insulation Voltage U_i (Pollution Degree 3)	IEC	V	690	
	UL/CSA	V	600	
Rated Operational Voltage U_e	IEC	V	690	
	UL/CSA	V	600	
Rated Thermal Current I_{th} (θ≤55ºC)		A	6	
Rated Operational Current I_e				
AC-14 / AC-15 (IEC 60947-5-1)	24V	A	4	
	60V	A	3.5	
	125V	A	3	
	230V	A	2	
	400V	A	1.5	
	500V	A	0.5	
	690V	A	0.3	
UL, CSA			C600	
DC-13 / DC-14 (IEC 60947-5-1)	24V	A	1	
	60V	A	0.5	
	110V	A	0.25	
	220V	A	0.1	
UL, CSA			R300	
Short-Circuit Protection With Fuse (RK5)		A	6	
Minimum Voltage / Admissible Current (IEC 60947-5-4)			17V / 5ma	

Thermal Overload Relays
RW Series – Bi-Metallic

RW Series Bi-Metallic Thermal Overload Relays Specifications Terminal Capacity and Tightening Torque – Main Contacts					
				RW27	RW67
Current Setting			A	0.28-40	25-80
Cable Size (75°C [167°F]) / Cu Cable)					
Flexible Cable	1 cable		mm^2	1.5-10	6.0-35
	2 cables		mm^2	1.5-10	–
Cable With Terminal or Rigid Cable	1 cable		mm^2	1.5-6	6.0-35
	2 cables		mm^2	1.5-6	–
Busbar			mm^2	–	–
Tightening Torque			N•m [lb•ft]	2.3 [1.69]	4.0 [2.95]
UL Cable Size (75°C [167°F]) / Cu Cable)			AWG	16 to 8	10 to 3
Tightening Torque (UL)			N•m [lb•in]	2.26 [20]	3.95 [35]

RW Series Bi-Metallic Thermal Overload Relays Specifications Terminal Capacity and Tightening Torque – Auxiliary Contacts				
			RW27	RW67
Type of Screws			M3.5x10 Philips	M3.5x10 Philips
Cable Size (75°C [167°F]) / Cu Cable)				
Cable With or Without Terminal	mm^2		2 x 1-2.5	2 x 1-2.5
Wire	AWG		16-12	16-12
Tightening Torque	N•m [lb•in]		1.5 [13]	1.5 [13]

Thermal Overload Relays
RW Series – Bi-Metallic

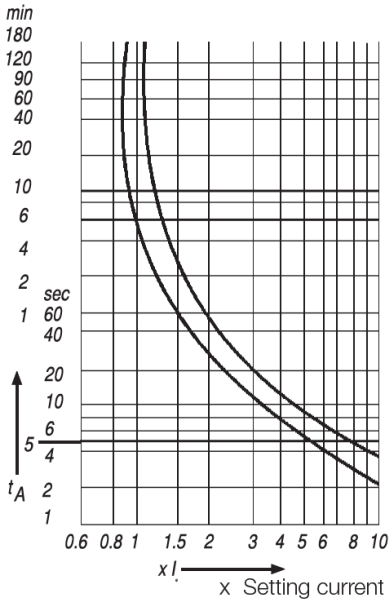
RW Series Bi-Metallic Thermal Overload Relays Specifications – General Technical Data			
			RW27
Standards			IEC 60947-1, UL 508
Rated insulation voltage U_i (Pollution Degree 3)	***IEC/EN 60947-4-1***	***V***	690
	UL, CSA	***V***	600
Rated impulse withstand voltage Uimp (IEC 60947-1)		***kV***	6
Rated operational frequency		***Hz***	25-400
Use with direct current?			Yes
Maximum operation per hour		***ops/h***	15
Protection degree (IEC 60529)	***Main contacts***		IP10
	Auxiliary contacts		IP20
	Frontal		IP20
Mounting			Direct on the contactor
Resistance to Impact (IEC 60068-2-27 - 1/2 sinusoid)		***g/ms***	10/11
Ambient Temperature	***Transport and storage***		-50°C to +80°C [-58°F to +176°F]
	Operating		-20°C to +70°C [-4°F to +158°F]
	Temperature compensation		-20°C to +60°C [-4°F to +140°F]
Altitude		***m [ft]***	2000 [6562]

RW Series Bi-Metallic Thermal Overload Relays Specifications – Main Contacts			
			RW27
Rated Operational Voltage U_e	***IEC 60947-4-1***	***V***	690
	UL, CSA	***V***	600
Setting Current / Max Fuse (Class RK5)		***A***	0.28-0.4 / 2
			0.43-0.63 /2
			0.56-0.8 / 2
			0.8-1.2 / 4
			1.2-1.8 / 6
			1.8-2.8 / 6
			2.8-4 / 10
			4-6.3 / 16
			5.6- 8 / 20
			7-10 / 25
			8-12.5 / 25
			10-15 / 35
			11-17 / 40
			15-23 / 50
			22-32 / 63
			32-40 / 90
Average Power Dissipation Per Pole		***W***	≤3

Thermal Overload Relays RW Series – Bi-Metallic

RW Tripping Characteristics

These tripping characteristics show the tripping of RW in relation to the current. They show the mean values of the tolerance ranges at on ambient temperature of 68°F (20°C), starting from cold stats. The tripping time of the overload releases at operational temperature is reduced to approximately 25% of the values shown. Under normal operational conditions, all Three-Phases of the RWs should be loaded.



Altitude and Temperature Derating

Derating of an RW overload relay is based on two possible factors.

Ambient temperature:
Temperature compensation considers a factor according to which the rated current must be reduced when ambient temperature is higher than 60°C [140°F].

Altitude:
Altitude compensation involves both rated current and voltage.

- Current compensation considers a factor according to the rated current must be reduced.
- For voltage, altitude limits the higher operating voltage the overload relay can be used.

Derating Calculation

The derating of the permissible operating current for installation altitudes above 2000m (6667 ft) and ambient temperatures over 60°C (140°F) is calculated according to the following formula:

Total derating = Derating altitude x Derating ambient temperature

Temperature Compensation (F [C])	Current Correction Factor
149 [65]	0.94
158 [70]	0.87
167 [75]	0.81
176 [80]	0.73

Altitude	Voltage Correction (U_e)
Up to 2000m (6667ft)	690
Up to 3000m (10,000 ft)	550
Up to 4000m (13,333 ft)	480
Up to 5000m (16,667ft)	420

Derating Example

Here is an example of how derating is calculated.

- Altitude: 3000m (10,000 ft)
- K1 = 0.96
- Ambient temperature: 70°C (158°F)
- K2 = 0.87

Total current derating = 0.96 x 0.87 = 0.84 x Ie

In this case, the maximum rated voltage that can be connected to the RW overload relay is 550V.

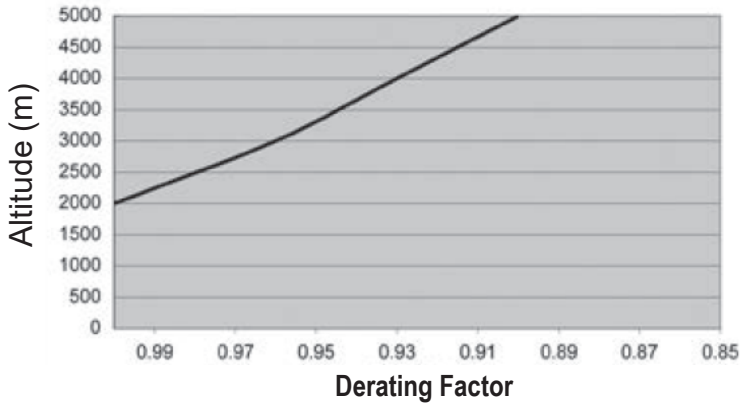
In order to select the proper overload relay, choose a device with a current range that accommodates the following:

Overload Setting Point = FLA motor / (K1 x K2)

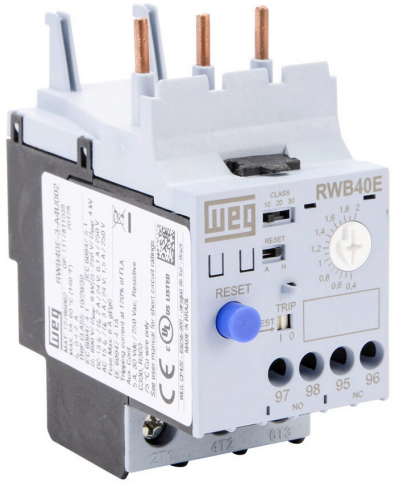
As in the example above, K1 x K2 = 0.84

For a motor with FLA = 20A:

Overload Setting Point = 20 / 0.84 = 23.8A



RW-E Series
Solid State Overload Relays



RWB40E-3-A4U002

Overview

RW-E Series Solid State Overload relays are developed with cutting-edge technology to meet the most demanding standards worldwide. With their wide current/AMP setting range, RW-E Series OL Relays can be used for protection of electric motors of different power ratings. The benefit is versatility and flexibility for manufacturers due to the possibility of standardization of control panels. This Solid State Overload Relay can be directly mounted on WEG Contactors (CWB line) providing very reliable and flexible motor starter units. The RW-E Series counts on two independent and highly reliable built in auxiliary contacts that assure the motor is switched off when a failure occurs.

Features

- 3-pole solid state overload relays with adjustable trip class: 10, 20 and 30
- Self-powered
- Wide 5:1 adjustment range
- Thermal memory
- Phase-loss protection (less than 5s)
- Phase unbalance protection (>40% between phases)
- Temperature compensated (-20°C [-4°F] up to +60°C [+140°F])
- Manual or automatic reset modes
- Direct mounting on CWB9-38 contactor
- Separate mounting is possible with accessories
- 1NO + 1NC built in auxiliary contacts

c UL us UL File No. E189202

RW-E Solid-State Overload Relay Catalog Number Sequence

RWB	40	E	-	3	-	A4U040

Contactor Series
RWB
Solid State
OL for CWB

Contactor Frame
40: 40A

OL Relay Type
E: Electronic OL

Power Poles
3: 3-Phase Relay

A4U002: 0.4 - 2.0A
A4U008: 1.6 - 8.0A
A4U025: 5 - 25A
A4U040: 8 - 40A

Table intended as reference only and not to create part numbers.

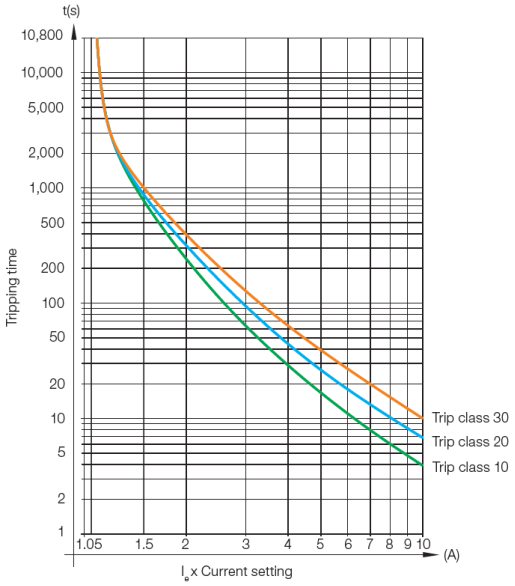
RW-E Series
Solid State Overload Relays

Suitable for a Wide Range of Applications

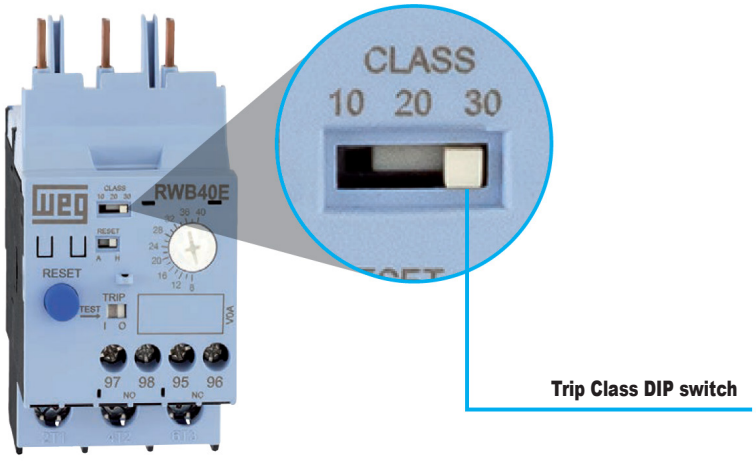
RW-E Series solid-state overload relays are suitable for protecting motors in a wide range of industrial applications including those where long starting time is required. Motors used in low, medium or heavy duty applications can be properly protected just by selecting the proper trip class (10, 20 or 30 according to IEC 60947-4-1) on the DIP-switches.

Additionally, the microprocessor electronic circuits of RW Series solid-state overload relays are temperature compensated according to IEC 60947-4-1, which means that throughout the temperature range of -20°C [-4°F] up to +60°C [140°F], the tripping point is not affected and performs consistently without undesirable tripping.

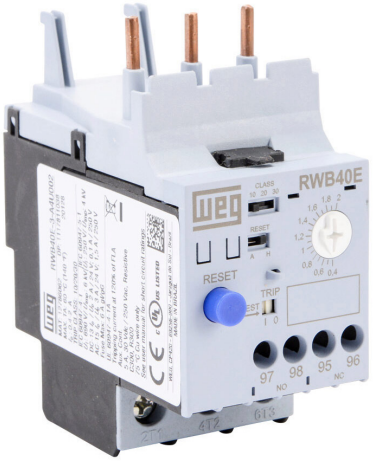
The RW-E Series also features thermal memory which assures that the heating and cooling effects of motors are modeled and that proper protection is guaranteed even after downtime periods.



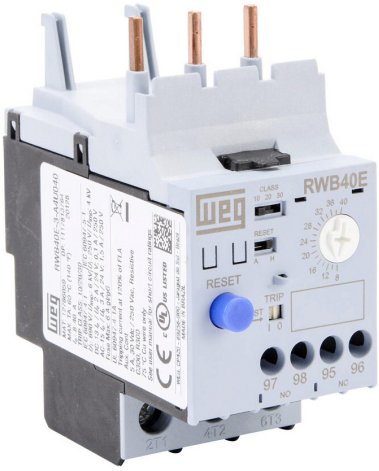
Trip Class	Multiples of Current Setting			
	1.05 x I_r	1.2 x I_r	1.5 x I_r	7.2 x I_r
10	–	T_p<2h	T_p<4min	4<T_p≤10s
20	–	T_p<2h	T_p<8min	6<T_p≤20s
30	–	T_p<2h	T_p<12min	9<T_p≤30s



RW-E Series
Solid State Overload Relays

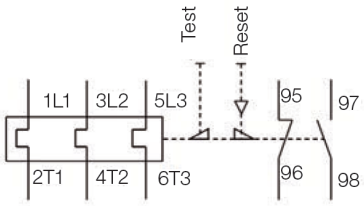


RWB40E-3-A4U002



RWB40E-3-A4U040

RW-E Series Solid-State Overload Relays Selection Guide

Part Number	Price	For Direct Mounting on Contactors	Current Range A	Max. Fuse (gL/gG) A	Diagram	Weight (kg [lb])	Dimensional Drawing
RWB40E-3-A4U002	$53.00	CWB9 through CWB38	0.4-2	16		0.25 [0.55]	PDF
RWB40E-3-A4U008	$53.00		1.6-8	32			PDF
RWB40E-3-A4U025	$53.00		5-25	63			PDF
RWB40E-3-A4U040	$83.00		8-40	125			PDF

Note: Not to be used in single-phase applications.

RWB-E Series
Solid State Overload Relays

Mounting Kit



BF27-2D

RW-E Series Solid-State Overload Relays Mounting Kit Selection Guide					
Part Number	***Price***	***Description***	***For Use With***	***Weight (kg [lb])***	***Dimensional Drawing***
BF27-2D	$8.50	Enables the overload relay to be mounted directly to a panel via screws or 35mm DIN rail	RWB40E	0.05 [0.11]	PDF

RW-E Series
Solid State Overload Relays

RW-E Series Series Solid State Overload Relays Specifications – General Data			
			RWB40E
Standards			IEC 60947-4-1, IEC 60947-5-1, IEC 60947-1, UL 60947-1, UL 60947-4-1A and UL 508
Rated Insulation Voltage U_i (Pollution Degree 3)	***IEC 60947-4-1***	***V***	690
	UL/CSA	***V***	600
Rated impulse withstand voltage U_{imp}		***kV***	6
Rated Operational Frequency (Sinusoidal Networks)		***Hz***	50/60
Suitable for use	***Three-phase loads***		Yes
	Single-phase/two-phase loads		No
	DC current loads		No
Trip class (IEC 60947-4-1)			10, 20 or 30, selectable
Additional featured protections	***Phase-loss***		Yes, <5s
	Phase unbalance		Yes, >40%
Reset	***Manual/minimum downtime for reset***		Yes / instantaneous
	Automatic/minimum downtime for reset		Yes / ≥90s
Maximum Operations Per Hour			30
Protection degree (IEC 60529)	***Main contacts***		IP10
	Auxiliary contacts		IP20
Mounting			Direct mounting on contactor or directly on the panel via screws or 35mm DIN rail when using the mounting kit accessory (BF27-2D)
Mechanical shock resistance 1/2 sinusoid			15g / 11ms
Vibration resistance (IEC 60068-2-6)			6g / 30-300 Hz
Ambient Temperature	***Transport and storage***		-50°C to +80°C [-58°F to +176°F]
	Operating		-20°C to +60°C [-4°F to +140°F]
	Temperature compensation		-20°C to +60°C [-4°F to +140°F]
Altitude			2000m [6562ft]

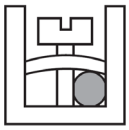
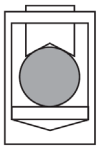
RW Series Series Solid State Overload Relays Specifications – Main Contacts			
			RWB40E
Rated Operational Voltage U_e (Pollution Degree 3)	***IEC 60947-4-1***	***V***	690
	UL/CSA	***V***	600
Current Setting / Max Fuse (RK5)		***A***	0.4-2 / 16 1.6-8 / 32 5-25 / 63 8-40 / 125
Setting Current / Average Power Dissipation Per Pole		***W***	0.4-2 / 0.07 1.6-8 / 0.06 5-25 / 0.38 8-40 / 1.5

RW-E Series
Solid State Overload Relays

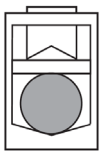
RW-E Series Series Solid State Overload Relays Specifications – Auxiliary Contacts

			RWB40E
Rated Insulation Voltage U_i (Pollution Degree 3)	IEC 60947-4-1	V	250
	UL/CSA	V	600
Rated Impulse Withstand Voltage U_{imp} (IEC 60947-1)		kV	4
Rated Operational Voltage U_e	IEC 60947-4-1	V	250
	UL/CSA	V	600
Rated Thermal Current Ith ≤60°C		A	5
Rated Operational Current I_e			
AC-14/AC-15 (IEC 60947-5-1)	24V	A	3
	120V	A	3
	250V	A	1.5
DC-13 (IEC 60947-5-1)	24V	A	2
	60V	A	0.4
	110V	A	0.22
	125V	A	0.22
	250V	A	0.1
NEMA Control Circuit Ratings	UL, CSA		C300 / R300
Short-Circuit Protection With Fuse		A	6
Minimum Voltage / Admissible Current (IEC 60947-5-4)			12V / 10mA

RW-E Series Series Solid State Overload Relays Specifications Terminal Capacity and Tightening Torque – Main Contacts

			RWB40E
Type of Screw			M3.5
			Flat / Phillips #2
Cable Size			
Flexible Cable	mm^2		–
Cable With Terminal / Rigid Cable	mm^2		–
AWG Wire			–
Tightening Torque	N•m [lb•ft]		–
Flexible Cable	mm^2		1-10
Cable With Terminal / Rigid Cable	mm^2		1-10
Wire	AWG		16-8
Tightening Torque	N•m [lb•ft]		1.7

RW-E Series Series Solid State Overload Relays Specifications Terminal Capacity and Tightening Torque – Auxiliary Contacts

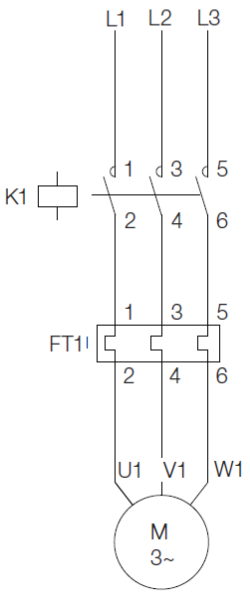
			RWB40E
Type of Screw			Flat / Phillips #1
Cable Size			
Cable With or Without Terminal	mm^2		1 x 1-2.5
Wire	AWG		16-12
Tightening Torque	N•m [lb•ft]		0.8 [0.59]

RW-E Series
Solid State Overload Relays

Technical Data

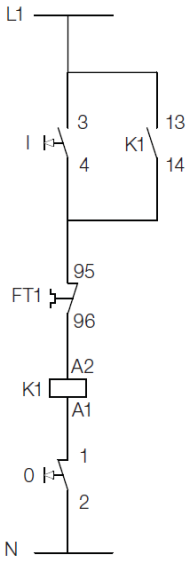
Motor Protection – Alternating Current

3-pole

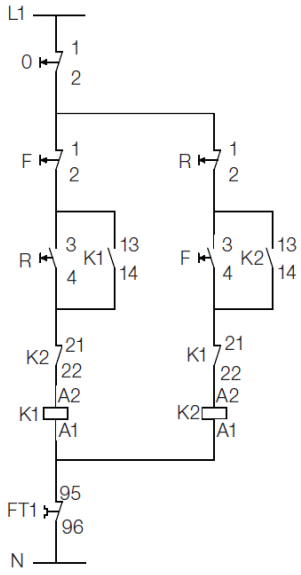


Typical Connection – Contactor + Overload Relay

Direct On Line Starter (1 Direction of Rotation)

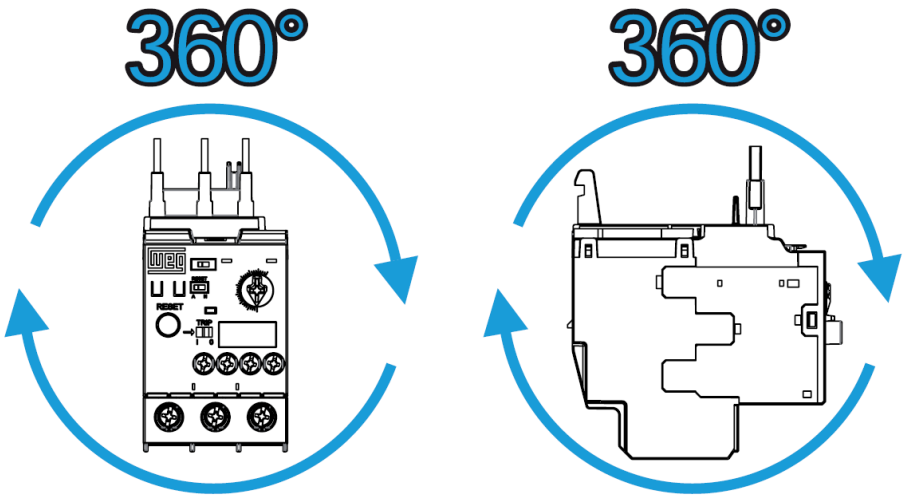


Direct On Line Starter (2 Directions of Rotation)



RW-E Series
Solid State Overload Relays

RWB40E Mounting Position



Mounting Position

Features

Ultra-slim 1 Pole - 6 A relay

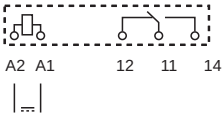
Printed circuit mount
- direct or via PCB socket
35 mm rail mount
- via screw or screwless sockets

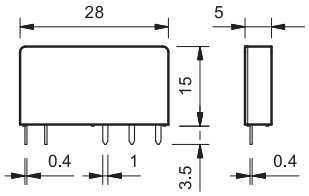
- 1 Pole changeover contacts or 1 Pole normally open contact
- Ultra slim, 5 mm, package
- Sensitive DC coil - 170 mW (Dual AC/DC coil drive possible using 93 series sockets)
- UL Listing (certain relay/socket combinations)
- Cadmium Free contact materials
- 8/8 mm clearance/creepage distance
- 6 kV (1.2/50 µs) insulation, coil-contacts

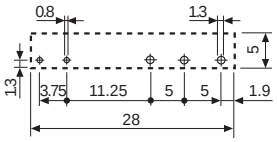
34.51



- 5 mm wide
- Low coil power
- PCB or 93 series sockets







For UL Horsepower and Pilot Duty ratings See "General technical information" page V

Copper side view

Contact specification		
Contact configuration		1 CO (SPDT)
Rated current/Maximum peak current	A	6/10
Rated voltage/Maximum switching voltage	V AC	250/400
Rated load AC1	VA	1,500
Rated load AC15 (230 V AC)	VA	300
Single phase motor rating (230 V AC)	kW	0.185
Breaking capacity DC1: 30/110/220 V	A	6/0.2/0.12
Minimum switching load	mW (V/mA)	500 (12/10)
Standard contact material		AgNi
Coil specification		
Nominal voltage (U_N)	V AC (50/60 Hz)	—
	V DC	5 - 12 - 24 - 48 - 60
Rated power AC/DC	VA (50 Hz)/W	—/0.17
Operating range	AC	—
	DC	(0.7...1.5)U_N
Holding voltage	AC/DC	—/0.4 U_N
Must drop-out voltage	AC/DC	—/0.05 U_N
Technical data		
Mechanical life AC/DC	cycles	—/10 · 10^6
Electrical life at rated load AC1	cycles	60 · 10^3
Operate/release time	ms	5/3
Insulation between coil and contacts (1.2/50 µs)	kV	6 (8 mm)
Dielectric strength between open contacts	V AC	1,000
Ambient temperature range	°C	–40...+85
Environmental protection		RT II
Approvals (according to type)		

Ordering information

Electromechanical relay (EMR)

Example: 34 series slim electromechanical relay, 1 CO (SPDT) 6 A contacts, 24 V sensitive DC coil.

3 4	. 5	1	. 7	. 0 2 4	. 0	0	1	0
					A	B	C	D

Series

Type
5 = Electromechanical type

No. of poles
1 = 1 pole, 6 A

Coil version
7 = Sensitive DC

Coil voltage
See coil specifications

A: Contact material
0 = Standard AgNi
4 = $AgSnO_2$
5 = AgNi + Au (5 µm)

B: Contact circuit
0 = CO (SPDT)
3 = NO (SPST)

C: Options
1 = None

D: Special versions
0 = Flux proof (RT II)
9 = Flat version

Selecting features and options: only combinations in the same row are possible.
Preferred selections for best availability are shown in **bold.**

Type	Coil version	A	B	C	D
34.51	sens. DC	**0** - 4 - 5	**0** - 3	**1**	**0**
34.51	sens. DC	0 - 4 - 5	0	1	9

Solid state relay (SSR)

Example: 34 series SSR relay, 2 A output, 24 V DC supply.

3 4	. 8	1	. 7	. 0 2 4	. 9 0 2 4

Series

Type
8 = SSR type

Output
1 = 1 NO (SPST-NO)

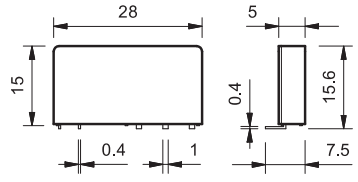
Input circuit
See input specifications

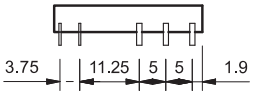
Output circuit
9024 = 2 A - 24 V DC
7048 = 0.1 A - 48 V DC
8240 = 2 A - 240 V AC

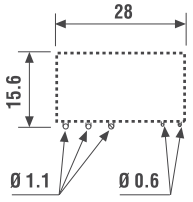
Flat pack version



Option = 34.51.7xxx.x019







Copper side view

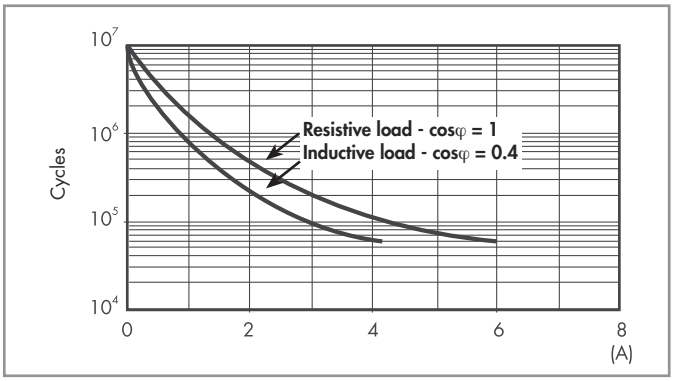
Electromechanical relay

Technical data

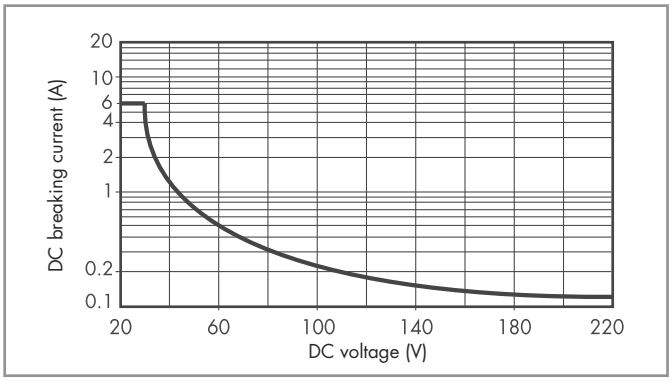
Insulation according to EN 61810-1				
Nominal voltage of supply system		V AC	230/400	
Rated insulation voltage		V AC	250	400
Pollution degree			3	2
Insulation between coil and contact set				
Type of insulation			Reinforced	
Overvoltage category			III	
Rated impulse voltage		kV (1.2/50 µs)	6	
Dielectric strength		V AC	4,000	
Insulation between open contacts				
Type of disconnection			Micro-disconnection	
Dielectric strength		V AC/kV (1.2/50 µs)	1,000/1.5	
Conducted disturbance immunity				
Burst (5...50)ns, 5 kHz, on A1 - A2			EN 61000-4-4	level 4 (4 kV)
Surge (1.2/50 µs) on A1 - A2 (differential mode)			EN 61000-4-5	level 3 (2 kV)
Other data				
Bounce time: NO/NC		ms	1/6	
Vibration resistance (5...55)Hz: NO/NC		g	10/5	
Shock resistance		g	20/14	
Power lost to the environment	without contact current	W	0.2	
	with rated current	W	0.5	
Recommended distance between relays mounted on PCB		mm	≥ 5	

Contact specification

F 34 - Electrical life (AC) v contact current



H 34 - Maximum DC1 breaking capacity



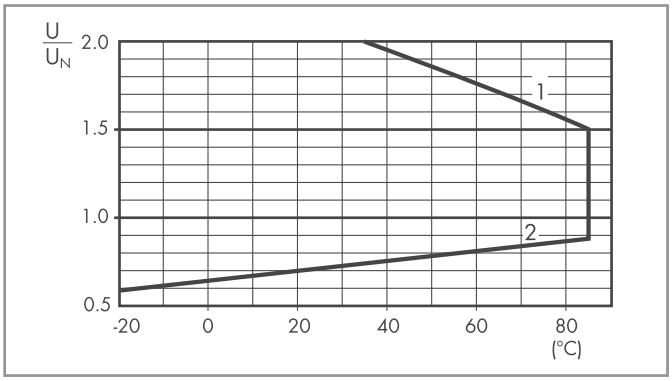
- When switching a resistive load (DC1) having voltage and current values under the curve, an electrical life of ≥ $60 \cdot 10^3$ can be expected.
- In the case of DC13 loads, the connection of a diode in parallel with the load will permit a similar electrical life as for a DC1 load. Note: the release time for the load will be increased.

Coil specifications

DC coil data

Nominal voltage U_N	Coil code	Operating range U_{min}	Operating range U_{max}	Resistance R	Rated coil consumption I at U_N
V		V	V	Ω	mA
5	**7**.005	3.5	7.5	130	38.4
12	**7**.012	8.4	18	840	14.2
24	**7**.024	16.8	36	3,350	7.1
48	**7**.048	33.6	72	12,300	3.9
60	**7**.060	42	90	19,700	3

R 34 - DC coil operating range v ambient temperature



1 - Max. permitted coil voltage.
2 - Min. pick-up voltage with coil at ambient temperature.

Solid state relay

Technical data

Other data			
Power lost to the environment	without output current	W	0.17
	with rated current	W	0.4

Input specification

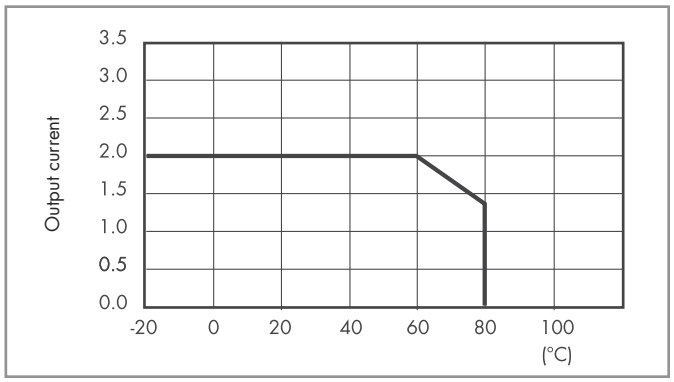
Input data - DC types

Nominal voltage U_N	Input code	Operating range U_{min}	Operating range U_{max}	Release voltage	Impedance	Control current I at U_N
V		V	V	V	Ω	mA
5	**7**.005	3.5	12 (10*)	1	715 (416*)	7 (12*)
24	**7**.024	16	30	10	3,200	7
60	**7**.060	35	72	20	21,300	3

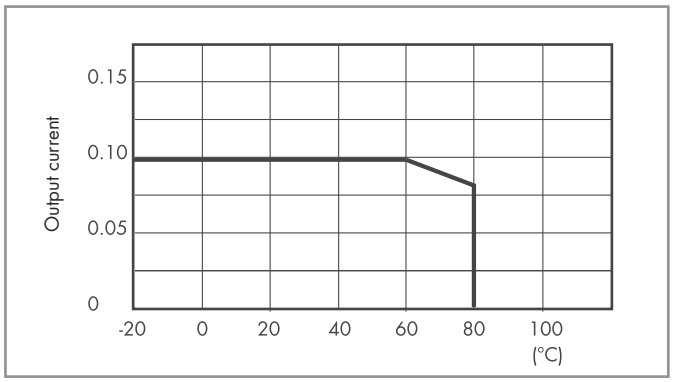
* AC Output version.

Output specification

L 34 - Output current v ambient temperature
SSR - 2 A DC & AC output types



L 34 - Output current v ambient temperature
SSR - 0.1 A DC output types



30W Ultra Slim Step Shape DIN Rail HDR-30 series

User's Manual



Features

- Ultra slim design with 35mm(2SU) width
- Universal input 85~264VAC(277VAC operational)
- No load power consumption<0.3W
- Isolation class Ⅱ
- Pass LPS (Limited power source)
- DC output voltage adjustable
- Protections : Short circuit / Overload / Over voltage
- Cooling by free air convection (working temperature:-30~+70°C)
- DIN rail TS-35/7.5 or 15 mountable
- LED indicator for power on
- 3 years warranty

Applications

- Household control system
- Building automation
- Industrial control system
- Factory automation
- Electro-mechanical apparatus

GTIN CODE

MW Search: https://www.meanwell.com/serviceGTIN.aspx

Description

HDR-30 is one economical ultra slim 30W DIN rail power supply series, adapt to be installed on TS-35/7.5 or TS-35/15 mounting rails. The body is designed 35mm(2SU) in width, which allows space saving inside the cabinets. The entire series adopts the full range AC input from 85VAC to 264VAC(277VAC operational) and conforms to BS EN/EN61000-3-2, the norm the European Union regulates for harmonic current.

HDR-30 is designed with plastic housing that it can effectively prevent user from electric hazards. With working efficiency up to 90%, the entire series can operate at the ambient temperature between -30℃ and 70℃ under air convection. The complete protection functions and relevant certificates for home automations and industrial control apparatus (IEC62368-1, UL508,UL62368-1, BS EN/EN61558-2-16) make HDR-30 a very competitive power supply solution for household and industrial applications.

Model Encoding

HDR - 30 - 12

- 12 → Output voltage
- 30 → Rated wattage
- HDR → Series name

SPECIFICATION

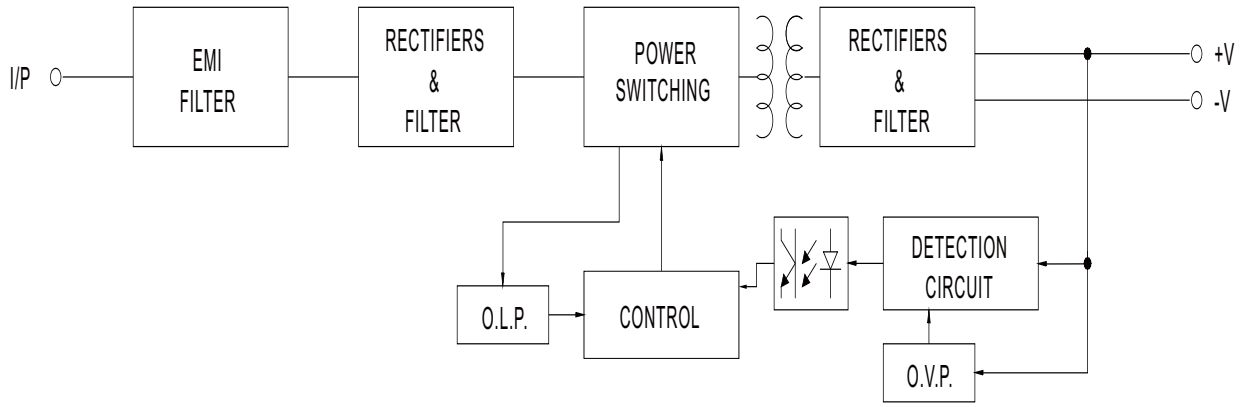
MODEL		HDR-30-5	HDR-30-12	HDR-30-15	HDR-30-24	HDR-30-48
OUTPUT	DC VOLTAGE	5V	12V	15V	24V	48V
	RATED CURRENT	3A	2A	2A	1.5A	0.75A
	CURRENT RANGE	0 ~ 3A	0 ~ 2A	0 ~ 2A	0 ~ 1.5A	0 ~ 0.75A
	RATED POWER	15W	24W	30W	36W	36W
	RIPPLE & NOISE (max.) Note.2	80mVp-p	120mVp-p	120mVp-p	150mVp-p	240mVp-p
	VOLTAGE ADJ. RANGE	4.5 ~ 5.5V	10.8 ~ 13.8V	13.5 ~ 18V	21.6 ~ 29V	43.2 ~ 55.2V
	VOLTAGE TOLERANCE Note.3	±2.0%	±1.0%	±1.0%	±1.0%	±1.0%
	LINE REGULATION	±1.0%	±1.0%	±1.0%	±1.0%	±1.0%
	LOAD REGULATION	±1.0%	±1.0%	±1.0%	±1.0%	±1.0%
	SETUP, RISE TIME	500ms, 50ms/230VAC 500ms, 50ms/115VAC at full load				
	HOLD UP TIME (Typ.)	30ms/230VAC 12ms/115VAC at full load				
INPUT	VOLTAGE RANGE	85 ~ 264VAC (277VAC operational) 120 ~ 370VDC (390VDC operational)				
	FREQUENCY RANGE	47 ~ 63Hz				
	EFFICIENCY (Typ.)	82%	88%	89%	89%	90%
	AC CURRENT (Typ.)	0.88A/115VAC 0.48A/230VAC				
	INRUSH CURRENT (Typ.)	COLD START 25A/115VAC 45A/230VAC				
PROTECTION	OVERLOAD	105 ~ 160% rated output power				
		Hiccup mode when output voltage <50%, recovers automatically after fault condition is removed				
		Constant current limiting within 50% ~100% rated output voltage, recovers automatically after fault condition is removed				
	OVER VOLTAGE	5.75 ~ 7.5V	15 ~ 18V	18.8 ~ 22.5V	30 ~ 36V	57.6~ 67.2V
		Protection type : Shut down o/p voltage, re-power on to recover				
ENVIRONMENT	WORKING TEMP.	-30 ~ +70℃ (Refer to "Derating Curve")				
	WORKING HUMIDITY	20 ~ 90% RH non-condensing				
	STORAGE TEMP., HUMIDITY	-40 ~ +85℃, 10 ~ 95% RH non-condensing				
	TEMP. COEFFICIENT	±0.03%/℃ (0 ~ 50℃) RH non-condensing				
	VIBRATION	10 ~ 500Hz, 2G 10min./1cycle, period for 60min. each along X, Y, Z axes; Mounting: Compliance to IEC60068-2-6				
	OPERATING ALTITUDE	2000 meters				
	OVER VOLTAGE CATEGORY	Ⅲ ; According to EN61558, EN50178,EN60664-1, EN62477-1 ; altitude up to 2000 meters				
SAFETY & EMC (Note 4)	SAFETY STANDARDS	UL62368-1, UL508, TUV BS EN/EN61558-2-16, BS EN/EN61558-1,IEC62368-1, EAC TP TC 004, BSMI CNS15598-1 approved; Design refer to TUV BS EN/EN62368-1				
	WITHSTAND VOLTAGE	I/P-O/P:4KVAC				
	ISOLATION RESISTANCE	I/P-O/P:100M Ohms / 500VDC / 25℃/ 70% RH				
	EMC EMISSION	**Parameter**	**Standard**	**Test Level / Note**		
		Conducted	BS EN/EN55032(CISPR32), CNS15936	Class B		
		Radiated	BS EN/EN55032(CISPR32), CNS15936	Class B		
		Harmonic Current	BS EN/EN61000-3-2	Class A		
		Voltage Flicker	BS EN/EN61000-3-3	-------		
	EMC IMMUNITY	BS EN/EN55035, BS EN/EN61000-6-2, BS EN/EN61204-3				
		Parameter	**Standard**	**Test Level /Note**		
		ESD	BS EN/EN61000-4-2	Level 3, 8KV air; Level 2, 4KV contact, criteria A		
		Radiated Susceptibility	BS EN/EN61000-4-3	Level 3, criteria A		
		EFT/Burest	BS EN/EN61000-4-4	Level 3, criteria A		
		Surge	BS EN/EN61000-4-5	Level 4,2KV/L-N, criteria A		
		Conducted	BS EN/EN61000-4-6	Level 3, criteria A		
		Magnetic Field	BS EN/EN61000-4-8	Level 4, criteria A		
		Voltage Dips and interruptions	BS EN/EN61000-4-11	＞95% dip 0. 5 periods, 30% dip 25 periods, ＞95% interruptions 250 periods		
OTHERS	MTBF	3670.4K hrs min. Telcordia SR-332 (Bellcore) ; 968.1K hrs min. MIL-HDBK-217F (25℃)				
	DIMENSION	35*90*54.5mm (W*H*D)				
	PACKING	0.13Kg;96pcs/14.2Kg/1.04CUFT				

NOTE

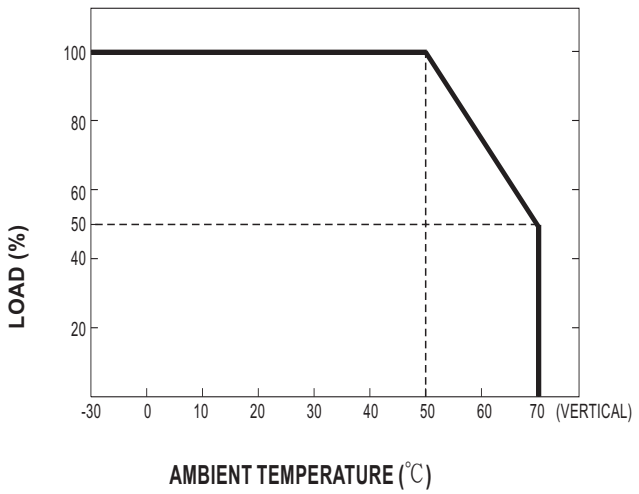
1. All parameters NOT specially mentioned are measured at 230VAC input, rated load and 25℃ of ambient temperature.
2. Ripple & noise are measured at 20MHz of bandwidth by using a 12" twisted pair-wire terminated with a 0.1 μF & 47 μF parallel capacitor.
3. Tolerance : includes set up tolerance, line regulation and load regulation.
4. The power supply is considered as an independent unit, but the final equipment still need to re-confirm that the whole system complies with the EMC directives. For guidance on how to perform these EMC tests, please refer to “EMI testing of component power supplies.” (as available on https://www.meanwell.com//Upload/PDF/EMI_statement_en.pdf)
5. The ambient temperature derating of 3.5℃/1000m with fanless models and of 5℃/1000m with fan models for operating altitude higher than 2000m(6500ft).

※ Product Liability Disclaimer : For detailed information, please refer to https://www.meanwell.com/serviceDisclaimer.aspx

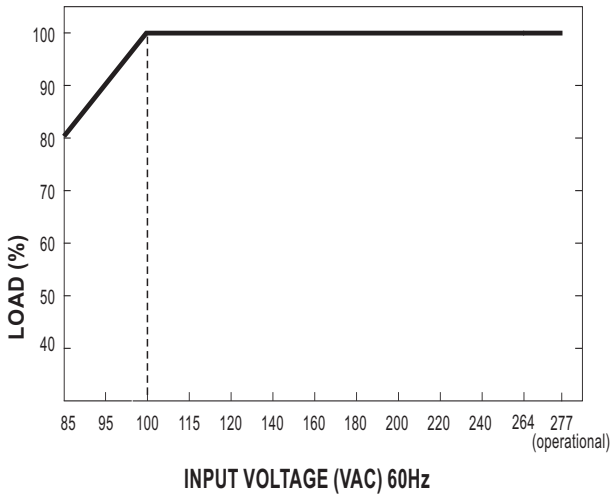
■ Block Diagram



■ Derating Curve

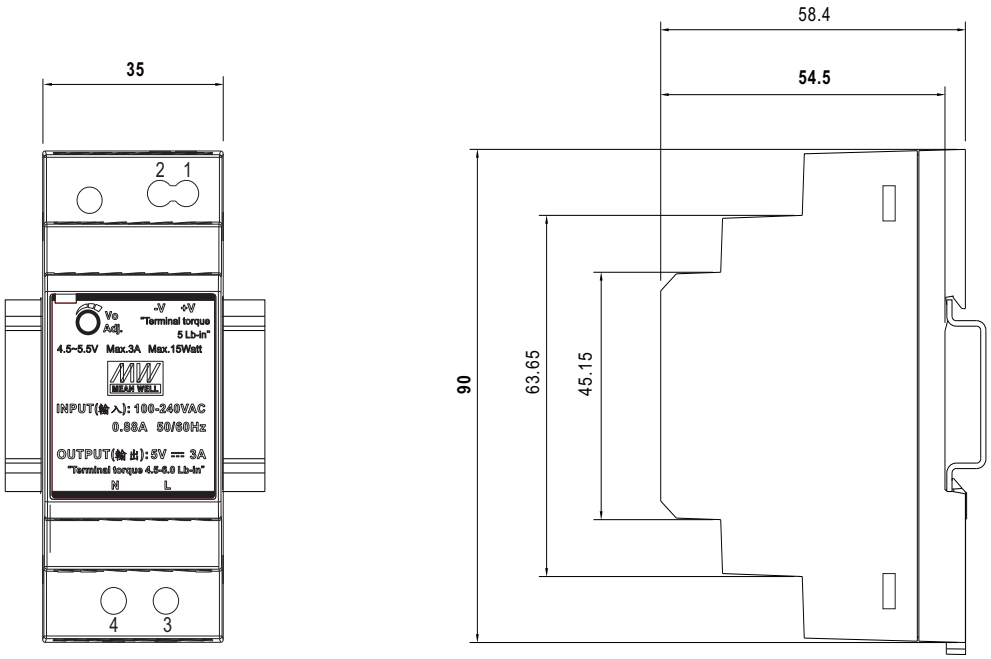


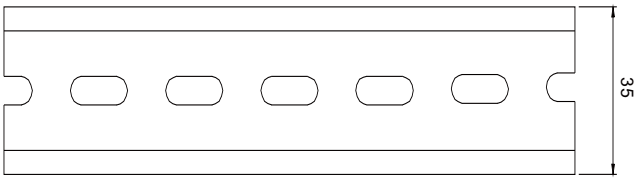
■ Output Derating VS Input Voltage



■ Mechanical Specification

（Unit: mm , tolerance ± 0.5mm)





ADMISSIBLE DIN-RAIL:TS35/7.5 OR TS35/15

Terminal Pin No. Assignment

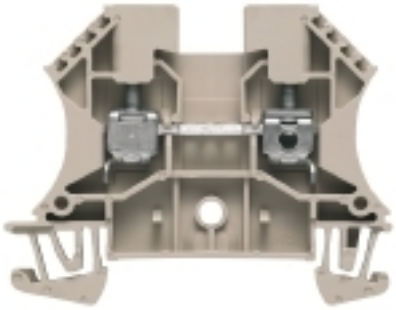
Pin No.	Assignment	Pin No.	Assignment
1	+V	3	AC/L
2	-V	4	AC/N

■ Installation Manual

Please refer to : http://www.meanwell.com/manual.html

W-Series
WDU 4

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Fax: +49 5231 14-292083
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Hardened steel for mechanical strength and high-quality tinned copper for optimum conductivity. All materials comply with RoHS requirements and have been tested to current environment guidelines.

General ordering data

Type	WDU 4
Order No.	1020100000
Version	W-Series, Feed-through terminal, Rated cross-section: 4 mm², Screw connection
GTIN (EAN)	4008190150617
Qty.	100 pc(s).

W-Series
WDU 4

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Technical data

Dimensions and weights

Width	6.1 mm	Height	60 mm
Height of lowest version	47 mm	Depth	46.5 mm
Weight	9 g	Net weight	9.57 g

Temperatures

Continuous operating temp., min.	-50 °C	Continuous operating temp., max.	120 °C

Rated data IECEx/ATEX

Certificate No. (ATEX)	KEMA98ATEX1683U	ATEX certificate	KEMA98ATEX1683U_d.pdf
ATEX certificate	KEMA98ATEX1683U_e.pdf	IEC Ex certificate	IECEXULD05.0008U_e.pdf
Max. voltage (ATEX)	690 V	Current (ATEX)	28 A
Wire cross section max. (ATEX)	4 mm²	Voltage, cross-connection	CrossConnectionGuide.pdf
Operating temperature range	For operating temperature range see EC Design Test Certificate / IEC Ex-Certificate of Conformity	Marking EN 60079-7	Ex e II
Marking ATEX Directive 94/9/EC	II 2 G D		

2 clampable wires (H05V/H07V) same cross-section (rated connection)

Wire connection cross section, finely stranded, two clampable wires, min.	0.5 mm²	Wire cross-section, finely stranded, two clampable wires, max.	1.5 mm²
Wire connection cross section, finely stranded with wire-end ferrules DIN 46228/1, 2 clampable wires, min.	0.5 mm²	Wire connection cross section, finely stranded with wire-end ferrules DIN 46228/1, 2 clampable wires, max.	1.5 mm²

Additional technical data

Explosion-tested version	Yes	Number of similar terminals	1
Open sides	right	Type of mounting	Snap-on
Version	Screw connection, for plug-in cross-connector, for screwable cross-connection, One end without connector		

CSA ratings data

Certificate No. (CSA)	200039-1057876	Voltage size C (CSA)	600 V
Current size B (CSA)	35 A	Current size C (CSA)	35 A
Wire cross section max. (CSA)	10 AWG	Wire cross section min. (CSA)	26 AWG

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W-Series
WDU 4

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Technical data

Clampable wires (rated connection)

Type of connection	Screw connection	Stripping length	10 mm
Blade size	0.6 x 3.5 mm	Connection direction	on side
Number of connections	2	Clamping range, rated connection, min.	0.13 mm²
Clamping range, rated connection, max.	6 mm²	Clamping screw	M 3
Tightening torque, min.	0.5 Nm	Tightening torque, max.	1 Nm
Torque level with DMS electric screwdriver	2	Gauge to IEC 60947-1	A4
Wire connection cross section, solid core, min. rated connection	0.5 mm²	Wire connection cross section, solid core max. rated connection	6 mm²
Wire connection cross section, stranded, rated connection, min.	1.5 mm²	Wire connection cross section, stranded, rated connection, max.	6 mm²
Wire connection cross section, finely stranded, max.	6 mm²	Wire connection cross-section, finely stranded, min.	0.5 mm²
Wire connection cross section, finely stranded with wire-end ferrules DIN 46228/1, rated connection, min.	0.5 mm²	Wire connection cross section, finely stranded with wire-end ferrules DIN 46228/1, rated connection, max.	4 mm²
Cross-section for connected conductor, finely stranded with wire-end ferrules and plastic collars DIN 46228/4, rated connection, min.	0.5 mm²	Wire connection cross-section, finely stranded with wire-end ferrules and plastic collars DIN 46228/4, rated connection, max.	4 mm²
Twin wire-end ferrules, min.	0.5 mm²	Twin wire-end ferrules, max.	2.5 mm²
Wire connection cross section AWG, min.	AWG 26	Wire connection cross section AWG, max.	AWG 10

Rated data

Rated cross-section	4 mm²	Rated voltage	800 V
Rated impulse withstand voltage	8 kV	Rated current	32 A
Current at maximum wires	41 A	Standards	IEC 60947-7-1
Pollution severity	3		

UL ratings data

Certificate No. (UR)	E60693	Voltage size C (UR)	600 V
Current size C (UR)	35 A	Conductor size Factory wiring max. (UR)	10 AWG
Conductor size Factory wiring min. (UR)	26 AWG	Conductor size Field wiring max. (UR)	10 AWG

Material data

Material	Wemid	Colour	Dark Beige
UL 94 flammability rating	V-0		

System specifications

Product family	W-Series	Type of connection	Screw connection
Connection direction	on side	Number of levels	1
Number of connections	2	No. of clamping points per level	2
Number of potentials per level	1	Levels cross-connected internally	No
Mounting rail	TS 35	End cover plate required	Yes
PE connection	No		

Classifications

ETIM 3.0	EC000897	UNSPSC	30-21-18-11
eClass 5.1	27-14-11-20	eClass 6.2	27-14-11-20
eClass 7.1	27-14-11-20		

W-Series
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Technical data

Product information

Descriptive text ordering data	1000 VDC rated voltage tested. Rated voltage is 400 V when using the ZQV cross-connector For alternative colours, see section on W-series accessories
Descriptive text technical data	Rated voltage is 400 V when using the ZQV cross-connector. Note max. current of terminal (41 A) when using WQV!
Descriptive text accessories	Socket and test plug refer to W-series Accessories section Only 400 V when using the shielding rail LS 2,8 1056400000.

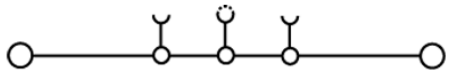
Approvals

Approvals	CSAEX CURUSEX GOSTEX IEC EX ME25 INMETRO ATEX - KEMA
ROHS	Conform

W-Series
WDU 4

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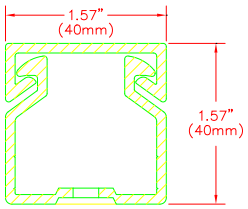
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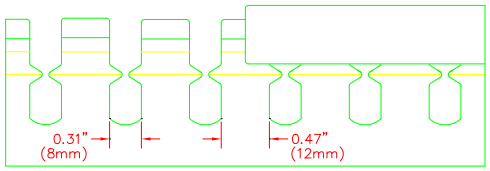
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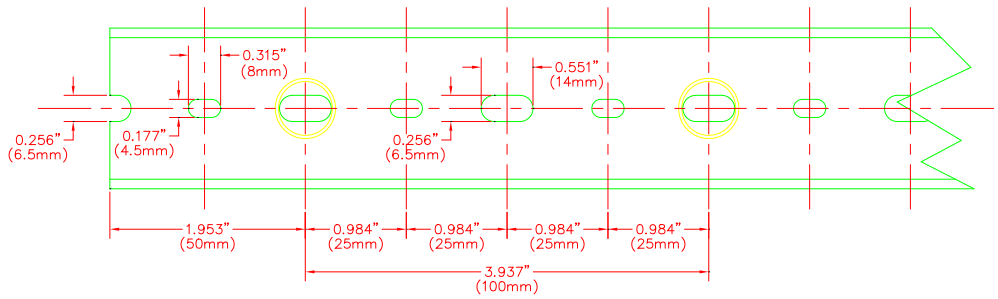
ZW Zimbabwe
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FRONT SECTION



SIDE VIEW

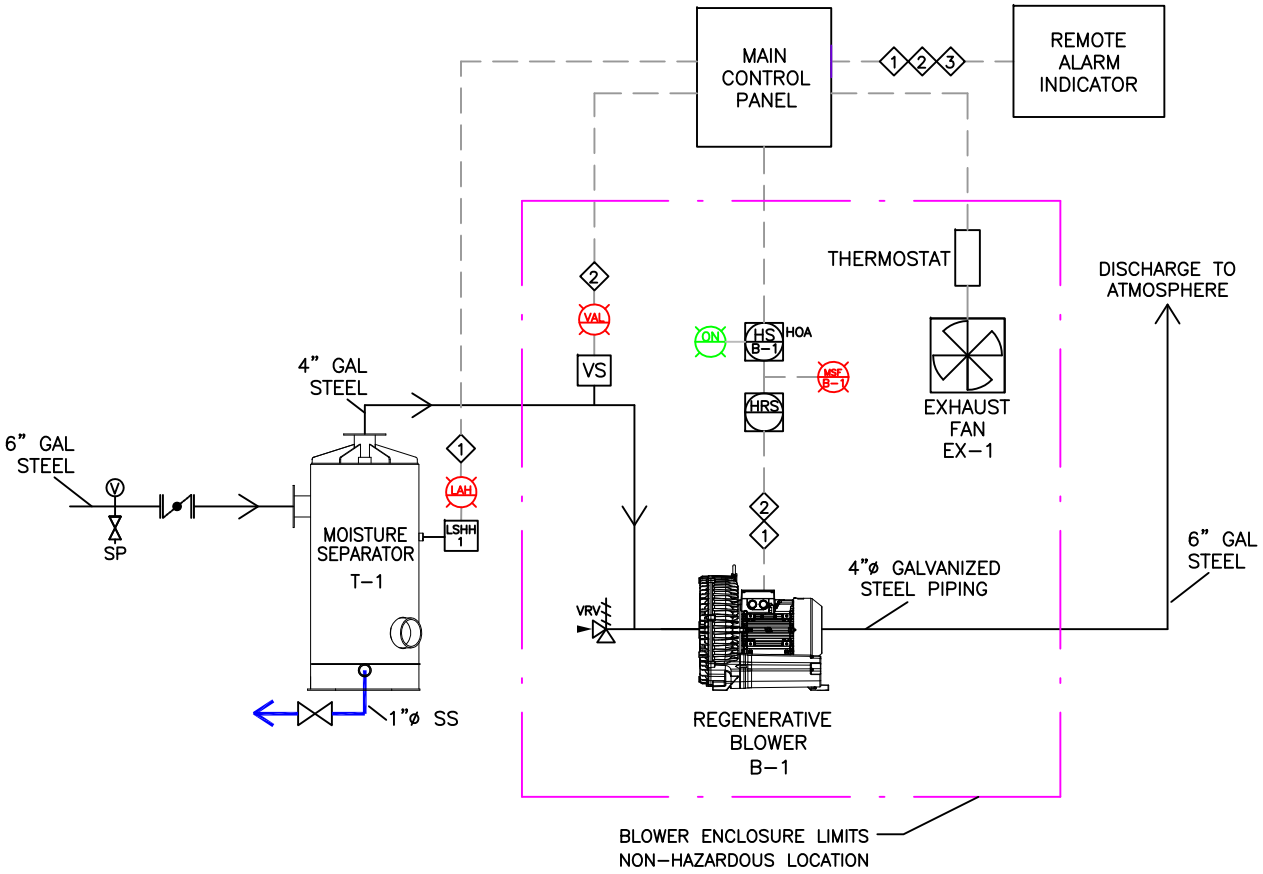


BASE PERFORATION

DWG# T1-1515

IBOCO

4. SYSTEM DRAWINGS



SYSTEM LEGEND:

- VACUUM GAUGE
- LS — LEVEL SWITCH
- VS — VACUUM SWITCH
- BUTTERFLY VALVE
- BALL VALVE
- SP — SAMPLE PORT
- VRV — VACUUM RELIEF VALVE
- UNION
- HS — HAND SWITCH PANEL MOUNTED
- HRS — RUN TIME METER
- CONTROL PANEL INDICATOR LIGHT
- CONTROL PANEL INTERLOCK
- ELECTRIC LINE
- AIR FLOW DIRECTION
- CONDENSATE WATER FLOW DIRECTION
- ENCLOSURE LIMITS

INDICATOR LIGHT INDEX:

- LAH — LEVEL ALARM HIGH
- VAL — VACUUM ALARM LOW
- MSF B-1 — MOTOR STARTER FAILURE
- ON — MOTOR RUN INDICATOR

INTERLOCK SCHEDULE:

1. HIGH LEVEL IN T-1 – SHUT DOWN B-1, ACTIVATE REMOTE ALARM.
2. LOW VACUUM – ACTIVATE REMOTE ALARM.
3. MOTOR STARTER FAULT – SHUT DOWN B-1, ACTIVATE REMOTE ALARM.

NOTES:

BLOWER: ATLANTIC BLOWER MODEL NO: AB-850 (10 HP, 3 PH, TEFC)
MOISTURE SEPARATOR T-1: ESD/W2W MODEL NO: AWS80-6

DRAWN/REVISED BY: JW
REVISION DATE: JUNE 18, 2024

FIGURE: 1

DRAWING TITLE

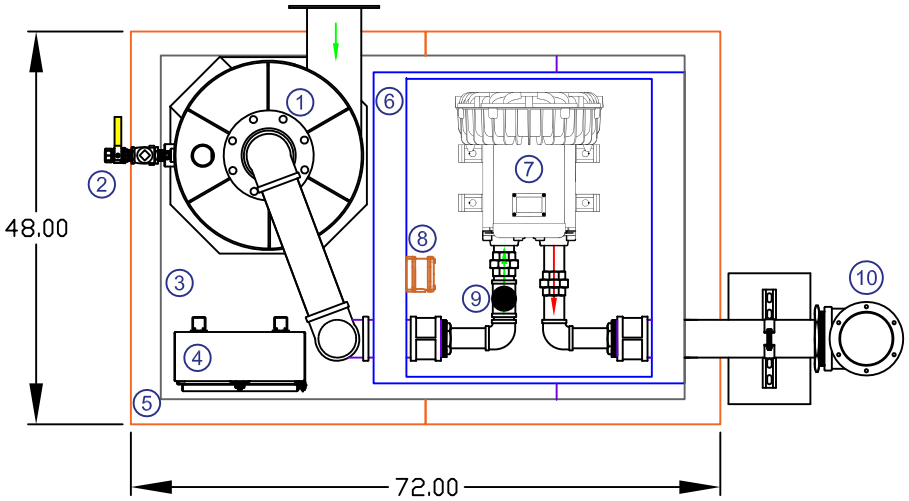
SOIL VAPOR EXTRACTION SYSTEM PROCESS AND INSTRUMENTATION DIAGRAM

PREPARED FOR

27-10 49TH AVENUE
LONG ISLAND CITY, NEW YORK

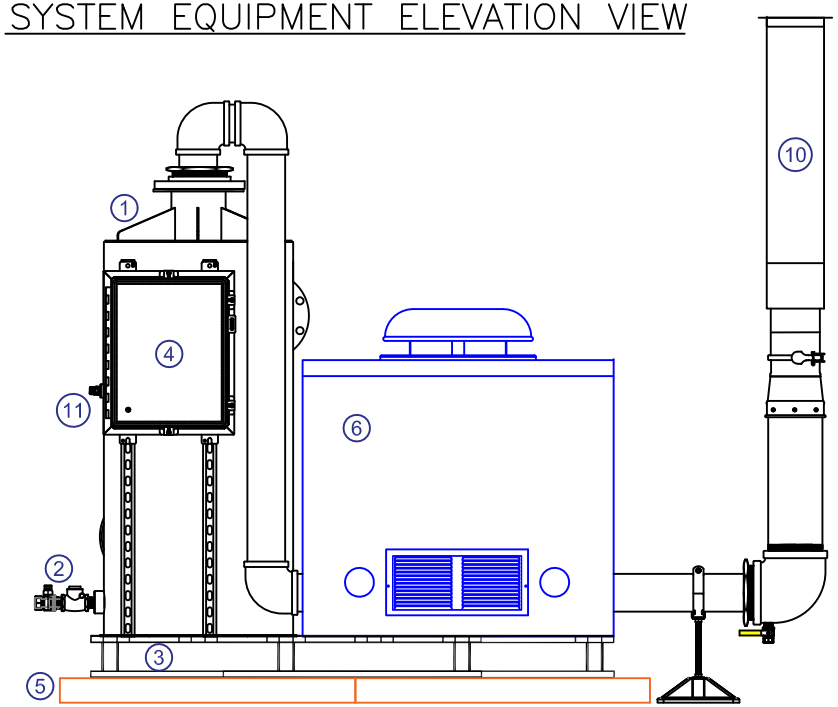
EnviroTrac
ENVIRONMENTAL SERVICES
5 OLD DOCK ROAD, YAPHANK, NEW YORK 11980
PHONE: (631)924-3001 FAX: (631)924-5001

SYSTEM EQUIPMENT PLAN VIEW



ITEM #	DESCRIPTION
1	MOISTURE SEPARATOR
2	CONDENSATE DISCHARGE - 1" BRONZE CHECK VALVE & 1" BRASS BALL VALVE
3	ALUMINUM PALLET
4	CONTROL PANEL
5	36"X48" EQUIPMENT MOUNTING PADS
6	BLOWER SOUND ENCLOSURE
7	REGENERATIVE BLOWER
8	VACUUM SWITCH
9	VACUUM RELIEF VALVE
10	NO-LOSS DISCHARGE STACKHEAD
11	LIQUID LEVEL SWITCH

SYSTEM EQUIPMENT ELEVATION VIEW



DRAWN/REVISED BY: JW
REVISION DATE: JUNE 18, 2024

FIGURE: 2

DRAWING TITLE

EQUIPMENT LAYOUT

PREPARED FOR

27-10 49TH AVENUE
LONG ISLAND CITY, NEW YORK

EnviroTrac
ENVIRONMENTAL SERVICES
5 OLD DOCK ROAD, YAPHANK, NEW YORK 11980
PHONE: (631)924-3001 FAX: (631)924-5001

GBR 25 Mini Digital Differential Pressure Gauge With Alarm

System alarms and monitoring made simple and affordable.

Finally a product that has what you need and can be easily installed.
The GBR 25 is a compact stand alone system gauge with an audible and visual alarm that works for VOC and Radon systems operating at system pressures greater than 2" wc. Included is a second relay that can be used to trigger additional alarms.
Includes Power supply
Optional 4-20 MA or 0-10 outputs can be used to monitor system pressure.

Contact OBAR for a quote to build custom alarm panels for your needs.

Applications and features

- Scale 0-40 inches WC eliminates need for multiple gauges.
- Visual and audible alarm included and factory set at 1" WC
  The alarm set point can be changed in the field.
- Second adjustable relay for triggering additional alarms.
- Optional 4-20 MA or 0-10 output for data.
- Accuracy is up to ±1% FS, with large LCD display.
- Function keys: zero reset, units select, display update time, automatic sleep time, alarm, etc.



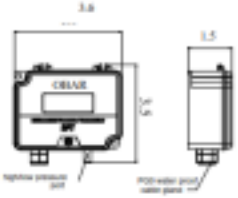
Specifications

Medium: Non-combustible, non-corrosive air, insensitive to moisture, dust, condensation and oil
Working Temp.: 20~70°C
Medium Temp.: 0~60°C
Temp. Compensation: 0~50°C
Working Pressure: overload 10xFS, burst 15xFS
Display: 5 bits LCD, with engineering unit & backlight
Output: 0-10V / 4-20mA (3 wires)
Output load: ≤500Ω (current), ≥2KΩ (voltage)
Relay Output: 2×SPST, 3A/30VDC, 3A/250VAC or 1xBuzzer
Accuracy: up to ±1.0%FS(±2.0%FS@25Pa range)
Long term stability: ±0.5%FS /Year
Thermal effect: <0.05%FS/°C (zero), <0.08%FS/°C(FS)
Power type 16~28VDC/AC
24V Power Supply included
Process Connection: 5mm ID tubing, two pairs (left/back)
Keys: 3 touch buttons
Protection: IP54
Approval: CE
Display update time: selectable for 0.5/1/5/10s (default 1s)

Other OBAR products you may be interested in.

DPT(DPT-F Flush Mount) Differential Pressure Transmitter





Pricing: $125 per unit

Add $20 for 4-20 mA / 0-10V version

Custom options and bulk order pricing available. Call or email for details.

OBAR Systems, Inc. **800-949-OBAR** **wholesale@obarsystems.com**

Low Profile Custom Alarm Panel



Features

Pre-wired solution for SSDS systems.

Vacuum tube connections pre-labeled to corresponding gauge.

Hinge orientation can be customized.

Secondary relay can be used for secondary alarm/MarCell Pro monitor or upgrade to a 4-20 mA/0-10v output for remote monitoring capability.

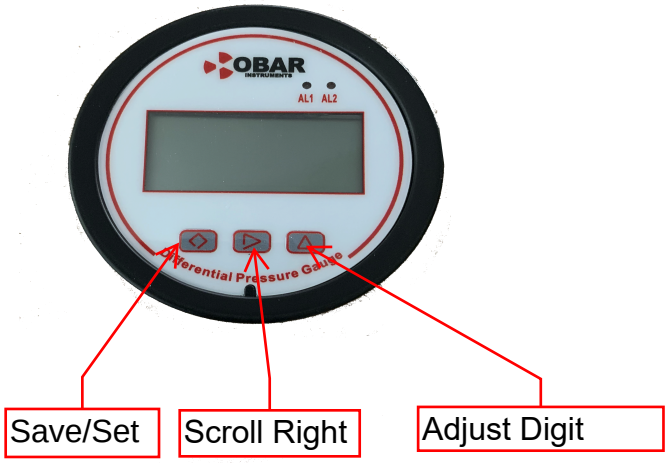
Low profile, wall mountable design.

Power supply included.

Custom labeling available.



GBR 25R Relay Gauge Programing Guide



The gauge is pre-set to:
Audible and Visual alarm with visual being displayed as "Lo"
Display is set to:
inches of W.C. Refresh: every 5 seconds. Alarm: activated at pressure less than 1.0" W.C. Alarm Delay: 0

Available Programs

The GBR series gauge/alarm are programmable for the following changes indicated by P# and setting #
P081 Display pressure readings in units of: #1 pascals, #2 K-pascals, #3 mbar, #4 mm water column, #5 inches water column
P075 Refresh display: 0.5, 1, 5, or 10 seconds
P401 or 402 to set relays

Steps to Access a Program

In each case to change a program setting use the following initial steps:
Press Save/Set button and P000 will appear. Press Scroll Right button to Select first digit 0. Press Adjust Digitbutton to enter program number for that digit.
Press Scroll Right button to select second, third or first digit and press Adjust Digit button to set the program number .
Once program number is set, press Save/Set Button to begin adjusting the program setting to the desired function.
After inputting the number representing the desired function, hold the Save/Set button to input the setting for that function and the gauge will return to displaying the system pressure.

P081 Pressure Units
(Preset to Inches of WC)
1. Activate P081 programing
2. Press Adjust Digit button to select a unit.
1= Pascal, 2=K Pascal, 3= mbar,
4= mm W.C., 5= in W.C.
3. Hold Save/Set button to input new settings

P075 Refresh Delay
(Preset to refresh every 5 Sec)
1. Activate P075 programing
2. Press Adjust Digit button to select refresh delay.
Refresh delay choices are 0.5, 1, 5, 10 seconds
3. Hold Save/Set button to input new settings

P302 Alarm Audible option
(Preset Audible & Visual)
1. Activate P302 programing
2. Press Adjust Digit button to select
1 for Audible & Visual alarm
0 for Visual alarm only.
3. Hold Save/Set button to input new settings

To Re Zero Display
1. Disconnect tubing from suction pipe.
2. Hold Scroll Right button for 5 seconds
3. Display should read zero
4. Reconnect tubing into the suction pipe

P810 Factory Reset
(Factory Setting is alarm off)
1. Activate P810 programing
2. Hold Save/Set button to revert to Factory Settings

P401 and 402 Relay Activation Pressure
(Preset to 250 Pa or 1.0" WC)
1. Activate P401 or 402 programing
2. Press Adjust Digit button and select 1.
0 turns off relay
1, 2, 3 & 4 are high versus low alarm variations
3. Press Save/Set button to next set low activation pressure
4. Pressure setting is made in Pascals (00250.0 Pa = 1"WC)
5. Use Scroll Right and Adjust Digit button to
specify desired low activation pascal pressure
6. Press Save/Set button to set specified low pressure
7. Next display is high pressure setting used for high low variations
High pressure setting used if 2, 3 or 4 was initially programed.
8. Press Save/Set button to next set and specify 0 for Alarm Delay.
9. Press Save/Set button to next specify 0 for Restore Delay
10 Press Save/Set Button and system pressure is displayed

APPENDIX E

Excavation Work Plan

APPENDIX E – EXCAVATION WORK PLAN (EWP)

E-1 NOTIFICATION

At least 15 days prior to the start of any activity that is anticipated to encounter remaining contamination or breach or alter the site's cover system, the site owner or their representative will notify the NYSDEC contacts listed in the table below. Table 1 includes contact information for the above notification. The information on this table will be updated as necessary to provide accurate contact information. A full listing of site-related contact information is provided in Appendix B.

Table 1: Notifications*

Daniel Nierenberg NYSDEC Project Manager	(518) 402-9554 Daniel.nierenberg@dec.ny.gov
Sarah Quandt NYSDEC Project Manager's Supervisor	(518) 402-9116 Sarah.quandt@dec.ny.gov
Kelly Lewandowski NYSDEC Site Control	(518) 402-9569 Kelly.lewandowski@dec.ny.gov
Megan Rivera NYSDOH Project Manager	(518) 402-7877 Megan.rivera@health.ny.gov

* Note: Notifications are subject to change and will be updated, as necessary.

This notification will include:

- A detailed description of the work to be performed, including the location and areal extent of excavation, plans/drawings for site re-grading, intrusive elements or utilities to be installed below the soil cover, estimated volumes of contaminated soil to be excavated, any modifications of truck routes, and any work that may impact an engineering control;
- A summary of environmental conditions anticipated to be encountered in the work areas, including the nature and concentration levels of contaminants of concern, potential presence of grossly contaminated media, and plans for any pre-construction sampling;
- A schedule for the work, detailing the start and completion of all intrusive work, and submittals (e.g., reports) to the NYSDEC documenting the completed intrusive work;

- A summary of the applicable components of this EWP;
- A statement that the work will be performed in compliance with this EWP, 29 CFR 1910.120 and 29 CFR 1926 Subpart P;
- A copy of the contractor's health and safety plan (HASP), in electronic format, if it differs from the HASP provided in Appendix F of this SMP;
- Identification of disposal facilities for potential waste streams; and
- Identification of sources of any anticipated backfill, along with the required request to import form and all supporting documentation including, but not limited to, chemical testing results.

The NYSDEC project manager will review the notification and may impose additional requirements for the excavation that are not listed in this EWP. The alteration, restoration and modification of engineering controls must conform with Article 145 Section 7209 of the Education Law regarding the application professional seals and alterations.

E-2 SOIL SCREENING METHODS

Visual, olfactory and instrument-based (e.g., photoionization detector) soil screening will be performed during all excavations into known or potentially contaminated material (remaining contamination) or a breach of the cover system. A qualified environmental professional as defined in 6 NYCRR Part 375, a PE who is licensed and registered in New York State, or a qualified person who directly reports to a PE who is licensed and registered in New York State will perform the screening. Soil screening will be performed when invasive work is done and will include all excavation and invasive work performed during development, such as excavations for foundations and utility work, after issuance of the COC.

Soils will be segregated based on previous environmental data and screening results into material that requires off-site disposal and material that requires testing to determine if the material can be reused on-site as soil beneath a cover or if the material can be used as cover soil. Further discussion of off-site disposal of materials and on-site reuse is provided in Sections E-6 and E-7 of this Appendix.

E-3 SOIL STAGING METHODS

Although no future soil movement is anticipated for the Site, if it is necessary, direct loading of trucks will be the preferred method of disposal. Soil stockpiles, if any, will be continuously encircled with a berm and/or silt fence. Hay bales will be used as needed near catch basins, surface waters and other discharge points.

Stockpiles, if any, will be kept covered at all times with appropriately anchored tarps. Stockpiles will be routinely inspected and damaged tarp covers will be promptly replaced.

Stockpiles, if any, will be inspected at a minimum once each week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the site and available for inspection by the NYSDEC.

E-4 MATERIALS EXCAVATION AND LOAD-OUT

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

The owner of the property and remedial party (if applicable) and its contractors are responsible for safe execution of all invasive and other work performed under this Plan.

The presence of utilities and easements on the site will be investigated by the qualified environmental professional. It will be determined whether a risk or impediment to the planned work under this SMP is posed by utilities or easements on the site. A site utility stakeout will be completed for all utilities prior to any ground intrusive activities at the site.

Loaded vehicles leaving the site will be appropriately lined, tarped, securely covered, manifested, and placarded in accordance with appropriate Federal, State, local, and NYSDOT requirements (and all other applicable transportation requirements). Trucks transporting contaminated soil must have either tight-fitting opaque covers that are secured on the sides and/or back, or opaque covers that are locked on all sides.

A truck wash will be operated on-site, as appropriate. The qualified environmental professional will be responsible for ensuring that all outbound trucks will be washed at the truck wash before leaving the site until the activities performed under this section are complete. Truck wash waters will be collected and disposed of off-site in an appropriate manner.

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

The qualified environmental professional will be responsible for ensuring that all egress points for truck and equipment transport from the site are clean of dirt and other materials derived from the site during intrusive excavation activities. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to site-derived materials. Material accumulated from the street cleaning and egress cleaning activities will be disposed off-site at a permitted landfill facility in accordance with all applicable local, State, and Federal regulations.

E-5 MATERIALS TRANSPORT OFF-SITE

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.

Material transported by trucks exiting the site will be secured with either tight-fitting opaque covers that are secured on the sides and/or back, or opaque covers that are locked on all sides. Loose-fitting canvas-type truck covers will be prohibited. If loads contain wet material capable of producing free liquid, truck liners will be used.

Truck transport routes are as follows:

To Site:

- Via Long Island Expressway, take exit 15 for Van Dam St
- Turn left toward Borden Ave
- Turn right onto 27th St
- Turn right onto 49th Ave

From Site:

- Turn left onto 49th Ave
- Turn left onto 27th St
- Turn right onto Borden Ave
- Turn right onto Long Island Expressway ramp

All trucks loaded with site materials will exit the vicinity of the site using only these approved truck routes, as shown in Figure 1. 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.

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

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

Queuing of trucks will be performed on-site in order to minimize off-site disturbance. Off-site queuing will be prohibited.

E-6 MATERIALS DISPOSAL OFF-SITE

All material excavated and removed from the site will be treated as contaminated and regulated material and will be transported and disposed off-site in a permitted facility in accordance with all local, State and Federal regulations. If disposal of material from this site is proposed for unregulated off-site disposal (i.e., clean soil removed for development purposes), a formal request with an associated plan will be made to the NYSDEC project manager. Unregulated off-site management of materials from this site will not occur without formal NYSDEC project manager approval.

Off-site disposal locations for excavated soils will be identified in the pre-excavation notification. This will include estimated quantities and a breakdown by class of disposal facility if appropriate, (e.g., hazardous waste disposal facility, solid waste landfill, petroleum treatment facility, C&D debris recovery facility). Actual disposal quantities and

associated documentation will be reported to the NYSDEC in the Periodic Review Report. This documentation will include, but will not be limited to: waste profiles, test results, facility acceptance letters, manifests, bills of lading and facility receipts.

Non-hazardous historic fill and contaminated soils taken off-site will be handled consistent with 6 NYCRR Parts 360, 361, 362, 363, 364 and 365. Material that does not meet Unrestricted SCOs is prohibited from being taken to a New York State C&D debris recovery facility (6 NYCRR Subpart 361-5 registered or permitted facility).

E-7 MATERIALS REUSE ON-SITE

On-Site reuse is not planned for the Site. However, if it is necessary, the qualified environmental professional, as defined in 6 NYCRR Part 375, will ensure that procedures defined for materials reuse in this SMP are followed and that unacceptable material (i.e., contaminated) does not remain on-site. Contaminated on-site material, including historic fill and contaminated soil, which is acceptable for reuse on-site will be placed below the demarcation layer or impervious surface, and will not be reused within the cover system or within landscaping berms. Contaminated on-site material may only be used beneath the site cover as backfill for subsurface utility lines with prior approval from the DEC project manager.

Proposed materials for reuse on-site must be sampled for full suite analytical parameters including per- and polyfluoroalkyl substances (PFAS) and 1,4-dioxane. The sampling frequency will be in accordance with DER-10 Table 5.4(e)10 unless prior approval is obtained from the NYSDEC project manager for modification of the sampling frequency. The analytical results of soil/fill material testing must meet the site use criteria presented in NYSDEC DER-10 Appendix 5 – Allowable Constituent Levels for Imported Fill or Soil for all constituents listed, and the NYSDEC Sampling, Analysis, and Assessment of Per- and Polyfluoroalkyl Substances April 2023 guidance values. Approvals for modifications to the analytical parameters must be obtained from the NYSDEC project manager prior to the sampling event.

Soil/fill material for reuse on-site will be segregated and staged as described in Sections E-2 and E-3 of this EWP. The anticipated size and location of stockpiles will be provided in the 15-day notification to the NYSDEC project manager. Stockpile locations

will be based on the location of site excavation activities and proximity to nearby site features. Material reuse on-site will comply with requirements of NYSDEC DER-10 Section 5.4(e)4. Any modifications to the requirements of DER-10 Section 5.4(e)4 must be approved by the NYSDEC project manager.

Any demolition material proposed for reuse on-site will be sampled for asbestos and the results will be reported to the NYSDEC for acceptance. Concrete crushing or processing on-site will not be performed without prior NYSDEC approval. Organic matter (wood, roots, stumps, etc.) or other solid waste derived from clearing and grubbing of the site may only be reused on-site with written approval from the NYSDEC project manager.

E-8 FLUIDS MANAGEMENT

Wastewater is not anticipated to be generated at the Site. However, if it is necessary, all liquids to be removed from the site, including but not limited to, excavation dewatering, decontamination waters and groundwater monitoring well purge and development waters, will be handled, transported and disposed off-site at a permitted facility in accordance with applicable local, State, and Federal regulations. Dewatering, purge and development fluids, if any, will not be recharged back to the land surface or subsurface of the site, and will be managed off-site, unless prior approval is obtained from NYSDEC.

Discharge of water generated during large-scale construction activities to surface waters (i.e., a local pond, stream or river) will be performed under a SPDES permit.

E-9 COVER SYSTEM RESTORATION

After the completion of soil removal and any other invasive activities the cover system will be restored in a manner that complies with the decision document. The existing cover system is comprised of a minimum of 6 inches of concrete slab and 2 inches of asphalt pavement. The demarcation layer, consisting of bottom of concrete or asphalt will be replaced to provide a visual reference to the top of the remaining contamination zone, the zone that requires adherence to special conditions for disturbance of remaining contaminated soils defined in this SMP. If the type of cover system changes from that which exists prior to the excavation (i.e., a soil cover is replaced by asphalt), this will

constitute a modification of the cover element of the remedy and the upper surface of the remaining contamination. A figure showing the modified surface will be included in the subsequent Periodic Review Report and in an updated SMP. The alteration, restoration and modification of engineering controls must conform with Article 145 Section 7209 of the Education Law regarding the application professional seals and alterations.

E-10 BACKFILL FROM OFF-SITE SOURCES

All materials proposed for import onto the site will be approved by the qualified environmental professional, as defined in 6 NYCRR Part 375, and will be in compliance with provisions in this SMP prior to receipt at the site. A Request to Import/Reuse Fill or Soil form, which can be found at http://www.dec.ny.gov/regulations/67386.html, will be prepared and submitted to the NYSDEC project manager allowing a minimum of 5 business days for review. A copy of the form is presented in Appendix E.

Material from industrial sites, spill sites, other environmental remediation sites, or potentially contaminated sites will not be imported to the site.

All imported soils will meet the backfill and cover soil quality standards established in 6 NYCRR 375-6.7(d) and DER-10 Appendix 5 for commercial use. Based on an evaluation of the land use, protection of groundwater and protection of ecological resources criteria, the resulting soil quality standards are listed in Table 2. 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 project manager. Soil material will be sampled for the full suite of analytical parameters, including PFAS and 1, 4-dioxane. Solid waste will not be imported onto the site.

Trucks entering the site with imported soils will be securely covered with tight fitting covers. Imported soils will be stockpiled separately from excavated materials and covered to prevent dust releases.

E-11 STORMWATER POLLUTION PREVENTION

Barriers and straw bale checks will be installed and inspected once a week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the site and available for inspection by the NYSDEC. All necessary repairs shall be made immediately.

Accumulated sediments will be removed as required to keep the barrier and straw bale check functional.

All undercutting or erosion of the silt fence toe anchor shall be repaired immediately with appropriate backfill materials.

Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering.

Erosion and sediment control measures identified in the SMP shall be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters.

Silt fencing or straw bales will be installed around the entire perimeter of the construction area.

E-12 EXCAVATION CONTINGENCY PLAN

If underground tanks or other previously unidentified contaminant sources are found during post-remedial subsurface excavations or development related construction, excavation activities will be suspended until sufficient equipment is mobilized to address the condition. The NYSDEC project manager will be promptly notified of the discovery.

Sampling will be performed on product, sediment and surrounding soils, etc. as necessary to determine the nature of the material and proper disposal method. Chemical analysis will be performed for a full list of analytes [TAL metals, TCL volatiles and semi-volatiles (including 1,4-dioxane), TCL pesticides and PCBs, and PFAS], unless the site history and previous sampling results provide sufficient justification to limit the list of analytes. In this case, a reduced list of analytes will be proposed to the NYSDEC project

manager for approval prior to sampling. Any tanks will be closed as per NYSDEC regulations and guidance.

Identification of unknown or unexpected contaminated media identified by screening during invasive site work will be promptly communicated by phone within two hours to NYSDEC's Project Manager. Reportable quantities of petroleum product will also be reported to the NYSDEC spills hotline. These findings will be also included in the Periodic Review Report.

E-13 COMMUNITY AIR MONITORING PLAN

The Community Air Monitoring Plan (CAMP) is included in Appendix F of the SMP. CAMP will include one upwind and one downwind station with their locations adjusted depending on prevailing wind.

Exceedances of action levels listed in the CAMP will be reported to NYSDEC and NYSDOH Project Managers.

E-13A SPECIAL REQUIREMENTS FOR WORK WITHIN 20 FEET OF POTENTIALLY EXPOSED INDIVIDUALS OR STRUCTURES

When work areas are within 20 feet of potentially exposed populations or occupied structures, the continuous monitoring locations for VOCs and particulates must reflect the nearest potentially exposed individuals and the location of ventilation system intakes for nearby structures. The use of engineering controls such as vapor/dust barriers, temporary negative-pressure enclosures, or special ventilation devices should be considered to prevent exposures related to the work activities and to control dust and odors. Consideration should be given to implementing the planned activities when potentially exposed populations are at a minimum, such as during weekends or evening hours in non-residential settings.

- If total VOC concentrations opposite the walls of occupied structures or next to intake vents exceed 1 part-per-million, monitoring should occur within the occupied structure(s). Depending upon the nature of contamination, chemical-specific colorimetric tubes of sufficient sensitivity may be necessary for comparing the exposure point concentrations with appropriate pre-determined response levels

(response actions should also be pre-determined). Background readings in the occupied spaces must be taken prior to commencement of the planned work. Any unusual background readings should be discussed with NYSDOH prior to commencement of the work.

- If total particulate concentrations opposite the walls of occupied structures or next to intake vents exceed 150 micrograms per cubic meter, work activities should be suspended until controls are implemented and are successful in reducing the total particulate concentration to 150 micrograms per cubic meter or less at the monitoring point.
- Depending upon the nature of contamination and remedial activities, other parameters (e.g., explosivity, oxygen, hydrogen sulfide, carbon monoxide) may also need to be monitored. Response levels and actions should be pre-determined, as necessary, for each site

E-13B SPECIAL REQUIREMENTS FOR INDOOR WORK WITH CO-LOCATED RESIDENCES OF FACILITIES

Unless a self-contained, negative-pressure enclosure with proper emission controls will encompass the work area, all individuals not directly involved with the planned work must be absent from the room in which the work will occur. Monitoring requirements shall be as stated above under "Special Requirements for Work Within 20 Feet of Potentially Exposed Individuals or Structures" except that in this instance "nearby/occupied structures" would be adjacent occupied rooms. Additionally, the location of all exhaust vents in the room and their discharge points, as well as potential vapor pathways (openings, conduits, etc.) relative to adjoining rooms, should be understood and the monitoring locations established accordingly. In these situations, it is strongly recommended that exhaust fans or other engineering controls be used to create negative air pressure within the work area during remedial activities. Additionally, it is strongly recommended that the planned work be implemented during hours (e.g. weekends or evenings) when building occupancy is at a minimum.

E-14 ODOR CONTROL PLAN

This odor control plan is capable of controlling emissions of nuisance odors off-site and on-site. Specific odor control methods to be used on a routine basis will include limiting open excavation areas and covering excavated soil (i.e., with polyethylene sheeting or in covered roll off containers). If nuisance odors are identified at the site boundary, or if odor complaints are received, work will be halted and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. NYSDEC and NYSDOH will be notified of all odor events and of any other complaints about the project. Implementation of all odor controls, including the halt of work, is the responsibility of the remedial party's Remediation Engineer, and any measures that are implemented will be discussed in the Periodic Review Report.

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

If nuisance odors develop during intrusive work that cannot be corrected, or where the control of nuisance odors cannot otherwise be achieved due to on-site conditions or close proximity to sensitive receptors, odor control will be achieved by sheltering the excavation and handling areas in a temporary containment structure equipped with appropriate air venting/filtering systems.

E-15 DUST CONTROL PLAN

Particulate monitoring must be conducted according to the Community Air Monitoring Plan (CAMP) provided in Section E-13. If particulate levels at the site exceed the thresholds listed in the CAMP or if airborne dust is observed on the site or leaving the site, the dust suppression techniques listed below will be employed. The remedial party will also take measures listed below to prevent dust production on the site.

A dust suppression plan that addresses dust management during invasive on-site work (although none is being anticipated at this time) will include, at a minimum, the items listed below:

- Dust suppression will be achieved using a dedicated on-site water truck or on-site water sources for road wetting. The equipment will be equipped with a water cannon or nozzle capable of spraying water directly onto off-road areas including excavations and stockpiles.
- Clearing and grubbing of larger sites will be done in stages to limit the area of exposed, unvegetated soils vulnerable to dust production.
- Gravel will be used on roadways to provide a clean and dust-free road surface.
- On-site roads will be limited in total area to minimize the area required for water truck sprinkling.
- Covering excavated areas and material after excavation activity ceases.
- Reducing the excavation size and/or number of excavations.

E-16 OTHER NUISANCES

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

A plan will be developed and utilized by the contractor for all remedial work to ensure compliance with local noise control ordinances.

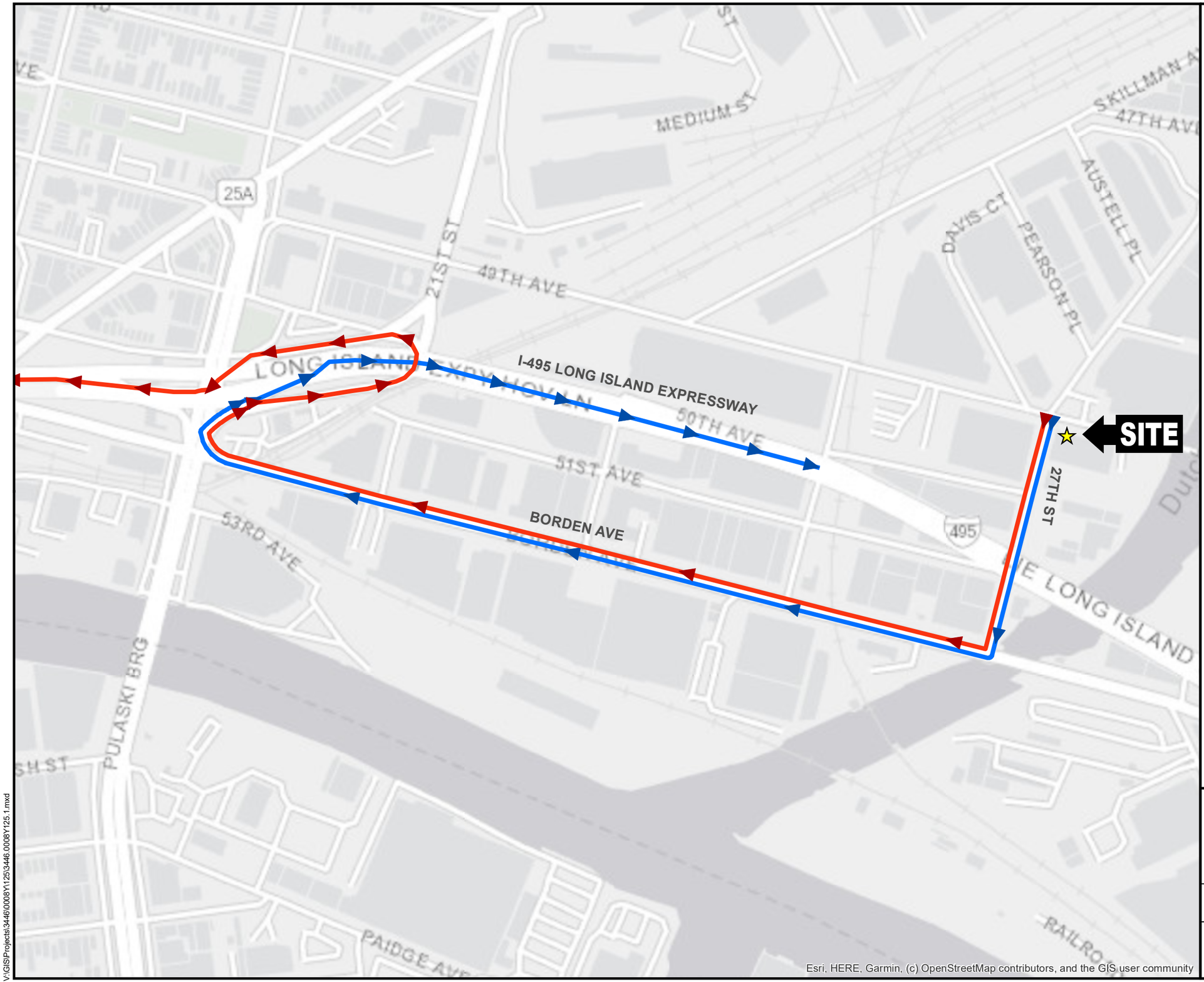
Table 2. Track 1/Track 4 Soil Cleanup Objectives

Parameter	Track 1 Soil Cleanup Objectives*	Track 4 Soil Cleanup Objectives**
Volatile Organic Compounds (Concentrations in mg/kg)		
1,1,1-Trichloroethane	0.68	500
1,1-Dichloroethane	0.27	240
1,1-Dichloroethene	0.33	500
1,2,4-Trimethylbenzene	3.6	190
1,3,5-Trimethylbenzene	8.4	190
1,2-Dichlorobenzene	1.1	500
1,2-Dichloroethane	0.02	30
1,3-Dichlorobenzene	2.4	280
1,4-Dichlorobenzene	1.8	130
2-Butanone (MEK)	0.12	500
Acetone	0.05	500
Benzene	0.06	44
n-Butylbenzene	12	500
Carbon tetrachloride	0.76	22
Chlorobenzene	1.1	500
Chloroform	0.37	350
cis-1,2-Dichloroethene	0.25	500
Ethylbenzene	1	390
Methylene chloride	0.05	500
MTBE	0.93	500
n-Propylbenzene	3.9	500
sec-Butylbenzene	11	500
tert-Butylbenzene	5.9	500
Tetrachloroethene	1.3	150
Toluene	0.7	500
trans-1,2-Dichloroethene	0.19	500
Trichloroethene	0.47	200
Vinyl chloride	0.02	13
Xylenes (total)	0.26	500
Semivolatile Organic Compounds (Concentrations in mg/kg)		
1,4-Dioxane	0.1	130
2-Methylphenol	0.33	500
3&4-Methylphenol	0.33	500
Acenaphthene	20	500
Acenaphthylene	100	500
Anthracene	100	500
Benzo[a]anthracene	1	5.6
Benzo[a]pyrene	1	1
Benzo[b]fluoranthene	1	5.6
Benzo[g,h,i]perylene	100	500
Benzo[k]fluoranthene	0.8	56
Chrysene	1	56
Dibenzo[a,h]anthracene	0.33	0.56
Dibenzofuran	7	350
Fluoranthene	100	500
Fluorene	30	500
Hexachlorobenzene	0.33	6
Indeno[1,2,3-cd]pyrene	0.5	5.6
Naphthalene	12	500
Pentachlorophenol	0.8	6.7

Table 2. Track 1/Track 4 Soil Cleanup Objectives

Parameter	Track 1 Soil Cleanup Objectives*	Track 4 Soil Cleanup Objectives**
Phenanthrene	100	500
Phenol	0.33	500
Pyrene	100	500
Metals (Concentrations in mg/kg)		
Arsenic	13	16
Barium	350	400
Beryllium	7.2	590
Cadmium	2.5	9.3
Chromium, Hexavalent	1	400
Chromium	30	1500
Copper	50	270
Cyanide, Total	27	27
Lead	63	1000
Manganese	1600	10000
Mercury	0.18	2.8
Nickel	30	310
Selenium	3.9	1500
Silver	2	1500
Zinc	109	10000
Pesticides (Concentrations in mg/kg)		
2,4,5-TP	3.8	500
4,4'-DDD	0.0033	92
4,4'-DDE	0.0033	62
4,4'-DDT	0.0033	47
Aldrin	0.005	0.068
alpha-BHC	0.02	3.4
alpha-Chlordane	0.094	24
beta-BHC	0.036	3
delta-BHC	0.04	500
Dieldrin	0.005	1.4
Endosulfan I	2.4	200
Endosulfan II	2.4	200
Endosulfan sulfate	2.4	200
Endrin	0.014	89
gamma-BHC (Lindane)	0.1	9.2
Heptachlor	0.042	15
Total Polychlorinated Biphenyls (Concentrations in mg/kg)		
Total Polychlorinated Biphenyls	0.1	1

* Soil cleanup objectives for the Track 1 remedy are the NYSDEC Part 375 Unrestricted Use SCOs.
** Soil cleanup objectives for the Track 4 remedy are the NYSDEC Part 375 Commercial Use SCOs.
mg/kg - Milligrams per kilogram (parts per million [ppm])
NYSDEC - New York State Department of Environmental Conservation
SCOs - Soil Cleanup Objectives



N

LEGEND

POINTS EAST

POINTS WEST

300 0 300'

Title:

TRUCK TRANSPORT ROUTE

27-10 49TH AVENUE
QUEENS, NEW YORK

Prepared for:

HUNTERS POINT SG, LLC

ROUX

Compiled by: S.S.	Date: 07/09/2025	FIGURE
Prepared by: M.S.R.	Scale: AS SHOWN	1
Project Mgr: D.K.	Project: 3446.0008Y000	
File: 3446.0008Y125.1.mxd		

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APPENDIX F

Health and Safety Plan and Community Air Monitoring Plan

Site-Specific Health and Safety Plan

27-10 49th Avenue
Long Island City, New York

June 19, 2023

Prepared for:

Hunters Point SG, LLC
10 W. Forest Avenue
Englewood, New Jersey 07631

Prepared by:

Roux Environmental Engineering and Geology, D.P.C.
209 Shafter Street
Islandia, New York 11749

3446.0008Y112/CV

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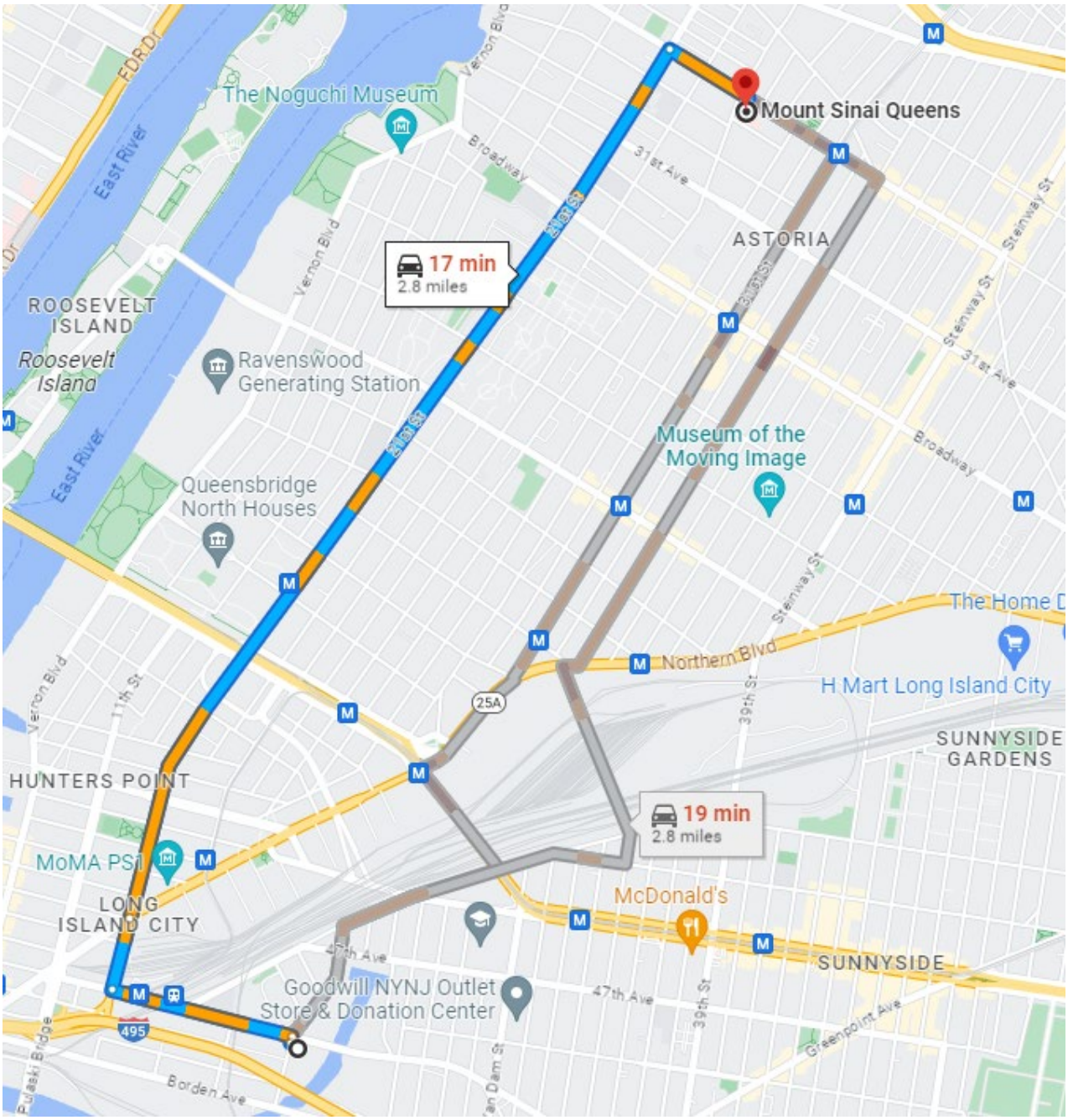
A. Job Safety Analysis (JSA) Forms
B. SDSs for Chemicals Used
C. COVID-19 Interim Health and Safety Guidance
D. Heat Illness Prevention Program
E. Personal Protective Equipment (PPE) Management Program
F. Subsurface Utility Clearance Management Program
G. Heavy Equipment Exclusion Zone Policy
H. Incident Investigation and Reporting Management Program
I. Fatigue Management Program
J. Silica Exposure Control Program
K. Ergonomics Management Program

Site-Specific Emergency Information

Emergency Phone Numbers

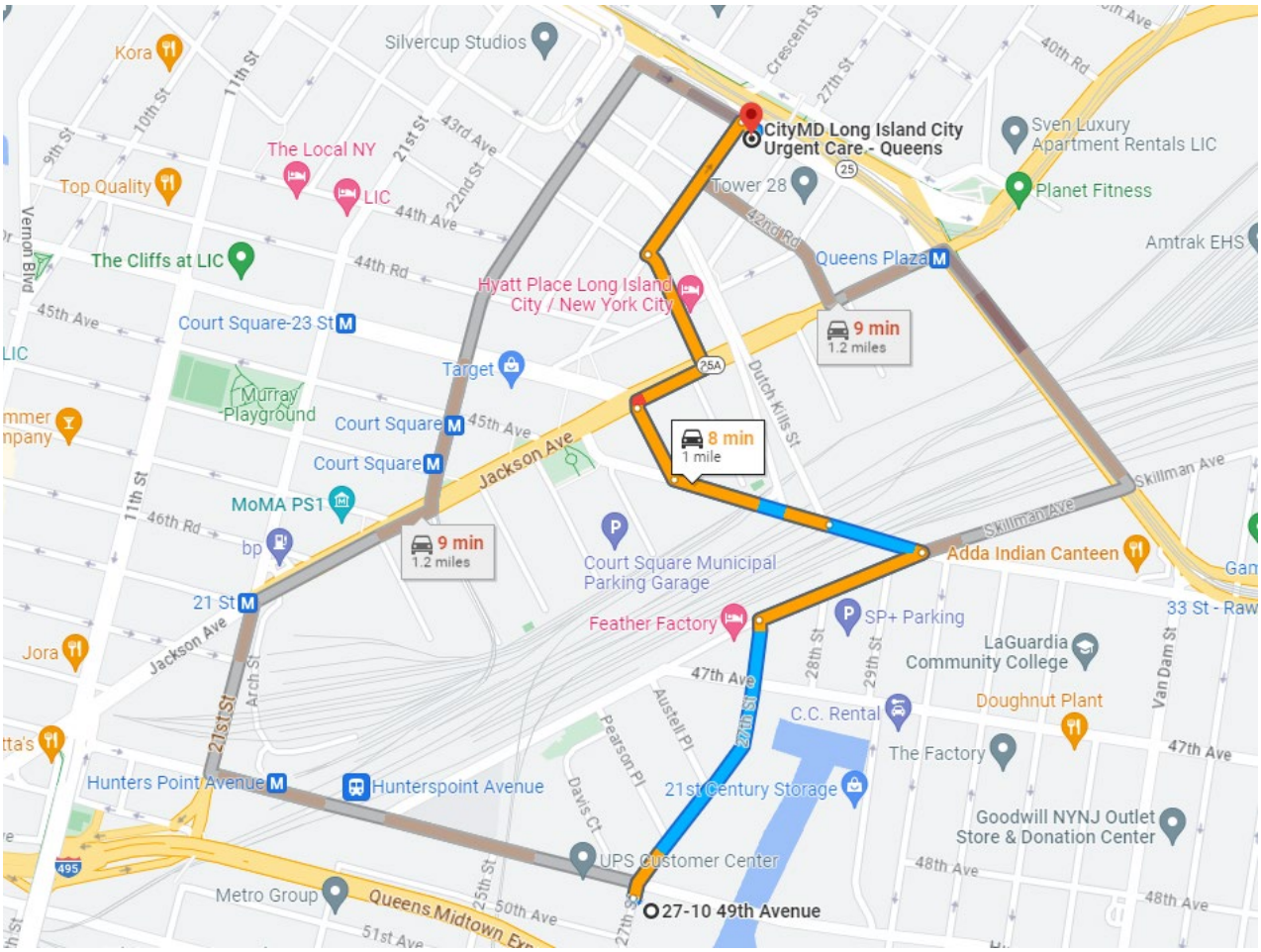
Most emergency services can be obtained by calling **911**. Where 911 service is not available, use the telephone numbers provided in the below table. The following is a master emergency phone list for use by the project management personnel. A more condensed version of the emergency numbers listed below will be posted throughout project work areas. Emergencies encountered on the site will be responded to by a combination of off-site emergency services and on-site personnel.

Emergency Contact Information			
Site Personnel			
Title	**Contact**		**Telephone**
Operations Manager (OM)	Jeff Wills		516-637-0213
Project Principal (PP)	Chris Proce		516-250-0356
Project Manager (PM)	David Kaiser		516-849-0562
Site Supervisor (SS)	TBD		
Site Health and Site Safety Officer (SHSO)	TBD		
Office Health and Safety Manager (OHSM)	Nevin Pahlad, CSP, CHMM		347-885-6930
Corporate Health and Safety Director (CHSD)	Brian Hobbs, CIH, CSP		631-807-0193
WorkCare, Inc. (Formally AllOne Health)	Occupational Health Care Management Provider		800-350-4511
Client Emergency Contact	Zach McHugh		561-302-7937
Outside Assistance			
Agency	**Contact**	**Telephone**	**Address/Location**
Ambulance/emergency medical services (EMS)	Mount Sinai Queens	(718) 932-1000	25-10 30th Ave Queens, NY 11102
Police	New York City Police Department	(718) 361-1021	4707 Pearson Place Queens, NY 11101
Fire	FDNY Engine 258/Ladder 115	(718) 999-2000	10-40 47th Ave Queens, NY 11101
Site Address	27-10 49th Avenue, Long Island City, New York 11101		



Route to Hospital: Mount Sinai Queens Hospital, 25-10 30th Ave, Queens, NY 11102:

- Head west on 49th Ave
- Turn right onto 21st St
- Continue straight to stay on 21st St
- Turn right onto 30th Ave
- Hospital will be on the right



Route to Urgent Care: CityMD Long Island City Urgent Care - Queens, 25-18 Queens Plaza S, Queens, NY 11101:

- Head west on 49th Ave
- Turn right onto 27th St
- Turn right onto Skillman Ave
- Turn left onto Thomson Ave
- Turn right onto 44th Dr
- Turn right onto Jackson Ave
- Turn left onto 43rd Ave
- Turn right at the 2nd cross street onto Crescent St
- Turn right onto Queens Plaza S
- Urgent Care will be on the right

1. Introduction

This Site-specific Health and Safety Plan (HASP) has been prepared by Roux Environmental Engineering and Geology, D.P.C. (Roux) for use during the pilot test and installation of a soil vapor extraction system (SVES), which will include drilling, limited soil excavation and disposal, asphalt and concrete demolition, piping installation, and blower installation to a portion of the Hunters Point SG (HP) building located at 27-10 49th Avenue, Long Island City, New York (Site; **Figure 1**). These activities fall within the scope of operations covered by the Occupational Safety and Health Administration (OSHA) standards promulgated at 29 CFR 1910.120 and 29 CFR 1926.65, both commonly referred to as the Hazardous Waste Operations and Emergency Response (HAZWOPER) Standard. In accordance with the HAZWOPER Standard, this Site-specific HASP was prepared to address the safety and health hazards associated with the installation of a SVES, soil sampling, vapor sampling, asphalt/concrete demolition, soil excavation and disposal activities being performed at the Site by Roux and to provide requirements and procedures for the protection of Roux employees, subcontractor personnel, government oversight personnel, Site personnel, and the general public. It also addresses client- and Site-specific requirements for health and safety. Additionally, subcontractors may be required to submit their own HASP as it relates to their specific work activities and will be kept onsite during such work.

Implementation of this HASP is the joint responsibility of the Project Manager (PM), the Site Health and Safety Officer (SHSO), and all field staff, with assistance from the Project Principal (PP), Office Health and Safety Manager (OHSM), and Corporate Health and Safety Director (CHSD). The PM for this project is David Kaiser. The Site Supervisor (SS) is TBD and Site Health and Safety Officer (SHSO) is TBD.

This HASP will be introduced to, reviewed, and signed off on by all Roux personnel through a formal training session prior to commencing work. A copy of the HASP will be kept at the Site at all times. The Roux SHSO or PM will be responsible for posting any changes, amendments, memos, etc. to the HASP. Any revisions to this HASP will be signed by appropriate personnel, which can include Roux's PP, CHSD, and SS. Any changes will be announced to all workers at the next safety meeting.

1.1 Roles and Responsibilities

Overall Roles and Responsibilities (R&Rs) of Roux personnel are provided in Roux's Policies and Procedures Manual. Only those R&Rs specific to HASP requirements are listed below.

Project Manager (PM)

The PM has responsibility and authority to direct all work operations. The PM coordinates safety and health functions with the Site Health and Safety Officer (SHSO), has the authority to oversee and monitor the performance of the SHSO, and bears ultimate responsibility for the proper implementation of this HASP. The specific duties of the PM are:

- Preparing and coordinating the Site work plan;
- Providing Site supervisor(s) with work assignments and overseeing their performance; Coordinating safety and health efforts with the SSHO;
- Ensuring effective emergency response through coordination with the Emergency Response Coordinator (ERC); and
- Serving as primary Site liaison with public agencies and officials and Site contractors.

Site Health and Safety Officer (SHSO)

The SHSO has the full responsibility and authority to develop and implement this HASP and to verify compliance. The SHSO reports to the Project Manager. The SHSO is on Site or readily accessible to the Site during all work operations and has the authority to halt Site work if unsafe conditions are detected. The specific responsibilities of the SHSO include:

- Managing the safety and health functions on this Site;
- Serving as the Site's point of contact for safety and health matters;
- Ensuring Site monitoring, worker training, and effective selection and use of PPE;
- Assessing Site conditions for unsafe acts and conditions and providing corrective action;
- Assisting the preparation and review of this HASP;
- Maintaining effective safety and health records as described in this HASP; and
- Coordinating with the SS and others as necessary for safety and health efforts.

Site Supervisor (SS)

The Site Supervisor (SS) is responsible for field operations and reports to the Project Manager (PM). The SS ensures the implementation of the HASP requirements and procedures in the field. The specific responsibilities of the Site Supervisor include:

- Executing the work plan and schedule as detailed by the PM;
- Coordination with the SHSO on safety and health; and
- Ensuring Site work compliance with the requirements of this HASP.

Employees

All Roux employees are responsible for reading and following all provisions of the Corporate Health and Safety Manual, including this HASP. Employees report to the SS at the project Site. Each employee is also responsible for the following:

- Wearing all appropriate PPE as outlined within this HASP;
- Attending all safety meetings;
- Inspecting tools and equipment prior to use, and taking any defective tools or equipment out of service;
- Appropriately documenting field events as they occur within a logbook or equivalent;
- Properly operating machinery and/or equipment only if trained to do so;
- Stopping work operations if unsafe conditions exist;
- Identifying and mitigating hazards when observed;
- Reporting all incidents and near misses to the Roux SHSO and SS immediately; and
- Knowing where emergency equipment is located (e.g., first aid kit, fire extinguisher).

Subcontractors and Visitors

Subcontractors and visitors are responsible for complying with the same health and safety requirements. It is the responsibility of all to make sure subcontractors and visitors comply and uphold the HASP. Subcontractors and visitors have the following additional responsibilities:

- Designating a qualified safety representative for the project that can make the necessary changes in work practices, as necessary;
- Attending all safety meetings while participating in Roux Site work activities;
- Reporting all incidents and near misses to Roux SHSO and SS immediately;
- Conducting initial and periodic equipment inspections in accordance with manufacturer and regulatory guidelines; and
- Providing copies of all Safety Data Sheets (SDS) to Roux SHSO for materials brought to the Site.

2. Background

Relevant background information is provided below, including a general description of the Site; a brief review of the Site's history with respect to hazardous material use, handling, and/or storage; and a review of known and potential releases of hazardous substances at the Site.

2.1 Site Description

The Site address is 27-10 49th Avenue in the Borough of Queens, City and State of New York. Additional information regarding the Site is provided in the tables below:

Property Location	
Property Name:	27-10 49th Avenue
Property Address:	27-10 49th Avenue
Property Town, County, State:	Long Island City, Queens County, New York
Property Tax Identification:	Tax Block 113, Lot 35
Nearest Intersections:	(Northwest) 27th Street and 49th Avenue (Southwest) 27th Street and 50th Avenue (Southeast) Dutch Kills (Northeast) Dutch Kills
Area Description:	The Site is located in an urban and developed area. The surrounding properties are currently used for a combination of commercial/industrial uses. The nearest residential properties are located 0.4 miles to the north.
Property Information	
Acreage:	0.87 acres
Shape:	Rectangular
Number of Buildings:	One
Number of Stories:	Two
Cellar/Slab-on-Grade:	Slab-on-Grade
Property Use:	The Site is developed with an industrial building with a parking lot located on the eastern side of the site. The first floor has historically been used as a warehouse for mixing, repackaging and distribution of petroleum products. The second floor was used for offices. The building is currently occupied by a ride share company, Lyft, and is used as an office space and as storage.

2.2 Site History

The Site was most recently used as a warehouse for mixing, repackaging and distribution of petroleum products. A limousine company utilized the second floor of the building as office space, with a small reception area on the first floor. Prior to these operations, the Site was used by courier companies for distribution.

2.3 Known and Potential Releases of Hazardous Substances at the Site

In November 2017, AESI conducted a Phase I Environmental Site Assessment (ESA) for the Site. AESI identified multiple recognized environmental conditions (RECs) based on the operations of the Site at the time and recommended additional investigation.

In October 2017, AESI conducted a Preliminary Remedial Investigation (PRI) at the Site. The PRI was conducted to evaluate potential impacts and to provide general characterization of the Site. A total of 56 soil samples, along with three (3) soil vapor samples, and four (4) ambient air samples were collected for chemical analysis. In addition, three (3) permanent monitoring wells were installed and a geophysical survey was completed as part of the PRI. Analytical results of the PRI identified the presence of elevated concentrations of tetrachloroethene (PCE) in soil gas and the presence of elevated concentrations of other VOCs in soil in the vicinity of the eastern floor drain. Based on the results of the investigation, AESI recommended that additional investigation activities be performed at the Site.

In order to confirm that PCE contamination identified during previous investigation activities was not migrating off-Site towards the Dutch Kills, AESI conducted a Supplemental Remedial Investigation (SRI). The SRI activities were conducted to delineate soil, groundwater, and soil vapor conditions at the Site. Based on the results of the SRI, Hunters Point SG, LLC applied to enter into the BCP as a volunteer in September 2018.

Due to the proximity of the Site to Dutch Kills and Newton Creek, the NYSDEC requested additional investigation activities to supplement existing data to define the nature and extent of contamination more fully in soil, groundwater, and soil vapor identified at the Site. As required by the NYSDEC, a Remedial Investigation Work Plan (RIWP) was prepared by AESI in July 2018 and was approved by the NYSDEC in August 2018. Subsequent to the RIWP approval, the Site was accepted into the BCP in September 2018 (as Site number C241219).

Upon being accepted as a Volunteer into the BCP, remedial investigation activities (outlined in the approved RIWP) were implemented to investigate and characterize the extent of environmental impacts on the Site, as well as to define chemical constituent migration pathways and evaluate the potential feasibility of planned remedial actions for the Site.

Remedial investigation activities included the installation of 23 soil borings, seven (7) permanent monitoring wells, 60 sub-slab soil gas screening points and eight (8) confirmation soil gas sample points. Based on the remedial investigation data, it was concluded that the nature of contamination present in groundwater was consistent with the historic fill materials used during development of the Site. It was also concluded that PCE contamination, previously identified in soil at the Site above Track 4 commercial soil cleanup objectives (SCOs), was fully delineated. In addition to the elevated PCE contamination, there was also petroleum-related contamination identified primarily in the vicinity of the oil/water separator within the Site building. Soil gas results identified high levels of PCE along the northern property boundary, with concentrations decreasing across the property towards the south and east.

In January 2019 AESI submitted an IRM Work Plan to NYSDEC, which was approved in March 2019.

3. Scope of Work

The current scope of work for the Site is oversight of the following tasks: pilot test and installation of a SVES, which will include drilling, limited soil excavation and disposal, asphalt and concrete demolition, piping installation, and blower installation to a portion of the building.

Non-routine activities will not be performed by Roux personnel.

If there are any changes with the scope, a revision of the HASP will be required to address any new hazards.

4. Site Control

This Site control program is designed to reduce the spread of hazardous substances from contaminated areas to clean areas, to identify and isolate contaminated areas of the Site, to facilitate emergency evacuation and medical care, to prevent unauthorized entry to the Site, and to deter vandalism and theft.

4.1 Site Map

A map of this Site, showing Site boundaries, designated work zones, and points of entry and exit is provided in **Figure 2**.

4.2 Site Access

Access to the work areas at the Site is restricted to reduce the potential for exposure to its safety and health hazards. During hours of Site operation, Site entry and exit is authorized only at the points identified in **Figure 2**. Entry and exit at these points is controlled by a fenced parking lot with an electric gate at the north side of the Site on 49th Avenue. When the Site is not operating, access to the Site will be coordinated with the Site contact, as needed.

4.3 Buddy System

This section is not applicable for all components of the SOW described in Section 3. Some Site inspections, SVES installation oversight and sampling are completed by a single Roux employee. However, when completing these tasks, the single Roux employee is accompanied either by Roux subcontractors or the Site caretaker/other representatives from HP. Any time Roux is on-site, HP is made aware and communications with HP and the Roux PM is maintained via cellular phone.

While working in the Exclusion Zone, Site workers use the buddy system. The buddy system means that personnel work in pairs and stay in close visual contact to be able to observe one another and summon rapid assistance in case of an emergency. The responsibilities of workers using the buddy system include:

- Remaining in close visual contact with partner;
- Providing partner with assistance as needed or requested;
- Observing partner for signs of heat stress, chemical overexposure or other difficulties;
- Periodically checking the integrity of partner's PPE; and
- Notifying the SS or other Site personnel if emergency assistance is needed.

4.4 Site Communications

The following communication equipment is used to support on-site communication: cell phone and visual hand signals.

As applicable, hand signals will be used according to the following:

Hand Signals

SIGNAL	MEANING
Hand gripping throat	Out of air, can't breathe
Grip partner's wrist	Leave area immediately
Hands on top of head	Need assistance
Thumbs up	I'm all right, okay
Thumbs down	No, negative

A current list of emergency contact numbers is included in the Site-Specific Emergency Information at the beginning of this HASP.

4.5 Site Work Zones

This Site is divided into three (3) major zones, described below. These zones are characterized by the likely presence or absence of biological, chemical, or physical hazards and the activities performed within them. Zone boundaries are clearly marked at all times and the flow of personnel among the zones is controlled. The Site is monitored for changing conditions that may warrant adjustment of zone boundaries. Zone boundaries are adjusted as necessary to protect personnel and clean areas. Whenever boundaries are adjusted, zone markings are also changed and workers are immediately notified of the change.

Exclusion Zone

The area where contamination exists is the Exclusion Zone (EZ). All areas where excavation and handling of contaminated materials take place are considered part of the EZ. This zone will be clearly delineated by chain link fencing, caution tape, cones or other effective barriers, as necessary. Safety tape may be used as a secondary delineation within the EZ. The zone delineation markings may be opened in areas for varying lengths of time to accommodate equipment operation or specific construction activities. The SHSO may establish more than one EZ where different levels of protection may be employed or where different hazards exist. Personnel are not allowed in the EZ without:

- A buddy (co-worker);
- Required minimum level PPE;
- Medical authorization;
- Training certification; and
- Requirement to be in the zone.

Contamination Reduction Zone

A Contamination Reduction Zone (CRZ) is established between the exclusion zone and the support zone. The CRZ contains the Contamination Reduction Corridor (CRC) and provides an area for decontamination

of personnel and equipment. The CRZ will be used for general Site entry and egress in addition to access for heavy equipment and emergency support services. Personnel are not allowed in the CRZ without:

- A buddy (co-worker);
- Appropriate PPE;
- Medical authorization;
- Training certification; and
- Requirement to be in the zone.

Support Zone

The Support Zone (SZ) is an uncontaminated area that will be the field support area for the Site operations. If required, the SZ will be determined before the start of work. Appropriate sanitary facilities and safety equipment will be located in this zone. Potentially contaminated personnel or materials are not allowed in this zone. The only exception will be appropriately packaged/decontaminated and labeled samples.

5. Job Hazard Evaluation

Roux's work at the Site is expected to entail a variety of physical, chemical, and biological hazards, all of which must be sufficiently managed to allow the work to be performed safely. Some of the hazards are Site-specific (i.e., they are associated with the nature, physical characteristics, and/or routine operation of the Site itself), while others are activity-specific (i.e., they are associated with [or arise from] the particular activity being performed). The various hazards can be grouped into the following categories:

- **Caught/Crushed** – the potential to become caught in, under, between, or by an object or parts of an object, such as equipment with parts that open and close or move up and down ("pinch points") or equipment that rotates, and the accompanying potential to have body parts cut, mangled, or crushed thereby.
- **Contact** – the potential to be struck by or against moving or stationary objects that can cause physical injury, such as heavy machinery, overhead piping, moving vehicles, falling objects, and equipment (including tools and hand-held equipment) or infrastructure with the ability to cut or impale.
- **Energy Sources** – the potential for bodily harm associated with energy sources, most notably electricity, but also including latent energy sources such as compressed air and equipment under tension (which when released could cause injurious contact or a fall).
- **Ergonomics** – the potential for musculoskeletal injury associated with lifting/carrying, pushing/pulling, bending, reaching, and other physical activity attributable to poor body position/mechanics, repetitive motion, and/or vibration.
- **Exposure** – the potential for injury/illness due to physical, chemical, or biological exposures in the work environment, including, but not limited to, temperature extremes, solar radiation, and noise (physical), chemical splashes and hazardous atmospheres (chemical), and animal/insect bites and poisonous plants (biological).
- **Falls** – the potential to slip or trip and thus fall or drop a load, resulting in bodily injury to oneself or others.

The foregoing is intended to provide Roux employees with a general awareness of the hazards involved with Site work. A more detailed review of the potential hazards associated with each specific activity planned for the Site (or on-going activity, as the case may be) is provided in the activity-specific Job Safety Analysis (JSA) forms in **Appendix A**. As can be seen in the JSA forms, the hazards are identified by category per the above, and specific measures designed to mitigate/manage those hazards are also identified. In preparing the JSA forms, all categories of hazards were considered, and all anticipated potential hazards were identified to the extent possible based on the experience of the personnel preparing and reviewing the JSA forms. However, there is always the possibility for an unanticipated hazard to arise, potentially as condition change over the course of the workday. Roux personnel must maintain a continual awareness of potential hazards in the work zone, regardless of whether the hazard is identified in the JSA form. Particular attention should be paid to hazards associated with exposure to hazardous substances (see **Table 1** for a listing of the hazardous substances most likely to be encountered in environmental media at the Site) and to Site personnel being located "in the line of fire" with respect to moving equipment, pinch points, and latent energy (e.g., being located or having body parts located within the swing radius of an excavator, between two sections of pipe being connected, below a piece of suspended equipment, or adjacent to a compressed air line).

5.1 Hazard Communication and Overall Site Information Program

The information in the JSAs and SDSs is made available to all employees and subcontractors who could be affected by it prior to the time they begin their work activities.

Modifications to JSAs are communicated during routine pre-work briefings, and periodically updated as needed in the HASP. SDSs will be maintained by the SHSO/SS for new chemicals brought on-site as needed. Copies of SDSs can be found in **Appendix B**.

5.2 Noise

Noise is associated with the operation of heavy equipment, power tools, pumps, and generators. Noise is also a potential hazard when working near operating equipment such as excavators, drill rigs or pole drivers. High noise (i.e., < 85 dBA) operations may be evaluated by the SHSO utilizing a type 2 handheld sound level meter (SLM) operating on the "A"-weighted scale with slow response because this scale most closely resembles human response to noise and complies with OSHA 29 CFR 1910.95. Hearing protection is required in areas with noise exposure greater than 85 dBA. Double hearing protection (ear plugs and earmuffs) should be donned in areas where the noise exposure is more than 95 dBA. Noise exposure will be controlled by hearing protection as described above or by maintaining set-backs from high-noise equipment, as warranted. Personnel handling heavy equipment and using power tools that produce noise levels exceeding those described levels above are required by OSHA 29 CFR 1910.95 to wear the appropriate Noise Reduction Rating (NRR) level of hearing protection. Appropriate hearing protection will be evaluated by the SHSO as necessary in consultation with the OHSM and CHSD.

5.3 Slip, Trip, and Fall Hazards

Slip, trip, and fall hazards may include, but are not limited to, general slip and trip hazards associated with uneven ground, possible debris, wet grass, and equipment. Prior to work, walking paths will be assessed for solid footings, any ground penetrations that may cause a tripping hazard will be appropriately marked, and other areas will be noted and discussed with the field team.

Personnel shall be aware of their surroundings and footings at all time, and all accommodations should be made for proper housekeeping and organized equipment placement at the Site, where possible, to help prevent any slip, trip, and fall-related incidents. All tools and materials should be appropriately stored when not in use and placed in appropriate storage containers.

5.4 Biological Hazards

Biological hazards that may potentially be present at a Site, include poisonous plants, insects (ticks, spiders, bees), animals (snakes, dogs), etc. Information on biological hazards can be found within Roux's Biological Hazard Awareness Management Program located within Roux's Corporate Health and Safety Manual. There is also potential for transmission and/or exposure to SARS-CoV-2, the virus that causes COVID-19. Prior to beginning work, on-Site protocols shall be established by the project team, including subcontractors, in accordance with federal, state, county, city, and/or other guidance, as applicable and consistent with Roux's COVID-19 Interim Health and Safety Guidance which can be found in **Appendix C**.

6. Emergency Response Plan

This emergency response plan details actions to be taken in the event of Site emergencies. The PM and SHSO is responsible for the implementation of emergency response procedures onsite. The SHSO/PM provides specific direction for emergency action based upon information available regarding the incident and response capabilities and initiates emergency procedures and notification of appropriate authorities. In the event of an emergency, Site personnel are evacuated and do not participate in emergency response activities, response is facilitated through external emergency services.

6.1 Emergency Response

The SHSO, after investigating the incident and relevant information, shall determine the level of response required for containment, rescue and medical care. Limited on-site emergency response activities could occur therefore the SHSO is responsible for notifying external emergency response agencies. The SHSO provides relevant information to the responding organizations, including, but not limited to, the hazards associated with the emergency incident, potential containment problems, and missing Site personnel.

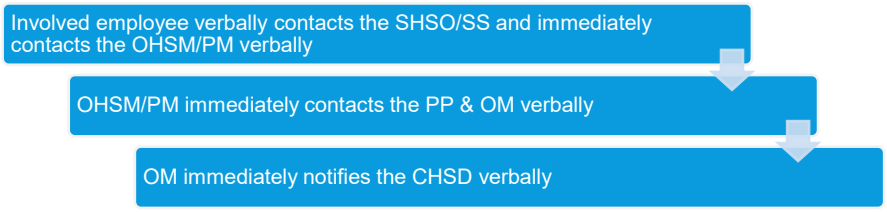
6.2 Emergency Alerting and Evacuation

If evacuation notice is given, Site workers leave the worksite, if possible, by way of the nearest exit. Appropriate primary and alternate evacuation routes and assembly areas have been identified and are shown on the Site Plan with Emergency Muster Area (**Figure 2**). The routes and assembly area will be determined by conditions at the time of the evacuation based on wind direction, the location of the hazard source, and other factors as determined by SHSO/PM.

Personnel exiting the Site gather at a designated assembly point. To determine that everyone has successfully exited the Site, personnel will be accounted for at the assembly point. If any worker cannot be accounted for, notification is given to the SHSO, PM, and any arriving response authorities so that appropriate action can be initiated. Subcontractors on this Site have coordinated their emergency response plans to ensure that these plans are compatible and potential emergencies are recognized, alarm systems are clearly understood, and evacuation routes are accessible to all personnel relying upon them.

6.3 Emergency Medical Treatment and First Aid

In the event of a work-related injury or illness, employees are required to follow the procedures outlined below. All work-place injury and illness situations require Roux's Project and Corporate Management Team to be notified when an injury/illness incident occurs, and communication with the contracted Occupational Health Care Management Provider, WorkCare, Inc. (Formally AllOne Health), is initiated, as necessary. The Injury/Illness Notification Flowchart is provided below and within Roux's Incident Investigation and Reporting program included within Roux's Corporate Health and Safety Manual.



If on-Site personnel require any medical treatment, the following steps will be taken:

a. Notify Roux's Project and Corporate Management Team for any work-related injury and/or illness occurrence, and communicate with the contracted Occupational Health Care Management Provider, WorkCare, immediately following the notifications provided above.

b. Based on discussions with the Project Team, Corporate Management and the WorkCare evaluation, if medical attention beyond onsite first aid is warranted, transport the injured / ill person (IP) to the Urgent Care Center, or notify the Fire Department or Ambulance Emergency service and request an ambulance or transport the victim to the hospital, and continue communications with Corporate Management Team. An Urgent Care/Hospital Route map with location to CityMD Long Island City Urgent Care/ Mount Sinai Queens Hospital is included as **Figure 3**.

c. Decontaminate to the extent possible prior to administration of first aid or movement to medical or emergency facilities.

d. First aid medical support will be provided by onsite personnel trained and certified in First Aid, Cardio Pulmonary Resuscitation (CPR), Automatic External Defibrillation (AED), and Blood-Borne Pathogens (BBP) Awareness, until relieved by emergency medical services (EMS).

e. The SHSO and PM will perform a Loss Investigation (LI) and the Project Team will complete the final Loss Report. If a Roux employee is involved in a vehicular incident, the employee must also complete the Acord Automobile Loss Notice.

7. Environmental Conditions and Response

7.1 Adverse Weather Conditions

In the event of adverse weather conditions, the SHSO or project principal will determine if work can continue without jeopardizing the health and safety of field workers. Some of the items related to adverse weather conditions to be considered prior to determining if work should continue include:

- Potential for heat stress and heat-related injuries;
- Potential for cold stress and cold-related injuries;
- Treacherous weather-related conditions. If wind speed is greater than 15 mph averaged over a 15-minute period or wind gusts over 25 mph, earthmoving operations will be ceased
- Limited visibility; and
- Electrical storm potential.

Site activities will be limited to daylight hours and acceptable weather conditions. Inclement working conditions may include heavy rain, fog, high winds, and lightning. The SHSO and/or PM shall observe daily weather reports and evacuate, if necessary, in case of inclement weather conditions.

7.2 Electrical Storm Guidelines

In the event that lightning and/or thunder are observed while working onsite, all onsite activities shall stop and personnel shall seek proper shelter (e.g., substantial building, enclosed vehicle, etc.). Work shall not resume until the threat of lighting has subsided and no lightning or thunder has been observed for 30 minutes. If the possibility of lightning is forecast for the day, advise the onsite personnel on the risks and proper procedure at the pre-work safety briefing. Continuously monitor for changing weather conditions and allow enough time to properly stop work if lightning is forecast.

7.3 Environmental Stressors, Heat Stress, Heat Exhaustion, and Heat Stroke

It is the employer's responsibility to monitor weather forecasts and ambient air temperatures, both prior to the work shift and during the shift. The National Oceanic and Atmospheric Administration records average minimum/maximum temperatures of 31-84 degrees Fahrenheit during the year in Queens, New York.

To prevent potential heat illness, the following strategies will be implemented:

- Adjusting personnel work/rest intervals;
- Monitoring for symptoms of heat illness;
- Providing shaded rest areas;
- Providing cool potable water so that each employee has access to at least one quart per hour for the entire shift, free of charge;
- Allowing for employees to acclimatize to the weather conditions and work demands;
- Observe workers during a heat wave (i.e., when the temperature is at least 80°F, and 10 degrees hotter than the average temperature of the five preceding days); and

- Implementing high heat procedures when the temperature reaches 95°F.

Roux's Heat Illness Prevention Plan is implemented when the ambient temperatures exceed 80°F. Roux's Heat Illness Prevention Program can be found within **Appendix D**. Additional information regarding heat illnesses is provided below. This can include, but is not limited to, access to shade that is sufficient in size to fit all workers who are on break; a car with air conditioning is acceptable, too. Preventative cool-down breaks shall be allowed at any time, and anyone taking such a break will be monitored for heat illness symptoms and not required to return to work until all symptoms (if present) of heat illness have disappeared. If necessary, first aid will be offered, but if symptoms are severe, emergency response procedures will be implemented per Section 6.3. Anyone who has shown symptoms of severe heat illness will not be sent home without being offered first aid or medical treatment.

High heat procedures must be implemented when temperatures reach 95°F. These procedures include:

- Ensuring that effective communication by voice, observation, or electronic means is maintained so that employees at the work site can contact a supervisor when necessary. An electronic device, such as a cell phone or text messaging device, may be used for this purpose only if the reception in the area is reliable.
- Observing employees for alertness and signs or symptoms of heat illness. The employer shall ensure effective employee observation/monitoring by implementing one or more of the following:
  - Supervisor or designee observation of 20 or fewer employees;
  - Mandatory buddy system; and
  - Regular communication with sole employee such as by radio or cellular phone, or other effective means of observation.
- Designating one or more employees on each worksite as authorized to call for emergency medical services and allowing other employees to call for emergency services when no designated employee is available.
- Encouraging employees throughout the work shift to drink plenty of water.
- A review of the high heat procedures during the daily tailgate meeting and remind employees of their right to take a cool-down rest when necessary.

7.3.1 Heat Stress

Heat stress is the body's response to excessive heat and can be a significant potential hazard. The risk of heat stress can be increased with heavy physical activity and/or the use of personal protective equipment in hot, humid weather environments. There are also personal risk factors that can contribute to the risk of suffering from heat stress, such as obesity, water intake, alcohol and caffeine consumption, pregnancy, age, medication, etc. Heat illness includes heat cramps, heat exhaustion, heat syncope, and heat stroke.

7.3.2 Heat Cramps

Heat cramps may be brought on by prolonged exposure to heat. As an individual sweats, water and salts are lost by the body resulting in painful muscle cramps, typically in the legs.

First aid treatment includes, but is not limited to, shade, rest, and fluid replacement. Typically, the individual should recover within one-half hour while being monitored constantly. If the individual has not improved substantially within 30 minutes and the body temperature has not decreased, the individual should be transported to a hospital for medical attention.

Per Roux's Heat Illness Prevention Plan, employees shall have access to potable drinking water that is fresh, pure, suitably cool, free of charge and in sufficient quantities. Access to shade shall be present when temperatures exceed 80 degrees Fahrenheit and shall be available when temperatures do not exceed 80 degrees Fahrenheit.

7.3.3 Heat Exhaustion

Heat exhaustion may occur in an individual who has been exposed to excessive heat while working or exercising. The circulatory system of the individual fails as blood collects near the skin to rid the body of excess heat through transference. The signs and symptoms of heat exhaustion are as follows:

- Rapid and shallow breathing;
- Weak pulse;
- Cold and clammy skin with heavy perspiration;
- Skin appears pale;
- Fatigue and weakness;
- Dizziness; and
- Elevated body temperature.

First aid treatment includes, but is not limited to, cooling the victim, elevating the feet, and replacing fluids.

If the individual is not substantially improved within 30 minutes and the body temperature has not decreased, the individual should be transported to the hospital for medical attention.

7.3.4 Heat Stroke

Heat stroke occurs when an individual is exposed to excessive heat and stops sweating. This condition is classified as a MEDICAL EMERGENCY requiring immediate cooling of the victim and transport to a medical facility. The signs and symptoms of heat stroke are as follows:

- Dry, hot, red skin;
- Body temperature approaching or above 105^{o}F;
- Confusion, altered mental state, slurred speech;
- Seizures;
- Large (dilated) pupils; and
- Loss of consciousness – the individual may go into a coma.

First aid treatment requires immediate cooling and transportation to a medical facility. Heat stress is a significant hazard if any type of protective equipment (semi-permeable or impermeable) that prevents evaporative cooling when worn in hot weather environments.

7.4 Cold Stress

Cold stress is a danger at low temperatures and when the wind-chill factor is low. Prevention of cold-related illnesses is a function of whole-body protection. Adequate insulating clothing must be used when the air temperature is below 60°F. A work/rest regimen will be initiated when ambient temperatures and protective

clothing cause a stressful situation. In addition, reduced work periods followed by rest in a warm area may be necessary in extreme conditions. The signs and symptoms of cold stress include the following:

- Severe shivering;
- Abnormal behavior;
- Slowing;
- Weakness;
- Stumbling or repeated falling;
- Inability to walk;
- Collapse; and/or
- Unconsciousness.

First aid requires removing the victim from the cold environment and seeking medical attention immediately. Also, prevent further body heat loss by covering the victim lightly with blankets. Do not cover the victim's face. If the victim is still conscious, administer hot drinks and encourage activity such as walking, wrapped in a blanket.

8. Safety Procedures

This section of the HASP presents the specific safety procedures to be implemented during Roux's activities at the Site in order to protect the health and safety of various on-site personnel. Minimum OSHA-mandated procedures are presented first, followed by client- and Site-specific procedures. Lastly, activity-specific procedures are discussed. These Site and activity-specific procedures supplement the general safety procedures included in Roux's Corporate Health and Safety Manual, which also must be followed in their entirely.

8.1 Training

At a minimum, Site personnel who will perform work in areas where there exists the potential for toxic exposure will be health and safety-trained prior to performing work onsite per OSHA 29 CFR 1910.120(e) and 29 CFR 1926.65(e). More specifically, all Roux, subcontractor, and other personnel engaged in sampling and remedial activities at the Site and who are exposed or potentially exposed to hazardous substances, health hazards, or safety hazards must have received at a minimum the 40 hour initial HAZWOPER training consistent with the requirements of 29CFR 1910.120(e)(3)(i) training and a minimum of 3 days' actual field experience under the direct supervision of a trained experienced supervisor, plus 8 hours of refresher training on an annual basis. Depending on tasks performed, less training may be permitted. Evidence of such training must be maintained at the Site at all times. Furthermore, all on-Site management and supervisory personnel directly responsible for or who supervise the employees engaged in Site remedial operations, must have received an additional 8 hours of specialized training at the time of job assignment on topics including, but not limited to, the employer's safety and health program and the associated employee training program, personal protective equipment program, spill containment program, and health hazard monitoring procedure and techniques, plus 8 hours of refresher training on an annual basis. Additionally, all workers who will be required to don a respirator will be properly trained on their employer's Respiratory Protection Program, which also includes being medically cleared to wear a respirator and passed a fit test, at least initially prior to use, and then annually thereafter in accordance with 29 CFR 1910.134, Respiratory Protection.

Roux personnel training records are maintained in a corporate database with records available upon request from either the OHSM/SHSO/CHSD or Human Resources Department.

8.2 Site-Specific Safety Briefings for Visitors

A site-specific briefing is provided to all site visitors who enter this site beyond the site entry point. For visitors, the site-specific briefing provides information about site hazards, the site lay-out including work zones and places of refuge, the emergency alarm system and emergency evacuation procedures, and other pertinent safety and health requirements as appropriate.

8.3 HASP Information and Site-Specific Briefings for Workers

Site personnel review this HASP and are provided a Site-specific tailgate briefing prior to the commencement of work to ensure employees are familiar with this HASP and the information and requirements it contains, as well as the relevant JSAs included in **Appendix A**. Additional briefings are provided as necessary to notify employees of any changes to this HASP as a result of information gathered during on-going Site characterization and analysis of changing conditions. Conditions for which we schedule additional briefings

include, but are not limited to: changes in site conditions, changes in the work schedule/plan, newly discovered hazards, and incidents occurring during Site work.

8.4 Medical Surveillance

The medical surveillance section of the Health and Safety Plan describes how worker health status is monitored at this site. Medical surveillance is used when there is the potential for worker exposure to hazardous substance at levels above OSHA Permissible Exposure Limits (PEL) or other published limits. The purpose of a medical surveillance program is to medically monitor worker health to ensure that personnel are not adversely affected by site hazards. The provisions for medical surveillance at this site are based on the site characterization and job hazard analysis found in Section 4 of this HASP and are consistent with OSHA requirements in 29 CFR 1910.120(f) as applicable.

8.4.1 Site Medical Surveillance Program

Medical surveillance requirements are based on a worker's potential for exposure as determined by the site characterization and job hazard analysis documented in Section 4 and JSAs within **Appendix A** of this HASP and in compliance with the requirements of 29 CFR 1910.120(f)(2). Based on site information and use of direct reading instruments, limited use of respirators (less than 30 days per year), and the absence of an employee-staffed HAZMAT team, a limited medical surveillance program is required and implemented at this site. The medical surveillance program provides that:

1. Workers assigned to tasks requiring the use of respirators receive medical examinations in accordance with 29 CFR 1910.134(e) to ensure they are physically capable to perform the work and use the equipment, and
2. If a worker is injured, becomes ill, or develops signs or symptoms of possible over-exposure to hazardous substance or health hazards, medical examinations are provided to that worker as soon as possible after the occurrence and as required by the attending physician.
3. These medical examinations and procedures are performed by or under the supervision of a licensed physician and are provided to workers free of cost, without loss of pay, and at a reasonable time and place. In addition, the need to implement a more comprehensive medical surveillance program will be re-evaluated after any apparent over-exposure.

8.4.2 Medical Recordkeeping Procedures

Medical recordkeeping procedures are consistent with the requirements of 29 CFR 1910.1020 and are described in the company's overall safety and health program. A copy of that program is available at our Islandia, New York office.

The following items are maintained in worker medical records:

- Respirator fit test and selection;
- Physician's medical opinion of fitness for duty (pre-placement, periodic, termination);
- Physician's medical opinion of fitness for respirator protection (pre-placement, periodic); and
- Exposure monitoring results.

8.4.3 Program Review

The medical program is reviewed to ensure its effectiveness. The Corporate Health and Safety Manager in coordination with the Human Resources Director is responsible for this review. At minimum, this review consists of:

- Review of accident and injury records and medical records to determine whether the causes of accidents and illness were promptly investigated and whether corrective measures were taken wherever possible;
- Evaluation of the appropriateness of required medical tests based on site exposures; and
- Review of emergency treatment procedures and emergency contacts list to ensure they were site-specific, effective, and current.

8.5 Personnel Protection

Site safety and health hazards are eliminated or reduced to the greatest extent possible through engineering controls and work practices. Where hazards are still present, a combination of engineering controls, work practices and PPE are used to protect employees. Appropriate personal protective equipment (PPE) shall be worn by Site personnel when there is a potential exposure to chemical, biological or physical hazards (e.g., falling objects, flying particles, sharp edges, electricity, and noise), as determined by the SHSO. The level of personal protection, type and kind of equipment selected will depend on the hazardous conditions and in some cases cost, availability, compatibility with other equipment, and performance. An accurate assessment of all these factors will be made before work can be safely executed.

Roux maintains a comprehensive written PPE program that addresses proper PPE selection, use, maintenance, storage, fit and inspection. Roux's PPE program can be found within **Appendix E**. PPE to be used at the Site will meet the appropriate American National Standards Institute (ANSI) standards and the following OSHA (General/Construction Industry) standards for minimum PPE requirements.

The minimum level of PPE for entry onto the Site is Level D. The following equipment shall be worn:

- Work uniform (long pants, sleeved shirt);
- Hard hat;
- Steel or composite toe work boots (must comply with American Society for Testing and Materials [ASTM]) F 2412-05, Standard Test Methods for Foot Protection and ASTM F 2413-05, Standard Specification for Performance Requirements for Foot Protection);
- Safety Glasses (must comply with one of the following ANSI/ISEA Z87.1-2010, ANSI Z87.1-2003, ANSI Z87.1-2003);
- Boot Covers (as needed);
- Hearing protection (as needed);
- High visibility clothing (shirt/vest); and
- Hand protection (e.g., minimum cut resistance meeting ANSI 105-2000 Level 2).

Note that jewelry shall be removed or appropriately secured to prevent it from becoming caught in rotating equipment or unexpectedly snagged on a fixed object (e.g., wrist watches, bracelets, rings, chains and necklaces, open earrings). Do not wear loose clothing and all shoulder-length hair should be tied back.

Site specific PPE ensembles and materials are identified within task specific JSAs located within **Appendix A**, and any upgrades or downgrades of the level of protection (i.e., not specified in the JSA) must be approved by the PP and immediately communicated to all Roux personnel and subcontractors as applicable. PPE is used in accordance with manufacturer's recommendations.

8.5.1 Hearing Conservation

Hearing protection is made available when noise exposures equal or exceed an 8-hour time-weighted average sound level of 85 dBA. Hearing protection is required when the 8-hour time weighted average sound level $\geq$ 85 dBA, or when noise levels exceed 140 dBA at any point or exceeds 115 dBA for at least 15 minutes. Where noise exposure meets or exceeds this level, noise is listed as a physical hazard in the JSA for the tasks/operation, and hearing protection is included as one of the control measures (PPE).

8.6 Monitoring

An air monitoring program is important to the safety of on- and off-Site personnel, and the surrounding area. A preliminary survey, to establish background conditions in the immediate sampling area, may be made prior to the initiation of Site work including, but not limited to, monitoring wind direction (e.g., wind socks) and approximate temperature during all invasive Site activities. This survey will be conducted with the appropriate pre-calibrated air monitoring instrument(s), as warranted by the field activity. Once this survey has been complete, any changes in the type of PPE will be determined and relayed to those working on-Site.

Work zone air monitoring will be performed to verify that the proper level of PPE is used, and to determine if increased protection or work stoppage is required. The following equipment shall be used to monitor conditions:

- A Photoionization Detector (PID) with a lamp energy of 10.6 eV will be used to provide direct readings of organic vapor concentrations during intrusive activities to determine that personnel protection is adequate. Concentrations shall be recorded during intrusive activities with the potential to encounter contaminant vapors.
- A pre-calibrated multi-gas meter with combustible Lower Explosive Limit (LEL), oxygen (O2), carbon monoxide (CO), and hydrogen sulfide (H2S) sensors shall be used to monitor the potential for oxygen-deficient atmospheres, explosive concentrations of organic vapors, and toxic gases during intrusive operations. The calibration for this device will be performed using a known gas composition calibration mixture.

Personal exposure monitoring utilizing activated charcoal tubes may be considered based on whether or not the area sample results are at or above half of the PEL. The decision to perform the monitoring will be made by, and under the control of, the CHSD.

Below are monitoring action levels for Site-specific chemicals of concern. In the event PID readings above the thresholds identified below are sustained for 5 minutes in the breathing zone, worker protection will require upgrading following notification to the OHSM and applicable parties.

8.6.1 Action Levels for Air Monitoring

PPE can remain at Level D if breathing zone VOC concentrations are less than 5 ppm and benzene is non-detect. Personnel are required to evacuate the Site when breathing zone VOC readings exceed 25 ppm.

The following tables include summaries of the air monitoring, work practices, and action levels for the expected contaminants. The action levels to initiate testing with colorimetric tubes for airborne volatiles is 1 ppm (PID reading) and is based on the Permissible Exposure Limit (PEL) for benzene (1 ppm). The colorimetric tubes are used to confirm the presence or absence of specific constituents, and they do not provide a measured concentration.

PPE can remain at Level D if breathing zone VOC concentrations are less than 5 ppm. Personnel are required to evacuate the Site when breathing zone VOC readings exceed 25 ppm.

The following tables include summaries of the air monitoring, work practices, and action levels for the expected contaminants.

Air Monitoring Summary and Action Levels Organic Vapors	
PID Reading in Breathing Zone (ppm)	**Action**
0-1 ppm above background	Continue monitoring
>1-5 ppm sustained 60 seconds	Continue monitoring, if applicable initiate additional collection of benzene/vinyl chloride/formaldehyde using colorimetric tubes.
<5 ppm and no presence of benzene/vinyl chloride/formaldehyde	Continue Monitoring, ventilate space
≥ 5 ppm - ≤ 25 ppm and no presence of benzene/vinyl chloride/formaldehyde	Ventilate space until PID reads < 5 ppm. If < 5 ppm cannot be achieved, upgrade to Level C[1].
≥ 25 ppm	Ventilate space and evacuate area. Consult with CHSD.

Background concentrations should be established at the beginning of each work day. It may be necessary to re-establish background concentrations and ambient conditions vary through the day.

1 Measured air concentrations of known organic vapors will be reduced by the respirator to one half of the PEL or lower, and the individual and combined compound concentrations shall be within the service limit of the respirator cartridge.

Air Monitoring Summary and Action Levels Oxygen	
O_2 Reading in Breathing Zone (%)[1]	**Action**
20.9% O_2	Oxygen level normal
< 19.5% O_2	Oxygen deficient Interrupt task/Evacuate area
>23.5% O_2	Oxygen enriched Interrupt task/Evacuate area

1. Action levels based on USEPA Standard Operating Safety Guides; Table 5-1

Air Monitoring Summary and Action Levels Carbon Monoxide	
CO Reading in Breathing Zone (ppm)[1]	**Action**
<12.5 ppm	Inspect exhaust system for leaks or other sources of CO. Monitor initially and every 15 minutes during use of CO-generating equipment.
12.5-25 ppm	Ventilate area. Monitor continuously and record measurements. Contact PM.
>25 ppm	Cease Field Operations. Ventilate area.

1. Based upon the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV) of 25 ppm as an 8-hour time weighted average (TWA) and OSHA's Permissible Exposure Limit (PEL) of 50 ppm as an 8-hour TWA concentration.

Air Monitoring Summary and Action Levels Combustible Gases	
Lower Explosive Limit (LEL) Reading	**Action**
< 4% LEL	Site activities will continue with normal monitoring
4% – 20% LEL	Stop work until levels dissipate to <4% LEL
> 20% LEL	Potential explosion hazard. Halt all site activities, research source of release, aerate work area, suppress source.
Air Monitoring Summary and Action Levels Hydrogen Sulfide	
Hydrogen Sulfide (H_2S) Reading	**Action**
<10 ppm	Site activities will continue with normal monitoring
≥10 ppm	Stop work until levels dissipate to <10 ppm; use mechanical ventilation if possible. Consult with CHSD if unable to reduce concentrations below 10 ppm.

8.6.2 Air Monitoring Equipment and Calibration

A PID calibrated to an appropriate calibration mixture will be used to detect organic vapors in and around the work areas. Monitoring will be conducted in and around all work areas and at the workers breathing zone before activities commence to establish a background level, then at 15-minute intervals throughout the day. All equipment will be calibrated according to the manufacturer's recommendation. A calibration log will be maintained and will include the name of the person who performed the calibration, the date and time calibrated, and the instrument reading at the time of calibration. A manual bellows pump or equivalent with colorimetric tubes for specific compounds will be utilized to determine the course of action related to upgrading or downgrading the level of respiratory protection, as applicable.

If air monitoring data indicate safe levels of potentially harmful constituents at consistent intervals (5-minute intervals), then monitoring can be conducted less frequently (every 30 minutes). This determination will be made by the onsite SHSO. Monitoring data, including background readings and calibration records, will be documented. Work to be performed on-Site will conform to Roux's Standard Operating Procedures (SOPs). Conformance with these guidelines as well as the guidelines described in this HASP will aid in mitigating the physical and chemical hazards mentioned throughout this HASP.

8.7 Tailgate Safety Meetings

A designated Site worker will provide daily safety briefings (e.g., tailgate meetings) including, but not limited to, the following scenarios:

- When new operations are to be conducted;
- Whenever changes in work practices must be implemented; and
- When new conditions are identified and/or information becomes available.

Daily safety briefings shall be recorded on the Roux Daily Tailgate Health and Safety Meeting Log/Daily Site Safety Checklist, and all completed forms will become a part of the project file.

8.8 Spill Containment

Spill containment equipment and procedures should, at a minimum, meet the requirements of the facility's Spill Prevention, Control and Countermeasure Plan, if applicable. Otherwise, spill containment equipment and procedures must be considered depending on the task, including, but not limited to, chemical/product transfer points and handling.

8.8.1 Initial Spill Notification and Response

Any worker who discovers a hazardous substance spill will immediately notify the SHSO. The worker will, to his/her best ability, report the hazardous substance involved, the location of the spill, the estimated quantity of material spilled, the direction/flow of the spill material, related fire/explosion incidents, and any associated injuries without compromising their own safety.

8.8.2 Spill Evaluation and Response

The SHSO is responsible for evaluating spills and determining the appropriate response. When this evaluation is being made, the spill area will be isolated and demarcated to the extent possible. If necessary to protect nearby community members, notification of the appropriate authorities is made by the PM as appropriate. On-Site response is limited to small spills (e.g., <10 gallons); large spills require external emergency responders who will be contacted by the SHSO.

8.9 Decontamination

The decontamination section of the HASP describes how personnel and equipment are decontaminated when they leave the Exclusion Zone. This section also describes how residual waste from decontamination processes is disposed. The site decontamination procedures are designed to achieve an orderly, controlled removal or neutralization of contaminants that may accumulate on personnel or equipment. These procedures minimize worker contact with contaminants and protect against the transfer of contaminants to clean areas of the site and off-site. They also extend the useful life of PPE by reducing the amount of time

that contaminants contact and can permeate PPE surfaces. Decontamination is facilitated within the CRZ at this site, if applicable.

8.9.1 Decontamination Procedures for Personnel and PPE

The following are general decontamination procedures established and implemented at this site.

1. Decontamination is required for all workers exiting a contaminated area. Personnel may re-enter the SZ only after undergoing the decontamination procedures described below in the next section.
2. Protective clothing is decontaminated, cleaned, laundered, maintained and/or replaced as needed to ensure its effectiveness.
3. PPE used at this site that requires maintenance or parts replacement is decontaminated prior to repairs, or
4. PPE used at this site is decontaminated or prepared for disposal on the premises. Personnel who handle contaminated equipment have been trained in the proper means to do so to avoid hazardous exposure.
5. This site uses an off-site laundry for decontamination of PPE. The site has informed that facility of the hazards associated with contaminated PPE from this site.
6. The site requires and trains workers that if their permeable clothing is splashed or becomes wetted with a hazardous substance, they will immediately exit the work zone, perform applicable decontamination procedures, shower, and change into uncontaminated clothing.
7. Procedures for disposal of decontamination waste meet applicable local, State, and Federal regulations.

8.9.2 Decontamination Procedures for Equipment

All tools, equipment, and machinery from the EZ or CRZ are decontaminated in the CRZ prior to removal to the SZ. Equipment decontamination procedures are designed to minimize the potential for hazardous skin or inhalation exposure and to avoid cross-contamination and chemical incompatibilities.

General Equipment Decontamination Procedures:

1. Decontamination is required for all equipment exiting a contaminated area. Equipment may re-enter the SZ only after undergoing the equipment decontamination procedures.
2. Vehicles that travel regularly between the contaminated and clean areas of the site are carefully decontaminated each time they exit the EZ and the effectiveness of that decontamination is monitored to reduce the likelihood that contamination will be spread to other parts of the site.
3. Particular attention is given to decontaminating tires, scoops, and other parts of heavy equipment that are directly exposed to contaminants and contaminated soil.
4. Procedures for disposal of decontamination waste shall meet applicable local, State, and Federal regulations.

The following items may be used to decontaminate equipment:

- Fresh water rinse;
- Non-phosphorus detergent wash;
- Acetone rinse;
- Distilled water rinse; and

- A steam cleaner or pressure washer (heavy equipment only).

8.9.3 Monitoring the Effectiveness of Decontamination Procedures

Visual examination and sampling are used to evaluate the effectiveness of decontamination procedures. Visual examination is used to ensure that procedures are implemented as described and that they appear to control the spread of contaminants under changing site conditions. Visual examination is also used to inspect for signs of residual contamination or for contaminant permeation of PPE.

Personnel who work in contaminated areas of the site, either the Contamination Reduction Zone (CRZ) or the Exclusion Zone, are trained in the principles and practices of decontamination described in this section of the HASP and in related SOPs. If site procedures are changed as a result of inspection and monitoring, all affected employees are notified of these changes.

8.10 Confined Space Entry

Confined Space Entry is not anticipated to be performed at the Site.

If required, the following is a list of the safety requirements for confined space entry at the Site:

- **ROUX PERSONNEL ARE NOT AUTHORIZED TO ENTER AN OSHA PERMIT REQUIRED CONFINED SPACE;**
- Currently the scope of work **DOES NOT** require personnel to enter permitted confined space for this project; and
- Any changes to the field activities that may necessitate confined space entry will be reported to the Project Principal and OHSM.

Confined space is defined as any space, depression, or enclosure that:

- Has limited opening for entry and egress;
- Is large enough for and employee to enter and perform assigned work; and
- Is not intended for continuous occupancy.

A permit required confined space is one that meets the definition of a confined space and has one or more of the following characteristics:

- May contain or produce life-threatening atmospheres due to oxygen deficiency the presence of toxic, flammable, or corrosive contaminants;
- Contains a material that has the potential for engulfment;
- Has an internal configuration that may cause an entrant to be trapped or asphyxiated by inwardly converging walls or by a floor that slopes downward and tapers to a smaller cross-section; and
- Contains any other serious safety or health hazards.

Although Roux personnel will not perform confined space entry, it is expected that subcontractors performing cleaning and mitigation and/or remedial measures activities may be required to enter structures that are considered to be a permit required confined space. Permitting of the confined space as well as hazard mitigation for entry will be completed by the subcontractor in accordance with 29 CFR 1910.146 or 1926.1201-1213 and/or applicable local/client requirements.

8.11 Client and Site-Specific

In addition to the OSHA-specific procedures discussed above, there may be client and site-specific safety procedures that must be adhered to during the performance of remedial activities at the Site.

8.12 Unusual or Significant Risks

Field activities that appear to have unusual or significant risks that cannot be adequately managed with existing risk tools such as LPS, HASPs, traffic safety plans, work permits, design and O&M practices, equipment HAZOPS or other safety tools must be referred to the CHSD to help with the assessment and management of the associated potential safety risks. Examples include the use of explosives for demolition, use of firearms to control wildlife, rappelling, demolition over water, diving, etc.

8.13 Activity-Specific Hazards

In addition to the general hazards discussed above, there are activity-specific hazards associated with each work activity planned for the Site. An activity-specific JSA has been completed for each of the activities planned for the Site. JSAs are provided in **Appendix A**. In the event that new work activities or tasks are planned, JSAs will be developed and implemented prior to performing the new activities. In the absence of a JSA, the personnel performing work must prepare a field JSA and receive clearance from a designated competent safety official prior to performing any task with significant risk. In emergency situations where time is critical SPSAs will be utilized to identify the task, associated hazards and mitigative actions to take. For lower risk activities (as deemed by the discretion of a Competent Person) where a JSA is determined to not be needed, the individual(s) conducting the activities must perform SPSAs prior to and during the work.

8.13.1 Electrical and Other Utility Assessment and Accommodations

Roux shall perform a site walk to identify any potential overhead electrical or utility lines. All applicable guidelines will be followed in the vicinity of overhead power and utility lines (see Section 8.13.3 below).

A One-Call notification will be made prior to any subsurface work to identify any buried utility lines to identify potential hazards. A Ground Penetrating Radar survey to determine underground utility location(s) is not necessary to be performed.

Roux has also reviewed all available Site maps showing buried utility lines to identify potential hazards, which revealed that no underground hazards are known to exist in the vicinity of the areas of the Site pertinent to this HASP.

8.13.2 Subsurface Work

Subsurface work activities will require adherence to Roux's Corporate Subsurface Utility Clearance Management program found within **Appendix F**.

8.13.2.1 Excavations and Trenching

Trenching and excavation work activities carried out by Roux and their subcontractors shall comply with applicable OSHA standards (i.e., 29 CFR 1926.650-652). Regional Notification Centers (i.e., Underground Services Alert) shall be notified at least two working days prior to the start of any digging or excavation work per state requirements (i.e., 811-One Call). Personnel responsible for excavation activities will be trained in

their job responsibilities. Additionally, for trenches 4 feet or deeper, where employees will enter, the trench needs to have a stairway, ladder or other safe means of egress, and located so that employees don't have to travel farther than 25 feet horizontally. Where employees will enter trenches greater than 5 feet deep, the trench must have some type of protective system or sloped sidewalls appropriately to prevent cave-ins.

The SHSO or other responsible Roux personnel will be present on-Site during all Roux contracted excavation and backfill operations and will supplement health and safety monitoring conducted by Subcontractor air quality screening to ensure that appropriate levels of protection and safety procedures are utilized. The proximity of chemical, water, sewer, and electrical lines will be identified by Roux and/or their subcontractor before any subsurface activity or sampling is attempted. Prior to any excavation activities, trees, shrubbery, and other objects that can potentially pose as a hazard during excavation should be supported or removed from the excavation area. The following safe work practices will be implemented during this task.

- The proximity of chemical, water, sewer, and electrical lines will be identified by a facility representative prior to beginning any subsurface activity;
- At the start of every day, a competent person will inspect excavations to evaluate if the area is stable and safe to enter. Inspections will be conducted as needed throughout the excavation operations. If deemed necessary, a competent person may also conduct inspections after rainfall or any other event that can potentially affect the integrity of the excavation. Employees will not enter excavations where water has accumulated until protective measures have been implemented.
- Prior to entering excavations greater than 4 feet in depth, air monitoring for oxygen and hazardous atmospheres must be conducted to assure atmospheric conditions are within normal levels described in Section 8.6. Continuous air monitoring with a standard multi-gas detector (O^2, LEL%, CO, H^2S) shall be used during the course of work within an excavation; if action limits are reached workers shall safely exit the excavation. Upgrades to worker protection should be evaluated with the SHSO and PP in consultation with the CHSD. Emergency rescue equipment, such as breathing apparatuses and safety harnesses connected to an extraction device, will be readily available in the event of hazardous atmospheric conditions;
- While earthmoving, stay out of the excavator's delineated heavy equipment exclusion zone and away from the excavation sides where there is potential for cave in (within excavations that are 6 feet or more in depth, a delineated perimeter 6 feet away from the excavated edge is required);
- During loading and unloading operations, stand away from haul trucks and other vehicles to avoid contact with any falling loads; and
- Traffic cones, caution tape, or other barriers will be set up around the perimeter of the excavation when employees are working along the excavation edge and for any excavation that will be left open overnight or unattended for more than two days.

Maximum Allowable Slopes

Soil or Rock Type	Maximum Allowable Slopes (H:V)[1] for Excavations Less Than 20 Feet Deep[3]
Stable Rock	Vertical (90°)
Type A[2]	3/4 : 1 (53°)
Type B	1 : 1 (45°)
Type C	1 1/2 : 1 (34°)

29 CFR 1926 Subpart P Appendix B Sloping and Benching Table B-1

Notes:

[1] Numbers shown in parentheses next to maximum allowable slopes are angles expressed in degrees from the horizontal. Angles have been rounded off.

[2] A short-term maximum allowable slope of 1/2H : 1V (63°) is allowed in excavations in Type A soil that are 12 feet (3.67 meters) or less in depth. Short-term maximum allowable slopes for excavations greater than 12 feet (3.67 meters) in depth shall be 3/4H : 1V (53°).

[3] Sloping or benching for excavations greater than 20 feet deep shall be designed and stamped by a registered professional engineer.

Proper stockpiling (i.e., 2 feet minimum distance from the excavation edge), containment, transport, storage, and disposal practices will be utilized and is dependent upon the potential type and amount of waste generated during operations. The location of safety equipment and evacuation procedures will be established prior to initiation of operations according to this HASP.

8.13.3 Heavy Equipment

Use of heavy equipment at the Site will require adherence to Roux's Corporate Heavy Equipment Exclusion Zone Management Program found within **Appendix G**. Additionally, operation of the drill rig/other heavy equipment will maintain clearances from overhead power lines in accordance with 29 CFR 1926.1408 Table A Minimum Clearance Distances provided below.

Minimum Required Clearances for Energized Overhead Power Lines

Nominal System Voltage of Power Line (K V)	Minimum Required Clearance (feet)
0-50	10
51-100	12
101-200	15
201-300	20
301-500	25
501-750	35
751-1000	45

1 kilovolt (KV) = 1,000 volts

8.14 Traffic Control

If Site operations encroach upon public streets or highways and a hazard exists to Site personnel because of traffic conditions, a traffic control plan will be implemented in accordance with the United States Department of Transportation's (DOT's) "Manual on Uniform Traffic Control Devices."

8.15 Sanitation

Sanitation facilities will be provided in accordance with the sanitation standards (29 CFR 1910.141, 29 CFR 1926.51 and 29 CFR 1928.110). Sanitation facilities will be maintained and kept in good conditions at all times.

9. Field Team Review

Each person performing work at or visiting this site shall sign this section after site-specific training is completed and before being permitted to access the CRZ or Exclusion Zone.

I have read and understand this Site-Specific Health and Safety Plan. I will comply with the provision contained therein.

Site/Project: HP – 27-10 49th Avenue, Long Island City, NY

Name & Company	Signature	Date

10. Approvals

By their signature, the undersigned certify that this HASP is approved and will be utilized at the 47-25 34th Street Site.

TBD – Site Health and Safety Officer	Date
Nevin Pahlad, CSP, CHMM – Office Health and Safety Manager	Date
David Kaiser – Project Manager	Date
Chris Proce – Project Principal	Date

TABLE

Toxicological Properties of Hazardous Substances Present at the Site

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at the Site.

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
ORGANOCHLORINE PESTICIDES (OCP)									
DDT	50-29-3	TWA 1 mg/m3	TWA 0.5 mg/m3	TWA 1 mg/m3	500 mg/m3	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin; paresthesia tongue, lips, face; tremor; anxiety, dizziness, confusion, malaise (vague feeling of discomfort), headache, lassitude (weakness, exhaustion); convulsions; paresis hands; vomiting; [potential occupational carcinogen]	Eyes, skin, central nervous system, kidneys, liver, peripheral nervous system	White, odorless and tasteless, very stable, water-insoluble, synthetic BP: 260°F Fl.Pt. = 162-171°F LEL: NA UEL: NA
Aldrin	309-00-2	TWA 0.1 mg/m3	TWA 0.25 mg/m3	TWA 0.25 mg/m3	25 mg/m3	Inhalation, ingestion, skin and/or eye contact	headache, dizziness; nausea, vomiting, malaise (vague feeling of discomfort); myoclonic jerks of limbs; clonic, tonic convulsions; coma; hematuria (blood in the urine), azotemia; [potential occupational carcinogen]	Developmemntal, Endocrine, Liver, Immune System, Nervous System,	Colorless to dark-brown crystalline solid with a mild chemical odor. BP: 293°F Fl.Pt. = 150°F LEL: NA UEL: NA
Lindane (gamma-BHC)	58-89-9	TWA 0.5 mg/m3	TWA 0.5 mg/m3	TWA 0.5 mg/m3	50 mg/m3	Inhalation, ingestion, skin and/or eye contact	irritation eyes, skin, nose, throat; headache; nausea; clonic convulsions; resp difficulty; cyanosis; aplastic anemia; muscle spasm; In Animals: liver, kidney damage	Eyes, skin, respiratory system, central nervous system, blood, liver, kidneys	White to yellow, crystalline powder with a slight, musty odor. BP: 614°F Fl.Pt. = 150°F LEL: NA UEL: NA
Dieldrin	860-57-1□	TWA 0.1 mg/m3	TWA 0.25 mg/m3	TWA 0.25 mg/m3	25 mg/m3	Inhalation, ingestion, skin and/or eye contact	headache, dizziness; nausea, vomiting, malaise (vague feeling of discomfort), sweating; myoclonic limb jerks; clonic, tonic convulsions; coma; ; In Animals: liver, kidney damage [potential occupational carcinogen]	Developmemntal, Endocrine, Liver, Immune System, Nervous System,	Colorless to light-tan crystals with a mild, chemical odor. BP: NA (Decomposes) Fl.Pt. = NA LEL: NA UEL: NA
VOLATILE ORGANIC COMPOUNDS (VOCs)									
1,1,1-Trichloroethane	71-55-6	TWA 350 ppm STEL 450 ppm	C 350 ppm (1900 mg/m^3) [15-minute]	TWA 350 ppm (1900 mg/m^3)	700 ppm	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin; headache, lassitude (weakness, exhaustion), central nervous system depression, poor equilibrium; dermatitis; cardiac arrhythmias; liver damage	Eyes, skin, central nervous system, cardiovascular system, liver	Colorless liquid with a mild, chloroform-like odor. BP: 165°F Fl.Pt. = NA LEL: 7.5% UEL: 12.5% Combustible Liquid, but burns with difficulty
1,1,2,2-Tetrachloroethane	79-34-5	TWA 1 ppm [skin]	Ca TWA 1 ppm (7 mg/m^3) [skin]	TWA 5 ppm (35 mg/m^3) [skin]	Ca [100 ppm]	Inhalation, skin absorption, ingestion, skin and/or eye contact	Nausea, vomiting, abdominal pain; tremor fingers; jaundice, hepatitis, liver tenderness; dermatitis; leukocytosis (increased blood leukocytes); kidney damage; [potential occupational carcinogen]	Skin, liver, kidneys, central nervous system, gastrointestinal tract	Colorless to pale-yellow liquid with a pungent, chloroform-like odor BP: 296°F Fl.Pt. = NA LEL: NA UEL: NA Noncombustible Liquid
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	TWA 1000 ppm STEL 1250 ppm	TWA 1000 ppm (7600 mg/m3) ST 1250 ppm (9500 mg/m3)	TWA 1000 ppm (7600 mg/m3)	2000 ppm	Inhalation, ingestion, skin and/or eye contact	Irritation skin, throat, drowsiness, dermatitis; central nervous system depression; In Animals: cardiac arrhythmias, narcosis	Skin, heart, central nervous system, cardiovascular system	Colorless to water-white liquid with an odor like carbon tetrachloride at high concentrations. [Note: A gas above 118°F.] BP: 118°F Fl.Pt. = NA LEL: NA UEL: NA
1,1,2-Trichloroethane	79-00-5	TWA 10 ppm [skin]	Ca TWA 10 ppm (45 mg/m3) [skin]	TWA 10 ppm (45 mg/m3) [skin]	Ca [100 ppm]	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, nose; central nervous system depression; liver, kidney damage; dermatitis; [potential occupational carcinogen]	Eyes, respiratory system, central nervous system, liver, kidneys	Colorless liquid with a sweet, chloroform-like odor BP: 237°F Fl.Pt. = NA LEL: 6% UEL: 15.5% Combustible Liquid, forms dense soot
1,1-Dichloroethane	75-34-3	TWA 100 ppm	TWA 100 ppm (400 mg/m^3)	TWA 100 ppm (400 mg/m^3)	3,000 ppm	Inhalation, ingestion, skin and/or eye contact	Irritation skin; central nervous system depression; liver, kidney, lung damage	Skin, liver, kidneys, lungs, central nervous system	Colorless, oily liquid with a chloroform-like odor. BP: 135°F Fl.Pt. = 2°F LEL: 5.4% UEL: 11.4% Class IB Flammable Liquid Fl.P. below 73°F and BP at or above 100°F.

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at the Site.

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
1,1-Dichloroethene	75-35-4	TWA 5 ppm	Ca	None	Ca	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, throat; dizziness, headache, nausea, dyspnea (breathing difficulty); liver, kidney disturbance; pneumonitis; [potential occupational carcinogen]	Eyes, skin, respiratory system, central nervous system, liver, kidneys	Colorless liquid or gas (above 89°F) with a mild, sweet, chloroform-like odor BP: 89°F Fl.Pt. = -2°F LEL: 6.5% UEL: 15.5% Class IA Flammable Liquid: Fl.P. below 73°F and BP below 100°F
1,2,3-Trichlorobenzene	87-61-6	Cameo Chemicals Source https://cameochemicals.noaa.gov/chemical/10051	NA	NA	NA	Inhalation, skin absorption, ingestion, skin and/or eye contact	Inhalation may cause irritation of respiratory tract. Irritating to the eyes. May redden skin on contact. Ingestion may cause liver damage.	Skin, eyes, respiratory tract, liver	A white solid with a sharp chlorobenzene odor. Insoluble in water and denser than water. Hence sinks in water Fl.Pt. = 234.9°F
1,2,4-Trichlorobenzene	120-82-1	C 5 ppm	C 5 ppm (40 mg/m3)	None	N.D.	inhalation, skin absorption, ingestion, skin and/or eye contact	irritation eyes, skin, mucous membrane; In Animals: liver, kidney damage; possible teratogenic effects	Eyes, skin, respiratory system, liver, reproductive system	Colorless liquid or crystalline solid (below 63°F) with an aromatic odor BP: 416°F Fl.Pt. = 222°F LEL (302°F): 2.5% UEL (302°F): 6.6% Class IIIB Combustible Liquid: Fl.P. at or above 200°F. Combustible Solid
1,2-Dibromo-3-chloropropane	96-12-8	NA	Ca	TWA 0.001 ppm	Ca	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat; drowsiness; nausea, vomiting; pulmonary edema; liver, kidney injury; sterility; [potential occupational carcinogen]	Eyes, skin, respiratory system, central nervous system, liver, kidneys, spleen, reproductive system, digestive system	Dense yellow or amber liquid with a pungent odor at high concentrations. [pesticide] [Note: A solid below 43°F.] BP: 384°F Fl.Pt. = (oc) 170°F LEL: NA UEL: NA Class IIIA Combustible Liquid: Fl.P. at or above 140°F and below 200°F.
1,2-Dibromoethane	106-93-4	None listed Skin	Ca TWA 0.045 ppm C 0.13 ppm [15-minute]	TWA 20 ppm C 30 ppm 50 ppm [5-minute maximum peak]	Ca [100 ppm]	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, respiratory system; dermatitis with vesiculation; liver, heart, spleen, kidney damage; reproductive effects; [potential occupational carcinogen]	Eyes, skin, respiratory system, liver, kidneys, reproductive system	Colorless liquid or solid (below 50°F) with a sweet odor. [fumigant] BP: 268°F Fl.Pt. = 50°F LEL: NA UEL: NA Noncombustible Liquid
1,2-Dichlorobenzene	95-50-1	TWA 25 ppm STEL 50 ppm	C 50 ppm (300 mg/m3)	C 50 ppm (300 mg/m3)	200 ppm	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, nose; liver, kidney damage; skin blisters	Eyes, skin, respiratory system, liver, kidneys	Colorless to pale-yellow liquid with a pleasant, aromatic odor. [herbicide] BP: 357°F Fl.Pt. = 1°F LEL: 2.2% UEL: 9.2% Class IIIA Combustible Liquid: Fl.P. at or above 140°F and below 200°F.
1,2-Dichloroethane	107-06-2	TWA 10 ppm	Ca TWA 1 ppm (4 mg/m3) ST 2 ppm (8 mg/m3)	TWA 50 ppm C 100 ppm 200 ppm [5-minute maximum peak in any 3 hours]	Ca [50 ppm]	Inhalation, ingestion, skin absorption, skin and/or eye contact	Irritation eyes, corneal opacity; central nervous system depression; nausea, vomiting; dermatitis; liver, kidney, cardiovascular system damage; [potential occupational carcinogen]	Eyes, skin, kidneys, liver, central nervous system, cardiovascular system	Colorless liquid with a pleasant, chloroform-like odor. [Note: Decomposes slowly, becomes acidic & darkens in color.] BP: 182°F Fl.Pt. = 56°F LEL: 6.2% UEL: 16% Class IB Flammable Liquid Fl.P. below 73°F and BP at or above 100°F.
1,2-Dichloropropane	78-87-5	TWA 10 ppm Dermal Sensitizer (DSEN)	Ca	TWA 75 ppm (350 mg/m3)	Ca [400 ppm]	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, respiratory system; drowsiness, dizziness; liver, kidney damage; In Animals: central nervous system depression; [potential occupational carcinogen]	Eyes, skin, respiratory system, liver, kidneys, central nervous system	Colorless liquid with a chloroform-like odor. [pesticide] BP: 206°F Fl.Pt. = 60°F LEL: 3.4% UEL: 14.5% Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.
1,3-Dichlorobenzene	541-73-1	https://cameochemicals.noaa.gov/chemical/8514				Inhalation, skin absorption, ingestion, skin and/or eye contact	INHALATION: Causes headache, drousiness, unsteadiness. Irritating to mucous membranes. EYES: Severe irritation. SKIN: Severe irritation. INGESTION: Irritation of gastric mucosa, nausea, vomiting, diarrhea, abdominal cramps and cyanosis.		Colorless liquid. Sinks in water. BP: 343°F Fl.Pt. = 146°F LEL: 2.02% UEL: 9.2%
1,4-Dichlorobenzene	106-46-7	TWA 10 ppm	Ca	TWA 75 ppm (450 mg/m3)	Ca [150 ppm]	Inhalation, skin absorption, ingestion, skin and/or eye contact	Eye irritation, swelling periorbital (situated around the eye); profuse rhinitis; headache, anorexia, nausea, vomiting; weight loss, jaundice, cirrhosis; In Animals: liver, kidney injury; [potential occupational carcinogen]	Liver, respiratory system, eyes, kidneys, skin	Colorless or white crystalline solid with a mothball-like odor. [insecticide] BP: 345°F Fl.Pt. = 150°F LEL: 2.5% UEL: NA Combustible Solid, but may take some effort to ignite.

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at the Site.

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
1,4-Dioxane	123-91-1	TWA 20 ppm [skin]	Ca C 1 ppm (3.6 mg/m3) [30-minute]	TWA 100 ppm (360 mg/m3) [skin]	Ca [500 ppm]	Inhalation, skin absorption, ingestion, skin and/or eye contact	irritation eyes, skin, nose, throat; drowsiness, headache; nausea, vomiting; liver damage; kidney failure; [potential occupational carcinogen]	Eyes, skin, respiratory system, liver, kidneys	Colorless liquid or solid (below 53°F) with a mild, ether-like odor. BP: 214°F Fl.Pt. = 55°F LEL: 2.0% UEL: 22% Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F
2-Butanone	78-93-3	TWA 200 ppm STEL 300 ppm	TWA 200 ppm (590 mg/m3) ST 300 ppm (885 mg/m3)	TWA 200 ppm (590 mg/m3)	3000 ppm	inhalation, ingestion, skin and/or eye contact	irritation eyes, skin, nose; headache; dizziness; vomiting; dermatitis	Eyes, skin, respiratory system, central nervous system	Colorless liquid with a moderately sharp, fragrant, mint- or acetone-like odor BP: 175°F Fl.Pt. = 16°F LEL (200°F): 1.4% UEL (200°F): 11.4% Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F
2-Hexanone	591-78-6	TWA 5 ppm STEL 10 ppm [skin]	TWA 1 ppm (4 mg/m3)	TWA 100 ppm (410 mg/m3)	1600 ppm	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, nose; peripheral neuropathy: lassitude (weakness, exhaustion), paresthesia; dermatitis; headache, drowsiness	Eyes, skin, respiratory system, central nervous system, peripheral nervous system	Colorless liquid with an acetone-like odor BP: 262°F Fl.Pt. = 77°F LEL: NA UEL: 8.0% Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F
4-Methyl-2-pentanone	108-10-1	TWA 20 ppm STEL 75 ppm	TWA 50 ppm (205 mg/m3) ST 75 ppm (300 mg/m3)	TWA 100 ppm (410 mg/m3)	500 ppm	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, mucous membrane; headache, narcosis, coma; dermatitis; In Animals: liver, kidney damage	Eyes, skin, respiratory system, central nervous system, liver, kidneys	Colorless liquid with a pleasant odor BP: 242°F Fl.Pt. = 64°F LEL (200°F): 1.2% UEL (200°F): 8.0% Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F
Acetone	67-64-1	TWA 250 ppm STEL 500 ppm	TWA 250 ppm (590 mg/m^3)	TWA 1000 ppm (2400 mg/m^3)	2500 ppm [10% LEL]	Inhalation, ingestion, skin and/or eye contact	irritation eyes, nose, throat; headache, dizziness, central nervous system depression; dermatitis	Eyes, skin, respiratory system, central nervous system	Colorless liquid with a fragrant, mint-like odor BP: 133°F Fl.Pt. = 0°F LEL: 12.8% UEL: 2.5% Class IB Flammable liquid: Fl.P. below 73°F and BP at or above 100°F.
Benzene	71-43-2	TWA 0.5 ppm STEL 2.5 ppm	Ca TWA 0.1 ppm ST 1 ppm	TWA 1 ppm ST 5 ppm	Ca [500 ppm]	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude (weakness, exhaustion); dermatitis; bone marrow depression; [potential occupational carcinogen]	Eyes, skin, respiratory system, blood, central nervous system, bone marrow	Colorless to light yellow liquid with an aromatic odor [Note: Solid below 42 °F] BP: 176°F Fl.Pt. = 12°F LEL: 1.2% UEL: 7.8% Class IB Flammable liquid. Fl.P. below 73°F and BP at or above 100°F.
Bromochloromethane	74-97-5	TWA 200 ppm	TWA 200 ppm (1050 mg/m3)	TWA 200 ppm (1050 mg/m3)	2000 ppm	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, throat; confusion, dizziness, central nervous system depression; pulmonary edema	Eyes, skin, respiratory system, liver, kidneys, central nervous system	Colorless to pale-yellow liquid with a chloroform-like odor. [Note: May be used as a fire extinguishing agent.] BP: 155°F Fl.Pt. = NA LEL: NA UEL: NA Noncombustible Liquid
Bromodichloromethane	75-27-4	https://cameochemicals.noaa.gov/chemical/16064				Inhalation, ingestion, skin and/or eye contact	Symptoms of exposure to this compound may include irritation of the skin, eyes, mucous membranes and respiratory tract. It may also cause narcosis. Other symptoms may include nausea, dizziness and headache.	Liver and kidney damage. Central nervous system effects may also occur.	Clear colorless liquid BP: 189°F Fl.Pt. = NA LEL: NA UEL: NA
Bromoform	75-25-2	TWA 0.5 ppm	TWA 0.5 ppm (5 mg/m3) [skin]	TWA 0.5 ppm (5 mg/m3) [skin]	850 ppm	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, respiratory system; central nervous system depression; liver, kidney damage	Eyes, skin, respiratory system, central nervous system, liver, kidneys	Colorless to yellow liquid with a chloroform-like odor. [Note: A solid below 47°F.] BP: 301°F Fl.Pt. = NA LEL: NA UEL: NA Noncombustible Liquid
Bromomethane	74-83-9	TWA 1 ppm [skin]	Ca	C 20 ppm (80 mg/m3) [skin]	Ca [250 ppm]	Inhalation, skin absorption (liquid), skin and/or eye contact (liquid)	Irritation eyes, skin, respiratory system; muscle weak, incoordination, visual disturbance, dizziness; nausea, vomiting, headache; malaise (vague feeling of discomfort); hand tremor; convulsions; dyspnea (breathing difficulty); skin vesiculation; liquid: frostbite; [potential occupational carcinogen]	Eyes, skin, respiratory system, central nervous system	Colorless gas with a chloroform-like odor at high concentrations. [Note: A liquid below 38°F. Shipped as a liquefied compressed gas.] BP: 38°F Fl.Pt. = NA (Gas) LEL: 10% UEL: 16.0% Flammable Gas, but only in presence of a high energy ignition source.

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at the Site.

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Carbon disulfide	75-15-0	TWA 1 ppm [skin]	TWA 1 ppm (3 mg/m3) ST 10 ppm (30 mg/m3) [skin]	TWA 20 ppm C 30 ppm 100 ppm (30-minute maximum peak)	500 ppm	Inhalation, skin absorption, ingestion, skin and/or eye contact	Dizziness, headache, poor sleep, lassitude (weakness, exhaustion), anxiety, anorexia, weight loss; psychosis; polyneuropathy; Parkinson-like syndrome; ocular changes; coronary heart disease; gastritis; kidney, liver injury; eye, skin burns; dermatitis; reproductive effects	Central nervous system, peripheral nervous system, cardiovascular system, eyes, kidneys, liver, skin, reproductive system	Colorless to faint-yellow liquid with a sweet ether-like odor. [Note: Reagent grades are foul smelling.] BP: 116°F Fl.Pt. = -22°F LEL: 1.3% UEL: 50.0% Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.
Carbon tetrachloride	56-23-5	TWA 5 ppm STEL 10 ppm [skin]	Ca ST 2 ppm (12.6 mg/m3) [60-minute]	TWA 10 ppm C 25 ppm 200 ppm (5-minute maximum peak in any 4 hours)	Ca [200 ppm]	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; central nervous system depression; nausea, vomiting; liver, kidney injury; drowsiness, dizziness, incoordination; [potential occupational carcinogen]	Central nervous system, eyes, lungs, liver, kidneys, skin	Colorless liquid with a characteristic ether-like odor BP: 170°F Fl.Pt. = NA LEL: NA UEL: NA Noncombustible Liquid
Chlorobenzene	108-90-7	TWA 10 ppm	NA	TWA 75 ppm (350 mg/m3)	1000 ppm	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose; drowsiness, incoordination; central nervous system depression; In Animals: liver, lung, kidney injury	Eyes, skin, respiratory system, central nervous system, liver	Colorless liquid with an almond-like odor BP: 270°F Fl.Pt. = 82°F LEL: 1.3% UEL: 9.6% Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F.
Chloroethane	75-00-3	TWA 100 ppm [skin]	Handle with caution in the workplace	TWA 1000 ppm (2600 mg/m3)	3800 ppm [10%LEL]	Inhalation, skin absorption (liquid), ingestion (liquid), skin and/or eye contact	Incoordination, inebriation; abdominal cramps; cardiac arrhythmias, cardiac arrest; liver, kidney damage	Liver, kidneys, respiratory system, cardiovascular system, central nervous system	Colorless gas or liquid (below 54°F) with a pungent, ether-like odor. [Note: Shipped as a liquefied compressed gas.] BP: 54°F Fl.Pt. = NA (gas), -58°F (liquid) LEL: 3.8% UEL: 15.4% Flammable Gas
Chloroform	67-66-3	TWA 10 ppm	Ca ST 2 ppm (9.78 mg/m3) [60-minute]	C 50 ppm (240 mg/m3)	Ca [500 ppm]	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; dizziness, mental dullness, nausea, confusion; headache, lassitude (weakness, exhaustion); anesthesia; enlarged liver; [potential occupational carcinogen]	Liver, kidneys, heart, eyes, skin, central nervous system	Colorless liquid with a pleasant odor BP: 143°F Fl.Pt. = -82°F LEL: NA UEL: NA Noncombustible Liquid
Chloromethane	74-87-3	TWA 50 ppm STEL 100 ppm	Ca	TWA 100 ppm C 200 ppm 300 ppm (5-minute maximum peak in any 3 hours)	Ca [2000 ppm]	Inhalation, skin and/or eye contact (liquid)	Dizziness, nausea, vomiting; visual disturbance, stagger, slurred speech, convulsions, coma; liver, kidney damage; liquid: frostbite; reproductive, teratogenic effects; [potential occupational carcinogen]	Central nervous system, liver, kidneys, reproductive system	Colorless gas with a faint, sweet odor which is not noticeable at dangerous concentrations. [Note: Shipped as a liquefied compressed gas.] BP: -12°F Fl.Pt. = NA (Gas) LEL: 8.1% UEL: 17.4% Flammable Gas
cis-1,2-Dichloroethene	156-59-2	TWA 200 ppm (All isomers)	TWA 200 ppm (790 mg/m3)	TWA 200 ppm (790 mg/m3)	1000 ppm	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, respiratory system; central nervous system depression	Eyes, respiratory system, central nervous system	Colorless liquid (usually a mixture of the cis & trans isomers) with a slightly acrid, chloroform-like odor. BP: 118-140°F Fl.Pt. = 36-39°F LEL: 5.6% UEL: 12.8% Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F
cis-1,3-Dichloropropene	10061-01-5	https://cameochemicals.noaa.gov/chemical/20168				Inhalation, ingestion, skin and/or eye contact	Symptoms of exposure to this compound may include local irritation of the eyes skin and respiratory tract; dermatitis, gasping, coughing, substernal pain, extreme respiratory distress, lacrimation, central nervous system depression, skin irritation, acute gastrointestinal distress with pulmonary congestion and edema. It also may cause injury to the liver, kidneys and heart.	Skin, eyes, mucous membranes, liver, kidney, heart	Colorless to amber liquid with a sweetish odor. BP: 219.7°F Fl.Pt. = NA LEL: NA UEL: NA
Cyclohexane	110-82-7	TWA 100 ppm	TWA 300 ppm (1050 mg/m3)	TWA 300 ppm (1050 mg/m3)	1300 ppm [10%LEL]	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, respiratory system; drowsiness; dermatitis; narcosis, coma	Eyes, skin, respiratory system, central nervous system	Colorless liquid with a sweet, chloroform-like odor. [Note: A solid below 44°F.] BP: 177°F Fl.Pt. = 0°F LEL: 1.3% UEL: 8.0% Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.
Dibromochloromethane	124-48-1	https://cameochemicals.noaa.gov/chemical/16183				Inhalation, ingestion, skin and/or eye contact	Symptoms of exposure to this compound may include irritation of the skin, eyes, mucous membranes and upper respiratory tract. It may also cause fatigue. Other symptoms may include central nervous system effects, lung and cornea irritation and liver and kidney damage. Prolonged exposure can cause nausea, dizziness, headache and narcosis.	Skin, eyes, mucous membranes, upper respiratory tract	Clear colorless to yellow-orange liquid BP: 246-248°F Fl.Pt. = Greater than 200°F LEL: NA UEL: NA

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at the Site.

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Dichlorodifluoromethane	75-71-8	TWA 1000 ppm	TWA 1000 ppm (4950 mg/m3)	TWA 1000 ppm (4950 mg/m3)	15,000 ppm	Inhalation, skin and/or eye contact (liquid)	Dizziness, tremor, asphyxia, unconsciousness, cardiac arrhythmias, cardiac arrest; liquid: frostbite	Cardiovascular system, peripheral nervous system	Colorless gas with an ether-like odor at extremely high concentrations. [Note: Shipped as a liquefied compressed gas.] BP: -22°F Fl.Pt. = NA LEL: NA UEL: NA Nonflammable Gas
Ethyl benzene	100-41-4	TWA 20 ppm	TWA 100 ppm (435 mg/m^3) ST 125 ppm (545 mg/m^3)	TWA 100 ppm (435 mg/m^3)	800 ppm [10%LEL]	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, mucous membrane; headache; dermatitis; narcosis, coma	Eyes, skin, respiratory system, central nervous system	Colorless liquid with an aromatic odor. BP: 277°F Fl.Pt. = 55°F LEL: 0.8% UEL: 6.7% Class IB Flammable Liquid below 73°F and BP at or above 100°F
Isopropyl benzene	98-82-8	TWA 5 ppm	TWA 50 ppm (245 mg/m3) [skin]	TWA 50 ppm (245 mg/m3) [skin]	900 ppm [10%LEL]	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, mucous membrane; dermatitis; headache, narcosis, coma	Eyes, skin, respiratory system, central nervous system	Colorless liquid with a sharp, penetrating, aromatic odor BP: 306°F Fl.Pt. = 96°F LEL: 0.9% UEL: 6.5% Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F
Methyl Acetate	79-20-9	TWA 200 ppm STEL 250 ppm	TWA 200 ppm (610 mg/m3) ST 250 ppm (760 mg/m3)	TWA 200 ppm (610 mg/m3)	3100 ppm [10%LEL]	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat; headache, drowsiness; optic nerve atrophy; chest tightness; In Animals: narcosis	Eyes, skin, respiratory system, central nervous system	Colorless liquid with a fragrant, fruity odor BP: 135°F Fl.Pt. = 14°F LEL: 3.1% UEL: 16% Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.
Methylcyclohexane	108-87-2	TWA 400 ppm	TWA 400 ppm (1600 mg/m3)	TWA 500 ppm (2000 mg/m3)	1200 ppm [LEL]	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat; dizziness, drowsiness; In Animals: narcosis	Eyes, skin, respiratory system, central nervous system	Colorless liquid with a faint, benzene-like odor BP: 214°F Fl.Pt. = 25°F LEL: 1.2% UEL: 6.7% Class IB Flammable Liquid: Fl.P. below 73°F and BP at or above 100°F.
Methylene chloride	75-09-2	TWA 50 ppm [skin] STEL 100 ppm	Ca	[1910.1052] TWA 25 ppm ST 125 ppm	Ca [2300 ppm]	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; lassitude (weakness, exhaustion), drowsiness, dizziness; numb, tingle limbs; nausea; [potential occupational carcinogen]	Eyes, skin, cardiovascular system, central nervous system	Colorless liquid with a chloroform-like odor. [Note: A gas above 104°F.] BP: 104°F Fl.Pt. = NA LEL: 13% UEL: 23% Combustible Liquid
Methyl-t-butyl ether	1634-04-4	TWA 50 ppm	NA	NA	NA	Inhalation, skin absorption, ingestion, skin and/or eye contact	May cause dizziness or suffocation. Contact may irritate or burn eyes or skin. May be harmful if swallowed.	Eyes, skin	A colorless liquid with a distinctive anesthetic-like odor. BP: 131°F Fl.Pt. = -14°F LEL: NA UEL: NA
o-Xylene	95-47-6	TWA 20 ppm (All isomers)	TWA 100 ppm (435 mg/m3) ST 150 ppm (655 mg/m3)	TWA 100 ppm (435 mg/m3)	900 ppm	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis	Eyes, skin, respiratory system, central nervous system, gastrointestinal tract, blood, liver, kidneys	Colorless liquid with an aromatic odor BP: 292°F Fl.Pt. = 90°F LEL: 0.9% UEL: 6.7% Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F
Styrene	100-42-5	TWA 10 ppm STEL 20 ppm OTO (ototoxicant)	TWA 50 ppm (215 mg/m3) ST 100 ppm (425 mg/m3)	TWA 100 ppm C 200 ppm 600 ppm (5-minute maximum peak in any 3 hours)	700 ppm	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, nose, respiratory system; headache, lassitude (weakness, exhaustion), dizziness, confusion, malaise (vague feeling of discomfort), drowsiness, unsteady gait; narcosis; defatting dermatitis; possible liver injury; reproductive effects	Eyes, skin, respiratory system, central nervous system, liver, reproductive system	Colorless to yellow, oily liquid with a sweet, floral odor BP: 293°F Fl.Pt. = 88°F LEL: 0.9% UEL: 6.8% Class IC Flammable Liquid: Fl.P. at or above 73°F and below 100°F
Tetrachloroethene	127-18-4	TWA 25 ppm STEL 100 ppm	Ca Minimize workplace exposure concentrations	TWA 100 ppm C 200 ppm (for 5 minutes in any 3-hour period), with a maximum peak of 300 ppm	Ca [150 ppm]	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, incoordination; headache, drowsiness; skin erythema (skin redness); liver damage; [potential occupational carcinogen]	Eyes, skin, respiratory system, liver, kidneys, central nervous system	Colorless liquid with a mild, chloroform-like odor BP: 250°F Fl.Pt. = NA LEL: NA UEL: NA Noncombustible Liquid, but decomposes in a fire to hydrogen chloride and phosgene

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at the Site.

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Sodium Hydroxide	1310-73-2	Ceiling 2 mg/m^3	C 2 mg/m^3	TWA 2 mg/m^3	10 mg/m^3	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, mucous membrane; pneumonitis; eye, skin burns; temporary loss of hair	Eyes, skin, respiratory system	Colorless to white, odorless solid (flakes, beads, granular form). BP: 2534°F Fl.Pt. = NA LEL: NA UEL: NA Noncombustible Solid, but when in contact with water may generate sufficient heat to ignite combustible materials.
Sulfuric Acid	7664-93-9	TWA 0.2 mg/m^3 (as thoracic particulate mass)	TWA 1 mg/m^3	TWA 1 mg/m^3	15 mg/m^3	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat; pulmonary edema, bronchitis; emphysema; conjunctivitis; stomatis; dental erosion; eye, skin burns; dermatitis	Eyes, skin, respiratory system, teeth	Colorless to dark-brown, oily, odorless liquid.[Note: Pure compound is a solid below 51°F. Often used in an aqueous solution.] BP = 554°F Fl.Pt. = NA LEL = NA UEL = NA Noncombustible Liquid, but capable of igniting finely divided combustible materials.
trans-1,2-Dichloroethene	156-60-5	200 ppm (All isomers)	TWA 200 ppm (790 mg/m3)	TWA 200 ppm (790 mg/m3)	1000 ppm	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, respiratory system; central nervous system depression	Eyes, respiratory system, central nervous system	Colorless liquid (usually a mixture of the cis & trans isomers) with a slightly acrid, chloroform-like odor. BP: 118-140°F Fl.P: 36-39°F LEL: 5.6% UEL: 12.8% Class IB Flammable Liquid Fl.P. below 73°F and BP at or above 100°F.
trans-1,3-Dichloropropene	10061-02-6	https://cameochemicals.noaa.gov/chemical/18110				Inhalation, ingestion, skin and/or eye contact	Symptoms of exposure to this compound may include local irritation of the eyes skin and respiratory tract, dermatitis, gasping, coughing, substernal pain, extreme respiratory distress, lacrimation, central nervous system depression, acute gastrointestinal distress with pulmonary congestion and edema. It may also cause injury to the liver, kidneys and heart	Skin, eyes, mucous membranes, liver, kidney, heart	A clear colorless liquid with chloroform odor BP: 234°F Fl.P: NA LEL: NA UEL: NA
Toluene	108-88-3	TWA 20 ppm (ototoxicant)	TWA 100 ppm (375 mg/m^3) ST 150 ppm (560 mg/m^3)	TWA 200 ppm C 300 ppm 500 ppm (10-minute maximum peak)	500 ppm	Inhalation, skin absorption, ingestion, skin and/or eye contact	irritation eyes, nose; lassitude (weakness, exhaustion), confusion, euphoria, dizziness, headache; dilated pupils, lacrimation (discharge of tears); anxiety, muscle fatigue, insomnia; paresthesia; dermatitis; liver, kidney damage	Eyes, skin, respiratory system, central nervous system, liver, kidneys	Colorless liquid with a sweet, pungent, benzene-like odor. BP: 232°F Fl.P: 40°F LEL: 1.1% UEL: 7.1% Class IB Flammable Liquid Fl.P. below 73°F and BP at or above 100°F.
Trichloroethene (TCE)	79-01-6	TWA 10 ppm STEL 25 ppm	Ca	TWA 100 ppm C 200 ppm 300 ppm (5-minute maximum peak in any 2 hours)	Ca [1000 ppm]	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury; [potential occupational carcinogen]	Eyes, skin, respiratory system, heart, liver, kidneys, central nervous system	Colorless liquid (unless dyed blue) with a chloroform-like odor. BP: 189°F Fl.Pt. = NA LEL(77°F): 8.0% UEL(77°F): 10.5% Combustible Liquid, but burns with difficulty.
Trichlorofluoromethane	75-69-4	STEL C 1000 ppm	C 1000 ppm (5600 mg/m3)	TWA 1000 ppm (5600 mg/m3)	2000 ppm	Inhalation, ingestion, skin and/or eye contact	Incoordination, tremor; dermatitis; cardiac arrhythmias, cardiac arrest; asphyxia; liquid: frostbite	Skin, respiratory system, cardiovascular system	Colorless to water-white, nearly odorless liquid or gas (above 75°F) BP: 75°F Fl.P: NA LEL: NA UEL: NA Noncombustible Liquid Nonflammable Gas
Vinyl Chloride (chloroethylene)	75-01-4	TWA 1 ppm	Ca	TWA 1 ppm C 5 ppm [15-minute]	Ca (ND)	Inhalation, skin and/or eye contact (liquid)	Lassitude (weakness, exhaustion); abdominal pain, gastrointestinal bleeding; enlarged liver; pallor or cyanosis of extremities; liquid: frostbite; [potential occupational carcinogen]	Liver, central nervous system, blood, respiratory system, lymphatic system	Colorless gas or liquid (below 7°F) with a pleasant odor at high concentrations.[Note: Shipped as a liquefied compressed gas.] BP: 7°F Fl.Pt. = NA (Gas) LEL: 3.6% UEL: 33.0% Flammable Gas
Xylene (m, o & p isomers)	108-38-3, 95-47-6, 106-42-3	TWA 20 ppm	NA	NA	NA	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis	Eyes, skin, respiratory system, central nervous system, gastrointestinal tract, blood, liver, kidneys	Colorless liquid with an aromatic odor BP: 282°F, 292°F, 281°F Fl. Pt. 82°F, 90°F, 81°F LEL: 1.1%, 0.9%, 1.1% UEL: 7.0%, 6.7%, 7.0% Class IC Flammable Liquid at or above 73°F and below 100°F.
Zinc Oxide (dust)	7440-66-6	TWA 2 mg/m3 (repsirable) STEL 10 mg/m^3 (respirable)	TWA 5 mg/m^3 C 15 mg/m^3	TWA 15 mg/m^3 (total dust) TWA 5 mg/m^3 (resp dust) TWA 5 mg/m^3 (fume)	500 mg/m^3	Inhalation	Metal fume fever: chills, muscle ache, nausea, fever, dry throat, cough; lassitude (weakness, exhaustion); metallic taste; headache; blurred vision; low back pain; vomiting; malaise (vague feeling of discomfort); chest tightness; dyspnea (breathing difficulty), rales, decreased pulmonary function	Respiratory system	White, odorless solid. BP: NA Fl.Pt. = NA LEL: NA UEL: NA Noncombustible Solid

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at the Site.

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
SEMI-VOLATILE ORGANIC COMPOUNDS (SVOCs)									
2-Chloronaphthalene	91-58-7	https://cameochemicals.noaa.gov/chemical/16185				Inhalation, ingestion, skin and/or eye contact	Chloracne, cysts, headache, fatigue, vertigo, anorexia and jaundice		Monoclinic plates or off-white crystalline powder BP: NA Fl.Pt. = NA LEL: NA UEL: NA
2-Methylnaphthalene	91-57-6	TWA 0.5 ppm TLV-SL 3 mg/100 cm2 [skin]	https://cameochemicals.noaa.gov/chemical/20668			Inhalation, ingestion, skin and/or eye contact	Headaches, nausea, vomiting, diarrhea, anemia, jaundice, euphoria, dermatitis, visual disturbances, convulsions and comatose	Skin, eyes, mucous membranes and upper respiratory tract	White crystalline solid Combustible solid BP: 466-468 ° F Fl.Pt. = 208 ° F LEL: NA UEL: NA
Acenaphthene	83-32-9	https://cameochemicals.noaa.gov/chemical/10358				Inhalation, ingestion, skin and/or eye contact	Irritation of the skin, eyes, mucous membranes and upper respiratory tract, vomiting	Skin, eyes, mucous membranes and upper respiratory tract	White needles BP: 534 ° F Fl.Pt. = NA LEL: 0.6% UEL: NA
Acenaphthylene	208-96-8	https://cameochemicals.noaa.gov/chemical/16157				Inhalation, ingestion, skin and/or eye contact			Colorless crystalline solid BP: 509 to 527 ° F at 760 mm Hg Fl.Pt. = NA LEL: NA UEL: NA
Anthracene (as coal tar pitch volatiles)	120-12-7	TWA 0.2 mg/m3 (as Benzene solubles)	Ca TWA 0.1 mg/m3 (cyclohexane-extractable fraction)	TWA 0.2 mg/m3 (benzene-soluble fraction) [1910.1002]	Ca [80 mg/m3]	Inhalation, skin and/or eye contact	Dermatitis, bronchitis, [potential occupational carcinogen]	Respiratory system, skin, bladder, kidneys	Black or dark-brown amorphous residue BP: NA Fl.Pt. = NA LEL: NA UEL: NA Combustible Solids
Benzo[a]anthracene	56-55-3	https://cameochemicals.noaa.gov/chemical/16171				Inhalation, injestion, skin and/or eye contact			Colorless leaflets or plates or coarse gold powder with a greenish-yellow fluorescence. May reasonably be expected to be a carcinogen. BP: 815° F at 760 mm Hg Fl.Pt. = NA LEL: NA UEL: NA
Benzo[a]pyrene (as coal tar pitch volatiles)	50-32-8	TWA 0.2 mg/m3 (as Benzene solubles)	Ca TWA 0.1 mg/m3 (cyclohexane-extractable fraction)	TWA 0.2 mg/m3 (benzene-soluble fraction) [1910.1002]	Ca [80 mg/m3]	Inhalation, skin and/or eye contact	Dermatitis, bronchitis, [potential occupational carcinogen]	Respiratory system, skin, bladder, kidneys	Black or dark-brown amorphous residue BP: NA Fl.Pt. = NA LEL: NA UEL: NA Combustible Solids
Benzo[b]fluoranthene	205-99-2	None listed	https://cameochemicals.noaa.gov/chemical/16172			Inhalation, injestion, skin and/or eye contact			Needles or yellow fluffy powder BP: NA Fl.Pt. = NA LEL: NA UEL: NA
Benzo[g,h,i]perylene	191-24-2	https://cameochemicals.noaa.gov/chemical/16174				Inhalation, injestion, skin and/or eye contact	Inhalation of material may be harmful. Contact may cause burns to skin and eyes. Inhalation of Asbestos dust may have a damaging effect on the lungs. Fire may produce irritating, corrosive and/or toxic gases. Some liquids produce vapors that may cause dizziness or suffocation. Runoff from fire control may cause pollution.	Lungs, skin, eyes	Colorless to white crystalline solid. Water insoluble. BP: NA Fl.Pt. = NA LEL: NA UEL: NA
Benzo[k]fluoranthene	207-08-9	https://cameochemicals.noaa.gov/chemical/16173				Inhalation, injestion, skin and/or eye contact	When heated to decomposition this compound emits acrid smoke and irritating fumes.		Pale yellow needles or yellow crystalline solid BP: 896° F Fl.Pt. = NA LEL: NA UEL: NA
Chrysene (as coal tar pitch volatiles	218-01-9	TWA 0.2 mg/m3 (as Benzene solubles)	Ca TWA 0.1 mg/m3 (cyclohexane-extractable fraction)	TWA 0.2 mg/m3 (benzene-soluble fraction) [1910.1002]	Ca [80 mg/m3]	Inhalation, skin and/or eye contact	Dermatitis, bronchitis, [potential occupational carcinogen]	Respiratory system, skin, bladder, kidneys	Black or dark-brown amorphous residue BP: NA Fl.Pt. = NA LEL: NA UEL: NA Combustible Solids
Dibenzo(a,h)anthracene	53-70-3	https://cameochemicals.noaa.gov/chemical/16192				Inhalation, injestion, skin and/or eye contact	Symptoms of exposure to this compound may include irritation. This compound is harmful if swallowed or inhaled. It may cause irritation. When heated to decomposition it emits acrid smoke, irritating fumes and toxic fumes of carbon monoxide and carbon dioxide.	Lungs	White crystals or pale yellow solid. Sublimes BP: 975° F Fl.Pt. = NA LEL: NA UEL: NA

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at the Site.

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Fluoranthene	206-44-0	https://cameochemicals.noaa.gov/chemical/16213				Inhalation, injestion, skin and/or eye contact	When heated to decomposition this compound emits acrid smoke and fumes.		Light yellow fine crystals BP: 482° F Fl.Pt. = NA LEL: NA UEL: NA
Fluorene	86-73-7	https://cameochemicals.noaa.gov/chemical/16214				Inhalation, injestion, skin and/or eye contact			White leaflets. Sublimes easily under a vacuum. Fluorescent when impure. BP: 563° F Fl.Pt. = NA LEL: NA UEL: NA
Indeno[1,2,3-cd]pyrene	193-39-5	https://cameochemicals.noaa.gov/chemical/16218				Inhalation, injestion, skin and/or eye contact			Yellow crystals BP: 997° F Fl.Pt. = NA LEL: NA UEL: NA
Naphthalene	91-20-3	TWA 10 ppm [skin]	TWA 10 ppm (50 mg/m3) ST 15 ppm (75 mg/m3)	TWA 10 ppm (50 mg/m3)	250 ppm	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes; headache, confusion, excitement, malaise (vague feeling of discomfort); nausea, vomiting, abdominal pain; irritation bladder; profuse sweating; jaundice; hematuria (blood in the urine), renal shutdown; dermatitis, optical neuritis, corneal damage	Eyes, skin, blood, liver, kidneys, central nervous system	Colorless to brown solid with an odor of mothballs. [Note: Shipped as a molten solid.] BP: 424°F Fl.P: 174°F LEL: 0.9% UEL: 5.9% Combustible Solid, but will take some effort to ignite
Phenanthrene	85-01-8	https://cameochemicals.noaa.gov/chemical/16236				Inhalation, injestion, skin and/or eye contact	Symptoms following exposure to this compound may include skin sensitization, dermatitis, bronchitis, cough, dyspnea, respiratory neoplasm, kidney neoplasm, skin irritation, and respiratory irritation.	Skin, respiratory tract	Colorless monoclinic crystals with a faint aromatic odor. Solutions exhibit a blue fluorescence. BP: 642° F Fl.Pt. = 340° F LEL: NA UEL: NA
Pyrene (see coal tar pitch volatiles)	129-00-0	TWA 0.2 mg/m3 (as Benzene solubles)	Ca TWA 0.1 mg/m3 (cyclohexane-extractable fraction)	TWA 0.2 mg/m3 (benzene-soluble fraction) [1910.1002]	Ca [80 mg/m3]	Inhalation, skin and/or eye contact	Dermatitis, bronchitis, [potential occupational carcinogen]	Respiratory system, skin, bladder, kidneys	Black or dark-brown amorphous residue BP: NA Fl.Pt. = NA LEL: NA UEL: NA Combustible Solids
METALS									
Aluminum	7429-90-5	TWA 1 mg/m3	TWA 10 mg/m^3 (total) TWA 5 mg/m^3 (resp)	TWA 15 mg/m^3 (total) TWA 5 mg/m^3 (resp)	N.D.	Inhalation, skin and/or eye contact	Irritation eyes, skin, respiratory system	Eyes, skin, respiratory system	Silvery-white, malleable, ductile, odorless metal BP: 4221°F Fl.Pt. = NA LEL: NA UEL: NA Combustible Solid, finely divided dust is easily ignited; may cause explosions.
Antimony	7440-36-0	TWA 0.5 mg/m3 (as Sb)	TWA 0.5 mg/m3 [*Note: The REL also applies to other antimony compounds (as Sb).]	TWA 0.5 mg/m3 [*Note: The PEL also applies to other antimony compounds (as Sb).]	50 mg/m3 (as Sb)	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat, mouth; cough; dizziness; headache; nausea, vomiting, diarrhea; stomach cramps; insomnia; anorexia; unable to smell properly	Eyes, skin, respiratory system, cardiovascular system	Silver-white, lustrous, hard, brittle solid; scale-like crystals; or a dark-gray, lustrous powder BP: 2975°F Fl.Pt. = NA LEL: NA UEL: NA Noncombustible Solid in bulk form, but a moderate explosion hazard in the form of dust when exposed to flame.
Arsenic	7440-38-2	TWA 0.01 mg/m3	Ca C 0.002 mg/m3 [15-minute]	[1910.1018] TWA 0.010 mg/m3	Ca [5 mg/m3 (as As)]	Inhalation, skin absorption, skin and/or eye contact, ingestion	Ulceration of nasal septum, dermatitis, gastrointestinal disturbances, peripheral neuropathy, resp irritation, hyperpigmentation of skin, [potential occupational carcinogen]	Liver, kidneys, skin, lungs, lymphatic system	Metal: Silver-gray or tin-white, brittle, odorless solid BP: Sublimes Fl.Pt. = NA LEL: NA UEL: NA Metal: Noncombustible Solid in bulk form, but a slight explosion hazard in the form of dust when exposed to flame
Barium	7440-39-3	TWA 0.5 mg/m3	0.5 mg Ba/m3 TWA	0.5 mg Ba/m3 TWA	50 mg Ba/m3	Inhalation, ingestion, skin and/or eye contact	Inhalation or contact with vapors, substance or decomposition products may cause severe injury or death. Contact may cause burns to skin, eyes, and mucous membranes. May be toxic by ingestion, inhalation and skin absorption. Used to make other chemicals.	Lungs, skin, eyes, and mucous membrane	A silver to white metallic solid BP: 1337°F Fl.Pt. = NA LEL: NA UEL: NA
Beryllium	7440-41-7	TWA 0.00005 mg/m^3	Ca C 0.0005 mg/m^3	TWA 0.002 mg/m^3 C 0.005 mg/m^3 0.025 mg/m3 [30-minute maximum peak]	Ca [4 mg/m^3 (as Be)]	Inhalation, skin and/or eye contact	Berylliosis (chronic exposure): anorexia, weight loss, lassitude (weakness, exhaustion), chest pain, cough, clubbing of fingers, cyanosis, pulmonary insufficiency; irritation eyes; dermatitis; [potential occupational carcinogen]	Eyes, skin, respiratory system	Hard, brittle, gray-white solid BP: 4532°F Fl.Pt. = NA LEL: NA UEL: NA Noncombustible Solid in bulk form, but a slight explosion hazard in the form of a powder or dust.

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at the Site.

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Cadmium	7440-43-9	TWA 0.01 mg/m^3 total dust TWA 0.002 mg/m^3 (as Cd) respirable fraction	Ca	TWA 0.005 mg/m^3	Ca [9 mg/m3 (as Cd)]	Inhalation, ingestion	Pulmonary edema, dyspnea (breathing difficulty), cough, chest tightness, substernal (occurring beneath the sternum) pain; headache; chills, muscle aches; nausea, vomiting, diarrhea; anosmia (loss of the sense of smell), emphysema, proteinuria, mild anemia; [potential occupational carcinogen]	Respiratory system, kidneys, prostate, blood	Silver-white/blue tinged lustrous, odorless solid. BP: 1409°F Fl.Pt. = NA LEL: NA UEL: NA Noncombustible - will burn in powder form
Calcium	7440-70-2	https://cameochemicals.noaa.gov/chemical/309				Inhalation, ingestion, skin and/or eye contact	Contact with eyes or skin produces caustic burns.	Eyes, skin	A silvery, soft metal that turns grayish white on exposure to air. BP: 2714°F Fl.Pt. = NA LEL: NA UEL: NA
Chromium	7440-47-3	TWA 0.5 mg/m^3 (metal) TWA 0.003 mg/m^3 (water-soluble Cr III compounds) TWA 0.0002 mg/m^3 (water-soluble Cr VI compounds) STEL 0.0005 mg/m3 (water-soluble Cr VI compounds)	TWA 0.5 mg/m^3	TWA 1 mg/m^3	250 mg/m^3 (as Cr)	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin; lung fibrosis (histologic)	Eyes, skin, respiratory system	Blue-white to steel-gray, lustrous, brittle, hard, odorless solid. BP: 4788°F Fl.Pt. = NA LEL: NA UEL: NA Noncombustible - will burn in dust form if heated in a flame
Cobalt	7440-48-4	TWA 0.02 mg/m3 [DSEN] [RSEN]	TWA 0.05 mg/m3	TWA 0.1 mg/m3	20 mg/m3 (as Co)	Inhalation, ingestion, skin and/or eye contact	Cough, dyspnea (breathing difficulty), wheezing, decreased pulmonary function; weight loss; dermatitis; diffuse nodular fibrosis; resp hypersensitivity, asthma	Skin, respiratory system	Odorless, silver-gray to black solid BP: 5612°F Fl.Pt. = NA LEL: NA UEL: NA Noncombustible Solid in bulk form, but finely divided dust will burn at high temperatures.
Copper	7440-50-8	TWA 0.2 mg/m^3 (fume) TWA 1 mg/m3 (dusts and mists)	TWA 1 mg/m^3	TWA 1 mg/m^3	100 mg/m^3 (as Cu)	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, nose, pharynx; nasal septum perforation; metallic taste; dermatitis; In Animals: lung, liver, kidney damage; anemia	Eyes, skin, respiratory system, liver, kidneys (increased risk with Wilson's disease)	Reddish, lustrous, malleable, odorless solid. BP: 4703°F Fl.Pt. = NA LEL: NA UEL: NA Noncombustible - powdered form may ignite
Iron (as iron oxide)	7439-89-6	TWA 5 mg/m3 (respirable particulate mass)	TWA 1 mg/m^3	NA	NA	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, mucous membrane; abdominal pain, diarrhea, vomiting; possible liver damage	Eyes, skin, respiratory system, liver, gastrointestinal tract	Appearance and odor vary depending upon the specific soluble iron salt. BP: NA Fl.Pt. = NA LEL: NA UEL: NA Noncombustible Solids
Lead	7439-92-1	TWA 0.05 mg/m3	TWA (8-hour) 0.050 mg/m3	[1910.1025] TWA 0.050 mg/m3	100 mg/m3 (as Pb)	Inhalation, ingestion, skin and/or eye contact	Lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation eyes; hypertension	Eyes, gastrointestinal tract, central nervous system, kidneys, blood, gingival tissue	A heavy, ductile, soft, gray solid BP: 3164°F Fl.Pt. = NA LEL: NA UEL: NA Noncombustible Solid in bulk form
Magnesium	7439-95-4	https://cameochemicals.noaa.gov/chemical/6949				Eye and/or skin contact	Dust irritates eyes in same way as any foreign material. Penetration of skin by fragments of metal is likely to produce local irritation, blisters, and ulcers which may become infected.	Eyes	A light silvery metal BP: 1202°F Fl.Pt. = NA LEL: NA UEL: NA
Manganese	7439-96-5	TWA 0.02 mg/m3 [R] TWA 0.1 mg/m3 [I]	TWA 1 mg/m3 ST 3 mg/m3	C 5 mg/m3	500 mg/m3 (as Mn)	inhalation, ingestion	Manganism; asthenia, insomnia, mental confusion; metal fume fever: dry throat, cough, chest tightness, dyspnea (breathing difficulty), rales, flu-like fever; low-back pain; vomiting; malaise (vague feeling of discomfort); lassitude (weakness, exhaustion); kidney damage	respiratory system, central nervous system, blood, kidneys	A lustrous, brittle, silvery solid BP: 3564°F Fl.Pt. = NA LEL: NA UEL: NA Metal: Combustible Solid
Mercury	7439-97-6	TWA 0.1 mg/m3, as Hg Aryl compounds TWA 0.025 mg/m3 as Hg, inorganic forms including metallic mercury	Hg Vapor: TWA 0.05 mg/m3 [skin] Other: C 0.1 mg/m3 [skin]	TWA 0.1 mg/m3	10 mg/m3 (as Hg)	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; cough, chest pain, dyspnea (breathing difficulty), bronchitis, pneumonitis; tremor, insomnia, irritability, indecision, headache, lassitude (weakness, exhaustion); stomatitis, salivation; gastrointestinal disturbance, anorexia, weight loss; proteinuria	Eyes, skin, respiratory system, central nervous system, kidneys	Metal: Silver-white, heavy, odorless liquid. [Note: "Other" Hg compounds include all inorganic & aryl Hg compounds except (organo) alkyls.] BP: 674°F Fl.Pt. = NA LEL: NA UEL: NA Metal: Noncombustible Liquid

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at the Site.

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Nickel	7440-02-0	TWA 1.5 mg/m^3 [elemental] TWA 0.1 mg/m^3 [soluble inorganic compound] TWA 0.2 mg/m^3 [insoluble inorganic compound] TWA 0.1 mg/m^3 [Nickel subsulfide]	Ca TWA 0.015 mg/m^3	TWA 1 mg/m^3	Ca [10 mg/m3 (as Ni)]	Inhalation, ingestion, skin and/or eye contact	Sensitization dermatitis, allergic asthma, pneumonitis; [potential occupational carcinogen]	Nasal cavities, lungs, skin	Lustrous, silvery, odorless solid. BP: 5139°F Fl.Pt. = NA LEL: NA UEL: NA Combustible Solid; nickel sponge catalyst may ignite spontaneously in air.
Potassium	9/7/7440	https://cameochemicals.noaa.gov/chemical/4289				Eye and/or skin contact	Will burn skin and eyes	Skin, eyes	Potassium is a soft silvery metal though normally grayish white due to oxidation BP: 1425°F Fl.Pt. = NA LEL: NA UEL: NA
Selenium	7782-49-2	TWA 0.2 mg/m3	TWA 0.2 mg/m3	TWA 0.2 mg/m3	1 mg/m3 (as Se)	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat; visual disturbance; headache; chills, fever; dyspnea (breathing difficulty), bronchitis; metallic taste, garlic breath, gastrointestinal disturbance; dermatitis; eye, skin burns; In Animals: anemia; liver necrosis, cirrhosis; kidney, spleen damage	Eyes, skin, respiratory system, liver, kidneys, blood, spleen	Amorphous or crystalline, red to gray solid. [Note: Occurs as an impurity in most sulfide ores.] BP: 1265°F Fl.Pt. = NA LEL: NA UEL: NA Combustible Solid
Silver	7440-22-4	TWA 0.1 mg/m3 [Metal, dust, and fume] TWA 0.01 mg/m3 [Soluble compounds, as Ag]	TWA 0.01 mg/m3	TWA 0.01 mg/m3	10 mg/m3 (as Ag)	Inhalation, ingestion, skin and/or eye contact	Blue-gray eyes, nasal septum, throat, skin; irritation, ulceration skin; gastrointestinal disturbance	Nasal septum, skin, eyes	Metal: White, lustrous solid BP: 3632°F Fl.Pt. = NA LEL: NA UEL: NA Metal: Noncombustible Solid, but flammable in form of dust or powder
Sodium	7440-23-5	https://cameochemicals.noaa.gov/chemical/7794				Skin contact	Severe burns caused by burning metal or by caustic soda formed by reaction with moisture on skin	Skin	A silvery soft metal that becomes grayish white upon exposure to air BP: 1621°F Fl.Pt. = NA LEL: NA UEL: NA
Thallium	7440-28-0	0.02 mg/m3 inhallable particulate matter	TWA 0.1 mg/m3 [skin]	TWA 0.1 mg/m3 [skin]	15 mg/m3 (as Tl)	Inhalation, skin absorption, ingestion, skin and/or eye contact	Nausea, diarrhea, abdominal pain, vomiting; ptosis, strabismus; peri neuritis, tremor; retrosternal (occurring behind the sternum) tightness, chest pain, pulmonary edema; convulsions, chorea, psychosis; liver, kidney damage; alopecia; paresthesia legs	Eyes, respiratory system, central nervous system, liver, kidneys, gastrointestinal tract, body hair	Appearance and odor vary depending upon the specific soluble thallium compound BP: NA Fl.Pt. = NA LEL: NA UEL: NA
Vanadium	7440-62-2	https://cameochemicals.noaa.gov/chemical/16147				Inhalation, skin absorption, ingestion, skin and/or eye contact	Highly toxic, may be fatal if inhaled, swallowed or absorbed through skin. Avoid any skin contact. Effects of contact or inhalation may be delayed. Fire may produce irritating, corrosive and/or toxic gases. Runoff from fire control or dilution water may be corrosive and/or toxic and cause pollution	Skin	Silvery-whitish powder BP: NA Fl.Pt. = NA LEL: NA UEL: NA
Zinc	7440-66-6	https://cameochemicals.noaa.gov/chemical/4814				Inhalation, skin absorption, ingestion, skin and/or eye contact	Inhalation or contact with vapors, substance or decomposition products may cause severe injury or death. May produce corrosive solutions on contact with water. Fire will produce irritating, corrosive and/or toxic gases. Runoff from fire control may cause pollution	Lungs	A grayish powder BP: NA Fl.Pt. = NA LEL: NA UEL: NA
PCBs									
PCBs (total)	11097-69-1, 53469-21-9	TWA 0.5 mg/m3 [skin] TWA 1 mg/m3 [skin]	Ca TWA 0.001 mg/m3 Ca TWA 0.001 mg/m3	TWA 0.5 mg/m3 [skin] TWA 1 mg/m3 [skin]	Ca [5 mg/m3] Ca [5 mg/m3]	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, chloracne; liver damage; reproductive effects; [potential occupational carcinogen]	Skin, eyes, liver, reproductive system	Colorless to pale-yellow, viscous liquid or solid (below 50°F) with a mild, hydrocarbon odor BP: 689-734°F, 617-691°F Fl.Pt. = NA, NA LEL: NA UEL: NA Nonflammable Liquid, but exposure in a fire results in the formation of a black soot containing PCBs, polychlorinated dibenzofurans, and chlorinated dibenzo-p-dioxins.

Table 1. Toxicological, Physical, and Chemical Properties of Compounds Potentially Present at the Site.

Compound	CAS #	ACGIH TLV	NIOSH REL	OSHA PEL	IDLH	Routes of Exposure	Toxic Properties	Target Organs	Physical/Chemical Properties
Petroleum Hydrocarbons									
Gasoline	86290-81-5	TWA 300 ppm STEL 500 ppm	Ca	None	Ca [N.D.]	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, mucous membrane; dermatitis; headache, lassitude (weakness, exhaustion), blurred vision, dizziness, slurred speech, confusion, convulsions; chemical pneumonitis (aspiration liquid); possible liver, kidney damage; [potential occupational carcinogen]	Eyes, skin, respiratory system, central nervous system, liver, kidneys	Clear liquid with a characteristic odor BP: 102°F Fl.Pt. = -45°F LEL: 1.4% UEL: 7.6%

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Abbreviations:

ACGIH – American Conference of Governmental Industrial Hygienists.
BP – boiling point at 1 atmosphere, °F
C – Ceiling, is a concentration that should not be exceeded during and part of the working exposure.
Ca – Carcinogenic.
CAS# - Chemical Abstracts Service registry number which is unique for each chemical.
DSEN - Dermal Sensitization
Ft Pt. – Flash point
IDLH - Immediately Dangerous to Life and Health concentrations represent the maximum concentration from which, in the event of respirator failure, one could escape within 30 minutes without a respirator and without experiencing any escape-impairing or irreversible health effects.
LEL – Lower explosive (flammable) limit in air, % by volume (at room temperature)
mg/m^3 – Milligrams of substance per cubic meter of air
NIOSH - National Institute for Occupational Safety and Health.
OSHA – Occupational Safety and Health Administration
OTO - Ototoxicant
PEL - OSHA Permissible Exposure Limit (usually) a time weighted average concentration that must not be exceeded during any 8 hour work shift of a 40 hr work week.
ppm – parts per million
REL – NIOSH Recommended Limit indicated a time weighted average concentration that must not be exceeded during any 10 hour work shift of a 40 hr work week
RSEN - Respiratory Sensitization
SG - Specific Gravity
STEL – ACGIH Short-term exposure limit (ST)
TLV - ACGIH Threshold Limit Values (usually 8 hour time weighted average concentrations).
TWA – 8-hour, time-weighted average
UEL – Upper explosive (flammable) limit in air, % by volume (at room temperature)
VP - Vapor Pressure

FIGURES

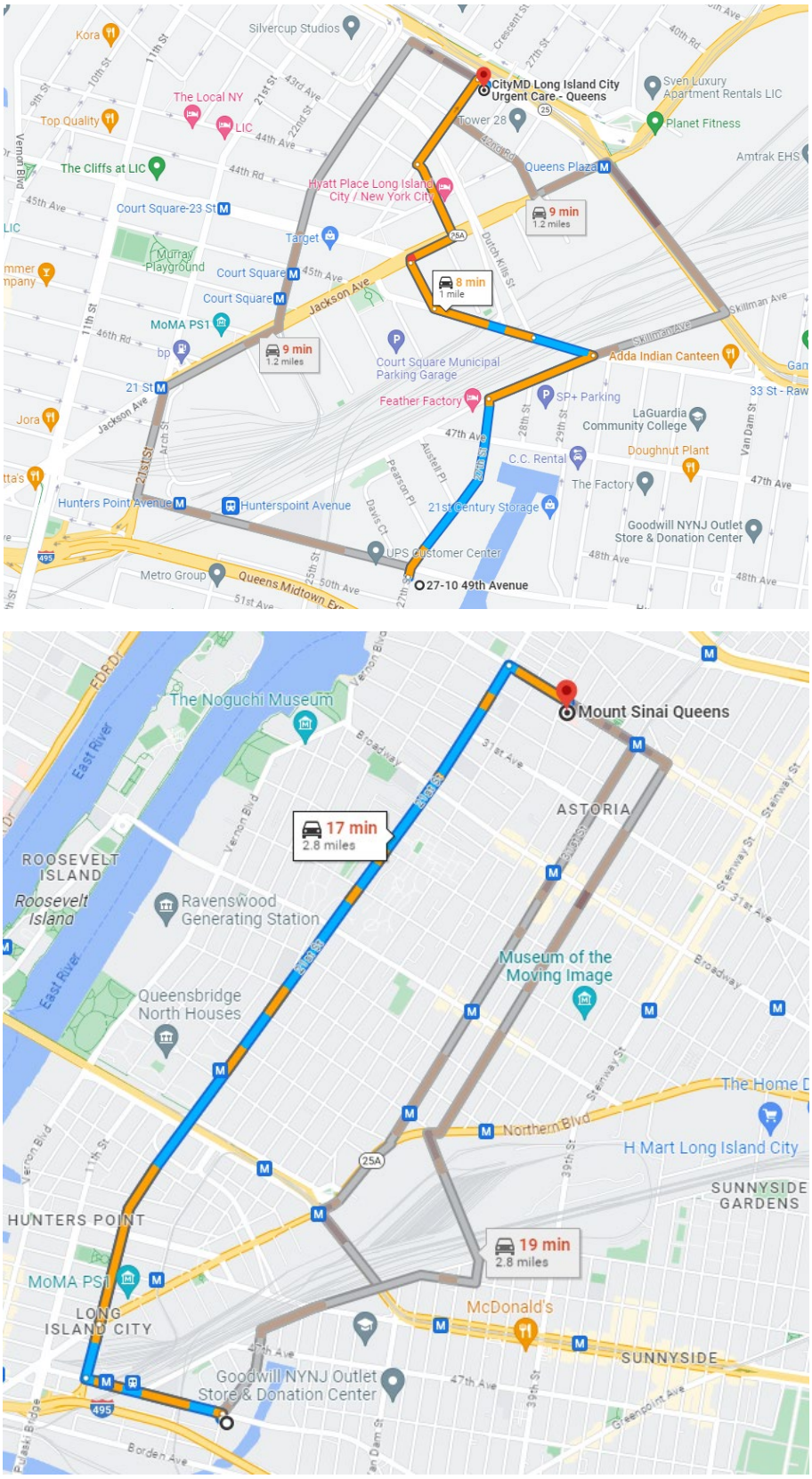
1. Site Location Map
2. Site Plan with Emergency Muster Area
3. Routes to Urgent Care and Hospital



Figure 1: **Site Location Map**



Figure 2: **Site Plan with Emergency Muster Area**



<u>Figure 3</u>: Routes to Urgent Care and Hospital

APPENDICES

A. Job Safety Analysis (JSA) Forms
B. Safety Data Sheets (SDSs) for Chemicals Used
C. COVID-19 Interim Health and Safety Guidance
D. Heat Illness Prevention Program
E. Personal Protective Equipment (PPE) Management Program
F. Subsurface Utility Clearance Management Program
G. Heavy Equipment Exclusion Zone Policy
H. Incident Investigation and Reporting Management Program
I. Fatigue Management Program
J. Silica Exposure Control Program
K. Ergonomics Management Program

APPENDIX A

Job Safety Analysis (JSA) Forms

JOB SAFETY ANALYSIS	Ctrl. No. GEN-003	DATE 4/10/2023	☐ NEW ☒ REVISED	PAGE 1 of 2

JSA TYPE CATEGORY	WORK TYPE	WORK ACTIVITY (Description)
GENERIC	**Construction - Excavation**	**Backfilling Excavation & Compaction**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
David Kaiser	Project Engineer	Brian Hobbs	CHSD
Edward Lacina	Senior Construction Manager		

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST	☐ GOGGLES	☐ AIR PURIFYING RESPIRATOR	☒ GLOVES: Leather/ cut-resistant level 2
☒ HARD HAT	☐ FACE SHIELD	☐ SUPPLIED RESPIRATOR	☐ OTHER _____
☐ LIFELINE / BODY HARNESS	☒ HEARING PROTECTION	☒ PPE CLOTHING: reflective DOT approved safety	
☒ SAFETY GLASSES	☒ SAFETY TOE BOOTS		

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Payloader, Backhoe, Dump Trucks, Mechanical gas powered tampers, Excavator with hydraulic tamper. APR when tamping if dust present. Two-way radios.

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs.

EXCLUSION ZONE (EZ): Maintain Minimum Heavy Equipment Exclusion Zone (HEEZ) around equipment and loads while it is in motion. The HEEZ must be greater than the swing zone of any moving part of the equipment, tip zone of the equipment, fall zone of the equipment and contents, distance that debris may travel during demolition activities and/or foot print of a structure to be demolished.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Pre-construction meeting: Review proposed excavation locations	**1a. CONTACT:** Potential for contact with subsurface utilities and above ground utilities	1a. Call state 811 for mark out service and one call ticket. 1a. Obtain private utility mark out service as necessary. 1a. Review and mark proposed excavations w/white paint. 1a. Identify all "Critical" zones. A Critical zone is any area within 10 feet of any operating utility. 1a. Complete subsurface clearance checklist. 1a. Soft dig must be conducted within 2 lateral feet of any suspected underground utility. 1a. Protection of aboveground utilities identified as being located within the work zone must be coordinated w/ client and utility owner.
2. Secure Work Area	**2a. CONTACT:** Potential for personnel to enter the work area. Potential for equipment to contact, or crush personnel. **2b. EXERTION:** Potential for muscle strain or tear while installing traffic cones and barrel	2a. Ensure work area is secure and inform others of work activity. Establish a HEEZ using 42" traffic cones, barrels & snow fencing or telescoping poles. Use of flag persons to maintain clear traffic and to minimize motorist confusion during set-up of new traffic pattern. HEEZ to include tip/swing radius of equipment. 2a. Dump Truck/Excavator/Payloader/Backhoe equipment to be set-up by personnel who are familiar with machinery. Spotters shall be in place for all equipment. and to control access to the HEEZ 2a. Truck wheels are chocked when driver is not in truck and engine shut off. 2a. Personnel shall stay out of the exclusion zone (10' minimum or greater than the equipment boom) while equipment is maneuvering. 2b. Keep back straight, keep load close to the body and bend knees while lifting and working. If over 50 lbs., use 2 or more laborers for lifting or use of equipment.

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.
[2] A hazard is a potential danger. Break hazards into six types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards; Energy Source – electricity, pressure, compression/tension.
[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

3. Backfilling excavation, and compaction	**3a. CONTACT:** Traffic and live equipment. . **3b. EXPOSURE:** Fumes from gas powered tamper **3c. FALL:** Slips, trips, fall hazards. **3d. OVEREXERTION:** Muscle strain, or tear. **3e. EXPOSURE:** Noise from tamper. Dust inhalation.	3a. Equipment and trucks shall be isolated from other workers, subcontractors and third party traffic with 42" traffic cones, barricades, snow fencing or telescoping poles, and/or Jersey barriers. Spotters shall direct dump truck for placement of fill near excavation. Pay loader/ Excavator, as directed by spotter, shall move fill into trench where it shall be placed in layers and compacted by mechanical means. 3a. Spotters will wear florescent vests at all times. 3a. Spotters will remain out of the exclusion zone, line-of-fire from equipment and third-party vehicles. 3a. Spotters and operators will have radios for communication, when other visual and/or hand signals are insufficient. 3a. Locate all overhead utilities. All personnel and machinery should maintain a minimum 10' distance from overhead electric lines. Refer to OSHA chart for distances and voltage. 3a. For excavations engineered (shored, sloped, benched} all personnel, equipment, and materials must remain a minimum of 2 feet from edge of excavation. 3b. Fueling of all equipment will be done outside of work area in a well-ventilated area. Refueling will be done only after a 2-5-minute cool down. 3c. Work area will be clean and free of any debris to remove slip, trip and fall hazards. All tools will be kept in designated areas. Insure work area is well illuminated. 3c. Workers should only be working in areas that have been leveled with a machine. 3c. All persons working at elevations over 6' shall use a guardrail system or personal fall arrest system while around excavation. 3d. Keep knees bent and back straight while transferring/ lifting/lowering tamper from elevated areas. Utilize a co-worker to avoid staining muscles. 3d. Keep knees bent and back straight while maneuvering tamper. Utilize a co-worker to avoid staining muscles. 3e. Workers will wear hearing protection during compaction tamper activities. 3e. Wear NIOSH approved dust mask for personal comfort. If dust is visible for extended time, limit by wetting down area. 3e. If dust continues stop work and evaluate if increase in APR is needed with approval and clearance.
4. Secure/leave site.	**4a. FALL:** Slip, trip, fall	4a. Clear work area of all debris and store all equipment in designated areas/containers before opening to traffic. 4a. Replace fencing and barricades as needed to secure path before opening roadway or area up to traffic(vehicle, pedestrian and/or bicycle).

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.
[2] A hazard is a potential danger. Break hazards into six types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards; Energy Source – electricity, pressure, compression/tension.
[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

JOB SAFETY ANALYSIS	Ctrl. No. GEN-004	DATE 4/10/2023	☐ NEW ☒ REVISED	PAGE 1 of 2

JSA TYPE CATEGORY	WORK TYPE	WORK ACTIVITY (Description)
GENERIC	**Construction - Concrete and Asphalt**	**Concrete Form Assembly and Concrete Pouring**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
David Kaiser	Senior Engineer	Brian Hobbs	CHSD

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST	☐ GOGGLES	☒ AIR PURIFYING RESPIRATOR	☒ GLOVES: Cut resistant and Nitrile/Latex
☒ HARD HAT	☒ FACE SHIELD	☐ SUPPLIED RESPIRATOR	☒ OTHER: Chaps, dust mask
☐ LIFELINE / BODY HARNESS	☒ HEARING PROTECTION	☒ PPE CLOTHING: reflective DOT approved safety	
☒ SAFETY GLASSES	☒ SAFETY TOE BOOTS: Steel /composite toe boots		

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Wheel Barrow, Trowels, Concrete Floats and Hand Tools (Extension Poles), Waterproof Boot Covers, Traffic Cones, Caution Tape, Portable Eye Wash Station

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs.

EXCLUSION ZONE (EZ): Maintain Minimum Heavy Equipment Exclusion Zone around equipment and loads while it is in motion. The HEEZ must be greater than the swing zone of any moving part of the equipment, tip zone of the equipment, fall zone of the equipment and contents, distance that debris may travel during demolition activities and/or foot print of a structure to be demolished.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Set-up work zone	**1a. CONTACT:** Moving equipment, third party traffic.	1a. Secure work area using barricades/barrels/cones and caution tape/safety fence. Use flagmen to control third party traffic. **Maintain minimum heavy equipment exclusion zone (EZ)** around equipment and live loads. 1a. When machines are operating, all workers will remain outside of EZ unless operator is in "HANDS OFF" mode.
2. Assembly of concrete forms (i.e. plywood, lumber, rebar, etc.)	**2a. CONTACT:** Contacting materials being lowered into work area. Potential for cuts and abrasions and to be contacted by nails while assembling. **2b. EXERTION:** Muscle strain. **2c. EXPOSURE:** Noise, dust, fumes. **2d. CAUGHT:** Pinch points, caught between, Crushed	2a. Workers will keep fingers and limbs out of the line-of-fire of tools, equipment and live loads. Workers will use inspected rigging and only attach rigging to manufacturer installed lifting points. Loads will be controlled with non-conductive tag lines from outside the EZ. Wear hard hat. See JSA for applicable cutting tool. 2b. When transporting and working with forms, workers will keep backs straight, knees bent, and loads close to their body. Any load more than 50 lbs., will be lifted by two or more workers or a mechanical lifting device. 2c. Workers will wear hearing protection, face shields and chaps when using all power tools. Fuel powered tools will be fueled away from the work zone in a well-ventilated area. Refueling will be done after a minimum cool down period of 5 minutes. See JSA for applicable cutting tool. 2d. Keep hands away from rigging while hooking/unhooking materials; wear cut resistant gloves.
3. Setup concrete trucks and chute	**3a. CONTACT/CAUGHT:** Potential for truck to contact personnel, fingers to be pinched while setting up chutes. Contact with overhead power lines. **3b. OVEREXERTION:** Strain, pulled muscles.	3a. Spotters will guide concrete trucks into position; wheel chocks will be set before work begins when trucks are parked. Workers will stay out of exclusion zone until truck is parked and secured. Keep hands clear of potential pinch points when assembling chutes. 3a. A minimum clearance of 10 feet shall be maintained from all overhead power lines. That distance may be reduced if shielding is in place or it is determined that lines are low voltage. Refer to site-specific HASP. 3b. All workers will keep back straight and bend their knees when lifting. Two workers or mechanical means will be used when load exceeds 50 lbs.

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.

[2] A hazard is a potential danger. Break hazards into six types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards; Energy Source – electricity, pressure, compression/tension.

[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
4. Pour concrete into forms	**4a. CONTACT:** Splashing from wet concrete.	4a. Portable eye wash stations shall be set up nearby for easy access; wear safety glasses. Nitrile or latex gloves and water proof boots or boot covers shall be worn to eliminate skin contact with concrete. Any concrete splashed onto non-waterproof clothing shall be removed to avoid skin irritation.
	4b. EXPOSURE: Concrete dust.	4b. Stand upwind while mixing dry concrete. Use dust mask or air purifying respirator to avoid silica inhalation.
5. Concrete finishing work with hand tools and/or vibrate to settle and remove air from poured cement,	**5a. ENERGY SOURCE:** Potential for personnel to be exposed to live electricity.	5a. Electrical tools shall be inspected for defects prior to being used. Any extension cords shall be heavy duty rated and be free from defects (no exposed wires). All electrical connections shall be connected to GFCI outlets. Generators shall be run in well ventilated locations.
	5b. OVEREXERTION: Potential muscle strain while vibrating cement, stepping over forms/rebar reinforcements. During use of hand tools to finish concrete, worker can overextend to reach far end of poured area.	5b. Constantly check/observe where you are walking; wear composite or steel-toed boots. Keep back straight and knees bent while settling concrete with vibrator. 5b. If worker needs to reach the far end of a poured area with finishing tools, they shall use extension poles and not over reach to maintain balance. Maintain even footing while using finishing tools. Use spotter during extension pole use.
	5c. CONTACT: Potential hand tools with extension poles/handles to contact nearby workers/pedestrians/vehicles/overh ead power lines.	5c. During use of hand tools to finish poured concrete workers will alert work crew. If utilizing extension poles/handles worker will use a spotter to make sure no contact is made with other workers, pedestrians, vehicles or overhead power lines.
6. Cleanup of work area and tools.	**6a. CONTACT/FALL:** Potential slip, trip, and fall on materials and tools left in the work area.	6a. Place additional materials and tools in designated storage areas. Remove any garbage from the work area.

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[2] A hazard is a potential danger. Break hazards into six types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards; Energy Source – electricity, pressure, compression/tension.
[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

JOB SAFETY ANALYSIS	Ctrl. No. GEN-005	DATE 4/10/2023	☐ NEW ☒ REVISED	PAGE 1 of 2

JSA TYPE CATEGORY	WORK TYPE	WORK ACTIVITY (Description)
GENERIC	**Construction**	**Cutting with Gas-powered Saw, Sawzall or Plasma Cutter**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
Ray Greenidge	Sr. Compliance Manager	Brian Hobbs	CHSD

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☒ REFLECTIVE VEST ☒ HARD HAT ☐ LIFELINE / BODY HARNESS ☒ SAFETY GLASSES	☐ GOGGLES ☒ FACE SHIELD (gas powered saw and plasma cutter) ☒ HEARING PROTECTION ☒ SAFETY SHOES: Steel-toed boots	☐ AIR PURIFYING RESPIRATOR ☐ SUPPLIED RESPIRATOR ☒ PPE CLOTHING: Fluorescent Long sleeved shirt and / or reflective safety vest	☒ GLOVES: Cut-resistant, leather, nitrile ☒ OTHER: Chaps for gas powered saw. Welding suit for plasma cutting.

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Sawzall/extension cord

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Set up/ Secure work area.	**1a. CONTACT:** Personnel could enter the work area	1a. Establish the work zone using 42" cones, caution tape, or fixed rigid barrier. Inform others of work activity.
2. Precutting procedure.	**2a. CONTACT:** Improper blade, malfunctioning guards, unsecured materials, flying debris	2a. Inspect all equipment for defects, replace or service if not functioning optimally. Check that all guards are working and in place, replace if missing. Ensure that blades are sharp and clean to avoid binding and/or burning. Cut on flat/secure work surfaces. Do not cut badly warped wood or boards with knots or nails. 2a. Unplug saw before handing it off to another person. 2a. Wear safety glasses, long-sleeved shirt and leather gloves. Utilize job specific PPE such as welding jacket or chaps when using gas powered saw or a plasma cutter.
	2b. EXPOSURE: Loud noises, dust, bright UV light	2b. When using gas powered saw, wet down area to be cut prior to cutting if high dust levels are anticipated. 2b. Wear hearing protection. Wear a dust mask if large amounts of dust are expected; cut upwind if possible. 2b. When plasma cutting, wear a face shield with shaded glasses rated to block UV light generated by the plasma cutter.
	2c. ENERGY SOURCE: Potential for electric shock	2c. Inspect extension cord for damage. If damaged, tag out and repair / replace. Do not operate saw while standing in water. Ensure GFCI protection at outlet or via attachment. 2c. Ensure all electrical equipment is rated for the task.

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.
[2] A hazard is a potential danger. Break hazards into six types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards; Energy Source – electricity, pressure, compression/tension.
[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
3. Saw Cutting.	**3a. CONTACT:** Fingers could be cut, lacerated or amputated by reciprocating blade; also flying debris and sparks	3a. Cut away from body. Keep fingers away from moving blade. No loose clothing. Never leave saw running unattended. Unplug saw before changing blades or making adjustments / repairs. Set-up barrier to contain sparks. Cut on flat/secure work surfaces. 3a. Wear Safety glasses 3a. Ensure that the saw blade stops rotating/reciprocating before placing saw on the ground.
	3b. CONTACT: Amputation and line of fire injury.	3b. Maintain a minimum 15-foot exclusion zone and ensure that operator and other personnel are kept out of the line-of-fire of the equipment.
	3c. FALL: Tripping hazards caused by cutting/grinding debris, extension cords.	3c. Keep debris generated in designated storage containers. Keep work area free of Slip, Trip and Fall hazards. 3c. Do not route extension cords through walking/working path.
	3d. EXERTION/ERGONOMICS: Lifting heavy or awkward materials may cause muscle strain.	3d. Maintain Proper Body Position while operating lifting and moving with equipment. Keep load close to body, knees bent, and back straight. 3d. Take frequent breaks or switch personnel if cutting for an extended period of time.
	3e. EXPOSURE: Personnel may be exposed to fire hazard during Hot Work Activities.	3e. Complete Hot Work Permit, Designate Fire Watch. 3e. Conduct work zone inspection: – Verify that all combustible or flammable materials or equipment fuel sources have been removed from within 35 feet of the proposed hot work. – If combustible or flammable materials or equipment fuel sources have not been removed from within 35 feet of the hot work, verify that engineering and procedural controls have been emplaced: curtains, blankets, wetting, ventilation. 3e. Two 20-lb. Type ABC Fire extinguishers required. 3e. Conduct continuous air monitoring / Lower Explosive Limit (LEL) screenings. Action Level: 10% of the LEL. 3e. If ambient air concentrations exceed LEL Action Levels, STOP WORK and contact supervisor. 3e. Wear hard hat, long sleeved-shirt and safety glasses. Utilize job specific PPE such as welding jacket or chaps and welding glasses when using gas powered saw or a plasma cutter.
4. Secure area when leaving tools unattended.	**4a. CONTACT:** Unauthorized personnel may enter the work area	4a. Unplug saw when not being used. Store equipment in designated storage areas when not being used.
	4b. FALL: Slip/trip/fall	4b. Store tool in designated storage location when it is not being used, secure all extension cords, keep all equipment out of walkways. 4b. Keep work area free of Slip, Trip and Fall Hazards.

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.
[2] A hazard is a potential danger. Break hazards into six types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards; Energy Source – electricity, pressure, compression/tension.
[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

JOB SAFETY ANALYSIS	Ctrl. No. GEN-006	DATE 4/10/2023	☐ NEW ☒ REVISED	PAGE 1 of 2

JSA TYPE CATEGORY:	WORK TYPE:	WORK ACTIVITY (Description):	
Generic	**Drilling**	**Direct Push Soil Borings / Well Installation**	
DEVELOPMENT TEAM	**POSITION / TITLE**	**REVIEWED BY:**	**POSITION / TITLE**
Timothy Zei	Project Hydrogeologist	Raymond Olson	OHSM
		Brian Hobbs	CHSD

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST ☒ HARD HAT ☐ LIFELINE / BODY HARNESS ☒ SAFETY GLASSES	☐ GOGGLES ☐ FACE SHIELD ☒ HEARING PROTECTION: (as needed) ☒ SAFETY SHOES: Composite-toe or steel toe boots	☐ AIR PURIFYING RESPIRATOR ☐ SUPPLIED RESPIRATOR ☒ PPE CLOTHING: Fluorescent reflective vest or high visibility clothing, Long Sleeve Shirt	☒ GLOVES: Leather, Nitrile and cut resistant ☒ OTHER: Insect Repellant, sunscreen (as needed)

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Geoprobe or Truck-Mounted Direct Push Drill Rig, Hand Tools, Photoionization Detector, Multi-Gas Meter (or equivalent), Macrocore liners, Liner Opening Tool, 20 lb. Type ABC Fire Extinguisher, 42" Cones & Flags, "Work Area" Signs, Water

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs

EXCLUSION ZONE (EZ): Maintain Minimum Heavy Equipment Exclusion Zone around equipment and loads while it is in motion. The HEEZ must be greater than the swing zone of any moving part of the equipment, tip zone of the equipment, fall zone of the equipment and contents, distance that debris may travel during demolition activities and/or foot print of a structure to be demolished.

"SHOW ME YOUR HANDS"
Driller and helper should show that hands are clear from controls and moving parts

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Mobilization of drilling rig (ensure the Subsurface Clearance Protocol and Drill Rig Checklist are completed)	**1a. CONTACT:** Equipment/property damage.	1a. The drill rig's tower/derrick will be lowered and secured prior to mobilization. 1a. A spotter should be utilized while moving the drill rig. If personnel move into the path of the drill rig, the drill rig will be stopped until the path is again clear. Use a spotter for all required backing operations. 1a. Set-up the work area and position equipment in a manner that eliminates or reduces the need for backing of support trucks and trailers. 1a. When backing up truck rig with an attached trailer use a second spotter if there is tight clearance simultaneously on multiple sides of the equipment or if turning angles limit driver visibility. 1a. Inspect the driving path for uneven terrain. Level or avoid if needed. 1a. Drill rig should have a minimum **exclusion zone which encompasses its tip radius** for non-essential personnel (i.e., driller helper, geologist) when the rig is moving/ in operation.
	1b. FALL: Slip/trip/fall hazards.	1b. Inspect walking path for uneven terrain, weather-related hazards (i.e., ice, puddles, snow, etc.), and obstructions prior to mobilizing equipment. 1b. Do not climb over stored materials/equipment; walk around. Practice good housekeeping. 1b. Use established pathways and walk on stable, secure ground.
	1c. CONTACT: Crushing from roll-over.	1c Geoprobe should cross all hills/obstructions head on with the mast down to reduce risk of roll-over.
2. Raising tower/derrick of drill rig	**2a. CONTACT:** Overhead hazards.	2a. Prior to raising the tower/derrick, the area above the drilling rig will be inspected for wires, tree limbs, piping, or other structures, that could come in contact with the rig's tower and/or drilling rods or tools. 2a. Maintain a safe distance of 10' from overhead structures.
	2b. CONTACT: Pinch Points/Amputation Points when raising the rig and instability of rig	2b. Inspect the equipment prior to use and avoid pinch/amputation points. 2b. Lower outriggers to ensure stability prior to raising rig tower/derrick. 2b. If the rig needs to be mounted, be sure to use three points of contact.
3. Advancement of drilling equipment and well installation	**3a. CONTACT:** Flying debris	3a. Be aware of and avoid potential line-of-fire hazards and wear required PPE such as eye, ear, and hand protection.
	3b. EXPOSURE: Noise and dust.	3b. Wet borehole area with sprayer to minimize dust. 3b. Stand upwind and keep body away from rig. 3b. Dust mask should be worn if conditions warrant. 3b. Wear hearing protection when the drill rig is in operation.
Assess [1]JOB STEPS	**Analyze [2]POTENTIAL HAZARDS**	**Act [3]CRITICAL ACTIONS**

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.
[2] A hazard is a potential danger. Break hazards into six types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards; Energy Source – electricity, pressure, compression/tension.
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3. Advancement of drilling equipment and well installation (Continued)	**3a. CONTACT:** Flying debris **3b. EXPOSURE:** Noise and dust. **3c. FALL:** Slip/trip/fall hazards. **3d. CAUGHT:** Limb/extremity pinching; abrasion/crushing. **3e. CONTACT:** Equipment imbalance during advancement of drill equipment. **3f. EXPOSURE:** Inhalation of contamination/vapors. **3g. EXERTION:** Potential for muscle strain/injury while lifting and installing well casings, lifting sand bags, and/or lifting rods.	3c. Contain drill cuttings and drilling water to prevent fall hazards from developing in work area. 3c. See 1b. 3d. Ensure all Emergency Safety Stop buttons function properly. 3d. Always wear leather gloves when making connections and using hand tools; wear cut-resistant (i.e., Kevlar) gloves when handling cutting tools. 3d. Inspect the equipment prior to use for potential pinch/amputation points. Keep hands away from pinch/amputation points and use of tools is preferable compared to fingers and hands. 3d. Inspect drill head for worn surface or missing teeth; replace if damaged or blunt. 3d. Ensure all jewelry is removed, loose clothing is secured, and PPE is secured close to the body. 3d. All non-essential personnel should stay away from the immediate work area; position body out of the line-of-fire of equipment. 3d. Drillers and helpers will understand and use the "Show Me Your Hands" Policy. 3d. Spinning rods/casing have an **exclusion zone of tip radius** while in operation. 3e. Drillers will advance the borehole with caution to avoid causing the rig to become imbalanced and/or tip. 3e. The blocking and leveling devices used to secure the rig will be inspected by drillers and Roux personnel regularly to see if shifting has occurred. 3e. In addition, personnel and equipment that are non-essential to the advancement of the borehole will be positioned away from the rig at a distance that is at least as far as the boom is high (**minimum exclusion zone**). 3f. Monitor ambient air for dangerous conditions using a calibrated photoionization detector (PID) to periodically monitor the breathing zone of the work area. 3f. If a reading of >5ppm is recorded, the Roux field personnel must temporarily cease work, instruct all Site personnel to step away from the area of elevated readings and inform the Roux PM of the condition. The Roux PM will then recommend additional precautions in accordance with the site specific health and safety plan. 3f. Use a multi-gas meter to monitor ambient air for dangerous conditions (i.e. unsafe levels of carbon monoxide when drilling indoors or the presence of explosive vapors). 3g. Keep back straight and bend at the knees. 3g. Utilize team lifting or mechanical means for objects over 50lbs. 3g. Use mechanical lifting device for odd shaped objects.
4. Remove sample liner.	**4a. EXERTION:** Potential for muscle strain/injury while removing liner from probe rod. **4b. CONTACT:** Pinch points and cuts **4c. EXPOSURE:** Inhalation and/or dermal contact with contaminants.	4a Utilize team lifting or mechanical means for objects over 50lbs. 4a. Use hydraulic liner extruder if available. 4b. Place liner on sturdy surface when opening. 4b. Don cut-resistant gloves and use appropriate liner cutter when opening liners. 4b. Always cut away from the body. 4c. Wear chemical-resistant disposable gloves when handling liners. 4c. See 3f.
5. Decontaminate equipment.	**5a. EXPOSURE/CONTACT**: To contamination (e.g., Separate Phase Hydrocarbons (SPH), contaminated groundwater, vapors). **5b. EXPOSURE:** To chemicals in cleaning solution including ammonia.	5a. Wear chemical-resistant disposable gloves and safety glasses. 5a. Contain decontamination water so that it does not spill. 5a. Use an absorbent pad to clean spills, if necessary. 5a. Spray equipment from side angle, not straight on, to avoid backsplash. 5a. See 3b and 3f. 5b. See 4a. Review SDS to ensure appropriate precautions are taken and understood.

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JOB SAFETY ANALYSIS	Ctrl. No. GEN-007	DATE 4/10/2023	☐ NEW ☒ REVISED	PAGE 1 of 2

JSA TYPE CATEGORY	WORK TYPE	WORK ACTIVITY (Description)
GENERIC	**General Site Activity**	**Driving**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
Valerie Sabatasso	Project Scientist	Brian Hobbs	CHSD

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST	☐ GOGGLES	☐ AIR PURIFYING RESPIRATOR	☒ GLOVES: Leather/ cut-resistant level 2
☒ HARD HAT: when outside vehicle	☐ FACE SHIELD	☐ SUPPLIED RESPIRATOR	☐ OTHER _____
☐ LIFELINE / BODY HARNESS	☒ HEARING PROTECTION	☒ PPE CLOTHING: high visibility vest, when outside vehicle	
☒ SAFETY GLASSES:when outside vehicle	☒ SAFETY TOE BOOTS: when outside vehicle		

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Motor Vehicle (i.e. car, truck, SUV)

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs

EXCLUSION ZONE (EZ): Maintain Minimum Heavy Equipment Exclusion Zone around equipment and loads while it is in motion. The HEEZ must be greater than the swing zone of any moving part of the equipment, tip zone of the equipment, fall zone of the equipment and contents, distance that debris may travel during demolition activities and/or foot print of a structure to be demolished.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Driving to/leaving Site	**1a. CONTACT:** Severe injury/disability, property damage, monetary loss (insurance premiums, deductibles, loss of license/job) caused by collision with or struck by other vehicles, obstructions, pedestrians, animals, etc. *Common factors that may lead to CONTACT incident, but not limited to: • distracted driving (cell phone, GPS, radio, billboards, "rubber necking") • lack of situational awareness • unfamiliarity with traffic patterns/road layout • weather conditions (wet/icy roads, hydroplaning, black ice) • weariness • high speeds • obstructed vision (solar glare, debris on windshield, blind spots, large vehicle at the front) • changes in travel pathway (construction, snow banks, non-operational signals, potholes, detours, special events) • improper vehicle maintenance (non-operational signal light, worn tires, cracked windshield, ineffective wipers) • loose or unsecure objects	1a. PLAN AHEAD – review/make yourself familiar with maps and driving directions before beginning the drive to the Site. Do not attempt to drive and review maps/directions at the same time. Pull over and stop your vehicle before looking at maps/directions. 1a. Complete a basic vehicle inspection before driving. Verify Inspection and Registration are current, tires and wipers are in good condition, all lights are functional, all glass/mirrors are undamaged, the horn is functional, roof/hood/trunk are free from accumulated snow and visibility is not impaired due to snow/ice/frost/fog on windows. 1a. Do not hang items in car that can obstruct your view or become projectiles in a collision. 1a. Do not get distracted using touch screen radios or GPS units built into newer models. Keep your eyes on the road and stay alert. 1a. Follow posted speed limits and obey traffic signals and roadway signs. 1a. Always wear your seat belt and shoulder harness when driving. 1a. When driving around large vehicles and trucks, maintain extra space as these vehicles may not be able to see a smaller car too close. 1a. Follow the "Rules of the Road" including: using your turn signals, coming to a complete stop, and allowing vehicles the right of way (yield) when they are when traffic laws require. 1a. Apply the Smith Five Keys® of safe driving • Aim High in Steering® - Expand eye lead time to a minimum of 15 seconds • Get the Big Picture® - Maintain proper a 4 second minimum following distance at all times - Scan mirrors every 5-8 seconds to achieve a circle of awareness - Position your vehicle so you can see relevant/non-relevant objects • Keep Your Eyes Moving® - Try to maintain about 180 degrees of visibility - Avoid blank and fixed stares. Avoid focusing on one object for more than 2 seconds • Leave Yourself an Out® - Avoid traveling in traffic clusters - Surround yourself with space - Anticipate the actions of others

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Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Driving to/leaving Site (cont'd)	**1a. CONTACT:** Severe injury/disability, property damage, monetary loss (insurance premiums, deductibles, loss of license/job) caused by collision with or struck by other vehicles, obstructions, pedestrians, animals, etc.	• Make Sure They See You® - Maintain eye contact with on-coming vehicles/pedestrians - Use warning devices (e.g., hand signals, high-lights, horns etc.) - Proper timing is essential 1a. Do not perform reconnaissance or inspections while driving. Your vehicle should be parked in a safe location when viewing or surveying the Site and vicinity 1a. Avoid sudden turns and stops. Don't drive recklessly – be in control of vehicle at all times. 1a. In inclement weather, first determine if work can be POSTPONED. Otherwise, plan according to weather conditions including checking forecast along entirety of travel route (especially, for long distances). Reduce speed as road conditions warrant. Travelling with winter car equipment in the winter is strongly recommended (i.e., shovel, scraper, brush, blanket, extra clothing, flashlight, bag of sand). If your vehicle has 4-wheel drive, review the operators manual and understand operating procedure prior to engaging 4-wheel drive. If at any point on your drive weather becomes too severe to proceed safely pull over if safe to do so or seek nearest cover (e.g., overpass) 1a. If feeling drowsy or sleepy, do not drive. Pull over in a safe place to rest if you experience any signs of drowsiness. Make sure to get adequate sleep the night before an early drive. 1a. Never operate a vehicle under the influence of alcohol or illegal substances or medications affecting your performance. 1a. Keep your eyes on the road. Do not call or talk on cellular phones. Pull over to a safe location if you must answer or make a call. 1a. When parking, pull-through when possible. If backing is required visually inspect area to ensure it is free from obstructions prior to backing in and relying solely on mirrors; use spotters when available.
2. Entering/Exiting Vehicle.	**2a. CAUGHT:** Personal injury (broken fingers/hand) while entering or exiting vehicles **2b. FALL:** Personal injury (twisted ankle, deep contusion, concussion, broken wrist/arm, etc.) from slip/fall on uneven or unstable or slippery surface while exiting/entering vehicle **2c. CONTACT:** Severe injury/disability, property damage, monetary loss (insurance premiums, deductibles, loss of license/job) caused by collision with or struck by other vehicles, obstructions, pedestrians, animals, etc.	2a. Open and close doors slowly. Never put hands or feet in between door and vehicle to avoid pinch points. 2b. When exiting the vehicle make sure your feet are on firm footing and weight is evenly distributed before exiting/standing. In inclement weather use hands to support yourself, by holding the car door and/or steering wheel, when exiting the vehicle. 2c. Check both directions for traffic before opening door. Do not exit vehicle if traffic does not permit you to exit safely 2c. Check anticipated path of door prior to opening, do not open door into any obstructions (e.g., bollards, high curbing)

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JSA TYPE CATEGORY	WORK TYPE	WORK ACTIVITY (Description)
Generic	**Construction - Excavation**	**Excavation / Trenching**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
David Kaiser	Senior Engineer	Brian Hobbs	CHSD
Tim Unalp	SHSO		

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST	☐ GOGGLES	☐ AIR PURIFYING RESPIRATOR	☒ GLOVES: Leather or cut resistant
☒ HARD HAT	☐ FACE SHIELD	☐ SUPPLIED RESPIRATOR	☐ OTHER
☒ LONG SLEEVED SHIRT	☒ HEARING PROTECTION	☒ PPE CLOTHING: Fluorescent reflective vest or high visibility long sleeved clothing	
☐ LIFELINE / BODY HARNESS	☒ SAFETY SHOES: Steel-toe boots		
☒ SAFETY GLASSES			

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Jackhammer, Excavator, Backhoe, Hand Tools, Photoionization Detector, barrels, 42" traffic cones, snow fencing, telescoping poles, temporary chain link fence, ladders, shovels, digging bars, power tools (cut-off saw), Two-way radios, Sheeting, Trench box, Retractable lanyard, Harness

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs

EXCLUSION ZONE (EZ): Maintain Minimum Heavy Equipment Exclusion Zone around equipment and loads while it is in motion. The HEEZ must be greater than the swing zone of any moving part of the equipment, tip zone of the equipment, fall zone of the equipment and contents, distance that debris may travel during demolition activities and/or footprint of a structure to be demolished.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Pre-Clearance Protocol.	**1a. CONTACT:** Damage to underground utility.	1a. Confirm that (if applicable) "Call Before You Dig" and local utility companies were contacted prior to trenching in order to confirm utility mark outs. Must have a case # before digging.
	1b. ENERGY SOURCE/CONTACT: Property damage; Pressurized water mains may cause lacerations or broken bones. Pressurized gas mains may explode causing serious injury, or death. Underground electric may cause severe burns, shock, or death.	1b. Pre-clearing of the trenching location must be conducted to a minimum of 5 vertical feet below the ground surface (10 feet minimum for Critical Zone) using soft digging methods or hand tools (shovel and non-metallic dig bar) prior to trenching. Supervisor should be contacted to discuss appropriate pre-clearing depth. **1b. Complete subsurface clearance checklist**.
	1c. FALL: Slip, Trip or Fall may cause muscle strains or tears, abrasions, lacerations, or broken bones.	1c. Be aware of the conditions when walking or loading equipment and working. Walk within established pathway avoiding uneven surfaces. Remove potential slip/trip/fall hazards.
2. Set up work zone.	**2a. CONTACT/CAUGHT:** Cuts/lacerations from equipment. Broken bones from contact by vehicle.	2a. Isolate work area from hazards with cones, barricades, and snow fencing, telescoping poles or temporary chain link fence. Utilize a flag person when necessary (i.e., third party traffic in area). Install traffic signs in roadways and for detours. Spotters will maintain and enforce exclusion zone.
	2b. FALL: Slip, Trip or Fall may cause muscle strains or tears, abrasions, lacerations, or broken bones.	2b. See 1c.

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Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
3. Trenching Activity.	**3a. CONTACT:** Serious injury including broken bones, muscle strains or tears, and possibly death due to contact with machine.	3a. Spotter(s) required for all heavy equipment operation. No worker shall be allowed inside the exclusion zone or along the trench/excavation area while any equipment is in operation. A minimum exclusion zone greater than the length of the equipment boom must be established. Workers only allowed in exclusion zone if the operator is in "Hands Off "mode. Operator will not operate equipment until worker is out of exclusion zone. Spotters and operators will have radios for communication, when either loses sight of one another, and/or in case of emergency.
	3b. FALL: Slip, Trip or Fall may cause muscle strains or tears, abrasions, lacerations, or broken bones	3b. Any trench/excavation deeper than 3' must have a ladder within 25' of any worker in the excavation. At least 3'(rungs) of the ladder shall be above the top of the excavation. All spoil piles shall be maintained 2' minimum from edge of excavation. 3b. Any trench/excavation deeper than 6' must have fall protection, retractable lanyard for ladder use, and 42" high guardrails along the edge of the trench/excavation.
	3c. EXPOSURE: Noise, Dust, Concrete- Asphalt, petroleum hydrocarbon vapors may cause damage to ears and lungs	3c. Air monitoring using a calibrated photoionization detector (PID) will be used to monitor the breathing zone of the work area. If a reading of >5ppm is recorded, the oversight personnel must temporarily cease work and instruct all Site personnel to step away from the area of elevated readings.
4. Setting Trench protections if necessary.	**4a. CAUGHT:** Injury due to contact with failed trench, may include muscle strains or tears, abrasions or lacerations, broken bones and possibly death.	4a. To prevent cave-ins and avoid caught by/between, excavations over 4' in depth, unless working in stable rock, shall have engineer approved shoring, sheeting or trench box. Top of protection shall be at least 2' above top of excavation.
	4b. CONTACT/CAUGHT: Injury due to rigging activities and entering exclusion zone during lifting and/or transport of shoring/trench box/material may include muscle strains or tears, abrasions or lacerations, broken bones and possibly death.	4b. Use only inspected rigging with 2, 3 or 4 lift points; wear cut-resistant gloves. Rigging to be hooked up to factory installed hook up points on equipment. Control load with non-conductive tag lines with workers out of exclusion zone. Don't stand underneath suspended load; wear steel toed boots and hard hat.
	4c. FALL: Possible injury due to fall into excavation may include muscle strains or tears, abrasions or lacerations, or broken bones.	4c. Shoring to be set and sides will be backfilled to avoid fall hazards before workers are allowed to enter area. Operator will be in "HANDS OFF" mode before workers enter work area to unhook rigging. An inspected ladder extending 3' above top of the shoring will be used to enter and exit the excavation. Workers will use three points of contact when using the ladder.
5. Secure/Leave Site. If backfilling, see excavation backfilling and compaction JSA for potential hazards and critical actions.	**5a. FALL:** Potential Slip, Trip or Fall - may cause muscle strains or tears, abrasions or lacerations, or broken bones.	5a. See 1c. 5a. All open excavations must be backfilled or secured prior to departure with steel plates, orange construction fence or temporary chain link fencing.

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JSA TYPE CATEGORY	WORK TYPE	WORK ACTIVITY (Description)
GENERIC	**Site Recon**	**Mobilization/Demobilization**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
Tim Unalp	SHSO	Brian Hobbs	CHSD

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST ☒ HARD HAT ☐ LIFELINE / BODY HARNESS ☒ SAFETY GLASSES	☐ GOGGLES ☐ FACE SHIELD ☒ HEARING PROTECTION (as needed) ☒ SAFETY SHOES: Steel Toe or composite toe	☐ AIR PURIFYING RESPIRATOR ☐ SUPPLIED RESPIRATOR ☒ PPE CLOTHING: Fluorescent reflective vest of high-visibility clothing; long sleeve shirt; long pants	☒ GLOVES: Leather, nitrile, and cut resistant (as needed) ☐ OTHER

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Required Equipment: Varies

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EXCLUSION ZONE (EZ): Maintain Minimum Heavy Equipment Exclusion Zone around equipment and loads while it is in motion. The HEEZ must be greater than the swing zone of any moving part of the equipment, tip zone of the equipment, fall zone of the equipment and contents, distance that debris may travel during demolition activities and/or foot print of a structure to be demolished.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Mobilize/demobilize and establish work area	**1a. FALL:** Slip/trips/falls from obstructions, uneven terrain, weather conditions, heavy loads, and/or poor housekeeping.	1a. Use 3 points-of-contact/ensure secure footing when entering and exiting vehicle. 1a. Inspect walking path for uneven terrain, steep hills, obstructions, and/or weather-related hazards (i.e., ice, snow, and puddles) prior to mobilizing equipment. Use established pathways. Walk on stable/secure ground. 1a. Do not climb over stored materials/equipment; walk around. Practice good housekeeping; organize and store equipment neatly in one area at its lowest potential energy. 1a. Wear boots with adequate treads. 1a. Delineate unsafe areas with 42” cones, caution tape and/or flagging.
	1b. CONTACT: Personal injury and/or property damage caused by being struck by Site traffic or equipment used in Site activities.	1b. Observe and maintain the posted speed limits. 1b. When first arriving onsite, park vehicles in designated parking space and/or out of the way locations. Use parking brake on all vehicles and tire chocks on work trucks and trailers. 1b. Check in with Site Manager/Supervisor to ensure coordination with other Site activities and to discuss any special hazards. Ensure that short-service employees (SSE) are identified. 1b. Identify potential traffic sources. 1b. Wear PPE including high visibility clothing or reflective vest. 1b. Use a spotter while moving work vehicles; plan ahead to avoid backing whenever possible. 1b. Maintain a minimum exclusion zone when vehicles are in motion (i.e. greater than swing/tip radius of equipment). When backing up truck rig with an attached trailer use a second spotter if there is tight clearance simultaneously on multiple sides of the equipment or if turning angles limit driver-to-spotter visibility. 1b. Delineate work area with 42” cones, flags, caution tape, and/or other barriers. 1b. Position “Work Area” signs at Site entrances, if possible, or at either side of work area.

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Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
		1b. Position largest vehicle to protect against oncoming traffic. 1b. Face traffic, maintain eye contact with oncoming vehicles, use a spotter, and establish a safe exit route. 1b. Observe potential overhead and ground surface features that may interfere with moving equipment. Clear the path of physical hazards prior to initiating mobilization.
	1c. CAUGHT: Personal injury from pinch points and being in line-of-fire of vehicle and/or equipment.	1c. Make sure driver has engaged parking brake and placed wheel chocks in a position to prevent movement. Be sure that vehicle is parked in front/down gradient (positioned to best block oncoming traffic) of work area. 1c. Wear leather gloves when handling any tools or equipment. Wear cut-resistant gloves (Kevlar or similar) when handling sharp objects/cutting tools/glass. 1c. Keep body parts away from line-of-fire of equipment. 1c. Always carry tools by the handles and/or designated carrier. Ensure sharp-edged tools are sheathed/secure. 1c. Remove any loose jewelry. Avoid wearing loose clothing and/or ensure loose clothing is secure. 1c. Secure all items on the equipment, tighten up any items or features that have potential to shift or break during mobilization.
	1d. OVEREXERTION: Muscle strains while lifting/carrying equipment.	1d. Use body positioning and lifting techniques that avoid muscle strain; keep back straight, lift with legs, turn with whole body, keep load close to body, and never reach with a load. 1d. Ensure that loads are balanced. Use assistance (mechanical or additional person) to carry equipment that is either unwieldy or over 50 lbs.
	1e. EXPOSURE: Personal injury from exposure to biological and environmental hazards.	1e. Inspect area to avoid contact with biological hazards (i.e. poisonous plants, stinging insects, ticks, etc.). 1e. Wear long sleeved clothes treated with Permethrin, apply insect repellant containing DEET to exposed skin, and inspect clothes and skin for ticks during and after work. 1e. Apply sunscreen (SPF 15+) if exposure to sun for 30 minutes or more is expected.
	1f. EXPOSURE: Weather related injuries.	1f. Watch for heat stress symptoms (muscle cramping, exhaustion, dizziness, nausea, rapid and shallow breathing). Take breaks in cool places and hydrate as needed. 1f. Watch for cold stress symptoms (severe shivering, slowing of body movement, weakness, stumbling or inability to walk, collapse). Take breaks in warm areas as needed. 1f. Wear clothing appropriate for weather and temperature conditions (e.g., rain jackets, snow pants, multiple layers). 1f. If lightning is observed, wait 30 minutes in a sheltered location (car is acceptable) before resuming work.
	1g. EXPOSURE: Personal injury from noise hazards.	1g. Wear hearing protection if sound levels exceed 85 dBA (if you must raise your voice for normal conversation).

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JOB SAFETY ANALYSIS	Ctrl. No. GEN-019	DATE: 01/13/2022	☐NEW ☒REVISED	PAGE 1 of 2

JSA TYPE CATEGORY	WORK TYPE	WORK ACTIVITY (Description)
GENERIC	**Site Reconnaissance**	**Site Walk and Inspection**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
Sara Barrientos	Project Geologist	Brian Hobbs	Corporate Health and Safety Director
Tim Unalp	SHSO	Joe Duminuco	Executive Vice President
		Ray Greenidge	Sr. Compliance Manager

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST ☒ HARD HAT ☐ LIFELINE / BODY HARNESS ☒ SAFETY GLASSES	☐ GOGGLES ☐ FACE SHIELD ☒ HEARING PROTECTION: ear plugs as necessary ☒ SAFETY SHOES: Steel or composite toed	☐ AIR PURIFYING RESPIRATOR ☐ SUPPLIED RESPIRATOR ☒ PPE CLOTHING: High-visibility vest or high-vis outerwear	☒ GLOVES: Leather/cut-resistant/chemical resistant ☒ OTHER: Tyvek and rubber boots as necessary, dust mask as necessary

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Required Equipment: Site map, emergency contact list, documentation of urgent care/hospital routes and / or guide familiar with Site, operating cell phone or walkie-talkie if Site allows, and bug spray.

Commitment to Safety – All personnel onsite will actively participate in SPSA performance by verbalizing SPSAs throughout the day.

EXCLUSION ZONE (EZ): Maintain Minimum Heavy Equipment Exclusion Zone around equipment and loads while it is in motion. The HEEZ must be greater than the swing zone of any moving part of the equipment, tip zone of the equipment, fall zone of the equipment and contents, distance that debris may travel during demolition activities and/or foot print of a structure to be demolished.

SITE SECURITY: Prior to site inspection verify appropriate method to address Site Security concerns as it relates to potential criminal activity, homeless population, and/or isolation concerns. Work with the Project Principal and/or Project Manager to address appropriately.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Check in with Site contact.	**1a. CONTACT/EXPOSURE/FALL:** Personal injury caused by lack of awareness of site-specific hazards.	1a. Inquire about hazards and other activities taking place at the Site. 1a. Inform Site contact of work scope, timeline and location(s). 1a. Discuss emergency evacuation procedures and muster points with Site contact.
2. Traversing the Site	**2a. CONTACT:** Property damage and personal injury caused by obstructions/vehicles or unauthorized personnel at remote Sites.	2a. All equipment must be stowed and secured prior to moving. 2a. Maintain speed limit as posted on-site. 2a. When possible, drive on established roadways. 2a. Yield to all pedestrians. 2a. Use pull-through spots or back into parking spots. 2a. Don high visibility clothing/safety vest. If working at remote Site, add orange accessories during hunting season.
	2b. FALL: Uneven terrain and weather conditions. Overgrown shrubs and vines. Equipment in the work zone.	2b. Inspect walking path for uneven terrain, weather-related hazards (i.e., ice, puddles, snow, etc.), and obstructions prior to mobilizing equipment. 2b. When possible, use established pathways and walk on stable, secure ground. 2b. Communicate traversing hazards with others.
	2c. OVEREXERTION: Muscle strain while carrying equipment.	2c. When carrying equipment to/from work area, use proper lifting techniques; keep back straight, lift with legs, keep load close to body, never reach with a load. Ensure that loads are balanced to reduce the potential for muscle strain. Use the buddy system or mechanical means to maneuver items heavier than 50-lb. If necessary, make multiple trips to carry equipment.
	2d. EXPOSURE: Biological hazards – ticks; bees/wasps; poison ivy; insects; (Ticks are most active any time the temperature is above freezing, typically from March to November.)	2d. Inspect area to avoid contact with biological hazards. 2d. Ticks: • Treat outer clothing including pants, shirts, socks, boots and hats the evening before with Permethrin (allowing at least two hours before use). • Apply DEET to exposed skin before travelling to the Site and reapply after two hours. • Check for ticks during and after work. 2d. Bees: • Use bee spray as appropriate to deter/eliminate bees.

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[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

	2e. EXPOSURE: Heat Stress & Cold Stress. Personal injury from working in inclement weather conditions.	• Protect exposed skin with insect repellent. 2d. Poison Ivy: • Identify areas of poison ivy and spray with weed killer. Don Tyvek and rubber boots while traversing poison ivy areas. • If skin contacts poison ivy, wash skin thoroughly with soap and water. 2e. Wear sunscreen with SPF 15 or greater on exposed skin whenever 30 minutes or more of sun exposure is expected. 2e. Watch for heat stress symptoms (muscle cramping, exhaustion, dizziness, rapid and shallow breathing). Take breaks as needed. 2e. Watch for cold stress symptoms (severe shivering, slowing of body movement, weakness, stumbling or inability to walk, collapse). Take breaks as needed. 2e. Wear appropriate rain gear as needed. 2e. Take frequent breaks if tired, wet, or cold/hot. Drink water. 2e. If lightning is observed, wait 30 minutes after last thunder boom/lightning bolt in a sheltered location (car acceptable) before starting work again.
3. Walking near heavy equipment and machinery.	**3a. CONTACT:** Personal injury from Site and roadway traffic. Personal injury from flying debris **3b. OVEREXERTION:** Personal injury from lifting/moving/rotating equipment. **3c. EXPOSURE:** Hearing damage from noise generating equipment/processes. Inhalation/exposure to hazardous vapors and or dust. **3d. EXPOSURE:** Working in a remote area.	3a. See 2a. 3a. Maintain an exclusion zone of at least 10'-25' feet from all engaged equipment. 3a. Keep body parts out of the line-of-fire of pinch points. 3a. Wear appropriate PPE always. 3b. See 2c. 3c. Wear hearing protection if >85 dBA. (i.e. noise levels which require you to raise your voice to communicate) 3c. Always wear leather gloves when handling any tools or equipment. 3c. Always wear appropriate PPE based off chemicals present. 3d. Use the "buddy system" whenever possible. If working alone, contact PM upon arrival/departure, as well as during work activities prior to commencing work if applicable. 3d. Always carry a communication device (i.e., cell phone, walkie-talkie) or directional (i.e., map, compass, etc.) when traversing remote areas. 3d. If available, follow Lone Worker Protocol/Procedure.
4. Working in adverse weather conditions.	**4a. EXPOSURE:** Heat Stress & Cold Stress. Personal injury from working in inclement weather conditions.	4a. Watch for heat stress symptoms (muscle cramping, exhaustion, dizziness, rapid and shallow breathing). Take breaks as needed. 4a. Watch for cold stress symptoms (severe shivering, slowing of body movement, weakness, stumbling or inability to walk, collapse). Take breaks as needed. 4a. Wear appropriate rain gear as needed. 4a. Take frequent breaks if tired, wet, or cold/hot. Drink water. 4a. If lightning is observed, wait 30 minutes after last thunder boom/lightning bolt in a sheltered location (car acceptable) before starting work again.
5. Departing Site.	**5a. EXPOSURE:** Exposure to unnecessary hazards should personnel believe Roux is on-Site during an emergency and conduct a search.	5a. Sign out or notify Site contact and Roux Project Manager of your departure.

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[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

JOB SAFETYANALYSIS Ctrl. No. GEN-020	DATE: 01/13/2022	☐NEW ☒REVISED	PAGE 1 of 2

JSA TYPE CATEGORY:	WORK TYPE:	WORK ACTIVITY (Description):
GENERIC	**Gauging & Sampling**	**Soil Sampling**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
MaryBeth Lyons	Project Scientist	Brian Hobbs	CHSD
Tim Unalp	SHSO	Ray Greenidge	Sr. Compliance Manager

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST ☒ HARD HAT ☐ LIFELINE / BODY HARNESS ☒ SAFETY GLASSES ☒ FLAME RESISTANT CLOTHING (as needed)	☐ GOGGLES ☐ FACE SHIELD: ☒ HEARING PROTECTION: (as needed) ☒ SAFETY SHOES: Composite-toe or steel toe boots	☐ AIR PURIFYING RESPIRATOR ☐ SUPPLIED RESPIRATOR ☒ PPE CLOTHING: Fluorescent reflective vest or high visibility clothing	☒ GLOVES: Leather, Nitrile and cut resistant ☒ OTHER: Insect repellant, sunscreen (as needed)

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Recommended Equipment: 42" traffic cones, caution tape, trowel

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs.

EXCLUSION ZONE (EZ): Maintain Minimum Heavy Equipment Exclusion Zone around equipment and loads while it is in motion. The HEEZ must be greater than the swing zone of any moving part of the equipment, tip zone of the equipment, fall zone of the equipment and contents, distance that debris may travel during demolition activities and/or foot print of a structure to be demolished.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Secure location	**1a. CONTACT:** Personnel and vehicular traffic may enter the work area.	1a. If in an area with foot or vehicle traffic, delineate the work area with 42" traffic cones and/or caution tape to prevent exposure to traffic and inform others of work activity. 1a. Wear reflective vest and/or high visibility clothing. 1a. Face the direction of any vehicular traffic. Position vehicle to protect worker from traffic. 1a. Communicate work activity with adjacent work areas.
	1b. FALL: Tripping/falling due to uneven terrain or entry/exit from excavations.	1b. Inspect pathways and work area for uneven terrain, weather-related hazards (i.e., ice, puddles, snow, etc.), and obstructions. 1b. Use established pathways and walk on stable, secure ground. 1b. Stage equipment and tools in a convenient, stable, and orderly manner. Store equipment at lowest potential energy. 1b. Roux employees should stay 5 feet from in-progress excavations and trenches. Should entry to an excavation be required (when stabilization is complete), ladders must be employed for steep embankments, excavations, pits, and trenches.
	1c. EXPOSURE: Exposure to sun and excessive heat, possibly causing sunburn, heat exhaustion or heat stroke. Exposure to cold temperatures possibly causing cold stress. Skin burn as a result of fire, if applicable. Exposure to explosive vapors due to tank farm operations. Exposure to airborne dust due to high wind speeds. Biological hazards - ticks, bees/wasps, poison ivy, thorns, insects, etc.	1c. Wear sunscreen with an SPF 15 or greater whenever 30 minutes or more of exposure is expected. 1c. Use a tent to shade the work area from direct sunlight particularly when warm temperatures are expected. 1c. Be aware of the location of all Site personnel. 1c. Watch for heat stress symptoms (muscle cramping, exhaustion, dizziness, rapid and shallow breathing). 1c. Watch for cold stress symptoms (severe shivering, slowing of body movement, weakness, stumbling or inability to walk, collapse). 1c. Take breaks for rest and water as necessary. Move to an area that is well shaded or a climate controlled area (i.e., car, site trailer, etc.). 1c. No open flames/heat sources. 1c. Conduct air monitoring and ensure that harmul vapor concentrations are within the levels detailed in the Site Specific HASP. Follow procedures detailed in HASP for exceedances. 1c. Flame retardant clothing must be worn when specified by Site policy. 1c. Cell phones should be disabled when specified by Site policy. 1c. Pre-treat field clothing with Permethrin prior to site visit to kill ticks and insects. 1c. Wear long sleeved shirts and tuck in (or tape) pant legs into socks or boots to prevent ticks from reaching skin. 1c. Spray insect repellant containing DEET on exposed skin when working in overgrown areas of the Site. 1c. Inspect area to avoid contact with biological hazards. 1c. Wear cut-resistant gloves when handling branches, shrubs, etc. that may lie within the walking path. 1c. Wear spoggles if the average wind speeds are above 15 mph. 1c. Personnel shall examine themselves and co-worker's outer clothing for ticks periodically when onsite. 1c. If skin comes in contact with poison ivy, wash skin thoroughly with soap and water. If rash persists after washing, immediately notify your supervisor, the OM and OHSM for possible consultation with a physician at an approved Occupational Health Clinic.

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[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
2. Collect Soil Sample	**2a. CONTACT:** Personal injury from pinch points, cuts, and abrasions from sampling equipment tools, and material within soil sample. Personal injury from contact with moving equipment while sampling. Personal injury from contact with glass sample jars.	2a. Wear cut-resistant (i.e., Kevlar) gloves under chemical-resistant (nitrile) disposable gloves when handling soil samples and sampling jars. 2a. Where possible, use trowel or equivalent tool to avoid contact with soil. 2a. If sampling from bucket of heavy equipment, ensure all equipment is off and operator utilizes the "show me your hands" policy. 2a. See 1a.
	2b. EXPOSURE: Exposure to contamination (impacted soil) and/or lab preservatives.	2b. Wear chemical-resistant (nitrile) disposable gloves over cut resistant gloves to protect hands when handling samples; use containment material or plastic sheeting to protect surrounding areas. 2b. Wear safety glasses to protect eyes from dust or air-borne contaminants that may results from disturbing the soil. 2b. Where possible, remain upgradient from sample location if collecting soil sample from stockpile, drill rig, etc. to avoid breathing contaminant vapors, if they are present. 2b. When collecting soil sample from hand auger, put large zip lock bag over entire auger to prevent spillage of soil on to the ground. 2b. Open sample jars slowly and fill carefully to avoid contact with preservatives.
	2c. EXERTION: Exertion due to repetitive motion and ergonomics.	2c. Utilize a table or raised surface for soil sampling if multiple soil samples are going to be taken to minimize repetitive bending motion.
3. Decontaminate equipment	**3a. EXPOSURE/CONTACT:** Contamination (e.g., Separate Phase Hydrocarbons (SPH), contaminated vapors and/or soil). **3b. EXPOSURE:** Chemicals in cleaning solution including ammonia.	3a. Wear chemical-resistant (nitrile) disposable gloves and safety glasses. 3a. Use an absorbent pad to clean spills. 3a. Properly dispose of used materials/PPE in provided drums in designated drum storage area. 3a. Remain upwind of sample and avoid breathing contaminant vapors, if they are present. 3b. Wear chemical-resistant (nitrile) disposable gloves and safety glasses. 3b. Work on the upwind side of decontamination area. 3b. Use an absorbent pad to clean spills. 3b. Properly dispose of used materials/PPE in provided drums in designated drum storage area. Ensure that all drums are properly labeled and secured.

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JOB SAFETY ANALYSIS	Ctrl. No. GEN-023	DATE: 01/13/2022	☐ NEW ☒ REVISED	PAGE 1 of 2

JSA TYPE CATEGORY	WORK TYPE	WORK ACTIVITY (Description)	
Generic	**Construction**	**Spotting Heavy Machinery**	
DEVELOPMENT TEAM	**POSITION / TITLE**	**REVIEWED BY:**	**POSITION / TITLE**
Levi Curnutte	Project Scientist	Brian Hobbs	CHSD
Tim Unalp	SHSO	Ray Greenidge	Sr. Compliance Manager

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST	☐ GOGGLES	☐ Particulate Respirator	☒ GLOVES: Cut resistant / leather
☒ HARD HAT	☐ FACE SHIELD	☐ SUPPLIED RESPIRATOR	☐ OTHER:
☒ LONG SLEEVED SHIRT	☐ HEARING PROTECTION	☒ PPE CLOTHING: Fluorescent reflective clothing	
☐ LIFELINE / BODY HARNESS	☒ SAFETY SHOES: Steel-/Composite-toe boots/shoes		
☒ SAFETY GLASSES			

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Heavy Machinery (i.e. excavator, payloader, truck, forklift, etc.), two-way radios.

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs

EXCLUSION ZONE (EZ): Maintain Minimum Heavy Equipment Exclusion Zone around equipment and loads while it is in motion. The HEEZ must be greater than the swing zone of any moving part of the equipment, tip zone of the equipment, fall zone of the equipment and contents, distance that debris may travel during demolition activities and/or foot print of a structure to be demolished.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Prepare for machine activity.	**1a. CONTACT:** Obstructions in the work area may create contact hazards from machinery. **1b. Fall :** Slip/Trip/Fall	1a. Cordon off the work area with safety barrels/cones and a rigid barrier (snow fence, traffic bar, etc.). Communicate that only necessary personnel should be in the work area. Spotter and equipment operator shall enforce the **EZ.** Operator will not operate but shall remain in the hands-off mode while personnel are within the exclusion zone. 1b. Ensure that work area is flat, level and clear of any obstructions or debris before setting up work zone.
2. Spotting.	**2a. CONTACT:** Machine or load contact with personnel, property, or machinery.	2a. Discuss the specifics of the work with the operator and be clear about any hand signals that will be used. Clearly discuss the limits of the assigned work area and the machine's Exclusion Zone. Maintain Exclusion Zone. The Exclusion Zone shall be delineated by using 42-inch traffic cones/barrels and a fixed rigid barrier. 2a. The Minimum Heavy Equipment Exclusion zone is greater than the swing/tip radius of equipment. 2a. Both the spotter and equipment operators shall have 2-way radios/cellular devices on their persons to ensure audible communication in the event any changes or new hazards may arise. 2a. All workers should stay outside of the Exclusion Zone of all equipment unless operator is stopped and in "Hands Off" mode. **(This includes the spotter unless an exception has been established in the Site-specific JSA).** If the Exclusion Zone must be reduced due to work area restrictions, then the spotter and operator shall enforce the reduced Exclusion Zone. 2a. Spotters must make eye contact with the machine operator or all movement ceases until visual contact can be reestablished. 2a. Spotter shall keep an eye out for any issues with the machine the operator may not see and communicate with other work crews and spotters on behalf of the operator. 2a. If the spotter needs to take a break, he must find a replacement before leaving or have the machine stop operations. **No heavy equipment shall operate without a spotter under any circumstances.** 2a. Wear fluorescent clothing/safety vest. 2a. **Do not multitask. Only perform Spotting**

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Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
	2b. FALL: Slip/Trip/Fall	2b. Look where walking to identify and avoid slip/trip/fall hazards. Avoid icy and/or wet surfaces. Remove obstacles if possible. 2b. Use designated walkways during spotting whenever possible. 2b. **Do not walk backwards. Always face the direction you are walking towards.**
	2c. CAUGHT: Caught between machinery and nearby objects.	2c. **Maintain Exclusion Zone.** Do not stand between large, loose or fixed objects or structures and the machinery while it is in motion. Keep in sight of operator at all times while being aware of surrounding structures.
	2d. EXPOSURE: Inhalation of exhaust from machinery.	2d. The spotter will position him/herself upwind of the working machinery, when possible. Spotter will also inform others working within the vicinity of the EZ of proper positioning, if applicable.

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JOB SAFETY ANALYSIS	Ctrl. No. GEN-025	DATE: 04/11/2023	☐ NEW ☒ REVISED	PAGE 1 of 1

JSA TYPE CATEGORY	WORK TYPE	WORK ACTIVITY (Description)
Generic	**General**	**Trucking**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
Lauren Dolginko	Project Geologist	Brian Hobbs	CHSD
Tim Unalp	SHSO		

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST	☐ GOGGLES	☐ AIR PURIFYING RESPIRATOR	☒ GLOVES: Leather or cut resistant
☒ HARD HAT	☐ FACE SHIELD	☐ SUPPLIED RESPIRATOR	☐ OTHER
☐ LONG SLEEVED SHIRT	☐ HEARING PROTECTION	☒ PPE CLOTHING: Fluorescent reflective vest or high visibility long sleeved clothing	
☐ LIFELINE / BODY HARNESS	☒ SAFETY SHOES: Steel-toe boots		
☒ SAFETY GLASSES			

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Heavy equipment (i.e. trucks)

COMMITMENT TO SAFETY- All personnel onsite will actively participate in Hazard recognition and mitigation throughout the day by verbalizing SPSAs.

EXCLUSION ZONE (EZ): Maintain Minimum Heavy Equipment Exclusion Zone around equipment and loads while it is in motion. The HEEZ must be greater than the swing zone of any moving part of the equipment, tip zone of the equipment, fall zone of the equipment and contents, distance that debris may travel during demolition activities and/or foot print of a structure to be demolished.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Set up work zone.	**1a. CONTACT:** Personal injury/property damage caused by obstruction/vehicle.	1a. Establish work zone for manifesting/paperwork by communicating with workers before task begins. Maintain a minimum **Exclusion Zone (EZ)** around all heavy equipment.
2. Loading of truck.	**2a. CONTACT:** Rolling Vehicle could cause bodily harm.	2a. All commercial vehicles without an operator must have their engines off and wheels chocked. Truck and loading area should be on level and stable ground.
	2b. CONTACT: Machine or load may crush personnel, property or machinery.	2b. All machines (Excavator, Lull, Backhoe) must have a spotter. Spotter must communicate contact hazards such as other personnel in the work area, objects in the machine's blind spot, and overhead lines to the operator. Spotter and operator should have 2-way radios or established hand signals to communicate when needed. 2b. Loads must not be swung over other vehicles or personnel. 2b. Maintain **EZ** around all equipment.
	2c. CONTACT: Load shifting during travel.	2c. Secure all loads prior to moving the truck with chains or straps or cribbing. 2c. Any loose soil or debris should be cleaned off truck sides prior to truck mobilization. 2c. All truck beds must be secured prior to traveling.
3. Dumping loads.	**3a. CONTACT:** Truck may flip sideways or backwards.	3a. All workers must stay behind and away from the side of trucks that are dumping to avoid contact with flying debris and the truck potentially tipping sideways or backwards. EZ must be maintained equal to the height of bed while lifted.
4. Exchanging paperwork with truck driver.	**4a. CONTACT/CAUGHT:** Broken bones from contact by vehicle.	4a. Truck driver should exit truck with proper PPE, using the three-point stance, and enter the established work zone to complete paperwork. If Site-specific safety prohibits drivers from exiting the truck, wait until truck is finished loading, with engine turned off, before approaching truck. 4a. Always establish eye contact with driver prior to approaching truck. 4a. Confirm sides of truck have been cleaned/brushed off prior to approaching truck.
	4b. FALL: Slip, Trip or Fall may cause muscle strains or tears, abrasions or lacerations, or broken bones.	4b. Survey walking route to identify slip/trip/fall hazards. Avoid icy/wet surfaces. Remove slip/trip/fall hazards if present. 4b. Communicate with driver and spotter prior to approaching truck. Maintain **EZ** around all heavy equipment.

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JOB SAFETY ANALYSIS	Cntrl. No. GEN-027	DATE: 01/14/2022	☐ NEW ☒ REVISED	PAGE 1 of 2

JSA TYPE CATEGORY	WORK TYPE	WORK ACTIVITY (Description)	
GENERIC	**Drilling**	**Pre-Drilling Clearance, Vactron and Air Knife**	
DEVELOPMENT TEAM	**POSITION / TITLE**	**REVIEWED BY:**	**POSITION / TITLE**
Courtney Rempfer	Project Scientist	Joseph Midwig	Senior Engineer
Sara Redding	Senior Hydrogeologist	Brian Hobbs	CHSD
		Ray Greenidge	Sr. Compliance Mgr.

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST ☒ HARD HAT ☐ LIFELINE / BODY HARNESS ☒ SAFETY GLASSES	☐ GOGGLES ☒ FACE SHIELD (While Air Knifing) ☒ HEARING PROTECTION (As needed) ☒ SAFETY SHOES: Composite toe or steel toe boots	☐ AIR PURIFYING RESPIRATOR ☐ SUPPLIED RESPIRATOR ☒ PPE CLOTHING: Fluorescent reflective vest or high visibility clothing; long-sleeve shirt	☒ GLOVES: Leather, Nitrile, cut-resistant ☒ OTHER: Dusk mask, insect repellant, sunscreen (as needed)

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Vac-Truck or Vac Drum, Compressor, Jack Hammer, Air Knife. Circular Saw, Hand Tools, Dust Mask, Photoionization Detector, Multi Gas Meter, 42 inch safety cones and flags, Retractable Cone Bars, Caution Tape, 20 lb. Fire Extinguisher, "Work Area" Signs, Pressurized Water Sprayer

Commitment to Safety – All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs

EXCLUSION ZONE: All non-essential personnel will maintain a distance of 10 feet from drilling equipment while equipment is moving/engaged

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Verify pre-clearance protocol	**1a. CONTACT:** Underground utility damage; property damage; personal injury.	1a. Confirm that (if applicable) "Call Before You Dig" and local utility companies were contacted prior to starting work in order to confirm utility mark outs. Must have a case # before digging. 1a Walk the Site to evaluate utility markings and review maps (see Site Walk Inspection JSA - GEN-019). Utilities are not always properly marked out, ensure use of observational skills through the pre-clearing checklist. 1a. Review pre-clearing checklist form and sub-surface clearance form. Pre-clearing protocol indicates that clearance must be conducted to a minimum of 5 vertical feet below ground surface or 10 vertical feet below ground surface in the critical zone using hand tools.
	1b. ENERGY SOURCE/CONTACT: Property damage; Pressurized water mains may cause lacerations or broken bones. Pressurized gas mains may explode causing serious injury, or death. Underground electric may cause severe burns, shock, or death.	1b. Pre-clearing of each soil boring/monitoring well location must be conducted to a minimum of 5 vertical feet below the ground surface (10 feet minimum for Critical Zone) using hand tools (shovel and non-metallic dig bar and hand auger) prior to drilling. Supervisor should be contacted to discuss appropriate pre-clearing depth. 1b. MUST Complete subsurface clearance checklist prior to pre-clearance.
	1c. FALL: Slip, Trip or Fall may cause muscle strains or tears, abrasions, lacerations, or broken bones.	1c. Be aware of the conditions when walking or loading equipment and working. Walk within established pathway avoiding uneven surfaces. Remove potential slip/trip/fall hazards.
2. Mobilize/demobilize and establish work area	**2a. SEE MOBILIZATION / DEMOBILIZATION JSA – GEN-015**	2a. See Mobilization / Demobilization JSA.
3. Concrete saw cutting, jack hammer and hand clearance with hand tools, air knife	**3a. CONTACT:** Flying debris striking face or body	3a Maintain 10' minimum exclusion zone. Use the required PPE (i.e., leather/cut proof gloves, safety glasses/face shield). 3a. Use anti-whip devices on compressor hoses. Ensure hose couplings are secure. 3a Wear a face shield to protect face from flying debris when using air knife. 3a. Utilize a traffic cone, cage or physical barriers over the hole during air knife activities to keep flying debris close to ground.
	3b. EXPOSURE: Inhalation/exposure to hazardous vapors and/or concrete dust, noise exposure	3b. Monitor breathing zone with a calibrated PID and/or multi-gas meter. If meters sustain readings greater than recommeneded in the HASP for the specific contaminant of concerns (COCs) the Roux field personnel must temporarily cease work, instruct all Site personnel to step away from the area of elevated readings. Contact PM. 3b. Wet concrete while using saw to minimize dust and wear dust mask to prevent inhalation. 3b. Stand upwind and keep body behind saw. Observers and helpers should avoid line-of-fire for saw blade. Always cut away from body. 3b. No open flames/heat sources.

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[2] A hazard is a potential danger. Break hazards into five types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards.

[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift." Avoid general statements such as, "be careful."

	3c. ENERGYSOURCE/CONTACT: Property damage; Pressurized water mains may cause lacerations or broken bones. Pressurized gas mains may explode causing serious injury, or death. Underground electric may cause severe burns, shock, or death.	3b. Wear hearing protection when saw, jackhammer or air compressor are in operation. Otherwise, if sound levels exceed 85 dbA, put on hearing protection. 3c. For air knifing, ensure extention/lance tip reaches the full 5 feet bgs. Air knife should be advanced **AT A MINIMUM** in all four corners of the expected boring location to find any possible arrangement of utilities. 3c. Ensure diameter of soil preclearance hole is at a **MINIMUM 2x** the diameter of any drilling or hard dig equipment that will be entering the hole. 3c. See Complete subsurface clearance protocol for information provided above.
	3d. ERGONOMICS/EXERTION: Muscle strain due to poor body positioning when handling equipment and materials	3d. Use body positioning and lifting techniques that minimizes muscle strain; keep back straight, lift with legs, keep load close to body, and never reach with a load. 3d. Ensure that loads are balanced to reduce the potential for muscle strain. 3d. Two people or a mechanical lifting aid are required when lifting objects over 50 lbs. or when the shape makes the object difficult to lift.
	3e. FALL: Tripping/falling due to uneven terrain, weather conditions, and materials/equipment stored at the Site	3e. Inspect walking path for uneven terrain, weather-related hazards (i.e., ice, puddles, snow, etc.), and obstructions prior to mobilizing equipment. Mob/Demob JSA. 3e. Do not climb over stored materials/equipment; walk around. Practice good housekeeping. 3e. Use established pathways and walk on stable, secure ground. 3e. Equipment and tools will be stored at the lowest point of potential energy and out of the walkway and immediate work area (i.e. tools should not be propped against walls or nearby equipment or vehicles). 3e. Equipment and tools that are not anticipated to be used will be returned to a storage area that is out of the immediate work area. 3e. Ensure power cords and compressed air lines are grouped when used within the work area. 3e. Pre-cleared location will be finished flush to grade as to prevent a slip/trip hazard or coned and taped off.
	3f. CAUGHT: Amputation points associated with the equipment and vacuum hose	3f. Always wear leather gloves when making connections and using hand tools; wear cut-resistant (i.e., Kevlar) gloves when handling cutting tools. 3f. Inspect the equipment prior to use for potential pinch points. 3f. Test all emergency shutdown devices prior to using equipment. 3f. Inspect saw blade for worn surface or missing teeth; switch blade if damaged or blunt. 3f. Ensure all jewelry is removed, loose clothing is secured, and PPE is secured close to the body. 3f. All non-essential personnel shall maintain a 10 foot exclusion zone; position body out of the line-of-fire of equipment. 3f. Drillers and helpers will understand and use the “Show Me Your Hands Policy”.
4. Move drum to staging area using drum cart	**4a. EXPOSURE/CONTACT:** Contamination (e.g., Separate Phase Hydrocarbons (SPH), contaminated groundwater, soil)	4a. Wear Nitrile chemical-resistant gloves under leather or cut proof gloves. 4a. Do not overfill drums. Ensure that the drum lids are attached securely. 4a. All drums will be staged in the designated storage area.
	4b. EXERTION: Muscle strain while maneuvering drums with drum cart/lift gate	4b. See 3d. Do not overfill drums. Use lift gate on back of truck to load and unload drums. Use drum dolly to move drum.
	4c. CAUGHT: Pinch points associated with handling drum lid	4c. Ensure that fingers are not placed under the lid of the drum. Wear leather gloves or cut proof gloves. Use appropriate ratchet while sealing drum lid.
5. Decontaminate equipment.	**5a. EXPOSURE/CONTACT**: To contamination (e.g., Separate Phase Hydrocarbons (SPH), contaminated groundwater, vapors).	5a. Wear chemical-resistant disposable gloves and safety glasses. 5a. Contain decontamination water so that it does not spill. 5a. Use an absorbent pad to clean spills, if necessary. 5a. Spray equipment from side angle, not straight on, to avoid backsplash. 5a. See 3b.
	5b. EXPOSURE: To chemicals in cleaning solution.	5b. See 4a. Review SDS to ensure appropriate precautions are taken and understood.

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JOB SAFETY ANALYSIS	Ctrl. No. GEN-032	DATE: 04/11/2023	☒ NEW ☐ REVISED	PAGE 1 of 2

JSA TYPE CATEGORY	WORK TYPE	WORK ACTIVITY (Description)
Generic	**Construction**	**Spotting Third-Party Traffic**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
Douglas Ferraiolo	Project Geologist	Brian Hobbs	CHSD
Jerry Tolosko	VP Principal Hydrogeologist	Rafhael Gandolff	Sr. H&S Specialist

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST	☐ GOGGLES	☐ Particulate Respirator	☒ GLOVES: Cut resistant / leather
☒ HARD HAT	☐ FACE SHIELD	☐ SUPPLIED RESPIRATOR	☐ OTHER:
☒ LONG SLEEVED SHIRT	☐ HEARING PROTECTION	☒ PPE CLOTHING: Fluorescent reflective clothing	
☐ LIFELINE / BODY HARNESS	☒ SAFETY SHOES: Steel-/Composite-toe boots/shoes		
☒ SAFETY GLASSES			

REQUIRED EQUIPMENT

Handheld fluorescent warning flags (1 per spotter), two-way radios.

COMMITMENT TO SAFETY- All personnel onsite will actively participate in hazard recognition and mitigation throughout the day by verbalizing SPSAs

EXCLUSION ZONE (EZ): Maintain Minimum Heavy Equipment Exclusion Zone around equipment, active operations (e.g., excavation, truck loading ,etc.) and loads while it is in motion. The HEEZ must be greater than the swing zone of any moving part of the equipment, tip zone of the equipment, fall zone of the equipment and contents, distance that debris may travel during demolition activities and/or foot print of a structure to be demolished. The HEEZ should not be compromised in any way by third party traffic.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Prepare for heavy equipment operations and/or job activity which require traffic stoppage.	**1a. CONTACT:** Third-party traffic in and/or adjacent to the work area may create contact hazards with machinery and site personnel. **1b. Fall :** Slip/Trip/Fall	1a. Cordon off the work area with safety barrels/cones and a rigid barrier (snow fence, traffic bar, etc.). Communicate that only necessary personnel should be in the work area. Spotter and equipment operator shall enforce the **EZ.** Operator will not operate but shall remain in the hands-off mode while personnel are within the exclusion zone. • Spotters must agree on communication via voice and hand signals before the activity begins. • Spotters must be visible and maintain contact with other spotters. • If contact is lost with either spotter, work operations should stop until communication has been re-established. • Spotters should never have additional duties while they are spotting. 1a. Spotters must analyze traffic patterns adjacent to the site to assess which traffic direction will need to be re-directed and what issues must be resolved prior to spotting traffic. 1a. The “Traffic Control Point” is a specific location where the spotter is positioned to direct traffic. 1a. **Spotters should select an appropriate Traffic Control Point where visibility, directions and personal safety will be maximized.** 1b. Ensure that the Traffic Control Point is flat, level and clear of any obstructions or debris before beginning spotting operations.

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[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
2. Spotting third-party traffic during site operations.	**2a. CONTACT:** Machine or load contact with third party traffic.	2a. Discuss the specifics of the work, limits of the assigned work area, and the machine's Exclusion Zone. Maintain the Exclusion Zone while spotting third-party traffic. 2a. **Spotters and equipment operators shall have 2-way radios/cellular devices on their persons** to ensure audible communication in the event any changes or new hazards may arise. 2a. Spotters must make eye contact with the machine operations and third-party traffic, or all movement ceases until visual contact can be reestablished. 2a. Spotter shall keep an eye out for any traffic issues the operator may not see and communicate with other work crews and spotters accordingly. 2a. If the spotter needs to take a break, he must find a replacement before leaving or stop operations. **Operations which may contact third-party traffic shall not be performed without a spotter under any circumstances.** 2a. Wear fluorescent clothing/safety vest. **Handheld fluorescent warning flags (1 per spotter) are required for spotting third party traffic.** 2a. Establish traffic control by performing all signals / movements with precision and ensuring drivers obey signals. • Break traffic at natural gaps whenever possible to direct opposite sides of traffic • Maintain consistency in the time you allow each direction of traffic to travel. Prioritize major routes over secondary routes. • If breaks do not occur, allow traffic to accumulate on opposite sides of the road before directing it to move. • Allow right turns whenever they do not interfere with traffic and pedestrians. • Make sure opposite lanes are stopped before allowing left turns to be made. 2a. **Do not multitask. Only perform Spotting.**
	2b. FALL: Slip/Trip/Fall	2b. Look where walking to identify and avoid slip/trip/fall hazards. Avoid icy and/or wet surfaces. Remove obstacles if possible. 2b. Use designated walkways during spotting whenever possible. 2b. **Do not walk backwards. Always face the direction you are walking towards.**
	2c. CAUGHT: Caught between machinery and nearby objects.	2c. **Maintain Exclusion Zone.** Do not stand between large, loose or fixed objects or structures and the machinery while it is in motion. Keep in sight of operator at all times while being aware of surrounding structures.
	2d. EXPOSURE: Inhalation of exhaust from machinery.	2d. The spotter will position him/herself upwind of the working machinery, when possible. Spotter will also inform others working within the vicinity of the EZ of proper positioning, if applicable.

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APPENDIX B

Safety Data Sheets (SDSs) for Chemicals Used



Danger

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Trade name : Isobutene
SDS no : SDS-076-CLP
Chemical description : Isobutene
CAS-No. : 115-11-7
EC-No. : 204-066-3
EC Index-No. : 601-012-00-4
Registration-No. : 01-2119456616-32
Chemical formula : C4H8 / CH2=C(CH3)2

1.2. Relevant identified uses of the substance or mixture and uses advised against

Relevant identified uses : Industrial and professional uses. Perform risk assessment prior to use.
Test gas/Calibration gas.
Chemical reaction / Synthesis.
Laboratory use.
Contact supplier for more information on uses.
Uses advised against : Consumer use.

1.3. Details of the supplier of the safety data sheet

Company identification : Air Liquide UK Ltd
Station Road, Coleshill
Birmingham, B46 1JY

E-Mail address (competent person) : david.hopper@airliquide.com

1.4. Emergency telephone number

Emergency telephone number : 01675 462695 (Available 24/7)

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP]

Physical hazards	Flammable gases, Category 1	H220
	Gases under pressure : Liquefied gas	H280

2.2. Label elements

Labelling according to Regulation (EC) No. 1272/2008 [CLP]

Hazard pictograms (CLP) :



GHS02 GHS04

Signal word (CLP) : Danger

Hazard statements (CLP) : H220 - Extremely flammable gas.
H280 - Contains gas under pressure; may explode if heated.

Precautionary statements (CLP)

- Prevention : P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
- Response : P377 - Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
P381 - In case of leakage, eliminate all ignition sources.
- Storage : P403 - Store in a well-ventilated place.

2.3. Other hazards

: Contact with liquid may cause cold burns/frostbite.

SECTION 3: Composition/information on ingredients

3.1. Substances

Name	Product identifier	%	Classification according to Regulation (EC) No. 1272/2008 [CLP]
Isobutene	(CAS-No.) 115-11-7 (EC-No.) 204-066-3 (EC Index-No.) 601-012-00-4 (Registration-No.) 01-2119456616-32	100	Flam. Gas 1, H220 Press. Gas (Liq.), H280

Contains no other components or impurities which will influence the classification of the product.

3.2. Mixtures : Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

- Inhalation : Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Perform cardiopulmonary resuscitation if breathing stopped.
- Skin contact : In case of frostbite spray with water for at least 15 minutes. Apply a sterile dressing. Obtain medical assistance.
- Eye contact : Immediately flush eyes thoroughly with water for at least 15 minutes.
- Ingestion : Ingestion is not considered a potential route of exposure.

4.2. Most important symptoms and effects, both acute and delayed

: Refer to section 11.

4.3. Indication of any immediate medical attention and special treatment needed

: None.

SECTION 5: Firefighting measures

5.1. Extinguishing media

- Suitable extinguishing media : Water spray or fog.
  Dry powder.
- Unsuitable extinguishing media : Carbon dioxide.
  Do not use water jet to extinguish.

5.2. Special hazards arising from the substance or mixture

Specific hazards : Exposure to fire may cause containers to rupture/explode.

Hazardous combustion products : Carbon monoxide.

5.3. Advice for firefighters

Specific methods : Use fire control measures appropriate for the surrounding fire. Exposure to fire and heat radiation may cause gas receptacles to rupture. Cool endangered receptacles with water spray jet from a protected position. Prevent water used in emergency cases from entering sewers and drainage systems.

If possible, stop flow of product.

Use water spray or fog to knock down fire fumes if possible.

Do not extinguish a leaking gas flame unless absolutely necessary. Spontaneous/explosive re-ignition may occur. Extinguish any other fire.

Move containers away from the fire area if this can be done without risk.

Special protective equipment for fire fighters : In confined space use self-contained breathing apparatus.

Standard protective clothing and equipment (Self Contained Breathing Apparatus) for fire fighters.

Standard EN 137 - Self-contained open-circuit compressed air breathing apparatus with full face mask.

Standard EN 469 - Protective clothing for firefighters. Standard - EN 659: Protective gloves for firefighters.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

: Try to stop release.

Evacuate area.

Monitor concentration of released product.

Consider the risk of potentially explosive atmospheres.

Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe.

Eliminate ignition sources.

Ensure adequate air ventilation.

Prevent from entering sewers, basements and workpits, or any place where its accumulation can be dangerous.

Act in accordance with local emergency plan.

Stay upwind.

6.2. Environmental precautions

: Try to stop release.

6.3. Methods and material for containment and cleaning up

: Ventilate area.

6.4. Reference to other sections

: See also sections 8 and 13.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Safe use of the product	:	Do not breathe gas. Avoid release of product into atmosphere. The product must be handled in accordance with good industrial hygiene and safety procedures. Only experienced and properly instructed persons should handle gases under pressure. Consider pressure relief device(s) in gas installations. Ensure the complete gas system was (or is regularily) checked for leaks before use. Do not smoke while handling product. Use only properly specified equipment which is suitable for this product, its supply pressure and temperature. Contact your gas supplier if in doubt. Avoid suck back of water, acid and alkalis. Assess the risk of potentially explosive atmospheres and the need for explosion-proof equipment. Purge air from system before introducing gas. Take precautionary measures against static discharge. Keep away from ignition sources (including static discharges). Consider the use of only non-sparking tools. Ensure equipment is adequately earthed.
Safe handling of the gas receptacle	:	Refer to supplier's container handling instructions. Do not allow backfeed into the container. Protect cylinders from physical damage; do not drag, roll, slide or drop. When moving cylinders, even for short distances, use a cart (trolley, hand truck, etc.) designed to transport cylinders. Leave valve protection caps in place until the container has been secured against either a wall or bench or placed in a container stand and is ready for use. If user experiences any difficulty operating valve discontinue use and contact supplier. Never attempt to repair or modify container valves or safety relief devices. Damaged valves should be reported immediately to the supplier. Keep container valve outlets clean and free from contaminants particularly oil and water. Replace valve outlet caps or plugs and container caps where supplied as soon as container is disconnected from equipment. Close container valve after each use and when empty, even if still connected to equipment. Never attempt to transfer gases from one cylinder/container to another. Never use direct flame or electrical heating devices to raise the pressure of a container. Do not remove or deface labels provided by the supplier for the identification of the content of the container. Suck back of water into the container must be prevented. Open valve slowly to avoid pressure shock.

7.2. Conditions for safe storage, including any incompatibilities

: Observe all regulations and local requirements regarding storage of containers.
Containers should not be stored in conditions likely to encourage corrosion.
Container valve guards or caps should be in place.
Containers should be stored in the vertical position and properly secured to prevent them from falling over.
Stored containers should be periodically checked for general condition and leakage.
Keep container below 50°C in a well ventilated place.
Store containers in location free from fire risk and away from sources of heat and ignition.
Keep away from combustible materials.
Segregate from oxidant gases and other oxidants in store.
All electrical equipment in the storage areas should be compatible with the risk of a potentially explosive atmosphere.

7.3. Specific end use(s)

: None.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Isobutene (115-11-7)	
DNEL: Derived no effect level (Workers)	
Long-term - local effects, inhalation	768.7 mg/m³
Long-term - systemic effects, inhalation	769 mg/m³

PNEC (Predicted No-Effect Concentration) : None established.

8.2. Exposure controls

8.2.1. Appropriate engineering controls

: Provide adequate general and local exhaust ventilation.
Product to be handled in a closed system.
Systems under pressure should be regularly checked for leakages.
Ensure exposure is below occupational exposure limits (where available).
Gas detectors should be used when flammable gases/vapours may be released.
Consider the use of a work permit system e.g. for maintenance activities.

8.2.2. Individual protection measures, e.g. personal protective equipment

: A risk assessment should be conducted and documented in each work area to assess the risks related to the use of the product and to select the PPE that matches the relevant risk. The following recommendations should be considered:
PPE compliant to the recommended EN/ISO standards should be selected.

• Eye/face protection : Wear goggles when transfilling or breaking transfer connections.
Standard EN 166 - Personal eye-protection - specifications.

• Skin protection

- Hand protection : Wear working gloves when handling gas containers.
Standard EN 388 - Protective gloves against mechanical risk.
Wear cold insulating gloves when transfilling or breaking transfer connections.

- Other : Consider the use of flame resistant anti-static safety clothing.
Standard EN ISO 14116 - Limited flame spread materials.
Standard EN 1149-5 - Protective clothing: Electrostatic properties.
Wear safety shoes while handling containers.
Standard EN ISO 20345 - Personal protective equipment - Safety footwear.

• Respiratory protection	:	Gas filters may be used if all surrounding conditions e.g. type and concentration of the contaminant(s) and duration of use are known. Use gas filters with full face mask, where exposure limits may be exceeded for a short-term period, e.g. connecting or disconnecting containers. Recommended: Filter AX (brown). Gas filters do not protect against oxygen deficiency. Standard EN 14387 - Gas filter(s), combined filter(s) and standard EN136, full face masks .
• Thermal hazards	:	None in addition to the above sections.

8.2.3. Environmental exposure controls

: Refer to local regulations for restriction of emissions to the atmosphere. See section 13 for specific methods for waste gas treatment.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Appearance

• Physical state at 20°C / 101.3kPa	:	Gas
• Colour	:	Colourless.
Odour	:	Sweetish. Poor warning properties at low concentrations.
Odour threshold	:	Odour threshold is subjective and inadequate to warn of overexposure.
pH	:	Not applicable for gases and gas mixtures.
Melting point / Freezing point	:	-140.3 °C
Boiling point	:	-7.1 °C
Flash point	:	Not applicable for gases and gas mixtures.
Evaporation rate	:	Not applicable for gases and gas mixtures.
Flammability (solid, gas)	:	Extremely flammable gas.
Explosive limits	:	1.6 - 10 vol %
Vapour pressure [20°C]	:	2.6 bar(a)
Vapour pressure [50°C]	:	6.05 bar(a)
Vapour density	:	Not applicable.
Relative density, liquid (water=1)	:	0.63
Relative density, gas (air=1)	:	2
Water solubility	:	388 mg/l
Partition coefficient n-octanol/water (Log Kow)	:	2.35
Auto-ignition temperature	:	465 °C
Decomposition temperature	:	Not applicable.
Viscosity	:	No reliable data available.
Explosive properties	:	Not applicable.
Oxidising properties	:	Not applicable.

9.2. Other information

Molar mass	:	56 g/mol
Critical temperature [°C]	:	145 °C
Other data	:	Gas/vapour heavier than air. May accumulate in confined spaces, particularly at or below ground level.

SECTION 10: Stability and reactivity

10.1. Reactivity

: No reactivity hazard other than the effects described in sub-sections below.

10.2. Chemical stability

: Stable under normal conditions.

10.3. Possibility of hazardous reactions

: Can form explosive mixture with air.
May react violently with oxidants.

10.4. Conditions to avoid

: Keep away from heat/sparks/open flames/hot surfaces. – No smoking.
Avoid moisture in installation systems.

10.5. Incompatible materials

: Air, Oxidisers.
For additional information on compatibility refer to ISO 11114.

10.6. Hazardous decomposition products

: Under normal conditions of storage and use, hazardous decomposition products should not be produced.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity : Toxicological effects not expected from this product if occupational exposure limit values are not exceeded.

LC50 inhalation rat (ppm)	≥ 10000

Skin corrosion/irritation : No known effects from this product.

Serious eye damage/irritation : No known effects from this product.

Respiratory or skin sensitisation : No known effects from this product.

Germ cell mutagenicity : No known effects from this product.

Carcinogenicity : No known effects from this product.

Toxic for reproduction : Fertility : No known effects from this product.

Toxic for reproduction : unborn child : No known effects from this product.

STOT-single exposure : No known effects from this product.

STOT-repeated exposure : No known effects from this product.

Aspiration hazard : Not applicable for gases and gas mixtures.

SECTION 12: Ecological information

12.1. Toxicity

Assessment : No ecological damage caused by this product.

EC50 48h - Daphnia magna [mg/l] : No data available.

EC50 72h - Algae [mg/l] : No data available.

LC50 96 h - Fish [mg/l] : No data available.

12.2. Persistence and degradability

Assessment : The substance is readily biodegradable. Unlikely to persist.

12.3. Bioaccumulative potential

Assessment	:	Not expected to bioaccumulate due to the low log Kow (log Kow < 4). Refer to section 9.

12.4. Mobility in soil

Assessment	:	Because of its high volatility, the product is unlikely to cause ground or water pollution. Partition into soil is unlikely.

12.5. Results of PBT and vPvB assessment

Assessment	:	Not classified as PBT or vPvB.

12.6. Other adverse effects

Other adverse effects	:	No known effects from this product.
Effect on the ozone layer	:	None.
Effect on global warming	:	No known effects from this product.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Contact supplier if guidance is required.

Do not discharge into areas where there is a risk of forming an explosive mixture with air. Waste gas should be flared through a suitable burner with flash back arrestor.

Do not discharge into any place where its accumulation could be dangerous.

Ensure that the emission levels from local regulations or operating permits are not exceeded.

Refer to the EIGA code of practice Doc.30 "Disposal of Gases", downloadable at http://www.eiga.org for more guidance on suitable disposal methods.

Return unused product in original container to supplier.

List of hazardous waste codes (from Commission Decision 2000/532/EC as amended) : 16 05 04 *: Gases in pressure containers (including halons) containing hazardous substances.

13.2. Additional information

: External treatment and disposal of waste should comply with applicable local and/or national regulations.

SECTION 14: Transport information

14.1. UN number

UN-No. : 1055

14.2. UN proper shipping name

Transport by road/rail (ADR/RID) : ISOBUTYLENE

Transport by air (ICAO-TI / IATA-DGR) : Isobutylene

Transport by sea (IMDG) : ISOBUTYLENE

14.3. Transport hazard class(es)

Labelling :



2.1 : Flammable gases.

Transport by road/rail (ADR/RID)

Class	:	2
Classification code	:	2F
Hazard identification number	:	23
Tunnel Restriction	:	B/D - Tank carriage : Passage forbidden through tunnels of category B, C, D and E. Other carriage : Passage forbidden through tunnels of category D and E

Transport by air (ICAO-TI / IATA-DGR)

Class / Div. (Sub. risk(s))	:	2.1

Transport by sea (IMDG)

Class / Div. (Sub. risk(s))	:	2.1
Emergency Schedule (EmS) - Fire	:	F-D
Emergency Schedule (EmS) - Spillage	:	S-U

14.4. Packing group

Transport by road/rail (ADR/RID)	:	Not applicable
Transport by air (ICAO-TI / IATA-DGR)	:	Not applicable
Transport by sea (IMDG)	:	Not applicable

14.5. Environmental hazards

Transport by road/rail (ADR/RID)	:	None.
Transport by air (ICAO-TI / IATA-DGR)	:	None.
Transport by sea (IMDG)	:	None.

14.6. Special precautions for user

Packing Instruction(s)

Transport by road/rail (ADR/RID)	:	P200
Transport by air (ICAO-TI / IATA-DGR)		
Passenger and Cargo Aircraft	:	Forbidden.
Cargo Aircraft only	:	200.
Transport by sea (IMDG)	:	P200

Special transport precautions : Avoid transport on vehicles where the load space is not separated from the driver's compartment.

Ensure vehicle driver is aware of the potential hazards of the load and knows what to do in the event of an accident or an emergency.

Before transporting product containers:

- Ensure there is adequate ventilation.
- Ensure that containers are firmly secured.
- Ensure valve is closed and not leaking.
- Ensure valve outlet cap nut or plug (where provided) is correctly fitted.
- Ensure valve protection device (where provided) is correctly fitted.

14.7. Transport in bulk according to Annex II of Marpol and the IBC Code

: Not applicable.

SECTION 15: Regulatory information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

EU-Regulations

Restrictions on use : None.

Other information, restriction and prohibition regulations	:	Ensure all national/local regulations are observed.
Seveso Directive : 2012/18/EU (Seveso III)	:	Listed.

National regulations

No additional information available

15.2. Chemical safety assessment

: A CSA has been carried out.

SECTION 16: Other information

Indication of changes	:	Revised safety data sheet in accordance with commission regulation (EU) No 2015/830.
Abbreviations and acronyms	:	ATE - Acute Toxicity Estimate CLP - Classification Labelling Packaging Regulation; Regulation (EC) No 1272/2008 REACH - Registration, Evaluation, Authorisation and Restriction of Chemicals Regulation (EC) No 1907/2006 EINECS - European Inventory of Existing Commercial Chemical Substances CAS# - Chemical Abstract Service number LC50 - Lethal Concentration to 50 % of a test population RMM - Risk Management Measures PBT - Persistent, Bioaccumulative and Toxic vPvB - Very Persistent and Very Bioaccumulative STOT- SE : Specific Target Organ Toxicity - Single Exposure CSA - Chemical Safety Assessment EN - European Standard UN - United Nations ADR - European Agreement concerning the International Carriage of Dangerous Goods by Road IATA - International Air Transport Association IMDG code - International Maritime Dangerous Goods RID - Regulations concerning the International Carriage of Dangerous Goods by Rail WGK - Water Hazard Class STOT - RE : Specific Target Organ Toxicity - Repeated Exposure
Training advice	:	Ensure operators understand the flammability hazard.
Further information	:	This Safety Data Sheet has been established in accordance with the applicable European Union legislation.
DISCLAIMER OF LIABILITY	:	Before using this product in any new process or experiment, a thorough material compatibility and safety study should be carried out. Details given in this document are believed to be correct at the time of going to press. Whilst proper care has been taken in the preparation of this document, no liability for injury or damage resulting from its use can be accepted.

End of document

APPENDIX C

COVID-19 Interim Health and Safety Guidance

COVID-19 INTERIM HEALTH AND SAFETY GUIDANCE

CORPORATE HEALTH AND SAFETY MANAGER	:	**Brian Hobbs, CIH, CSP**
EFFECTIVE DATE	:	**03/2020**
REVISION DATE	:	**09/21/2022**
REVISION NUMBER	:	**9**

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1. PURPOSE

This guidance has been implemented to establish work practices, administrative procedures, and engineering controls to minimize potential exposure to SARS-CoV-2, the virus that causes COVID-19. The following guidance has been developed based on local, state and federal recommendations/requirements regarding COVID-19. The purpose of this document is to supplement existing site-specific Health and Safety Plans (HASPs) and provide interim health and safety guidance to minimize potential exposure to SARS-CoV-2. Should additional scientific information or regulatory information change, this document shall be updated accordingly.

2. SCOPE AND APPLICABILITY

This guidance covers all Roux employees and the subcontractors that Roux oversees. Site specific HASPs shall be developed to incorporate elements of mitigative measures against COVID-19 exposure. If work cannot be carried out in compliance with this guidance, the project shall be further evaluated by the Project Principal (PP), Office Manager (OM), and Corporate Health and Safety Director (CHSD) prior to work authorization.

Roux subcontractors are required to review, comply with, and implement Roux's COVID-19 Interim Health and Safety Guidance while on Site. Subcontractors may implement additional preventative measures as they see fit. All work shall be conducted in a manner consistent with the federal, state, and local guidance as it relates to COVID-19.

3. BACKGROUND

What is COVID-19?

COVID-19 is a respiratory disease caused by SARS-CoV-2, a coronavirus discovered in 2019. The virus spreads mainly from person to person through respiratory droplets produced when an infected person coughs, sneezes, or talks. Some people who are infected may not have symptoms. Multiple variants of the virus that causes COVID-19 are circulating globally. There are currently several vaccines which have been developed which are authorized, recommended and effective at protecting you from getting sick.

What are the symptoms of COVID-19?

Reported illnesses have ranged from mild symptoms to severe illness and death for confirmed COVID-19 cases. Symptoms may appear 2 to 14 days following exposure to the virus. People with these symptoms or combinations of symptoms may have COVID-19:

- Fever or chills
- Cough
- Shortness of breath or difficulty breathing
- Fatigue
- Muscle or body aches
- Headache
- New loss of taste or smell
- Sore throat
- Congestion or runny nose
- Nausea or vomiting
- Diarrhea

This list is not all possible symptoms. The CDC will continue to update this list as they learn more about the virus. For an updated symptom list please reference the following link for CDC Symptoms of Coronavirus.

If someone develops emergency warning signs for COVID-19, they should be instructed to get medical attention immediately. Emergency warning signs can include those listed below; however, this list is not all inclusive. Please consult your medical provider for any other symptoms that are severe or concerning.

- Trouble breathing
- Persistent pain or pressure in the chest
- New confusion
- Inability to wake or stay awake
- Pale, gray, or blue-colored skin, lips, or nail beds, depending on skin tone

How does COVID-19 spread?[1]

Individuals who are within close contact (within 6 feet) of a person with COVID-19 or have direct contact with that person are at greatest risk of infection.

COVID-19 spreads in three main ways:

- Breathing in air when close to an infected person who is exhaling small droplets and particles that contain the virus.
- Having these small droplets and particles that contain virus land on the eyes, nose, or mouth, especially through splashes and sprays like a cough or sneeze.
- Touching eyes, nose, or mouth with hands that have the virus on them.

Transmission of SARS-CoV-2 from inhalation of virus in air farther than six feet from an infectious source can occur.

Some infections can be spread by exposure to virus in small droplets and particles that can linger in the air for minutes to hours. These viruses may be able to infect people who are further than 6 feet away from the person who is infected or after that person has left the space. This kind of spread is referred to as **airborne transmission** and is an important way that infections like tuberculosis, measles, and chicken pox are spread. Per published reports, factors that increase the risk of SARS-CoV-2 infection under these circumstances include:

- Enclosed spaces with inadequate ventilation or air handling within which the concentration of exhaled respiratory fluids, especially very fine droplets and aerosol particles, can build-up in the air space.
- Increased exhalation of respiratory fluids if the infectious person is engaged in physical exertion or raises their voice (e.g., exercising, shouting, singing).
- Prolonged exposure to these conditions, typically more than 15 minutes.

Spread from contact with contaminated surfaces or objects is less common.

Respiratory droplets can also land on surfaces and objects. It is possible that a person could get COVID-19 by touching a surface or object that has the virus on it and then touching their own mouth, nose, or eyes. Spread from touching surfaces is not thought to be a common way that COVID-19 spreads.

4. TRAINING REQUIREMENTS

All employees with potential exposure to COVID-19 shall be provided training that incorporates COVID-19 exposure mitigation strategies, such as implementation of proper social distancing, personal hygiene (e.g., handwashing), as well as disinfection procedures, as outlined by CDC guidelines.

5. EXPOSURE RISK POTENTIAL

Worker risk of occupational exposure to COVID-19 can vary from very high, high, medium, or lower (caution) risk. This level of exposure is dependent on several factors, which can include industry type; need for contact within 6 feet of people known to be or suspected of being infected with COVID-19; density of work environment; and industrial setting (i.e., healthcare building, occupied interior work area, minimal ventilation).

Provided below is background risk level information taken from the U.S. Department of Labor Occupational Safety and Health Administration Guidance on preparing workplaces for COVID-19. Risk evaluations for each project shall be conducted by the PP and OM in consultation with the CHSD to ensure Roux employees and subcontractors remain within the lower exposure (caution) category. If it is identified there is a medium exposure risk or higher, further evaluation and mitigative measures shall be evaluated to reduce overall exposure risk prior to work authorization.

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1 How COVID-19 Spreads https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/how-covid-spreads.html#edn1



Very High Exposure Risk (Activities not conducted by Roux)

Very high exposure risk includes occupations/work activities with high potential for exposure to known or suspected sources of COVID-19 during specific medical, postmortem, or laboratory procedures. This can include but is not limited to:

- Healthcare workers (e.g., doctors, nurses, dentists, paramedics, emergency medical technicians) performing aerosol-generating procedures (e.g., intubation, cough induction procedures, bronchoscopies, some dental procedures and exams, or invasive specimen collection) on known or suspected COVID-19 patients.
- Healthcare or laboratory personnel collecting or handling specimens from known or suspected COVID-19 patients (e.g., manipulating cultures from known or suspected COVID-19 patients).
- Morgue workers performing autopsies, which generally involve aerosol-generating procedures on the bodies of people who are known to have, or suspected of having, COVID-19 at the time of their death.

High Exposure Risk (Activities not conducted by Roux)

High exposure risk occupations/work activities include exposure to known or suspected COVID-19 positive individuals. This can include but not limited to:

- Healthcare delivery and support staff (hospital staff who must enter patients' rooms) exposed to known or suspected COVID-19 patients.
- Medical transport workers (ambulance vehicle operators) moving known or suspected COVID-19 patients in enclosed vehicles.
- Mortuary workers involved in preparing bodies for burial or cremation of people known to have, or suspected of having, COVID-19 at the time of death.
- Those who have frequent or sustained contact with coworkers, including under close working conditions indoors or in poorly ventilated spaces in various types of industrial, manufacturing, agriculture, construction, and other critical infrastructure workplaces.
- Those who have frequent indoor or poorly ventilated contact with the general public, including workers in retail stores, grocery stores or supermarkets, pharmacies, transit and transportation operations, law enforcement and emergency response operations, restaurants, and bars.

Medium Exposure Risk

Medium exposure risk occupations/work activities include those that require frequent and/or close contact with (i.e., within 6 feet for a cumulative total of 15 minutes or more over a 24-hour period)) people who may be infected with COVID-19, but who are not known or suspected to be COVID-19 positive. For most of our worksites, it is assumed there is on-going community transmission for COVID-19. Therefore, workers who work at sites and may have contact with the general public, other contractors, high-population-density work environments (i.e., greater than 10 people) fall within medium exposure risk group category. This can include, but is not limited to, sampling events that require two or more workers to collect and log samples in close contact or work occurring in an interior space with limited ventilation and several workers present.

Lower Exposure Risk (Caution)

Lower exposure risk (caution) occupations/work activities are those that do not require close contact (within 6 feet for a cumulative total of 15 minutes or more over a 24-hour period) with other people. During these activities, there is limited contact (i.e., within 6 feet of) the general public or other workers. Workers in this category have minimal occupational contact with the public and other coworkers. This includes construction oversight that does not require close contact, sampling or gauging events performed by one worker and our remote workers as well as office workers who do not have frequent close contact with coworkers, clients, or the public.

6. CDC FULLY VACCINATED GUIDANCE

You are up to date with your COVID-19 vaccines if you have completed a COVID-19 vaccine primary series and received the most recent booster dose recommended for you by CDC. Additional information concerning vaccinations can be found at the following link.

7. COVID-19 HEALTH SCREENING

7.1 Roux Employees

Depending on local/state/client requirements, Roux employees may self-attest to a COVID-19 Daily Health Questionnaire that is to be completed at home through a mobile application on scheduled workdays. The purpose of this program is to ensure business continuity as well as mitigate any potential exposure to our employees and others if it is determined employees are at-risk for contracting COVID-19. As part of this self-attestation, all employees are required to take their temperatures daily at home to confirm they do not have a fever (≥ 100.4). Employees who answer yes to any of these questions are instructed to contact their Office Manager and/or Department Head immediately and should not enter the office or go to a field site. Information shall be used to determine appropriate internal response in consultation with the Human Resources Director (HRD) and CHSD.

Below, you will find our COVID-19 Daily Health Questionnaire that all Roux employees are required to self-attest to **every scheduled workday by 9:30 AM.** If employees do not promptly fill out the questionnaire by the time listed above, there will be additional follow up by HR, H&S, and/or OMs.

According to the U.S. Centers for Disease Control and Prevention & the World Health Organization, COVID-19 Symptoms include:

- *Fever (≥100. 4°F) or chills*
- *Cough*
- *Shortness of breath or difficulty breathing*
- *Fatigue*
- *Muscle or body aches*
- *Headache*
- *New loss of taste or smell*
- *Sore throat*
- *Congestion or runny nose*
- *Nausea or vomiting*
- *Diarrhea*

Have you experienced any of the COVID-19 related symptoms noted above in the last 14 days? Please Note: We do not expect employees to answer "yes" to the symptoms question if these are symptoms you normally experience due to another condition or medication.

- *Yes*
- *No*

Have you been in close contact with someone who is suspected or confirmed to have COVID-19 or who is under investigation for COVID-19 within the last 14 days? * Close contact as defined by the CDC is being within 6 feet of someone who has COVID-19 for a cumulative total of 15 minutes or more over a 24-hour period.*

- *Yes*
- *No*

Have you traveled outside of the country, been on a cruise ship and/or traveled to areas within the United States which have state mandated travel restrictions in the last 14 days?

- *Yes*
- *No*

Have you tested positive for COVID-19 within the last 14 days?

- *Yes*
- *No*

7.2 Subcontractors

Depending on local/state/client requirements, Subcontractors who shall perform work onsite may be required to attest to the fitness of their work crew on a daily basis. This requires each worker to self-assess by asking themselves the four questions listed in the section above and also contained within the Roux Subcontractor Work Crew COVID-19 Daily Health Attestation. If any crew member answers "Yes" to any of the questions, that worker is not to report to the field site and should seek proper medical advice in accordance with local, state and federal guidelines. In addition if required by local/state/client requirements, the Sub-Contractor shall self-attest to vaccination status in order for the Field Team to ensure conformance with updated guidance for fully vaccinated individuals should state/local/client requirements allow. See Section 6. CDC Fully Vaccinated Guidance.

On a daily basis, the subcontractor supervisor must provide the Subcontractor Work Crew COVID-19 Daily Health Attestation complete with the names of all work crew fit to be on the Site for that day (i.e., who have answered "No" to all questions on the self-assessment) to Roux's Project Manager or Site Supervisor. The Subcontractor must notify Roux if there have been any "Yes" responses daily. Subcontractors shall not be required to provide the name or any other personal information of any employee who has answered "Yes" to any of the self-assessment questions, however, the Subcontractor should provide the date and times that the employee has been onsite in the prior 14 days. Records shall be maintained within the project files indicating health screening has been performed, records shall be retained for not less than 14 days following the date of submission. The Roux Subcontractor Work Crew COVID-19 Daily Health Check Attestation can be found within Appendix A.

8. SELF-ISOLATION & QUARANTINE

8.1 Self-Isolation

What if I am asked to self-isolate at home and when can I return from home isolation?

Depending on the situation, if you are COVID-19 positive or suspected to have COVID-19, employees may be required to self-isolate in their homes, as per CDC or local health department guidelines. Roux shall follow CDC guidance in areas where local/state requirements allow. The following table below outlines CDC isolation guidance.

Day 0 is your first day of symptoms or a positive viral test. Day 1 is the first full day after your symptoms developed or your test specimen was collected. If you have COVID-19 or have symptoms, isolate for at least 5 days.

IF YOU Tested positive for COVID-19 or have symptoms, regardless of vaccination status:	**Stay home for at least 5 days** Stay home for 5 days and isolate from others in your home. Wear a well-fitted mask if you must be around others in your home.	**Ending isolation if you had symptoms** End isolation after 5 full days if you are fever-free for 24 hours (without the use of fever-reducing medication) and your symptoms are improving. **Ending isolation if you did NOT have symptoms** End isolation after at least 5 full days after your positive test. **If you were severely ill with COVID-19** You should isolate for at least 10 days. Consult your doctor before ending isolation.	**Take precautions until Day 10** **Wear a mask** Wear a well-fitted mask for 10 full days any time you are around others inside your home or in public. Do not go to places where you are unable to wear a mask. **Avoid travel** **Avoid being around people who are at high risk**

8.2 Quarantine

Employees may be required to self-quarantine due to potential exposure with a suspected and/or confirmed COVID-19 positive individual as well as recent travel as per local/state guidelines. Consult with your OM regarding whether your situation requires quarantine following close contact. People in quarantine should stay home, separate themselves from others, monitor their health, and follow directions from their state or local health department.

8.2.1 Travel Related Quarantine/Testing

All travel out of state must be communicated with the OM and/or Department Head prior to departure. Please note, some federal/state/local entities require submissions of traveler health forms and potentially require additional testing for COVID-19. It is expected all Roux employees will comply with such federal/state/local travel requirements.

9. WORKPLACE CONTROLS

During the project planning phase, worksite evaluations shall be carried out by the PP and OM in consultation with the CHSD to determine risk exposure levels for work activities. If it is determined there is a high exposure risk level or higher, additional workplace controls shall be evaluated and implemented as required in addition to the basic infection prevention measures outlined below in Section 10. Additional workplace controls can include engineering controls (i.e., ventilation, physical barriers), administrative controls (i.e., minimizing contact between workers, rotating shifts, site specific training), and additional personal protective equipment (i.e., respiratory protection). If exposure risk cannot be mitigated, potential project postponement may be necessary at the discretion of the OM in consultation with the CHSD.

A Job Safety Analysis (JSA) has been developed and is provided in Appendix B, which summarizes and applies concepts within this guidance, including the infection prevention measures listed below. This JSA shall be required for all fieldwork in areas where there is community-based transmission of COVID-19.

10. INFECTION PREVENTION MEASURES

The following is basic infection prevention and personal hygiene practices which shall be implemented for all Roux field activities as well as in the office setting.

- ***Personal Hygiene***
  - Wash your hands often with soap and water for at least 20 seconds.
    - If soap and water are not available, use an alcohol-based sanitizer that contains at least 60% alcohol.
    - Key times to wash your hands include after blowing your nose, coughing or sneezing, after using the restroom, and before eating or preparing food.
  - Do not touch your eyes, face, nose and mouth with unwashed hands.
  - Cover your mouth and nose with a tissue when you cough or sneeze or use the inside of your elbow.
  - Throw potentially contaminated items (e.g., used tissues) in the trash.
- ***Avoid Close Contact/Secondary Contact with People and Potentially Contaminated Surfaces***
  - Apply appropriate social distance (6+ feet), as appropriate.
  - Do not work in areas with limited ventilation with other Site workers (e.g., small work trailer which lacks HVAC system).
  - Morning tailgate/safety meetings are recommended to occur outside or in well ventilated work trailers.
  - Contact your lab/equipment vendor to confirm equipment is properly disinfected prior to being shipped.
  - Do not carpool with others unless all individuals are comfortable with traveling together.
  - For company owned vehicles limit sharing of vehicles with coworkers. If unable to limit sharing of company owned vehicles, properly clean vehicle before driving with a focus on commonly touched surfaces (e.g., steering wheels, shifters, buttons, etc.).
  - Use caution when using public restrooms, portable toilets. Use paper towel as a barrier when touching door handles and faucets.
- ***Cleaning and Disinfecting***
  - Clean high touched surfaces daily. Examples of high-touch surfaces include: counters, tables, doorknobs, handles, stair rails, desks, toilets, faucets, and sinks. In most situations, regular cleaning (at least once a day) is enough to sufficiently remove virus that may be on surfaces. However, if certain conditions apply, you may choose to disinfect after cleaning. When there is no confirmed or suspected COVID-19 cases known to have been in a space, cleaning once a day is usually enough to sufficiently remove virus that may be on surfaces and help maintain a healthy facility.
  - You may want to either clean more frequently or choose to disinfect in addition to cleaning in shared spaces if the space:
    - Is a high traffic area, with a large number of people,
    - Is poorly ventilated,
    - Does not provide access to handwashing or hand sanitizer, or
    - The space is occupied by individuals at increased risk for severe illness.

If a someone who tested or is presumed COVID-19 positive and has been in your facility within the last 24 hours, you should clean and disinfect the space. This will be done in consultation with the CHSD.

The following outlines cleaning and disinfection protocols for specific types of surfaces as required. Please consult with the CHSD when developing site-specific cleaning and disinfection protocols.

- ***Hard (Non-porous) Surfaces***
  - If surfaces are dirty, they should be cleaned with a detergent/soap and water prior to disinfection.
  - Refer to the manufacturer's instructions to ensure safe and effective use of the product and wear appropriate personal protective equipment (e.g., gloves, safety glasses, face shield).
  - Many products require:
    - Keeping surface wet for a period of time (i.e., contact time).
      - Refer to manufacturer's instructions outlining adequate contact time.
    - Precautions such as wearing gloves and making sure you have good ventilation during use of the product.
  - Disposable gloves should be removed aseptically and discarded after cleaning. Wash hands immediately following removal of gloves. Refer to Appendix C for how to remove gloves aseptically.
  - If products on EPA List N: Disinfectants for Coronavirus (COVID-19) are not available, bleach solutions can be used if appropriate for the surface and will be effective against coronaviruses when properly diluted.
    - Most household bleach contains 5%–9% sodium hypochlorite. Do not use a bleach product if the percentage is not in this range or is not specified, such as some types of laundry bleach or splash-less bleach as these are not appropriate for disinfection.
    - Follow the directions on the bleach bottle for preparing a diluted bleach solution. If your bottle does not have directions, you can make a bleach solution for disinfecting by mixing:
      - 5 tablespoons (1/3 cup) of bleach per gallon of room temperature water; OR
      - 4 teaspoons of bleach per quart of room temperature water.
    - Follow the manufacturer's application instructions for the surface. If instructions are not available, leave the diluted bleach solution on the surface for at least 1 minute before removing or wiping. This is known as the "contact time" for disinfection. The surface should remain visibly wet during the contact time.
    - Ensure proper ventilation during and after application (for example, open windows).
    - Never mix household bleach (or any disinfectants) with any other cleaners or disinfectants. This can cause vapors that may be very dangerous to breathe in.
    - Make a new diluted bleach solution daily. Bleach solutions will not be as effective after being mixed with water for over 24 hours. Products with EPA-approved emerging viral pathogen claims are expected to be effective against COVID-19. Follow the manufacturer's instructions for all cleaning and disinfecting products (e.g., concentration, application method and contact time, etc.).
- ***Soft (Porous) Surfaces***
  - For soft (porous) surfaces, remove visible contamination if present and clean with appropriate cleaners indicated for use on the surfaces. After cleaning:
    - Launder items as appropriate in accordance with the manufacturer's instructions. If possible, launder using the warmest appropriate water setting for the item and dry items completely; or
    - Use products with the EPA-approved emerging viral pathogens that claim they are suitable for porous surfaces.

- ***Electronics***
  - For electronics such as tablets, touch screens, keyboards, remote controls, etc. remove visible contamination if present.
    - Follow the manufacturer's instructions for all cleaning and disinfection products.
    - Consider use of wipeable covers for electronics.
    - If no manufacturer guidance is available, consider the use of alcohol-based wipes or sprays containing at least 70% alcohol to disinfect touch screens. Dry surfaces thoroughly to avoid pooling of liquids.
- ***Linens, Clothing, and Other Items that Go in the Laundry***
  - Although it is unlikely field clothing would become potentially contaminated with COVID-19, it is recommended that field staff regularly launder field clothing following any field event upon returning home.
  - In order to minimize the possibility of dispersing the virus from potentially contaminated clothing, do not shake dirty laundry.
  - Wash items as appropriate in accordance with the manufacturer's instructions. If possible, launder items using the warmest appropriate water setting for the items and dry items completely.
  - Clean and disinfect hampers or other containers used for transporting laundry according to guidance listed above.
- ***Office/Site Specific-Cleaning and Disinfection Protocols***
  - Each office and long-term field site shall develop internal cleaning and disinfecting practices, which can be broken into three categories: routine cleaning; enhanced cleaning and disinfecting; and deep cleaning and disinfecting.
  - In the instance there is someone who is suspected or confirmed positive for COVID-19 and has worked at the office or field site within the last 24 hours, deep cleaning and disinfecting shall be considered. The CHSD shall work with the OM and Office Health and Safety Manager (OHSM) to evaluate site-specific measures that shall be carried out prior to deep cleaning and disinfecting. If more than 24 hours have passed since the person who is sick or diagnosed with COVID-19 has been in the space, cleaning shall be carried out. You may choose to also disinfect depending on certain conditions and in consultation with the CHSD.
  - If deep cleaning and disinfection is carried out the following will be considered:
    - Closing off all areas potentially affected and wait at least several hours before you clean and disinfect.
    - Areas should remain closed off until cleaning and disinfecting takes place; if able, ventilation shall be increased in the space (e.g., opening doors, windows, increasing CFM).

11. FACE COVERINGS

The CDC recommends the use of face coverings/masks in public settings where other social distancing measures are difficult to maintain. Masks are required on planes, buses, trains and other forms of public transportation traveling into, within, or out of the United States and in U.S. indoor transportation hubs such as airports and stations. The use of face coverings is to supplement and NOT replace the existing practices outlined above.

Based on existing studies and on-going recommendations and/or requirements from federal, state, and local entities, Roux is recommending the use of face coverings, when appropriate. Appropriate use is defined when local authorities or clients require the use of face coverings in conjunction with established social distancing, or if an employee elects to use a cloth covering on their own accord. Roux will provide appropriate face coverings that shall meet the basic requirements outlined by the CDC guidance.

Face Coverings (i.e., masks) should:

- Have two or more layers;
- Completely cover the nose and mouth;
- Fit snugly against the sides of the face and not have any gaps; and
- Have a nose wire to prevent air from leaking out of the top of the mask.

When donning and doffing the face covering, individuals should avoid touching their eyes, nose, and mouth. Following removal of the face covering, employees should wash their hands immediately using the guidelines described in Section 10 Infection Prevention Measures-Personal Hygiene above. Face coverings should be routinely washed depending on the frequency of use.

APPENDIX A

Roux Subcontractor Work Crew
COVID-19 Daily Health Screening Questionnaire

Subcontractor Work Crew
COVID-19 Daily Health Attestation

Date:
Company Name:
Supervisor Name: Signature:
Project Name:
Site Address:
Number of Workers on site:

Prior to entry onto a field site, the following questions shall be asked by the Subcontractor Supervisor to their work crew. **Subcontractors and Field Teams shall self-attest to vaccination status in order to ensure compliance with state/local guidance for fully vaccinated and unvaccinated individuals.**

It is preferred this questionnaire is completed for each individual prior to their arrival at the field site. If the answer to any of these questions is YES, the worker is not to report to the field site and seek proper medical advice, in accordance with CDC Guidelines. **The Subcontractor Supervisor must provide this form on a daily basis to the Roux primary contact for the project and notify Roux of any YES responses.**

1. Have you experienced any signs/symptoms of COVID-19 such as fever (≥100.4°F), cough, shortness of breath, chills, fatigue, muscle/body aches, headache, new loss of taste or smell, sore throat, congestion or runny nose, nausea/vomiting or diarrhea in the last 5 days?

2. Have you been in close contact* with someone who is suspected or confirmed to have COVID-19 or who is under investigation for COVID-19 within the last 5 days?

*Close contact as defined by the CDC is being within 6 feet of someone who has COVID-19 for a cumulative total of 15 minutes or more over a 24-hour period. Those who are up to date on COVID-19 vaccinations or had confirmed COVID-19 within the past 90 days (you tested positive using a viral test) you do not need to quarantine.

3. Have you traveled outside of the country, been on a cruise ship and/or traveled to areas within the United States which have state mandated travel restrictions in the last 5 days?

4. Have you tested positive for COVID-19 within the last 5 days?

Please list the crew member's names on site for the day.

1.	8.
2.	9.
3.	10.
4.	11.
5.	12.
6.	13.
7.	14.

APPENDIX B

Job Safety Analysis-Working in Areas Affected by COVID-19

JOB SAFETY ANALYSIS	Ctrl. No. CVD-19	DATE: 01/10/2022	☐ NEW ☒ REVISED	PAGE 1 of 2

JSA TYPE CATEGORY	WORK TYPE	WORK ACTIVITY (Description)
Generic	**Fieldwork**	**Working in Areas Affected by Coronavirus**

DEVELOPMENT TEAM	POSITION / TITLE	REVIEWED BY:	POSITION / TITLE
Kristina DeLuca	Health and Safety Specialist	Brian Hobbs	CHSD

REQUIRED AND / OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT

☐ LIFE VEST	☐ GOGGLES	☐ AIR PURIFYING RESPIRATOR	☒ GLOVES – Leather/cut-resistant in field and nitrile as needed
☒ HARD HAT – In field	☐ FACE SHIELD	☐ SUPPLIED RESPIRATOR	
☐ LIFELINE / BODY HARNESS	☐ HEARING PROTECTION	☒ PPE CLOTHING – High visibility vest in field	☐ OTHER
☒ SAFETY GLASSES – In field	☒ SAFETY SHOES – Steel/composite toe in fie		

REQUIRED AND / OR RECOMMENDED EQUIPMENT

Face covering/mask, nitrile gloves, hand soap, water source, hand sanitizer, disinfectant spray and disinfectant wipes.

Commitment to Safety – All personnel onsite will actively participate in SPSA performance by verbalizing SPSAs throughout the day.

SOCIAL DISTANCING: Maintain 6' of distance between yourself and all other people at all times. If you do not believe the scope of work can be conducted while maintaining this distance, contact your Project Manager immediately.

Assess [1]JOB STEPS	Analyze [2]POTENTIAL HAZARDS	Act [3]CRITICAL ACTIONS
1. Project Preplanning	N/A	• Review and follow COVID-19 CDC, Roux, Client and local orders/protocols. • Ensure all workers are fit for duty - anyone feeling sick should remain at home even if symptoms do not align with COVID-19. If a worker has been in contact with someone potentially positive or positive for COVID-19, contact your Office Manager. • Determine PPE needs and ensure adequate supply of disinfectant wipes/spray, soap and water or hand sanitizer at Site. Due to high demands and limited supply, plan ahead. • Use the minimum number of employees necessary to safely complete the work.
2. Mobilization	**Exposure:** Becoming infected or infecting co-workers	**Personal/Rental/Roux Owned Vehicle** • Avoid carpooling, unless all individuals are up to date on vaccinations. • Verify workers/other people are not approaching vehicle prior to exiting the vehicle. Maintain 6' of distance from general public, as appropriate. **Public Transportation** • Public transit should not be used unless absolutely necessary. Consider renting a car rather than taking public transit. If public transit is required, wear appropriate face covering/mask and apply social distancing (6 ft). Wash hands or use hand sanitizer immediately after. **Hotel Stay (Refer to COVID-19 H&S Guidance for more info)** • If a hotel stay is deemed necessary for the given field work, ensure that you clean your room upon initial arrival. • Place the "Do Not Disturb" placard on the room while away and limit housekeeping services to the extent feasible during your stay to minimize the reintroduction and spread of the virus from others.. Wash hands or use hand sanitizer often.
3. Tailgate Meeting	**Exposure:** Becoming infected or infecting co-workers	• Perform outside or indoors in areas with ample ventilation. • If unvaccinated, maintain at least a 6+ ft distance between you and others. • Discuss primary infection prevention measures listed below. • Discuss COVID-19 symptoms with coworkers and subcontractors to ensure fitness for duty. Anyone exhibiting signs or symptoms should be instructed to leave the Site, contact your Project Manager.

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.
[2] A hazard is a potential danger. Break hazards into six types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards, energy source; Energy Source – electricity, pressure, compression/tension.
[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

4. Site Activities	**Exposure:** Becoming infected or infecting co-workers	• Coordinate field activities at the beginning of the day (i.e. Tailgate meeting) to minimize time spent in crowded spaces or overlap while completing job tasks. • Don face coverings as appropriate. • Apply social distancing (6+ ft) when interacting with others if unvaccinated. If anyone comes within 6 ft of you while conducting work and your work prevents you from moving away, politely ask them to move back. If others are unable to move from your space, stop work and leave area. • Minimize shaking hands or touching others. • Minimize sharing of equipment or other items with co-workers and subcontractors unless wearing appropriate PPE (e.g. nitrile gloves), as appropriate. • If anyone is experiencing COVID-19 signs or symptoms in your vicinity, stop work and leave the area. • Do not work in areas with limited ventilation with others. • Cover your mouth and nose with tissue or paper towel or with your elbow when coughing or sneezing and wash hands or use hand sanitizer immediately after. If sick contact SHSO/PM and leave Site immediately. • Clean work surfaces/areas with approved cleaners you're responsible for (ex: desk, office doorknob, computer, etc.) at least daily. • Avoid public spaces and going out to eat by bringing your own lunch to the Site. If performing work in high density urban areas, it is recommended all food must be consumed at or in your vehicle or within designated work trailer. Wash hands or use hand sanitizer before eating and immediately after.

Primary Infection Prevention Measures

- Wash your hands often with soap and water for at least 20 seconds.
  - If soap and water are not available, use an alcohol-based sanitizer that contains at least 60% alcohol. Key times to wash hands include after blowing your nose, coughing or sneezing, after using the restroom, and before eating or preparing food.
- Do not touch your eyes, face, nose and mouth with unwashed hands.
- Cover your mouth and nose with a tissue when you cough or sneeze or use the inside of your elbow. Throw potentially contaminated items (e.g. used tissues) in the trash.
- Avoid close contact/secondary contact with people and potentially contaminated surfaces.
  - Apply appropriate social distance (6+ feet).
  - Minimize handshaking/touching others and use caution when accessing public spaces.
- Clean frequently touched surfaces daily. Commonly touched items can include but are not limited to tables, doorknobs, light switches, countertops, handles, desks, phones, keyboard, toilets, sinks and field equipment. If surfaces are dirty, they should be cleaned with soap and water prior to disinfection. If surface cannot be cleaned/disinfected, then wash hands or use sanitizer as soon as possible.

[1] Each Job or Operation consists of a set of tasks / steps. Be sure to list all the steps needed to perform job.
[2] A hazard is a potential danger. Break hazards into six types: Contact - victim is struck by or strikes an object; Caught - victim is caught on, caught in or caught between objects; Fall - victim falls to ground or lower level (includes slips and trips); Exertion - excessive strain or stress / ergonomics / lifting techniques; Exposure - inhalation/skin hazards; Energy source – electricity, pressure, compression/tension.
[3] Using the first two columns as a guide, decide what actions or procedures are necessary to eliminate or minimize the risk. List the recommended safe operating procedures. Say exactly what needs to be done - such as "use two persons to lift". Avoid general statements such as, "be careful".

APPENDIX C

How to Remove Gloves

How to Remove Gloves

To protect yourself, use the following steps to take off gloves

1



Grasp the outside of one glove at the wrist. Do not touch your bare skin.

2



Peel the glove away from your body, pulling it inside out.

3



Hold the glove you just removed in your gloved hand.

4



Peel off the second glove by putting your fingers inside the glove at the top of your wrist.

5



Turn the second glove inside out while pulling it away from your body, leaving the first glove inside the second.

6



Dispose of the gloves safely. Do not reuse the gloves.

7



Clean your hands immediately after removing gloves.

Heat Illness Prevention Program

HEAT ILLNESS
PREVENTION PROGRAM

CORPORATE HEALTH AND SAFETY DIRECTOR	:	**Brian Hobbs, CIH, CSP**
EFFECTIVE DATE	:	**10/2019**
REVISION DATE	:	**03/2023**
REVISION NUMBER	:	**2**

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1. PURPOSE

Roux Associates, Inc. and its affiliated **companies**, Roux Environmental Engineering and Geology, D.P.C, and Remedial Engineering (collectively, "Roux") has established this heat illness prevention program to assist in preventing workplace accidents, injuries, and illnesses associated with temperature extremes. Roux is committed to taking every precaution to protect employees who might be exposed to heat stress, including establishing safe work practices, heat illness prevention controls, and emergency preparedness, which will be detailed in this plan.

2. SCOPE AND APPLICABILITY

Roux's Heat Illness Prevention Program applies to all employees who may be exposed to heat stress in the field.

3. ROLES AND RESPONSIBILITIES

The Heat Illness Prevention Program Administrator for Roux is the Corporate Health and Safety Director (CHSD), Brian Hobbs, CIH, CSP. The daily administration of the program is delegated to the Operations Manager (OM) and Office Health and Safety Manager (OHSM). The CHSD has the authority, responsibility, and overall accountability for the comprehensive implementation of this program.

All managers and supervisors shall implement and maintain the heat illness prevention program in work areas where there is a potential for heat stress.

Management Responsibilities

Management (i.e., Project Managers, Project Principals, OM) must provide the following to promote compliance and foster a good safety culture:

- Comply with applicable standards.
- Inform employees of the provisions of the heat illness prevention program and ensure understanding.
- Provide sufficient water, shade, rest areas, and other heat illness controls for employees.
- Assist with establishing work practices to minimize heat stress risks, such as acclimatization, required rest periods, employee monitoring, and strategic scheduling.
- Encourage employees to report hazardous conditions or heat illness symptoms.
- Provide training to any employee who could possibly be exposed to the risk of heat illness.

Employee Responsibilities

Employees are expected to actively participate in the organization's heat illness prevention program, which includes the following responsibilities:

- Receive appropriate training with regards to heat stress.
- Understand core concepts of heat illness prevention and follow guidelines to mitigate risks.
- Recognize the signs and symptoms of heat illness and immediately report them.
- Cooperate with workplace inspections and incident investigations.

Effective Communication

All Roux employees shall be accountable for ensuring there is effective communication with both the field team and their subcontractors. Communication between Roux employees project leads (e.g., Project Principal, Project Managers) and subcontractors (if applicable) will be established and maintained, so that employees can quickly contact should there be a change in condition or someone at the Site exhibits signs/symptoms of heat stress. These

types of incidents would follow Roux's Incident Investigation and Reporting Management Program 2.12 and Roux's Injury Illness Prevention Program 2.22.

4. HAZARD IDENTIFICATION AND ASSESSMENT

Prior to scheduled field work, the project team shall ensure a hazard assessment is conducted as it relates to heat stress. This will include a determination of how much heat and exertion employees are likely to be exposed to based on the work activity.

Factors that can increase heat stress can include the following:

- Temperatures at the work site;
- Humidity;
- A lack of air movement or exchange;
- The amount of time employees spend working in the heat;
- The time of day work takes place;
- Sources of radiant heat (e.g., sunlight, fire, or hot furnace);
- Work activities that produce heat (e.g., welding);
- Physical contact with warm or hot objects or liquids;
- The clothing and PPE employees are required to wear; and/or
- Physically strenuous work.

Results of the hazard analysis should be used to determine appropriate controls for mitigating heat stress, whenever possible, for planning acclimatization and for developing work schedules that rotate workers to limit employee exposure. Typically, the Site Supervisor (SS) or Site Health and Safety Officer (SHSO) shall conduct worksite observations to assure all employees follow heat illness prevention procedures and that hazards are sufficiently controlled. However, all employees should be continuously evaluating work site conditions and be able to recognize heat stressors in order to prevent heat illnesses.

5. TRAINING

All Roux employees shall be trained on the topics listed below prior to beginning work, which may potentially expose workers to heat stress.

Training Topics

- The environmental, behavioral, and personal risk factors for heat illness, such as radiant heat sources, exertion, clothing and PPE, and use of alcohol or drugs.
- Types of heat illnesses, common symptoms, and appropriate emergency response for each.
- The knowledge that mild symptoms may quickly become more severe or life-threatening.
- The importance of immediately reporting any signs or symptoms of heat illness to the supervisor.
- The employer's responsibility to provide shade, water, access to first aid, and cool-down rests during work and the employee's freedom to exercise their rights under this standard without fear of retaliation.
- The employer's heat stress plan and its procedures:
  - Procedures for employees who are newly assigned to work in high heat areas.

  - The organization's acclimatization methods, as applicable.
  - Heat wave procedures.
  - Heat illness and emergency response, including contact information.
- The importance of frequent consumption of water and the taking of rest breaks.
- How heat illness prevention applies to employees' specific tasks.

Increasing Training Effectiveness:

- The SS/SHSO will hold daily tailgates with the field team to go over daily work tasks and basic safety information including Job Safety Analysis (JSA) review as well as incorporate elements such as current weather and effects on the work activities for the day.
- If a heat wave or high heat is anticipated, OHSMs and/or OMs will provide communications to Roux employees prior to their shifts and remind them of any special high heat procedures.

6. DRINKING WATER

Employees shall be given access to potable drinking water. Access to water will be provided as near as possible to where employees are working, and there shall be enough locations so employees will have sufficient water. Water should be fresh and pure, free of taste or smell that would discourage employees from drinking, comfortably cool, and obtained from an approved source.

The recommendation is that during warm or hot weather, employees drink four 8-ounce glasses of water, or a total of one quart per hour, throughout the entire work shift. Easy access to sufficient potable drinking water throughout the work shift encourages employees to drink.

During a heat wave, water shall be replenished more often to keep available and cool. Water containers (and all spouts and levers) must be kept clean. If able, provide single use drinking cups with appropriate waste receptacle. Accessible sanitation facilities shall also be maintained at work Sites as appropriate.

SS/SHSO are responsible for the following:

- Drink sufficient water before, during, and after work shifts to maintain hydration.
- Encourage frequent drinking of small amounts of water throughout the shift. In high heat environments, remind field staff and subcontractors that drinking extra water may be necessary.
- Discourage the choosing of drinks with caffeine or sugar that may possibly dehydrate employees instead of water. Also, discourage the drinking of alcohol.
- Monitor the water supply.
- If employees become dehydrated and are unable to alleviate symptoms with the steps below, get them immediate medical attention.

Field Staff/Subcontractors are responsible for the following:

- Drink sufficient water before, during, and after work shifts to maintain hydration. Drink up to 4 cups of water per hour, especially during hot weather.
- Be aware that in high heat situations, you may need to drink more water.
- Monitor yourself and others for signs of dehydration. If you feel dehydrated:
  - Follow Roux's Incident Notification Flowchart;

- Rest in the shaded resting area; and
- Drink water in small amounts, but frequently.

7. ACCESS TO SHADE

Access to shaded areas will be provided to Roux staff, as needed. Employees are encouraged to use these areas when they feel overheated. Roux's SS/SHSO shall oversee the proper implementation of shaded areas and will communicate these locations on a daily basis with the Field Team.

Depending on the Site, shaded areas can include the following:

- Pop-up Tents
- Canopies
- Umbrellas
- Structures mechanically ventilated or open to air movement
  - Garage
- Conex mounted RV canopies
- Full and thick tree canopies that block direct sunlight
- Buildings
- Enclosed areas only if they provide cooling comparable to shade in open air
  - Vehicles with air conditioning

Shaded Area Requirements

Shade shall be strong enough to cool employees down and other shadows should not be visible in the shade. Shade will be provided by Roux when the air temperature exceeds 80°F. If the temperature is less than 80°F, shade will be available and provided upon request. The SS/SHSO will monitor conditions to determine when the air will exceed (and is exceeding) 80°F. For most Sites, air will be monitored hourly and shade will be setup immediately if 80°F is exceeded.

Shade shall be located as close as practical to areas where employees are working and is easily accessible. These areas will be considered safe and free from other hazards. Shaded areas should be large enough to accommodate all employees who are on a break, resting, or recovering without crowding. Should natural vegetation be used for shade, the SS/SHSO will evaluate shade for effectiveness.

Field Staff Responsibilities

Field Staff should take ordinary rest breaks in the shaded areas and monitor themselves for signs of heat stress, and go to the shaded area when they need to cool down. Any issues or problems with shaded areas should be reported to the SS/SHSO for the Site.

If shaded areas are used for a preventative cool-down, the SS/SHSO will ensure the affected employees will remain in the shade until they begin to feel better. The SS/SHSO will continue to monitor the employees and ask them if they are experiencing symptoms of a heat illness. Employees shall not be sent back to work before symptoms have ended and at a minimum at least 10 minutes of rest.

8. MONITORING AND SCHEDULING

Monitoring

The SS/SHSO and Field Team will continue to monitor themselves and others for signs of heat illness. The SS/SHSO will monitor when the air temperature exceeds 80°F. Throughout the summer, weather and temperature will be monitored at least two weeks ahead, and the work schedule will be planned to accommodate the expected weather.

Scheduling

Scheduling accommodations may include:

- Working during cooler hours of the day
- Working at night
- Stopping work early
- Rescheduling work activities
- Increasing frequency of breaks

In general, strenuous work activities shall be rescheduled to the coolest parts of the day.

Special precautions are required for temperatures above 80°F, 95°F, and heat waves. These precautions are provided in sections below.

9. ACCLIMATIZATION AND NEW EMPLOYEE PROCEDURES

Roux requires employees to be acclimatized in order for them to better tolerate heat in the workplace. Acclimatization is the physical process of adapting to a different thermal environment, allowing a better toleration of heat. Acclimatization procedures require gradual exposure that gives the employee time to adjust to each level of exposure. Acclimatization is essential for new employees, but is necessary for all employees when the temperature significantly changes. Heat stress is much more likely if these procedures are not followed.

The SS/SHSO is responsible for observing new employees during their first 14 days of employment in high heat areas.

Re-acclimatization is necessary if employees are absent from high heat environments for a week or more or the temperature increases significantly.

10. HEAT WAVE AND EXTREME HEAT PROCEDURES

Heat Wave Procedures

A heat wave is defined as consistent temperatures over 80°F or if the temperature is 10° higher than the average daily temperatures in the preceding 5 days.

SS/SHSO and Project Management (e.g., PP, PM) shall closely observe and monitor employees during a heat wave. The Field Teams should institute a ratio of one SS to 20 or fewer employees, a mandatory buddy system, or a consistent practice for supervisors to check on employees. Pre-shift meetings to review high heat procedures with employees will be carried out to emphasize work rest schedules, drinking water, shade, etc.

Extreme Heat Procedures

When work site temperatures equal or exceed 95°F, the employer will enact extreme heat procedures:

- Employees will be closely observed by the SS/SHSO for signs of heat illness. New employees will be supervised for acclimatization.
- Effective communication and monitoring will be assured through the use of periodic check ins with the SS/SHSO via phone. Communications between employees and Project Management (e.g., PP/PM) will be established and maintained. Mandatory 10-minute break periods are required for every two hours worked. SS/SHSO must enforce this rule.
- Pre-shift safety tailgate meetings will occur to review procedures and to remind employees to drink water and take cool-down rests if needed. SS/SHSO shall remind employees to rest and drink water. Employees should drink more water than usual.

11. EMERGENCY RESPONSE PROCEDURES

Roux is dedicated to providing prompt appropriate care for all employees who report or show symptoms of heat illness. If an employee shows signs of heat illness, they will be monitored and shall not be left alone or sent home without being offered first aid or emergency medical services. If on-Site personnel require any medical treatment, the following steps will be taken:

1. Notify Roux's Project and Corporate Management Team for any work-related injury and/or illness occurrence, and communicate with the contracted Occupational Health Care Management Provider, AllOne Health (AOH), immediately following the notifications provided above.
2. Based on discussions with the Project Team, Corporate Management, and the AOH evaluation, if medical attention beyond onsite First Aid is warranted, transport the injured / ill person (IP) to the Urgent Care Center, or notify the Fire Department or Ambulance Emergency service and request an ambulance or transport the victim to the hospital, and continue communications with Corporate Management Team. An Urgent Care/Hospital Route map with locations and directions are provided within Site Specific Health and Safety Plans.
3. First aid medical support will be provided by onsite personnel trained and certified in First Aid, Cardio Pulmonary Resuscitation (CPR), Automatic External Defibrillation (AED), and Blood-Borne Pathogens (BBP) Awareness, until relieved by emergency medical services (EMS).
4. The SHSO and Project Manager will perform a Loss Investigation (LI) and the Project Team will complete the final Loss Report.

12. HEAT-RELATED ILLNESSES

Heat Stress

Heat stress is a significant potential hazard and can be associated with heavy physical activity and/or the use of personal protective equipment (PPE) in hot weather environments. For these reasons, the company will provide potable drinking water and access to shade or other areas of relief (i.e., air-conditioned vehicles, work trailers). Supervisors, prior to supervising personnel in the field as well as all personnel involved with the field work of a project, are trained in this HASP that includes preventing heat-related illnesses and the below procedures in response to heat-related symptoms and illness. Since much of our work is dependent upon environmental factors beyond our control, we must closely monitor air temperature and humidity and be aware of avoiding radiant heat sources and providing as much air circulation as possible wherever we work. Physical factors that need to be evaluated as part of our Job Safety Analysis (JSA) reviews include the level of physical activity and duration of work and the type (i.e., color, weight breathability) of the clothing we select. In addition, personal factors such as age, weight, fitness, drug/alcohol use, and prior history of heat-related illness need to be considered.

Heat cramps are brought on by prolonged exposure to heat. As an individual sweats, water and salts are lost by the body, resulting in painful muscle cramps. The signs and symptoms of heat stress are as follows:

- Severe muscle cramps, usually in the legs and abdomen;
- Exhaustion, often to the point of collapse; and
- Dizziness or periods of faintness.

First aid treatment includes, but is not limited to, shade, rest, and fluid replacement. Typically, the individual should recover within one-half hour while being monitored constantly. If the individual has not improved substantially within 30 minutes and the body temperature has not decreased, the individual should be transported to a hospital for medical attention.

Heat Exhaustion

Heat exhaustion may occur in a healthy individual who has been exposed to excessive heat while working or exercising. The circulatory system of the individual fails as blood collects near the skin to rid the body of excess heat through transference. The signs and symptoms of heat exhaustion are as follows:

- Rapid and shallow breathing;
- Weak pulse;
- Cold and clammy skin with heavy perspiration;
- Skin appears pale;
- Fatigue and weakness;
- Dizziness; and
- Elevated body temperature.

First aid treatment include, but is not limited to, cooling the victim, elevating the feet, and replacing fluids. If the individual is not substantially improved within 30 minutes and the body temperature has not decreased, the individual should be transported to the hospital for medical attention.

Heat Stroke

Heat stroke occurs when an individual is exposed to excessive heat and stops sweating. This condition is classified as a MEDICAL EMERGENCY requiring immediate cooling of the victim and transport to a medical facility. The signs and symptoms of heat stroke are as follows:

- Dry, hot red skin;
- Body temperature approaching or above 105 degrees F;
- Confusion, altered mental state, slurred speech;
- Seizures;
- Large (dilated) pupils; and
- Loss of consciousness – the individual may go into a coma.

First aid treatment requires immediate cooling and transportation to a medical facility. Heat stress is a significant hazard if any type of protective equipment (semi-permeable or impermeable) that prevents evaporative cooling is worn in hot weather environments.

13. OTHER HEAT CONTROLS

Clothing and PPE

Employees should choose clothing that is reflective, light-colored, lightweight, loose-fitting and breathable. Clothing should cover the exposed parts of the body. In direct sun, hard hats with a brim or bill may be helpful. Should specialized cooling garments be applicable, please consult with your OM/OHSM/CHSD.

Managing Employee Risk Factors

It is recommended that employees are aware of how their health can affect their risk of heat stress. The following increases ones risk for a heat related illness:

- A poor level of physical fitness
- Obesity
- Chronic or acute illnesses
- Conditions such as diabetes, heart disease, or high blood pressure
- Certain medications, such as diuretics
- Age (60+)

Employees should:

- Maintain their health outside of work
- Be aware of the effects of medications
- Drink adequate amounts of water
- Eat light, cool meals during work shifts and save heavy meals until after the shift is over
- Do not skip meals: food helps replace electrolytes when sweating
- Take breaks as needed
- Do not consume alcohol prior to working in a hot environment

APPENDIX E

Personal Protective Equipment (PPE) Management Program

PERSONAL PROTECTIVE EQUIPMENT
MANAGEMENT PROGRAM

CORPORATE HEALTH AND SAFETY DIRECTOR	:	**Brian Hobbs, CIH, CSP**
EFFECTIVE DATE	:	**01/2019**
REVIEW DATE	:	**03/2023**
REVISION NUMBER	:	**4**

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1. PURPOSE

Roux Associates, Inc. and its affiliated companies, Roux Environmental Engineering and Geology, D.P.C., and Remedial Engineering (collectively, "Roux") has instituted the following program to establish guidelines for the selection of personal protective equipment (PPE) for use by Roux personnel performing field activities in hazardous environments. PPE is not meant to be a substitute for engineering, work practice, and/or administrative controls, but PPE should be used in conjunction with these controls to protect employees in the workplace. Clothing, body coverings, and other accessories designed to prevent worker exposure to workplace hazards are all types of PPE. To ensure adequate PPE employee-owned PPE is evaluated on a case-by-case basis to insure its adequacy, maintenance and sanitation.

2. SCOPE AND APPLICABILITY

These guidelines apply to all PPE selection decisions to be made in implementing the Roux program. The foundations for this program are the numerous Occupational Health and Safety Administration (OSHA) standards related to PPE cited in 29 CFR 1910 Subpart I, 29 CFR 1926 Subpart E, and the hazardous environment work employee protection requirements under the OSHA Hazardous Waste Operations and Emergency Response (HAZWOPER) standard at 29 CFR 1910.120 and 1926.65. To ensure hazard assessments are documented, the levels of protection, types of protection, and tasks requiring protection are covered in site-specific Health and Safety Plans (HASPs) and Job Safety Analyses (JSAs).

3. PROCEDURES

Due to the varied nature of site activities and the different potential hazards associated with different sites, several aspects must be considered when selecting PPE. The following text describes PPE selection logic and provides guidelines and requirements for the appropriate selection and use of PPE.

3.1 Introduction

To harm the body, chemicals must first gain entrance. The intact skin and respiratory tract are usually the first body tissues that are exposed to chemical contaminants. These tissues provide barriers to some chemicals but in many cases, are damaged themselves or are highly permeable by certain chemical compounds. PPE therefore is used to minimize or eliminate chemical compounds from coming into contact with these first barrier tissues.

The proper selection of equipment is important in preventing exposures. The Project Manager (PM) or health and safety personnel making the selection will have to take several factors into consideration. The level of protection, type, and kind of equipment selected depends on the hazardous conditions. In some cases, additional selection factors include cost, availability, compatibility with other equipment, and performance. An accurate assessment of all these factors must be made before work can be safely carried out.

3.1.1 Training

Training shall be provided to all field-based employees in the proper use and care of PPE. Training shall include, but is not limited to, the initial 40-hour HAZWOPER training, annual 8-hour HAZWOPER refresher training, and site-specific PPE training. The training program includes when PPE is necessary; what types of PPE are necessary; how to don, doff, adjust and wear PPE; the limitations of PPE; the proper care, maintenance, useful life and disposal of PPE. In addition, retraining shall be conducted when workplace changes require a change in PPE when an employee demonstrates a lack of knowledge or improper use of PPE is identified. Training certifications are provided to employees that include the date of training and certification subject.

3.2 Types of PPE

The type and selection of PPE must meet certain general criteria and requirements as required under OSHA 29 CFR 1910.132 (General Industry) and 1926.95 (Construction). In addition to these general requirements, specific requirements and specifications exist for some types of PPE that form the basis of the protective clothing scheme. All manufacturer's recommendations for PPE care and use shall be followed. All PPE shall be maintained in a sanitary and reliable condition. Additionally, proper fit and/or size shall be evaluated to ensure adequate protection for all employees. Should PPE become defective, it shall be immediately removed from service and discarded.

The following is a list of the common types of specific PPE and the specific requirements for the PPE type, where applicable:

1. Hard Hats - Regulated by 29 CFR 1910.135 and 1926.100; and, specified in ANSI Z89.1.
2. Face Shields and Safety Glasses - Regulated by 29 CFR 1910.133 and 1926.102; and, specified in ANSI Z87.1.
3. Respiratory Protection - Regulated by 29 CFR 1910.134 and 1926.103.
4. Hand Protection - Not specifically regulated.
5. Foot Protection - Regulated by 29 CFR 1910.136 and 1926.96; and, specified in ANSI Z41.1.
6. Protective Clothing (e.g., fully encapsulated suits, aprons) - Not specifically regulated.

3.3 Protective Clothing Selection Criteria

3.3.1 Chemicals Present

The most important factor in selecting PPE is the determination of what chemicals the employee may be exposed to. On field investigations, the number of chemicals may range from a few to several hundred. The exact chemicals or group of chemicals present at the site (certain groups tend to require similar protection) can be determined by collecting and analyzing samples of the air, soil, water, or other site media. When data are lacking, research into the hazardous materials used or stored at the site can be used to infer potential chemical exposures on the site.

The most appropriate clothing shall be selected once the known, or suspected chemicals have been identified and taken into consideration based on the type of work to be performed.

Protective garments are made of several different substances for protection against specific chemicals. There is no universal protective material. All will decompose, be permeated by, or otherwise fail to protect under given circumstances. Fortunately, most manufacturers make guides to the use of their products (i.e., Dupont's Tyvek™ Permeation Guide). These guides are usually for gloves and coveralls and typically provide information regarding chemical degradation rates (failure of the material to maintain structural integrity when in contact with the chemical), and may provide information on the permeation rate (whether or not the material allows the chemical to pass through). When permeation tables are available, they shall be used in conjunction with degradation tables to determine the most appropriate protective material for the specific chemical hazard(s).

During most site work, chemicals are usually in mixed combinations, and the protective materials are not in continuous contact with pure chemicals for long periods of time; therefore, the selected material may be adequate for the particular chemical of most concern and type of work being performed, yet not the "best" protecting material for all site chemicals and activities. Selection shall depend upon the most hazardous

chemicals based on their hazards and concentrations. Sometimes layering (i.e., using several different layers of protective materials) affords the best protection.

3.3.2 Concentration of the Chemical(s)

One of the major criteria for selecting protective material is the concentration of the chemical(s) in air, liquid, and/or solid state. Airborne and liquid chemical concentrations should be compared to the OSHA standards and/or American Conference of Governmental Industrial Hygienists (ACGIH) and National Institute for Occupational Safety and Health (NIOSH) guidelines to determine the level of skin or other absorptive surface (e.g., eyes) protection needed. While these standards are not designed specifically for skin exposed directly to the liquid, they may provide skin designations indicative of chemicals known to have significant skin or dermal absorption effects. For example, airborne levels of PCBs on-site may be low because it is not very volatile, so the inhalation hazard may be minimal; however, PCB-containing liquid coming in direct contact with the skin may cause overexposure. Thus, PCBs have been assigned a skin designation in both the OSHA and ACGIH exposure limit tables.

3.3.3 Physical State

The characteristics of a chemical may range from nontoxic to extremely toxic, depending on its physical state. Inorganic lead in soil would not be considered toxic to site personnel, unless it became airborne, since it is generally not absorbed through the intact skin. However, organic lead in a liquid could be readily absorbed through the skin. Soil is frequently contaminated with hazardous materials. Concentrations will vary from a few parts per million to nearly one hundred percent by volume. The degree of hazard is dependent on the type of soil and concentration of the chemical. Generally speaking, "dry" soils that have not become airborne do not pose a hazard to site personnel if they take minimal precautions, such as wearing some type of lightweight gloves.

3.3.4 Length of Exposure

The length of time a material is exposed to a chemical increases the probability of a breakthrough. Determinations of actual breakthrough times for short-term exposures indicate that several different materials can be used that would be considered inadequate under long-term exposures. It should be kept in mind that during manufacturer’s permeation testing, a pure (100% composition) liquid is usually placed in direct contact with the material producing a worst-case situation.

3.3.5 Abrasion

When selecting protective clothing, the job the employee is engaged in must be taken into consideration. Persons moving drums or performing other manual tasks may require added protection for their hands, lower chest and thighs. The use of leather gloves and a heavy apron over other normal protective clothing will help prevent damage to the normal PPE, and thus reduce worker exposures.

3.3.6 Dexterity

Although protection from skin and inhalation hazards is the primary concern when selecting PPE, the ability to perform the assigned task must be maintained. For example, personnel cannot be expected to perform work that requires fine dexterity if they must wear a thick glove. Therefore, the PPE selection process must consider the task being performed and provide PPE alternatives or techniques that allow dexterity to be maintained while still protecting the worker (e.g., wearing tight latex gloves over more bulky hand protection to increase dexterity).

3.3.7 Ability to Decontaminate

If disposable clothing cannot be used, the ability to decontaminate the materials selected must be taken into consideration. Once a chemical makes contact with the material, the PPE must be cleaned before it can be reused. If the chemical has completely permeated the material, the clothing cannot be adequately decontaminated, and the material should be discarded.

3.3.8 Climactic Conditions

The human body works best with few restraints from clothing. Protective clothing adds a body burden by increasing weight, restricting movement, and preventing the body's natural cooling process. In severe situations, a modified work program must be used.

Some materials act differently when they are very hot and very cold. For example, PVC becomes almost brittle in very cold temperatures. If there are any questions about the stability of the protective materials under different conditions, the manufacturer should be contacted prior to using PPE in the field.

3.3.9 Work Load

Like climactic conditions, the type of work activity may affect work duration and the ability of personnel to perform certain tasks. Similarly, the amount of protective materials a person wears will affect their ability to perform certain tasks. For example, a person in a total encapsulating suit, even at 72°F, cannot work for more than a short period of time without requiring a break.

The work schedule should be adjusted to maintain the health of the employees. Modified work practices may include allowing more time for individual job tasks and implementing work/rest cycles per NIOSH and ACGIH thermal stress recommendations. Special consideration should be given to the selection of clothing that both protects the worker and adds the least burden when personnel are required to perform strenuous tasks. Excessive bodily stress frequently represents the most significant hazard encountered during field work.

3.4 Types of Protective Materials

1. Cellulose or Paper: suitable for nuisance dusts and coarse fibers.
2. Natural and Synthetic Fibers
    a. Tyvek™: suitable small sized hazardous particles, including lead, asbestos, and mold.
    b. Tychem™: suitable for a variety of hazards from light liquid splashes to heavy exposures of industrial chemicals and agents.
    c. Nomex™: suitable for flame-resistance, radiation resistance, acids, alkalis, fluorocarbon refrigerants (CFCs), and non-polar solvents.
3. Elastomers
    a. Polyethylene: suitable for polar substances and solvents.
    b. Saran™ : suitable for flame-resistance, acids, alkalis, oils, and organic solvents.
    c. Polyvinyl Chloride (PVC): suitable for alcohols, oils, inorganic acids, alkalis, and salts.
    d. Neoprene: suitable for polar/non-polar substances, petroleum mixtures, and ≤ 200 F heat resistance.
    e. Butyl Rubber: suitable for polar substances and solvents.
    f. Viton: suitable for non-polar substances, petroleum mixtures, and ≤ 200 F heat resistance.

g. Nitrile: suitable for polar/non-polar substances and petroleum mixtures.

3.5 Protection Levels

3.5.1 Level A Protection

Level A protection (a fully encapsulated suit) is used when skin hazards exist or when there is no known data that positively rule out skin and other absorption hazards. Per the Roux Respiratory Protection Management Program, Roux employees are not authorized to enter an IDLH atmosphere; therefore, the program does not allow the use of supplied-air respirators (SARs) or self-contained breathing apparatus (SCBA). At no time will Level A work be performed without the consent of the CHSD and OM.

The following conditions suggest a need for Level A protection:

- Confined facilities where probability of skin contact is high;
- Sites containing known skin hazards;
- Sites with no established history to rule out skin and other absorption hazards;
- Atmosphere immediately dangerous to life and health (IDLH) through the skin absorption route;
- Site exhibiting signs of acute mammalian toxicity (e.g., dead animals, illnesses associated with past entry into site by humans);
- Sites at which sealed drums of unknown materials must be opened;
- Total atmospheric readings on the Photoionization Detector (PID), Flame Ionization Detector (FID), and similar instruments indicate 500 to 1,000 ppm of unidentified substances; and
- Extremely hazardous substances (e.g., cyanide compounds, concentrated pesticides, Department of Transportation Poison "A" materials, suspected carcinogens and infectious substances) are known or suspected to be present and skin contact is possible.

The following items constitute Level A protection:

- Open circuit, pressure-demand self-contained breathing apparatus (SCBA);
- Totally encapsulated suit;
- Gloves, inner (surgical type);
- Gloves, outer;
- Chemical protective;
- Boots, chemical protective, steel toe and shank;
- Radiation detector (if applicable); and
- Communications.

3.5.2 Level B Protection

Level B protection is utilized when the highest level of respiratory protection is needed but hazardous material exposure to the few unprotected areas of the body is unlikely.

The following conditions suggest a need for Level B protection:

- The type and atmospheric concentration of toxic substances have been identified and they require the highest level of respiratory protection;

- IDLH atmospheres where the substance or concentration in the air does not present a severe skin hazard;
- The type and concentrations of toxic substances do not meet the selection criteria permitting the use of air-purifying respirators; and
- It is highly unlikely that the work being done will generate high concentrations of vapors, gases or particulates, or splashes of materials that will affect the skin of personnel.

Personal protective equipment for Level B includes:

- Open circuit, pressure-demand SCBA;
- Chemical protective clothing:
- Overalls and long-sleeve jacket; or
- Coveralls;
- Gloves, inner (surgical type); gloves, outer, chemical protective;
- Boots, chemical protective, steel toe, and shank; and
- Communications optional.

3.5.3 Level C Protection

Level C protection is utilized when both skin and respiratory hazards are well defined, and the criteria for using negative pressure respirators have been fulfilled (i.e., known contaminants and contaminant concentrations, acceptable oxygen levels, approved filter/cartridge available, known cartridge service life, etc.). Level C protection may require an emergency escape respirator during specific initial entry and site reconnaissance situations or when applicable after that.

Personal protective equipment for Level C typically includes:

- full facepiece air-purifying respirator;
- emergency escape respirator (optional);
- chemical protective clothing:
  - overalls and long-sleeved jacket; or
  - coveralls;
- gloves, inner (surgical type);
- gloves, outer, chemical protective; and
- boots, chemical protective, steel toe, and shank.

3.5.4 Level D Protection

Level D is the basic work uniform. Personal protective equipment for Level D includes:

- Coveralls;
- Safety boots/shoes;
- Eye protection;
- Hand protection;

- Reflective traffic safety vest (mandatory for traffic areas or railyards);
- Hard hat (with face shield is optional); and
- Emergency escape respirator is optional.

3.5.5 Level E Protection

Level E protection is used when radioactivity above 10 millirems per hour (mrems/hr) is detected at the site. Personal protective equipment for Level E includes:

- Coveralls;
- Air purifying respirator (i.e., P100 or equivalent);
- Time limits on exposure;
- Appropriate dermal protection for the type of radiation present, and
- Radiation dosimetry and ambient monitoring.

3.5.6 Additional Considerations

Fieldwork will contain a variety of situations due to chemicals in various concentrations and combinations. These situations may be partially ameliorated by following the work practices listed below:

1. Foot protection is needed on every site. If the ground to be worked on is contaminated with liquid, and it is necessary to walk in the chemicals, some sort of protective shoe coverings or "booties" can be worn over the boots. Shoe coverings should be designed with soles to help prevent slips. Using disposable shoe coverings when contacting liquid contamination can cut down on overall decontamination requirements. If non-liquids are to be encountered, a Tyvek™ bootie could be used. The advantage of booties is questionable if the ground contains any sharp objects. Boots should be worn with either cotton or wool socks to help absorb perspiration.
2. If the site situation requires the use of hard hats, chin straps should be used if a person will be stooping over where his/her hat may fall off. Respirator straps should not be placed over the hard hats, as this will affect the fit of the respirator.

   Some types of protective materials conduct heat and cold readily. In cold conditions, natural material clothing should be worn under protective clothing. Protective clothing should be removed prior to allowing a person "to get warm." Applying heat, such as with a space heater, to the outside of the protective clothing may drive contaminant permeation. In hot weather, under clothing will absorb sweat. It is recommended that workers use all cotton undergarments.
3. Body protection should be worn and taped to prevent anything from running into the top of the boot. Gloves should be worn and taped to prevent substances from entering the top of the glove. Duct tape is preferred, but masking tape can be used. When aprons are used, they should be taped across the back for added protection. However, this should be done in such a way that the person has mobility.
4. Atmospheric conditions such as precipitation, temperature, wind direction, humidity, wind velocity, and pressure determine the behavior of contaminants in air or the potential for volatile materials to become airborne. These parameters should be considered in determining the need for and the level of protection.
5. A program must be established for periodic air monitoring during site operations. Without an air monitoring program, any changes to air quality would go undetected and might jeopardize on-site personnel. Monitoring can be done with various types of air pumps and filtering devices followed by laboratory analysis of the filtration media, personnel dosimeters, and periodic walk-throughs by personnel carrying real-time direct-reading survey instruments.

6. For operations in the exclusion zone, different levels of protection may be selected, and various types of chemical-resistant clothing may be worn. This selection should be based on the job function, reason for being in the area, and the potential for skin contact with, or inhalation of, the chemicals present.
7. Escape masks must be readily available when levels of respiratory protection do not include a SCBA and the possibility of an IDLH atmosphere exists. The use and placement of escape masks should be made on a case-by-case basis. Escape masks should be strategically located at the site in areas that have higher possibilities of vapors, gases or particulates.

APPENDIX F

Subsurface Utility Clearance Management Program

SUBSURFACE UTILITY CLEARANCE MANAGEMENT PROGRAM

CORPORATE HEALTH AND SAFETY DIRECTOR	:	**Brian Hobbs, CIH, CSP**
EFFECTIVE DATE	:	**01/2019**
REVIEW DATE	:	**03/2023**
REVISION NUMBER	:	**3**

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APPENDICES

Appendix A – Roux Subsurface Utility Clearance Checklist

Appendix B – Utility Verification/Site Walkthrough Record

Appendix C – Private Utility Technology Applications and Considerations

1. PURPOSE

Roux Associates, Inc. and its affiliated companies, Roux Environmental Engineering and Geology, D.P.C., and Remedial Engineering (collectively, "Roux") has instituted the following program for completing proper utility mark-outs and for conducting subsurface clearance activities. This establishes a method to ensure, to the greatest extent possible, that utilities have been identified and contact and/or damage to underground utilities and other subsurface structures will be avoided. For the purpose of this program, a structure is defined as any underground feature that may present a potential source(s) of energy, such as, but not limited to, utility vaults, bunkers, piping, electrical boxes, wires, conduits, culverts, utility lines, underground tanks, and ducts.

2. SCOPE AND APPLICABILITY

The Subsurface Utility Clearance Management Program applies to all Roux employees, its contractors, and subcontractors. Employees are expected to follow this program for all intrusive work involving Roux or other personnel (e.g., contractors/subcontractors) working for Roux unless the client's requirements are more stringent. Intrusive work activities can include, but are not limited to, digging or scraping the ground surface, including, but not limited to, excavation; test pitting or trenching; soil vapor sampling or the installation of soil borings, soil vapor monitoring points and wells, or monitoring wells; and drilling within concrete slabs on grade.

Deviation from the program, regardless of the specific work activity or location, must be pre-approved based on the client's site knowledge, experience, site conditions, and additional documentation on the site. Any exceptions shall be documented through Roux Subsurface Variance Form located within the Roux Health & Safety Application or through OKTA. Approval is required by the Project Principal (PP) and the Operations Manager (OM) in consultation with the Office Health and Safety Manager (OHSM) or Corporate Health and Safety Director (CHSD) prior to mobilization. Depending on the work location, more stringent federal, state, local, or client requirements may apply. It is the responsibility of the Project Team to identify such requirements prior to mobilization.

3. PROCEDURES

3.1 Before Intrusive Activities/Job Planning Process

Obtain, review, and field verify relevant historical site data that may include: as-builts/site plans; easement/right-of-way information; historical aerial photos/development plans; local/state permitting records; previous site investigation/boring logs; and/or interviews with site representative/client.

If there is the potential for unexploded ordinances or munitions, consultation with your OM and CHSD is required prior to site operations.

During the project kick-off meeting for intrusive activities, the Project Manager (PM) will review the Roux Subsurface Utility Clearance Checklist and Utility Verification (Appendix A) / Site Walkthrough Record (Appendix B) and the below bullet points with the project field team:

- Review the work scope to be performed with the site owner/tenant to determine if it may impact any utilities;
- Determine the need for utility owner companies to be contacted or to have their representatives on site;

- Where mark-outs terminate at the property boundary, consider the use of private utility locating / GPR / geophysical-type services. Use of private utility locating firms, however, does not eliminate the legal requirement for the subcontractor (e.g., driller, excavation firm) to submit a request for Public Utility Mark-outs. Also, the information provided by the service may be inaccurate and unable to locate subsurface utilities and structures in urban areas, landfills, urban fill areas and below reinforced slabs, etc. They should not be relied upon as the only means of performing utility clearance;
    - A mark-out is defined as the process of contracting with a competent and qualified company to confirm the presence or absence of underground utilities and structures. This process will clearly mark-out and delineate utilities that are identified so that intrusive work activities can be performed without causing disturbance or damage to the subsurface utilities and structures. After utility mark-outs are completed the soft Digging must completed prior to intrusive work.
- Documented description of the dig site, which is included in the project's Health and Safety Plan (HASP), and one call report will be maintained in the field and distributed amongst Roux personnel, its contractors, and subcontractors; and
- Documentation of the actual placement of mark outs in the field shall be collected using dated pictures, videos and/or sketches with distance from markings to fixed objects. All documentation shall be maintained within the project file.

3.2 Utility Mark Out

- Ensure the Mark-out / Stake-out Request Information Sheet (or one-call report) is complete and accurate for the site, including address and cross streets, and review for missing utilities.
    - Note: utility mark-out organizations do not have contracts with all utilities and it is often necessary to contact certain utilities separately, such as the local water and sewer authorities.
- Have written confirmation prior to mobilizing to the site that the Project Team or Roux personnel performing the intrusive activity has correctly completed the mark-out notification process, including requesting mark-outs, waiting for mark-outs to be applied to ground surfaces at the site, and receiving written confirmation of findings (via fax or email) from utility operators for all known or suspected utilities in the proposed area of intrusive activity, and provided utility owner written confirmation to Roux personnel for review and project files documentation.
- Do not begin any intrusive activity until all utility mark-outs have been completed (i.e., Did all utilities mark-out the site?) and any unresolved mark-out issues are finalized. Perform a site walk to review the existing utilities and determine if the utility locators have located said utilities.

  (Note: The Tolerance Zone is defined as three feet plus half of the diameter or half of the greatest dimension (for elliptical sewers, duct banks, and other non-cylindrical utilities) of a utility and three feet from the outside edge of any subsurface structure.)
- For non-subscribing utility owners or if public one-call service is not available, perform due diligence and request further information regarding utility type, construction details, location and burial depth directly from public service providers/utility owners. Request utility mark-out by each public service provider/utility owner as applicable. Confirm contact and response by each public utility owner on the Subsurface Utility Clearance Checklist.
- If utilizing a Private Markout, ensure the contractor has a plan regarding what types of technology will be used based on Table 1 in Appendix C: Private Utility Technology Applications and Considerations. If possible, it is recommended that multiple technologies are used to sweep each location/work area. Use tracer wire to locate the utility (when tracer wires are present). Record the results of the private utility mark-out on the Utility Verification/Site Walkthrough Record form.

3.3 Site Visit/Utility Walkthrough

Before mobilization with the subcontractor or during the pre-work safety tailgate with the subcontractor, perform a site walkthrough after utility mark-outs have been completed to determine whether additional potential hazards are present and look for visible signs of utilities that may be present. Outlined below are considerations regarding a site walk before intrusive activities.

- Identify overhead utilities that may impede equipment mobilization or work zones to ensure adequate clearance distance, as specified within the site-specific Health and Safety Plan (HASP).

The presence of any of the following may indicate potential subsurface structures:

- Locations of buildings, equipment, and features like area lights, signs, sprinkler systems, phones, drains, natural gas meters, manholes, etc.;
- Warning tape, which is often a sign of underground services;
- Material like pea gravel, sand, or other non-native materials can indicate the presence of tanks or lines or any deviations from the established native soil or backfill conditions;
- Red concrete, which is often used for electrical duct banks;
- Evidence of damaged utilities, such as piping materials, insulation, or odors present in the work area; and
- Other utilities including fire hydrants, electrical transformers, pipeline markers, valve covers, steam lines, and valve box covers, clean-outs, etc.

By observing the path between the main service line and the connection point, it may be possible to determine the likely routing of on-site utilities. However, this method should not be relied upon solely, and proper risk mitigation strategies should be in place before proceeding with any ground disturbance activities.

For sites with potential underground storage tanks present (UST) the following guidance applies:

- Identify if the product piping is either rigid or flexible.
- Conduct a visual examination of the tank field, observation wells, dispensers, vent stacks, and UST fill points to determine their location.
- Locate and become familiar with the emergency shutoff button/switch, if present.
- Determine the orientation, arrangement, and location of the tanks, as well as their size and capacity, through the examination of visible features at grade, such as fill ports and extractor covers, and by consulting any available as-built drawings.

3.4 Guidance on Preferred Methods of Clearing the Subsurface

At least one of the methods listed below should be carried out during pre-clearing activities. The Project Team is responsible for evaluating risks associated with the Scope of Work to determine which method is selected.

The following approaches shall be considered and implemented based on the Scope of Work.

- Soft Digging
    - This is the preferred method of utility clearance when clearing higher-risk utilities. Soil should be cleared through the use of a vacuum truck/equivalent, an accompanying air knife (preferred), or a water lance to break up and loosen the soil for removal with the vacuum.

- Hand Digging
  - Soil should be broken up and removed using a shovel or other appropriate hand tools without excessive force. Limit the use of dig bars or other tools that, if used incorrectly, can significantly damage utilities.
- Hand Augering
  - The hand auger must be turned slowly without excessive force. Rounded edge augers are preferred. Hand augers should not be used in pea stone/pea gravel where utilities may be present and could potentially be damaged by the hand auger. The abrupt absence of soil recovery in a hand auger could indicate utilities as pea gravel or sand may have spilled out of the auger (exception: native soil conditions that typically result in poor hand auger recoveries).

3.4.1 Guidance for Tools and Equipment

Personnel performing pre-clearance activities shall keep tools and equipment in safe working order and be properly inspected before use. If tools or equipment are broken, they will be tagged and removed from service. The following specify additional guidelines regarding tools and equipment:

- Hand digging tools must have a non-conductive handle, such as fiberglass, wood, or composite, or fully insulated handles and potential contact surfaces.
- Blades on shovels and post-hole diggers should have rounded or blunt edges.
- Pick axes or pointed spades should not be used for physical clearance.
- Crow bars, pinch bars, or pry bars should not be used to break hardened soil or backfill, except when authorized by the SS lead to loosen materials like bricks or larger stones.
- Electric-powered equipment must have ground fault protection.
- Should there be refusal or difficulty with advancing hand tools, the contractor shall stop work and notify the Roux SS/SHSO immediately.

3.5 During Intrusive Activities

Remove any surface coverings (i.e., pavement, brush, debris, etc.) to ensure workers have clear visibility of the work area and subsurface conditions. Avoid mechanical jack hammering over known lines unless they are de-energized, locked-out/tagged-out and potential repairs are planned or if the utility has been completely disconnected prior.

Install Pre-Clearance exploratory test holes using one of the techniques, as outlined in Section 3.4, for the first 5-ft below land surface (BLS) at each location before conducting intrusive mechanized activities.

- The size of the pre-clearance exploratory test hole should be, at a minimum, twice the diameter of any downhole tool or boring device. Note: Pre-Clearance exploratory test holes should be defined in the SOW/proposal provided to the client to prevent project delays and to allow adequate time for PM and PP to evaluate alternative approaches for the project. Alternative approaches will need to be pre-approved by the OM.
- For direct push applications (CPT, Geoprobe®, etc.) the borehole clearance diameter shall be at least 125% of the diameter of the largest tool being pushed through the subsurface (e.g., tip, rod, sampler, etc.), to the minimum required depth.
- For excavations, all utilities need to be marked and then exposed by hand following the protocols in this program. Pre-clearing for excavations may be performed by the “moat” technique (i.e., soft Digging around the perimeter). In these cases, dig in small lifts (<12” for first 5 feet) using a dedicated spotter.)

- For Tolerance Zone work, unless otherwise agreed upon with the Utility Operator, work within the tolerance zone requires verification by means of pre-clearance test holes specified in Section 3.4 to expose the utility. Once structures have been verified, a minimum clearance of three feet must be maintained between the utility and any powered equipment. If considered a high risk utility, additional requirements may be necessary and required by the Operator of the utility. Consultation with the OM and CHSD may be appropriate.

The PM, field team lead or personnel performing oversight is to:

- Ensure the mark-out remains valid. (In certain states, there are limits regarding the duration of time after the mark-out was applied to the ground surface work can be started or interrupted.) Additionally, the mark-outs must be maintained, documented, and in many cases, refreshed periodically to be considered valid. This will be accomplished through calls to the one call center.
- Ensure intrusive activities are only performed within the safe boundaries of the mark-out as detailed in the One-Call Report.
- Halt all work if intrusive activities have resulted in the discovery of an unmarked utility. Roux personnel shall notify the facility owner/operator and the one call center. All incidents such as this will be reported as per Roux Incident Investigation and Reporting Management Program.
- Halt all work if intrusive activities must take place outside of the safe boundaries of a mark-out and only proceed after new mark-outs are performed.
- Halt the intrusive activities and immediately consult with the PP if an unmarked utility is encountered.
- Completing any subsurface utility incident reports that are necessary.
- If a utility cannot be found as marked, Roux personnel shall notify the facility owner/operator directly or through the one-call center. Following notification, the excavation/mechanical intrusive work may continue unless otherwise specified in state law.
- Contractors/subcontractors must contact the one-call center to refresh the ticket when the excavation continues past the life of the ticket. State law dictates ticket life; however, at a maximum, ticket life shall not exceed 20 working days.

3.6 Stop Work Authority

Each Roux employee has Stop Work Authority that he or she will execute upon determination of any imminent safety hazard, emergency situation, or other potentially dangerous situation, such as hazardous weather conditions. This Stop Work Authority includes subsurface clearance issues such as the adequacy of a mark-out or identification during intrusive operations of an unexpected underground utility. Authorization to proceed with work will be issued by the PM/PP in consultation with the OHSM after such action is reviewed and resolved. The PM will initiate and execute all management notifications and contact emergency facilities and personnel when this action is appropriate.

Appendix A - Roux Subsurface Utility Clearance Checklist

Roux Subsurface Utility Clearance Checklist ***Date of Revision: 3/2023***

Work site set-up and work execution

ACTIVITY	Yes	No	N/A	COMMENTS INCLUDING JUSTIFICATION IF RESPONSE IS NO OR NOT APPLICABLE
Daily site safety meeting conducted, SPSAs performed, JSAs reviewed, appropriate work permits obtained (if applicable).				
HASP is available and reviewed by site workers / visitors.				
Subsurface Utility Clearance Procedure has been reviewed with all site workers.				
Mechanical intrusive work activities may not be performed at any location without authorization from the Roux Site Supervisor (SS). Clearance activities may not be performed at any location unless the SS is physically present.				
Work area secured; traffic control established as needed. Emergency shut-off switch located. Fire extinguishers / other safety equipment available as needed.				
Utility mark-outs (public / private) clear and visible. Provide Excavator's Stake-Out Reference Number / Request Date / Time.				
Tolerance zone work identified. Intrusive work activities cannot be performed in areas that are in direct conflict with any markings made by public or private locators.				
Unless the PP & OM authorizes it, all boreholes and test pit locations must be physically cleared before using mechanized equipment. Required minimum physical clearance depths and diameters are as follows: • Physically clear to a depth of 5 feet bls. • The size of the pre-clearance exploratory test hole must be, at a minimum, twice the diameter of any downhole tool or boring device. • For direct push applications (CPT, Geoprobe®, etc.) the borehole clearance diameter shall be at least 125% to the diameter of the largest tool being pushed through the subsurface (e.g., tip, rod, sampler, etc.).				
Work execution plan reviewed and adhered to (ground disturbance methods, clearance depths, any special utility protection requirements, or any other execution requirements; especially for Tolerance Zone work).				

Mechanical intrusive work is prohibited within 3-feet distance in all directions from subsurface structures that will be intentionally exposed during pre-clearance. Any removal of material within 3-feet of the subsurface structure may only proceed by hand using non-conductive tools/compressed air if authorized by state law and the owner/operator of the utility.				
All equipment onsite must maintain the appropriate horizontal distance from any point on the equipment to the nearest overhead electrical power line. Refer to site-specific HASP and local/utility company requirements.				
Verbal endorsement received from Roux PM and OM for any required field deviations to work execution plan.				

Key Reminders for Execution

The Subsurface Utility Clearance Protocol should be referenced to determine all requirements while executing subsurface work. The bullet points below are intended as general reminders only and should not be relied upon solely.

- The size of the pre-clearance exploratory test hole must be at a minimum twice the diameter of any downhole tool or boring device.
- For direct push applications (CPT, Geoprobe®, etc.) the borehole clearance diameter shall be at least 125% to the diameter of the largest tool being pushed through the subsurface (e.g., tip, rod, sampler, etc.), to the minimum required depth.
- The tolerance zone is defined as three feet plus half of the diameter or half of the greatest dimension (for elliptical sewers, duct banks, and other non-cylindrical utilities) of a utility and three feet from the outside of any subsurface structure.
- For excavations, all utilities need to be marked and then exposed by hand, following the protocols in this program. Pre-clearing for excavations may be performed by the “moat” technique (i.e., soft digging around the perimeter). In these cases, dig in small lifts (<12” for first five feet) using a dedicated spotter.) For Tolerance Zone work, unless otherwise agreed upon with the Utility Operator, work within the tolerance zone requires verification by means of hand-dug test holes to expose the utility. Once structures have been verified, a minimum clearance of three feet must be maintained between the utility and any powered equipment.

Appendix B - Utility Verification/Site Walkthrough Record

Employee Name:_____

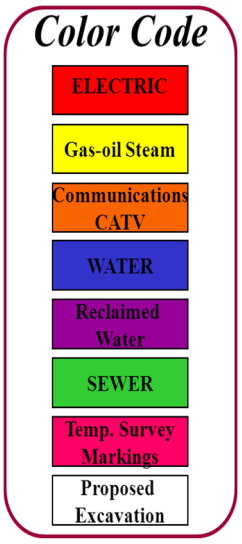
Date: _____

Instructions: For each utility suspected at the job site, indicate the location on the job site, approximate burial depth, and means of detecting the utility. Leave blank if that utility is not believed to be present.

Utility	Description of Utility Location Identified Onsite	Approx. Depth (bls)	Method / Instrumentation used to determine Utility Location	Utility Owner Response (Date/Time)	Mark Out Indicates (Clear / Conflict)
Electrical Lines					
Gas Lines					
Pipelines					
Steam Lines					
Water Lines					
Sanitary and Stormwater Sewer lines					
Pressured Air-Lines					
Tank Vent Lines					
Fiber Optic Lines					
Underground Storage Tanks					
Phone Lines/ Other					

* bls - below land surface

Site Sketch Showing Utilities:



Other Comments / Findings:

Completed by: _____

Signature: _____ Date: _____

Appendix C – Private Utility Technology Applications and Considerations

Technology ⇒ Utility/Object ⇓	Radio Frequency Electro-Magnetic Detector (connection to utility, or induction without connection)	Radio Frequency Electro-Magnetic Detector (passive sweep)	Ground Penetrating Radar (GPR)⊙	Acoustic Plastic Pipe Locator	Beacon, Sonde or Conductive Rodder Insertion	EM-61 (time domain electromagnetics) Ξ	
Power/Instrument Line (Energized/Signaled) □	✱ G	G	G	R	R	G	
Power Line (Non-energized) □	✱ G	R	G	R	R	G	
Sewer/Water Line (Metallic) □	✱ G	Y	G	Y	G	G	
Sewer/Water Line (Non-metallic)	R	R	G	G	✱ G	R	
Instrument / Telecomm Lines (Non-energized)	✱ G	R	G	R	R	Y Only if metallic	
Hydrocarbon Transmission Line (Pipeline)◆ □	✱ G	R	G	R	R	G	
Metallic/Non-Metallic Line (with Tracer Wire)	✱ G	Y	G	Y	Y	G metallic	Y non-metallic
Metallic/Non-Metallic Line (without Tracer Wire)	G metallic	R non-metallic	R	✱ G	Y	Y	G metallic	R non-metallic
Metal or Fiberglass UST	R	R	✱ G	R	R	G metallic	R non-metallic

Additional Considerations

Technology ⇒ Variable ⇓	Radio Frequency Electro-Magnetic Detector	Ground Penetrating Radar (GPR)⊙	Acoustic Pipe Locator	Beacon, Sonde, or Conductive Rodder Insertion	EM-61 Ξ
Moist Soil	G	Y	G	G	G
Dry Soil	Y	G	Y	G	G
Clay	Y	R	G	G	G
Concrete w/Rebar	R	Y	G	G	R
Long Horizontal Profile	G	G	G	G	G
Short Horizontal but Deep Vertical Profile	Y	G	R	R	G
Access to Line✚	G	N/A	G	G	G
No Access to Line✚	G (induction or passive) R (direct connect)	G	R	R	G G
Ferrous Metal	G	G	G	G	G
Non-ferrous Metal	Y	G	G	G	G
Adjacent or crossing conductive utility(ies)	Y	N/A	N/A	N/A	Y

Each site will be unique. Do not use this table as the sole criteria for technology selection. Use it as a starting point to assess available, applicable technology(s).

✱ Indicates best technology for given object. Site structures, rebar in concrete, shallow groundwater tables, perched storm water, etc. can significantly affect performance and reliability of any electro/magnetic method. Other utilities which cross or are adjacent to the target line can cause the EM signal to bleed or jump to the other utility line.

□ Metallic lines that have power running through them or can be connected to a tracer signal generator.

◆ Natural gas pipeline locating technicians must be trained/certified (in the U.S. requires DOT and Office of Pipeline Safety standards, other regions may have similar certification or requirements).

⊙ Most sensitive to interpretation. The skill, training and experience of operator are critical.

Ξ Emerging technology with limited availability.

✚ Access: induce unique electronic signature, apply acoustical impulse or insert conductive rodder/beacon/sonde.

Green Generally, an applicable technology **Yellow** May or may not be applicable **Red** Not generally applicable

APPENDIX G

Heavy Equipment Exclusion Zone Policy

HEAVY EQUIPMENT EXCLUSION ZONE MANAGEMENT PROGRAM

CORPORATE HEALTH AND SAFETY DIRECTOR	:	**Brian Hobbs, CIH, CSP**
EFFECTIVE DATE	:	**01/2019**
REVIEWED DATE	:	**03/2023**
REVISION NUMBER	:	**2**

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5. STOP WORK AUTHORITY 2

1. PURPOSE

The Exclusion Zone Management Program aims to establish the minimum clearance distance that must be maintained between workers and heavy equipment while equipment is in operation (i.e., engaged or moving). The intent is to have no personnel or equipment entering the Exclusion Zone while the equipment is in operation or moving to ensure that Roux and Subcontractor employees are unnecessarily exposed to the hazards of the equipment.

2. SCOPE AND APPLICABILITY

This Management Program applies to all Roux Associates, Inc. and its affiliated companies, Roux Environmental Engineering and Geology, D.P.C., and Remedial Engineering (collectively, "Roux") employees and their subcontractors performing fieldwork and are potentially exposed to heavy equipment. Heavy equipment includes, but is not necessarily limited to, excavation equipment, drill rigs, vacuum trucks, forklifts, lull telehandlers, man lifts, bobcats, delivery trucks, etc.

3. PROCEDURES

As specified in the following sections of this program, Exclusion Zones must be established and maintained during activities involving the movement/operation of heavy equipment. The Exclusion Zone requirements apply to all personnel on the site but are primarily focused on personnel required to work near the equipment. The exclusion zone is in effect when heavy equipment is moving or engaged (e.g., movement of an arm or bucket of an excavator, rotation of an auger, lifting of a load with a forklift, raising/lowering of a man lift, etc.).

1. The Exclusion Zone must meet the following minimum requirements:
   - A minimum distance of 10 feet from all heavy equipment and loads being moved by the equipment;
   - Greater than the swing/reach radius of any moving part on the heavy equipment (i.e., for large equipment, this may mean an exclusion zone distance larger than 20 feet);
   - Greater than the fall zone of equipment and their contents; and
   - Greater than the tip-over distance of the heavy equipment.

   The size of the Exclusion Zone will need to be determined on a task-specific basis considering the size of the heavy equipment in use and the task being performed. Prior to all heavy equipment operations, the Exclusion Zone(s) distance must be specifically identified in the Job Planning Process and incorporated in the pre-job tailgate meeting with the subcontractor(s), including any updates to our Job Safety Analysis (JSA).
2. The spotter (or another authorized individual) should be responsible for enforcing the Exclusion Zone and not conducting any other task. The spotter should be positioned immediately outside of the Exclusion Zone within a clear line of sight of the equipment operator. The spotter must signal the operator to stop work if anyone or anything has the potential to enter or compromise the Exclusion Zone. The operator should stop work if the spotter is not within their line of sight. If a spotter must be within the Exclusion Zone, they must be in a designated area outside the swing/tip radius, fall zone, line of fire of lifted loads, etc. If multiple pieces of equipment are being used, one spotter may be adequate so long as there is a clear line of sight and the spotter can control the zone(s). Radios would be required since hand signals would not be adequate if two pieces of equipment were running.

3. If an individual must enter the Exclusion Zone, the designated Spotter must signal the Equipment Operator to stop the equipment. Once the equipment is no longer moving (e.g., movement of an arm of an excavator is STOPPED, lifting of a load with a forklift STOPPED, raising/lowering of a man lift is STOPPED, etc.), the operator must bring the boom/arm to the ground ensuring a “Zero Energy State” and DISENGAGE THE CONTROLS and STOP and SIGNAL BY “SHOWING HIS HANDS.” This signal will indicate that it is safe for the person to enter the limits of the Exclusion Zone to perform the required activity. The equipment must remain completely stopped/disengaged until all personnel exited the Exclusion Zone's boundaries and the designated Spotter has signaled by “SHOWING HIS HANDS” to the Equipment Operator that it is safe to resume operations.
4. When entering the limits of the Exclusion Zone, personnel must, at a minimum:
    - Establish eye contact with the operator and approach the heavy equipment in a manner that is in direct line of sight to the Equipment Operator;
    - Never walk under any suspended loads or raised booms/arms of the heavy equipment; and
    - Identify a travel path free of Slip/Trip/Fall hazards.
5. The Exclusion Zone should be delineated using cones with orange snow fences or solid poles between the cones, barrels, tape, or other measures. For work in rights-of-way, rigid barriers, such as Jersey barriers or temporary chain link fences, should be used. For certain types of widespread or moving/mobile equipment operations, such delineation may not be practicable around equipment or individual work areas. In such instances, it is expected that the entire operation will be within a larger secure work area or that additional means will be utilized to ensure the security of the work zone.

All subcontractors who provide heavy equipment operations to field projects must implement a program that meets or exceeds the expectations described above as well as any additional requirements that may be required on a client or site-specific basis. Logistics involving heavy equipment should be understood and discussed prior to the field event during the job planning phase.

3.1 Exceptions

It is recognized that certain heavy equipment activities may require personnel to work within the limits of the Exclusion Zone as specified in this program. Such activities may include certain excavation clearance tasks, drill crew activities, or construction tasks. However, any such activity must be pre-planned, emphasizing limiting the amount and potential exposure of any activity required within the zone. The critical safety steps to mitigate the hazards associated with working within the Exclusion Zone must be defined in the JSA and potentially other project-specific plans (i.e., critical lift plans, etc.), and approved by the Roux Project Principal (PP), Office Health and Safety Manager (OHSM) and client representative, if required, prior to implementation.

4. TRAINING

Many Roux projects have different requirements that are client-specific or site-specific in nature. However, all Roux employees are provided initial training, as well as annually thereafter, on our Heavy Equipment Exclusion zone policy.

5. STOP WORK AUTHORITY

All Roux employees and their subcontractors have stop-work authority. Upon initial hire, all Roux employees are provided initial safety orientation, including stop work authority. All Roux employees and subcontractors are encouraged to stop work whenever any task or operation presents unreasonable risk or employees are

unsure how to carry out work safely. This includes upon observing any questionable safety-related behavior or condition, they are to stop work immediately and discuss the behavior or condition with the individual(s) involved. Upon stopping work, the following actions will be taken:

- Notify the affected parties to include the Project Manager (PM) and Site Health and Safety Officer (SHSO);
- Work to correct the situation or not proceed until the situation is corrected by the PM or SHSO;
- Resume work only when told to proceed by either the PM or SHSO;
- The SHSO will document the Stop-Work intervention in the field logbook;
- Stop-Work interventions will be reported to the PP for review to ensure the interventions are closed; and
- The PP will share learnings from the interventions, as appropriate, throughout the firm, to demonstrate the importance of the Stop-Work interventions.

Please note: Any form of retribution or intimidation directed at any individual or company for exercising their right to issue a stop work authority will not be tolerated.

Incident Investigation and Reporting Management Program

☐ **Roux Environmental Engineering and Geology, D.P.C.**
☐ **Roux Associates, Inc.** ☐ **Remedial Engineering, P.C.**

ACCIDENT REPORT

Brian Hobbs, Corporate Health and Safety Director
Cell: (631) 807-0193; Office: (631) 630-2416

PART 1: ADMINISTRATIVE INFORMATION

Project #: _____
Project Name: _____
Project Location (street address/city/state)**:**

_____

_____

Client Corporate Name / Contact / Address / Phone #:

_____

_____

_____

_____

_____

Immediate Verbal Notifications Given To:

Corporate Health & Safety	☐Yes	☐No
Office Health & Safety	☐Yes	☐No
Office Manager	☐Yes	☐No
Project Principal	☐Yes	☐No
Project Manager	☐Yes	☐No
Client Contact	☐Yes	☐No

REPORT STATUS (time due):

☐ Initial (24 hr) ☐ Final (5-10 days)
Date: _____ Date: _____

Accident Report Delivered To:

Corporate Health & Safety	☐Yes	☐No
Office Health & Safety	☐Yes	☐No
Office Manager	☐Yes	☐No
Project Principal	☐Yes	☐No
Project Manager	☐Yes	☐No

REPORT TYPE: ☐ Loss ☐ Near Loss Estimated Costs: $ _____

_____

OSHA CASE # Assigned by Corporate Health & Safety if Applicable:

Corporate Health & Safety Confirmed Final Accident Report
☐Yes ☐No

DATE OF INCIDENT: _____

TIME INCIDENT OCCURRED: _____ ☐AM ☐PM

INCIDENT LOCATION – City, State, and Country (If outside U.S.A.) _____

INCIDENT TYPES: (Select most appropriate if Loss occurred.)
From lists below, please select the option that best categories the incident. When selecting an injury or illness, also indicate the severity level.

☐**INJURY** ☐**ILLNESS**

----------**Severity Level**----------

☐Fatality ☐First Aid ☐Medical
☐Restricted Work ☐Lost Time Treatment

OTHER INCIDENT TYPES

☐Spill / Release
Material involved:_____
Quantity (U.S. Gallons): _____

☐Misdirected Waste ☐Consent Order ☐NOV
☐Property Damage ☐Exceedance
☐Motor Vehicle ☐Fine / Penalty

ACTIVITY TYPE (Check most appropriate one.)

☐CAMP ☐Construction ☐Drilling ☐Driving ☐Excavation / Trenching
☐Gauging ☐O&M ☐Other Soil Work (e.g. Compaction) ☐Sampling ☐Site Walk/Inspection
☐Subsurface Clearance ☐Trucking ☐Waste Mgmt. ☐Work Area Prep. ☐Other

INJURY TYPE (Check all applicable.)

☐Abrasion ☐Amputation ☐Burn ☐Cold/Heat Stress ☐Inflammation ☐Laceration
☐Occupational Illness ☐Puncture ☐Rash ☐Repetitive Motion ☐Sprain/Strain ☐Other_____

BODY PART AFFECTED (Check all applicable.)

☐Respiratory ☐Neck ☐Chest ☐Abdomen ☐Groin ☐Back
☐Shoulder ☐Arm ☐Wrist ☐Hand/Fingers ☐Eye ☐Head
☐Face ☐Leg ☐Knee ☐Ankle ☐Foot/Toes ☐Other_____

I. PERSON(S) DIRECTLY / INDIRECTLY INVOLVED IN INCIDENT (Attach additional information as necessary/applicable.)

Name/Phone # of Each Person Directly/Indirectly Involved in Incident:	Designate: Roux/Remedial Employee Roux/Remedial Subcontractor Client Employee Client Contractor Third Party	As applicable, Current Occupation; Yrs in Current Occupation; Current Position; and Yrs in Current Position:	As applicable, Employer Name; Address; and Phone #:	As applicable, Supervisor Name; and Phone #:
1)				
2)				

II. PERSONS INJURED IN INCIDENT (Attach additional information as necessary/applicable.)					
Name/Phone # of Each Person Injured in Incident:	Designate: Roux/Remedial Employee Roux/Remedial Subcontractor Client Employee Client Contractor Third Party	As applicable, Current Occupation; Yrs in Current Occupation; Current Position; and Yrs in Current Position:	As applicable, Employer Name; Address; and Phone #:	As applicable, Supervisor Name; and Phone #:	Description of Injury:
1)					
2)					

III. PROPERTY DAMAGED IN INCIDENT (Attach additional information as necessary/applicable.)				
Property Damaged:	Property Location:	Owner Name, Address & Phone #:	Description of Damage:	Estimated Cost:
1)				
2)				$

IV. WITNESSES TO INCIDENT (Attach additional information as necessary/applicable.)		
Witness Name:	Address:	Phone #:
1)		
2)		

PART 2: WHAT HAPPENED AND INCIDENT DETAILS

PROVIDE FACTUAL DESCRIPTION OF INCIDENT (e.g., describe loss/near loss, injury, response / treatment).

I. AUTHORITIES/GOVERNMENTAL AGENCIES NOTIFIED (Attach additional information as necessary/applicable.)				
Authority/Agency Notified:	Name/Phone #/Fax # of Person Notified:	Address of Person Notified:	Date & Time of Notification:	Exact Information Reported/Provided:

II. PUBLIC RESPONSES TO INCIDENT (if applicable)				
Response/Inquiry By: (check one)	Entity Name:	Name/Phone # of Respondent/ Inquirer:	Address of Entity/Person:	Date & Time of Response/Inquiry:
☐ Newspaper ☐ Television ☐ Community Group ☐ Neighbors ☐ Other _____				
Describe Response/Inquiry:				
Roux/Remedial Response:				

(Check all that apply.) (Attach photos, drawings, etc. to help illustrate the incident.)
ATTACHED INFORMATION: ☐Photo ☐Sketches ☐Vehicle Acord Form ☐Police Report ☐Other

Name(s) of person(s) who prepared Initial and Final Report:	**Title(s):**	**Phone number(s):**

PART 3: INVESTIGATION TEAM ANALYSIS

Date Investigation Started (MM/DD/YYYY):

Factors, Root Causes, and Solution (FRCS): Complete FRCS form and answer all 7 factor questions. If answering NO to Factors 1 – 4 identify root cause(s) and explain why QIs) occurred. If answering YES to Factors 5 – 7 circle the root cause(s). Transfer the solutions guidance that addresses each root cause from the FRCS form to this form. Attach your completed FRCS Worksheet. If Factors 1-7 do not apply to the incident, write "External Cause" in the Factor column below and leave the remaining fields blank.

DESCRIPTION OF UNDESIRABLE BEHAVIOR/CONDITION

1.

2.

FACTOR(S) AND SOLUTION(S): HOW TO REDUCE POSSIBILITY OF INCIDENT RECURRING
Selection of factors and solutions reflects the analysis of investigation team and is not meant to be a legally binding conclusion as to the Root Cause and/or solution.

CAUSAL FACTOR/ BEHAVIOR/ CONDITION	ROOT CAUSE	SOLUTION(S) [Must Match Root Cause(s)]	PERSON RESPONSIBLE	AGREED DUE DATE	ACTUAL COMPLETION DATE

INVESTIGATION TEAM:

PRINT NAME	JOB POSITION	DATE	SIGNATURE

QUALITY REVIEW Correct root cause(s) identified? Do root cause(s) and solution(s) match? Are solution(s) feasible / maintainable?

Name: **Job Title:**

PART 4: Date Solutions were Implemented & Validated (Were Solutions Effective?)

Date	Solution	Verifier / Validator Name and Job Title	**Details** (of I & V performed)

APPENDIX I

Fatigue Management Program

FATIGUE MANAGEMENT PROGRAM

CORPORATE HEALTH AND SAFETY DIRECTOR	:	**Brian Hobbs, CIH, CSP**
EFFECTIVE DATE	:	**01/2020**
REVIEW DATE	:	**03/2023**
REVISION NUMBER	:	**1**

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1. PURPOSE AND APPLICABILITY

Roux Associates, Inc. and its affiliated companies, Roux Environmental Engineering and Geology, D.P.C, and Remedial Engineering (collectively, "Roux") has implemented this program to establish controls to ensure Roux employees are aware of fatigue and assist with the overall control of factors that cause fatigue. Hazards that contribute to overall worker fatigue will be properly identified and managed in order to prevent incidents that can result in personal injury, environmental damage, and/or property damage. This program applies to all locations or projects where employees could be impacted by worker fatigue.

2. CONSEQUENCES OF FATIGUE

Definitions of fatigue vary between industries, regions, and professional perspectives. Confusion over the terminology relating to fatigue, and the causes of fatigue can pose a challenge to managing the associated risk. Therefore, a single definition of fatigue should be identified and used consistently. The definition of fatigue used in this document, and proposed for broader use in industry, is that provided in ANSI/API RP 755: *Reduced mental and physical functioning caused by sleep deprivation and/or being awake during normal sleep hours. This may result from extended work hours, insufficient opportunities for sleep, failure to use available sleep opportunities, or the effects of sleep disorders, medical conditions, or pharmaceuticals which reduce sleep or increase sleepiness.*

Fatigue can contribute to the risk of accidents by impairing performance in many different ways:

- Diminished ability to perform certain tasks (e.g., slowed reaction times; periods of delayed response or no response (lapses) during vigilance-based tasks; increased errors of omission (forgetting to do something); impaired selective attention; reduced accuracy of short-term memory.
- Changes in emotional state and willingness to apply effort (e.g., being quieter or more withdrawn than usual, lacking in energy, lacking in motivation, and being irritable/grumpy).
- Changes in the way we communicate (e.g., diminished ability to communicate effectively).

Observable signs of fatigue include fidgeting, rubbing eyes, yawning, frequent blinking, staring blankly, long blinks, difficulty keeping eyes open, and head nodding. Head nodding and difficulty keeping eyes open are associated with extreme levels of fatigue and are symptoms of what is termed "micro-sleeps," short periods of time (seconds) when the brain disengages from the environment (by ceasing to process visual information and sounds), and we slip uncontrollably into a light sleep for a short time. The characteristic head nodding associated with micro-sleeps is caused by the muscles in the neck relaxing as we enter light sleep.

3. TRAINING REQUIREMENTS

All technical employees are provided an initial employee orientation before they can perform fieldwork. The orientation shall be provided by the Operations Manager (OM), Office Health and Safety Manager (OHSM), or their designee. Fatigue management shall be incorporated within this initial orientation and provided to employees annually thereafter as appropriate. At a minimum, the following information should be communicated:

- How to recognize and control fatigue;
- Work and personal habits; and
- Reporting fatigue to supervision.

Pre-employment physicals, including drug screening, as appropriate, are required prior to fieldwork activities.

4. WHAT CAUSES FATIGUE?

Fatigue is determined by a multitude of work-related and individual factors, some of which are listed below. In order to provide comprehensive protection from the impaired performance caused by fatigue, site-specific procedures are developed to minimize the overall risk of fatigue.

Work-related factors contributing to fatigue can include:

- Shift schedule design;
- Overtime and on-call arrangements;
- Commute;
- Environmental conditions;
- Access to food and water;
- Type of work;
- Task design; and
- Breaks within shifts.

Individual factors contributing to fatigue can include:

- Sleep environment/disorders;
- Health;
- Domestic commitments;
- Knowledge of fatigue reduction strategies;
- Age; and
- Secondary employment.

5. NOTIFICATIONS AND RESPONSIBILITIES

The following individuals have responsibilities for notification under this policy.

Employee: Roux employees who are using prescription or non-prescription drugs that may affect their ability to perform their work safely are encouraged to identify themselves to the Roux PM or Human Resources (HR) prior to reporting to the job site and to provide the PM/HR with up-to-date information on the medication and its effects.

Project Principals (PPs) and Project Managers (PMs): PPs are responsible for notifying the PM/HR when an employee self-identifies as using prescription or non-prescription drugs that may affect their ability to perform their work safely. When required by the Client contract or policy, the Roux PP (or PM if delegated this authority by the PP) shall also provide applicable notice to the client's designated representative. The notice should be completed in advance using any applicable client notification forms and shall be acknowledged/approved by the client representative prior to the employee commencing work. The Roux PM shall notify the field manager/supervisor, who will be responsible for field observation of the employee while on their project and for making sure that co-workers are aware of the employee's situation. All personnel is expected to watch out for the self-identified employee.

6. PROCEDURES

- Site-specific HASPs shall include language to address and control hazards associated with the use of prescription and nonprescription drugs**,** as applicable.
- Daily tailgate safety briefings and Job Safety Analysis (JSA) reviews will include discussions surrounding fatigue management. Content will include such items as:
  - Limiting work hours;
  - Job rotation;
  - Allowing for sufficient sleep;
  - Ergonomic controls;
  - JSA task analysis;
  - Rest breaks;
  - Types of medications that can cause fatigue; and
  - Avoidance, where possible, of the use of medications that increase fatigue.
- Ergonomically designed equipment will be selected and provided as deemed appropriate through a JSA. Ergonomic equipment can include, but is not limited to:
  - Providing antifatigue mats for standing;
  - Lift assist devices for repetitive lifting;
  - Proper lighting and control of temperature where possible;
  - Ergonomic-friendly mouse (for computer), wrist supports and adjustable chairs; and
  - Providing diagrams and other literature to employees to show good ergonomic body positioning techniques for office and field activities.

APPENDIX J

Silica Exposure Control Program

SILICA EXPOSURE CONTROL
MANAGEMENT PROGRAM

CORPORATE HEALTH AND SAFETY DIRECTOR	:	**Brian Hobbs, CIH, CSP**
EFFECTIVE DATE	:	**01/2022**
REVIEW DATE	:	**03/2023**
REVISION NUMBER	:	**1**

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APPENDICES

Appendix A 29 CFR 1926.1153 Table 1—Specified Exposure Control Methods When Working with Materials Containing Crystalline Silica

1. PURPOSE

Roux Associates, Inc. and its affiliated companies, Roux Environmental Engineering and Geology, D.P.C, and Remedial Engineering (collectively, "Roux") have implemented this Program to establish controls for occupational respirable crystalline silica exposure. The Written Silica Exposure Control Program (Program) applies to Roux personnel who are potentially exposed to airborne concentrations of respirable crystalline silica at or above regulatory and industry action levels and exposure limits. Potential for respirable crystalline silica exposure may result from field operations, work activities, or proximity to work locations where airborne silica is being emitted. This Program also applies to subcontractors, superintendents, foremen, or safety personnel who may be responsible for overseeing Roux's subcontractor operations that have the potential to expose Roux personnel to airborne concentrations of silica.

Occupational Safety and Health Administration (OSHA) 29 CFR 1926.1153: *Respirable Crystalline Silica* (Construction Industry) and 29 CFR 1910.1053: *Respirable Crystalline Silica* (General Industry), contain regulatory requirements specific to occupational respirable crystalline silica exposure. This Written Silica Exposure Control Program is developed in accordance with the requirements in 29 CFR 1926.1153(g).

2. DEFINITIONS

Crystalline silica is a common mineral found in the earth's crust. Materials like sand, stone, concrete, and mortar contain crystalline silica. The following definitions provide additional information regarding respirable crystalline silica exposure and were adapted from OSHA 29 CFR 1926.1153:

- *Respirable Crystalline Silica*: Quartz, cristobalite, and/or tridymite silica contained in airborne particles are determined to be respirable by a sampling device designed to meet the characteristics for respirable-particle-size-selective samplers specified in the International Organization for Standardization (ISO) 7708:1995: Air Quality—Particle Size Fraction Definitions for Health-Related Sampling.
- *Employee Exposure*: The exposure to airborne respirable crystalline silica that would occur if an employee were not using respiratory protection or engineering controls. Activities such as abrasive blasting with sand; sawing brick or concrete; sanding or drilling into concrete walls; grinding mortar; manufacturing brick, concrete blocks, stone countertops, or ceramic products; and cutting or crushing stone result in worker exposure to respirable crystalline silica dust. Industrial sand used in certain operations, such as foundry work and hydraulic fracturing (fracking), is also a source of respirable crystalline silica exposure. Workers who inhale these very small crystalline silica particles are at increased risk of developing serious silica-related diseases, including:
    - Silicosis, an incurable lung disease that can lead to disability and death;
    - Lung cancer;
    - Chronic obstructive pulmonary disease (COPD); and
    - Kidney disease.
- *Action Level*: A concentration of airborne respirable crystalline silica of 25 micrograms per cubic meter ($\mu g/m^3$), calculated as an 8-hour Time-Weighted Average (TWA). The employer shall assess the exposure of workers who have the potential for respirable crystalline silica exposure at or above the action level.
- *Permissible Exposure Limit (PEL)*: A concentration of airborne respirable crystalline silica of 50 micrograms per cubic meter ($\mu g/m^3$), calculated as an 8-hour Time-Weighted Average (TWA).

3. SCOPE AND APPLICABILITY

The practices and procedures described in this Program include:

- Job tasks in the workplace that involve potential exposure to respirable crystalline silica;
- Engineering controls, work practices, and respiratory protection are used to limit employee exposure to respirable crystalline silica;
- Housekeeping measures used to limit employee exposure to respirable crystalline silica;
- Administrative controls are used to restrict access to work areas, when necessary, to minimize the number of employees exposed to respirable crystalline silica; and
- Employee training and awareness.

4. SITE-SPECIFIC HAZARDS

This Program describes the site-specific hazards associated with projects involving potential exposure to airborne concentrations of respirable crystalline silica. These work tasks include, but are not limited to:

- Use of stationary masonry saws used to cut concrete, tile, concrete masonry block, sheetrock, gypsum fiber roof board, or any other product containing quartz.
- Handheld power saws used to cut concrete, asphalt, concrete masonry block, sheetrock, gypsum fiber roof board, or any other product containing quartz.
- Walk-behind saws used to cut concrete or asphalt.
- Rig-mounted or free-standing core saws or drills (including impact and rotary hammer drills) used to penetrate the concrete, concrete masonry block, sheetrock, gypsum fiber roof board, or any other structural component or product containing quartz.
- Jackhammers and handheld powered chipping tools used to demolish or modify concrete, concrete masonry block, or any other structural component or product containing quartz.
- Vehicle-mounted hammers or chipping tools are used to demolish concrete, concrete masonry block, or any other structural component or product containing quartz.
- Handheld grinders or cut-off wheels used for mortar removal or cutting/grinding of concrete, concrete masonry block, sheetrock, gypsum fiber roof board, or any other structural component or product containing quartz.
- Walk-behind milling machines or bead blasters used for surfacing activities on concrete, concrete masonry block, asphalt, or any other product containing quartz.
- Installation or demolition of sheetrock, including mudding, taping, and texturizing activities with quartz-containing materials.
- Hand or power tool sanding of painted surfaces. Current latex paint products contain quartz, and the painted substrate (sheetrock, concrete masonry block, concrete) contains quartz.
- Drivable asphalt milling machines used to mill asphalt roadways or walkways.
- Ball mills or crushing equipment used to size products containing quartz.
- All housekeeping operations are associated with the activities described above.

Roux employees who work in proximity to operations with the potential for generating airborne respirable crystalline silica must be aware of safe work practices and take all necessary precautions to avoid and minimize exposure.

5. TRAINING REQUIREMENTS

Per OSHA 29 CFR 1926.1153(i)(2), Roux employees who are potentially exposed to airborne concentrations of respirable crystalline silica will be provided training to demonstrate knowledge and understanding of the following:

- Health hazards associated with exposure to respirable crystalline silica;
- Specific tasks in the field or workplace that could result in exposure to respirable crystalline silica;
- Specific engineering controls, work practices, and respiratory protection requirements to mitigate potential respirable crystalline silica exposure;
- The contents of 29 CFR 1926.1153; and
- The identity of the competent person.

Each employee will have access to safety data sheets (as applicable) and will be provided information on the health hazards associated with respirable crystalline silica exposure, including cancer, lung, immune system, and kidney effects. In addition, Roux employees will be provided training and information regarding specific work activities identified in this Program that may result in respirable crystalline silica exposure. Employee training will provide a discussion of respirable crystalline silica hazards and exposure assessment of anticipated job tasks. The implementation of air monitoring, specific engineering and/or work practice control measures, personal protective equipment (PPE) including respiratory protection, and medical surveillance will be performed per *29 CFR 1926.1153 Table 1—Specified Exposure Control Methods When Working With Materials Containing Crystalline Silica* requirements. Please refer to Appendix A for Table 1 control measures. Employee training will also include the identification of a competent person for respirable crystalline silica exposure assessment and the determination of control methods.

6. COMPETENT PERSON REQUIREMENTS & RESPONSIBILITIES

Roux shall identify a Competent Person to inspect and oversee all activities with potential airborne respirable crystalline silica exposure. Subcontractors working on projects within the scope of this Program shall appoint a Competent Person capable of executing the duties described herein. The Competent Person must have training in the inspection of work areas and equipment and in the determination of safe working conditions. This person shall have a working knowledge of the 1926.1153 standards, shall be capable of identifying airborne silica hazards, shall determine the need for initial and additional exposure monitoring, shall recommend and implement engineering and work practice controls, shall establish levels of PPE, and shall have the authority to take action to eliminate hazards and correct incidences of noncompliance.

7. SAFE WORK PRACTICES

The requirements of this section are to be followed by Roux employees and other on-Site personnel who may be exposed to airborne concentrations of respirable crystalline silica at or above the regulatory limits.

7.1. EXPOSURE ASSESSMENT

Roux will either comply with and implement all controls required by *29 CFR 1926.1153 Table 1—Specified Exposure Control Methods When Working With Materials Containing Crystalline Silica* **or** conduct an initial exposure assessment in accordance with 29 CFR 1926.1153(d)(2). An exposure assessment is not necessary where it can

be demonstrated that engineering controls used in Table 1 are effective at maintaining potential respirable crystalline silica exposure well below regulatory limits:

- An exposure assessment is required when employees may be exposed to airborne silica at or above the action level in order to determine the extent to which employees are exposed, and the appropriate exposure controls required.
- An initial determination of exposure shall be made at the beginning of operations. The determination shall consist of the collection of personal air samples representative of a typical full shift, including at least one sample for each similar exposure group in each work area, either for each shift or for the shift with the highest potential exposure level.
- During the initial exposure assessment, personnel shall be protected by respiratory protection as specified in *29 CFR 1926.1153 Table 1—Specified Exposure Control Methods When Working With Materials Containing Crystalline Silica* until workplace airborne concentrations are determined.
- During the initial exposure assessment and all phases of work, personnel shall be provided with protective clothing and equipment, hygiene facilities, and training as applicable.
- Whenever a change in equipment, process, controls, or personnel occurs or a new task has been initiated, an additional exposure assessment is required.
- When an assessment determines that exposure has occurred above the action level, but below the PEL, additional monitoring shall be required at least every 6 months, additional monitoring shall continue until such time that the monitoring results fall below the action level on two separate occasions at least 7 days apart.
- When monitoring yields results above the PEL, quarterly monitoring is required. Quarterly monitoring may be suspended when additional monitoring results fall below the action level on two separate occasions at least 7 days apart.
- Air monitoring may be unwarranted where the Competent Person can clearly demonstrate, in the absence of air monitoring data, that a work activity will not create airborne silica concentrations in excess of the action level. Where a negative exposure determination is reached without air monitoring, the Competent Person must develop a written program as to why exposures are not expected to exceed the action level.

7.2. COMMUNICATION OF HAZARDS

This written compliance Program shall be made available to all Roux employees. In addition, owners, subcontractors, and other personnel in proximity to work locations where airborne respirable crystalline silica is being emitted shall also be provided the Program.

7.3. CONTROL METHODS

A site-specific written compliance program shall be established and implemented prior to the start of operations within the scope of this Program. The written Program shall outline the control methods for maintaining employee exposure below the PEL.

Engineering and work practice controls, including administrative controls, shall be implemented to reduce and maintain employee exposure to silica at or below the PEL, to the extent that such controls are feasible.

Where all feasible engineering and work practice controls that can be instituted are not sufficient to reduce employee exposure to or below the PEL, such controls shall be used to reduce employee exposure to the lowest feasible level in conjunction with respiratory protection.

Respiratory protection shall be selected based on guidance in 1926.1153 *Table 1—Specified Exposure Control Methods When Working With Materials Containing Crystalline Silica* or based on a Certified Industrial Hygienist's or

Competent Person's assessment of the potential airborne silica exposure that may be created by the means and methods of work (high energy operations with high airborne dust generation or low energy operations with low dust generation).

In addition to exposure control methods provided in Table 1, all affected Roux and subcontractor personnel shall comply with the following work practices to properly mitigate respirable crystalline silica exposure:

- When using mechanical ventilation to control exposure, regularly evaluate the system's ability to effectively control exposure, including particulate filters, ducting, and mechanical components.
- If administrative controls are used to limit exposure, establish and implement a job rotation schedule that includes employee identification, exposure duration, and anticipated exposure levels where each affected employee is located.
- If vacuuming is the method selected, specialized vacuums with High-efficiency Particulate Air (HEPA) filtration are required. Methods to use and empty vacuums in a manner that minimizes the reentry of silica into the workplace shall be described and used. Use of household vacuums with HEPA filters are not allowed at any time for the collection of dust or debris that contains silica.
- Never use compressed air to remove silica from any surface unless it is used in conjunction with a ventilation system designed to capture the airborne dust created while using the compressed air.
- Maintain all surfaces as free as possible from accumulations of silica. Select methods for cleaning surfaces and floors that minimize the likelihood of silica becoming airborne (such as using a HEPA vacuum).
- Employees shall not eat, drink, smoke, chew tobacco or gum, or apply cosmetics in any areas where exposure to silica is above the PEL and/or Action Level (in other words, regulated areas).
- Do not allow employees to leave the workplace wearing any protective clothing or equipment that is required to be worn during their work shift without HEPA vacuum removal of dust.

7.4. PERSONAL PROTECTIVE EQUIPMENT & RESPIRATORY PROTECTION

Roux employees shall be provided, at no cost, protective work clothing and equipment including cotton coveralls or similar full-body clothing, gloves, hats, shoes or disposable shoe coverlets, face shields, vented goggles, or other appropriate PPE. Half-mask and/or full-facepiece air-purifying respirators (APR) with an OSHA assigned protection factor (APF) of at least 10 will be used as the appropriate respiratory protection for work operations with the potential for respirable crystalline silica exposure at or above the action level. Full-facepiece APRs with an OSHA APF of 25 are required for mortar removal using handheld grinders equipped with a shroud and dust collection system. Respiratory protection must be used for the following conditions:

- During periods when employee exposure to airborne respirable crystalline silica exceeds the Action Level.
- For work operations where engineering and work-practice controls are not sufficient to reduce employee exposure to or below the Action Level.
- During periods when an employee requests a respirator.
- During periods when respirators are required to provide interim protection while conducting initial exposure assessments.
- Powered air-purifying respirators (PAPR) shall be provided to employees who request such a respirator to use where it will provide adequate protection..

8. MEDICAL SURVEILLANCE REQUIREMENTS

Roux shall institute medical surveillance for any employees required by this Program to wear respiratory protection for 30 or more days per year. Initial medical surveillance consists of medical and work history with emphasis on: past, present, and anticipated exposure to crystalline silica exposure , dust and other agents affecting the respiratory system; any history of respiratory system dysfunction, including signs and symptoms of respiratory disease (e.g., shortness of breath, cough, wheezing); history of tuberculosis; and smoking status and history; a physical examination with emphasis on the respiratory system; chest X-ray (a single posterior-anterior radiographic projection or radiograph of the chest at full inspiration recorded on either film (no less than 14 x 17 inches and no more than 16 x 17 inches) or digital radiography systems), interpreted and classified according to the International Labor Office (ILO) International Classification of Radiographs of Pneumoconiosis by a NIOSH-certified B Reader; a pulmonary function test to include forced vital capacity (FVC) and forced expiratory volume in one second (FEV1) and FEV1/FVC ratio, administered by a spirometry technician with a current certificate from a NIOSH approved spirometry course; testing for latent tuberculosis infection; and any other tests deemed appropriate by the Occupational Medicine Provider. Subcontractors are responsible for implementing a medical surveillance program for their employees.

APPENDIX A - 29 CFR 1926.1153 Table 1—Specified Exposure Control Methods When Working with Materials Containing Crystalline Silica

Table 1: Specified Exposure Control Methods When Working with Materials Containing Crystalline Silica

Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours/shift	>4 hours/shift
(i) Stationary masonry saws	Use saw equipped with integrated water delivery system that continuously feeds water to the blade. Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.	None	None
(ii) Handheld power saws (any blade diameter)	Use saw equipped with integrated water delivery system that continuously feeds water to the blade. Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions:		
	• When used outdoors	None	APF 10
	• When used indoors or in an enclosed area	APF 10	APF 10
(iii) Handheld power saws for cutting fiber-cement board (with blade diameter of 8 inches or less)	For tasks performed outdoors only: • Use saw equipped with commercially available dust collection system • Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions • Dust collector must provide the air flow recommended by the tool manufacturer, or greater, and have a filter with 99% or greater efficiency	None	None
(iv) Walk-behind saws	Use saw equipped with integrated water delivery system that continuously feeds water to the blade. Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions:		
	• When used outdoors	None	None
	• When used indoors or in an enclosed area	APF 10	APF 10
(v) Drivable saws	For tasks performed outdoors only:		

Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours/shift	>4 hours/shift
	• Use saw equipped with integrated water delivery system that continuously feeds water to the blade. • Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions	None	None
(vi) Rig-mounted core saws or drills	Use tool equipped with integrated water delivery system that supplies water to cutting surface. Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.	None	None
(vii) Handheld and stand-mounted drills (including impact and rotary hammer drills)	Use drill equipped with commercially available shroud or cowling with dust collection system. Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions. Dust collector must provide the air flow recommended by the tool manufacturer, or greater, and have a filter with 99% or greater efficiency and a filter-cleaning mechanism. Use a HEPA-filtered vacuum when cleaning holes.	None	None
(viii) Dowel drilling rigs for concrete	For tasks performed outdoors only: • Use shroud around drill bit with a dust collection system. Dust collector must have a filter with 99% or greater efficiency and a filter-cleaning mechanism	APF 10	APF 10
(ix) Vehicle-mounted drilling rigs for rock and concrete	Use dust collection system with close capture hood or shroud around drill bit with a low-flow water spray to wet the dust at the discharge point from the dust collector.	None	None
	OR		
	Operate from within an enclosed cab and use water for dust suppression on drill bit.	None	None

Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours/shift	>4 hours/shift
(x) Jackhammers and handheld powered chipping tools	Use tool with water delivery system that supplies a continuous stream or spray of water at the point of impact:		
	• When used outdoors	None	APF 10
	• When used indoors or in an enclosed area	APF 10	APF 10
	OR		
	Use tool equipped with commercially available shroud and dust collection system.		
	Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.		
	Dust collector must provide the air flow recommended by the tool manufacturer, or greater, and have a filter with 99% or greater efficiency and a filter-cleaning mechanism:		
	• When used outdoors	None	APF 10
	• When used indoors or in an enclosed area	APF 10	APF 10
(xi) Handheld grinders for mortar removal (*i.e.*, tuckpointing)	Use grinder equipped with commercially available shroud and dust collection system.	APF 10	APF 25
	Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.		
	Dust collector must provide 25 cubic feet per minute (cfm) or greater of airflow per inch of wheel diameter and have a filter with 99% or greater efficiency and a cyclonic pre-separator or filter-cleaning mechanism.		
(xii) Handheld grinders for uses other than mortar removal	For tasks performed outdoors only: • Use grinder equipped with integrated water delivery system that continuously feeds water to the grinding surface	None	None
	• Operate and maintain tool in accordance with manufacturer's		

Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours/shift	>4 hours/shift
	instructions to minimize dust emissions		
	OR		
	• Use grinder equipped with commercially available shroud and dust collection system • Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions		
	Dust collector must provide 25 cubic feet per minute (cfm) or greater of airflow per inch of wheel diameter and have a filter with 99% or greater efficiency and a cyclonic pre-separator or filter-cleaning mechanism:		
	• When used outdoors	None	None
	• When used indoors or in an enclosed area	None	APF 10
(xiii) Walk-behind milling machines and floor grinders	Use machine equipped with integrated water delivery system that continuously feeds water to the cutting surface.	None	None
	Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.		
	OR		
	Use machine equipped with dust collection system recommended by the manufacturer.	None	None
	Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.		
	Dust collector must provide the air flow recommended by the manufacturer, or greater, and have a filter with 99% or greater efficiency and a filter-cleaning mechanism.		
	When used indoors or in an enclosed area, use a HEPA-filtered vacuum to remove loose dust in between passes.		

Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours/shift	>4 hours/shift
(xiv) Small drivable milling machines (less than half-lane)	Use a machine equipped with supplemental water sprays designed to suppress dust. Water must be combined with a surfactant.	None	None
	Operate and maintain machine to minimize dust emissions.		
(xv) Large drivable milling machines (half-lane and larger)	For cuts of any depth on asphalt only: • Use machine equipped with exhaust ventilation on drum enclosure and supplemental water sprays designed to suppress dust.	None	None
	• Operate and maintain machine to minimize dust emissions.		
	For cuts of four inches in depth or less on any substrate:		
	• Use machine equipped with exhaust ventilation on drum enclosure and supplemental water sprays designed to suppress dust.	None	None
	• Operate and maintain machine to minimize dust emissions.		
	OR		
	Use a machine equipped with supplemental water spray designed to suppress dust. Water must be combined with a surfactant.	None	None
	Operate and maintain machine to minimize dust emissions.		
(xvi) Crushing machines	Use equipment designed to deliver water spray or mist for dust suppression at crusher and other points where dust is generated (e.g., hoppers, conveyers, sieves/sizing or vibrating components, and discharge points).	None	None
	Operate and maintain machine in accordance with manufacturer's instructions to minimize dust emissions		
	Use a ventilated booth that provides fresh, climate-controlled air to the operator, or a remote control station.		

Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours/shift	>4 hours/shift
(xvii) Heavy equipment and utility vehicles used to abrade or fracture silica-containing materials (*e.g.*, hoe-ramming, rock ripping) or used during demolition activities involving silica-containing materials	Operate equipment from within an enclosed cab.	None	None
	When employees outside of the cab are engaged in the task, apply water and/or dust suppressants as necessary to minimize dust emissions.	None	None
(xviii) Heavy equipment and utility vehicles for tasks such as grading and excavating but not including: Demolishing, abrading, or fracturing silica-containing materials	Apply water and/or dust suppressants as necessary to minimize dust emissions.	None	None
	OR		
	When the equipment operator is the only employee engaged in the task, operate equipment from within an enclosed cab.	None	None

APPENDIX K

Ergonomics Management Program

ERGONOMICS MANAGEMENT PROGRAM

CORPORATE HEALTH AND SAFETY MANAGER	**:**	**Brian Hobbs, CIH, CSP**
EFFECTIVE DATE	**:**	**01/2019**
REVIEW DATE	**:**	**03/2023**
REVISION NUMBER	**:**	**1**

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APPENDIX

Appendix A – Symptom Solver

1. PURPOSE AND BACKGROUND

Roux Associates, Inc. and its affiliated companies, Roux Environmental Engineering and Geology, D.P.C., and Remedial Engineering (collectively, "Roux") has instituted the following program to aide in preventing back injuries and other work-related musculoskeletal disorders (WMSDs) or cumulative trauma injuries to personnel. Ergonomic issues involving WMSDs can arise not only in the office, but also in the field and when driving. WMSDs are disorders of the muscles, nerves, tendons, ligaments, joints, cartilage, blood vessels, or spinal discs. WMSDs may include muscle strains and tears, ligament sprains, joint and tendon inflammation, pinched nerves, and spinal disc degeneration.

2. SCOPE AND APPLICABILITY

This program applies to all tasks where Roux personnel and contractors perform manual lifting and have the potential for material handling and ergonomic stresses. It is the responsibility of the Corporate Health and Safety Manager (CHSM) to aide in developing and training Office Health and Safety Managers (OHSM) and Site Health and Safety Officers (SHSO) to implement this program.

3. PROCEDURES

3.1 Safe Lifting Practices Management

A. Evaluate all assignments to assess if they can be completed without risk of back injury e.g., moving boxes, computers, equipment, etc.).

B. Require that heavier items be stored on lower shelving units; ideally between knee and shoulder height.

C. Recognize lifting-intensive tasks (poor lift design, high frequency, and/or excessive weight) and provide the means by which personnel can perform lifting duties without risk of injury e.g., carts, dollies, trucks with lift gates).

D. Secure outside assistance if personnel cannot safely accomplish the job e.g., additional staff, contract movers).

E. Contact the OHSM or SHSO when assistance is necessary to evaluate a lifting task that may pose a back-injury/WMSD risk to assigned personnel.

F. Ensure that personnel receive the required training outlined below.

3.2 Training Management

A. Personnel who may have lifting or other ergonomic issues receive training that includes the following topics:

1. Recognizing potential hazards and how to correct and prevent them.
2. Proper workstation set up and maintenance.
3. How to avoid unnecessary physical stress and strain.
4. How to comfortably handle lifting jobs without undue strain.
5. Proper use of equipment.
6. Stretching and strengthening exercises to minimize risk of injury.

3.3 Office Moves and Relocations

A. Utilize professional movers for moving office furniture for both offsite moves and interoffice moves.
    1. Desks, file cabinets, bookcases, etc.
    2. Intensive moving of file boxes
    3. Any other heavy equipment or materials.
B. Ensure that the moving contractor is appropriately evaluated and insured.
C. Assure as applicable that all unstable items (e.g., bookcases) are secured to prevent tip over in transit, and when placed.

3.4 Workplace Evaluations

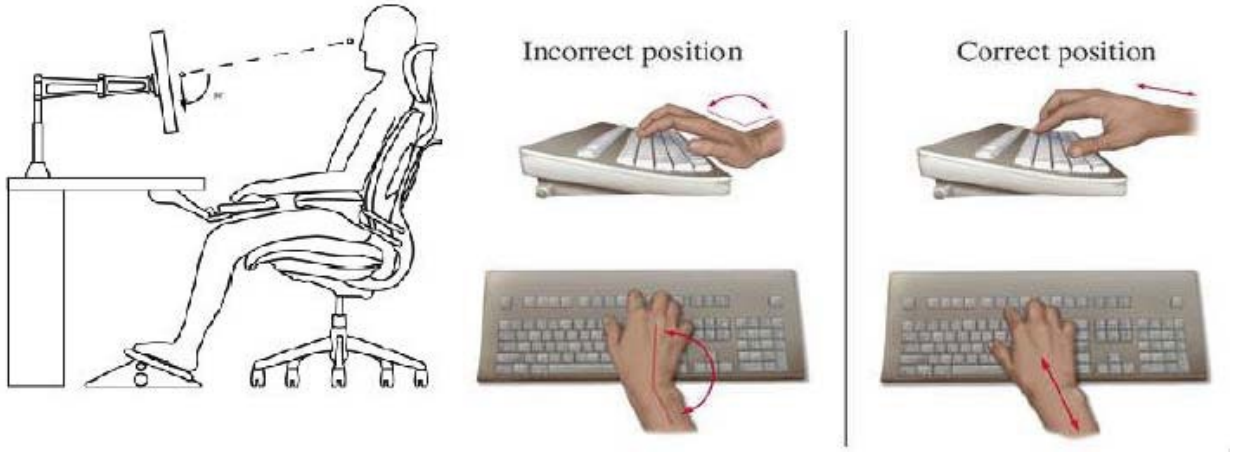
At the request of personnel, workstation evaluations of office workstations are available through the OHSM. As it relates to site-specific activities, guidelines will be specified within site-specific Job Safety Analyses (JSA) that are covered prior to any work activity. JSAs include information on the procedural steps, hazards and how to control specific hazards as it relates to specific tasks. Ergonomic hazards are identified and controls are recommended depending upon the specific activity.

4. OFFICE ERGONOMICS

There is no single “correct” posture that will fit everyone. An ergonomic injury or illness can be easily avoided through ergonomic education and following basic design goals of an office desk.

Repetitive motions are one of the key causes for ergonomic injuries/illnesses and working at an office desk for a prolonged time significantly increases the potential for an ergonomic injury or illness. Highly repetitive tasks that involve long periods of static posture may require several short rest breaks called “micro breaks.” During these breaks, employees are encouraged to stand, stretch, and move around. This provides rest and allows muscles time to recover. Alternately the employee can try to vary their work tasks throughout the day to break up highly repetitive tasks.

4.1 Office Ergonomic Set-up Recommendations



- Top of the monitor should be at or just below eye level to avoid awkward neck posture, and positioned directly in front of you.
- Head and neck should be balanced and in-line with torso.
- Elbows should be close to the body and supported by arm rests.
- Hips and knees should be approximately at a 90-degree angle. The back of the knee should be slightly higher than the seat pan to allow blood to circulate freely.
- The lumbar curve of the back should be supported.
- Keep your wrist and hands in-line with forearms.
- Avoid crossing legs. Feet should be firmly on the ground or on a footrest.
- Keep monitor and keyboard as close as possible; this will keep you in a sound posture.
- The mouse should be located on the same level as the keyboard.
- Take advantage of how your chair can be adjusted to your body.
- Vary work task to cut down on repetitive motion.
- Take short breaks to stretch muscles and to rest the eyes.
- Keep items most frequently used close to you.

5. DRIVING ERGONOMIC GUIDANCE

5.1 Typical Problems from Frequent Driving

- Neck, back and shoulder pain;
- Cramps, pressure points, and poor circulation in the legs and buttocks;
- Immediately after driving, there is an increased chance of low back injury from lifting; and
- Long-term potential for degeneration of spinal discs and disc herniation.

5.2 Chronic Back and Neck Injuries from Driving are Caused by Two Main Risk Factors

- Sitting for long periods of time; and
- Whole-body vibration.

5.3 Long-Term Sitting

When you sit, your pelvis rolls backward and the small part of your back flattens out. This increases the pressure in the discs of the spine. In this position, the discs are less prepared to handle the vibrations from your car.

Ligaments in your back help to hold the spine together as you move. These ligaments will stretch and slacken if you sit down for a long time. After standing up, they remain slack for a while and cannot support the spine as they normally do.

If your seat is not correctly adjusted, you could develop pressure points in the buttocks and back of the legs and muscle strain in the lower back.

Continuous upper back and neck muscle work is often required to hold the head in position, especially if vibration is present. Continuous muscle activity can lead to muscle strain.

Holding a foot pedal down over a long period may cause stiffness and spasm in the legs and lower back.

5.4 Whole-Body Vibration

Whole-body vibration stimulates bursts of back muscle activity. This causes neck and back muscles to tire more quickly and decreases the support these muscles can give to the spine. Even if the muscles are working very lightly, activity for an extended time without rest will lead to fatigue and increase the risk of back injury.

Long-term exposure to whole-body vibration is a common way to develop a herniated disc in your back. The increased disc pressure from sitting speeds up this process.

5.5 Ergonomic Driving Tips

1) Before you even get into your car, remove everything from your pocket(s)—anything that can add pressure points to your body while you drive.
2) Move your car seat all the way to the back, get in, and begin adjusting until you feel comfortable. Have the seat adjusted to approximately a 100° angle, which will decreases pressure on your lower back.

3) If your seatbelt is too tight or uncomfortable, pick up some soft, thick fabric and wrap it around your seatbelt.
4) If the back of the seat is uncomfortable, a lumbar support pillow can be used.
5) Adjust all mirrors to fit your body and line of sight. You shouldn't have to crane your neck to see what's going on around you. For blind spots, small mirrors can be purchased and placed on the side-view mirrors or dashboard to help you see.
6) Keep items you may need while driving in the front seat, such as tissue paper and sunglasses. Twisting and reaching in the car are awkward postures, not to mention the danger it leads to while operating a vehicle.
7) If you are on a long driving trip, take frequent breaks; get out of the car and stretch. Take a quick walk if possible. It's also a good idea to rest your eyes for a bit.
8) The best posture for gripping the steering wheel is keeping two hands on the wheel except when shifting gears. Change your hand postures frequently to improve circulation and reduce fatigue.
    a. **Common Postures to be Avoided:**
        i. **Death Grip** – Your grip should be light. If your knuckles are white, you are gripping too hard.
        ii. **The one arm cool dude** – One wrist at the 12 o'clock position on the wheel with the fingers over the top. This causes compression of the soft tissues of the wrist, as well as reducing circulation of the neck and shoulder (and also will result in bone-to-bone contact with your face in the event the air bag were to deploy).
        iii. **Arms straight out** – You should be able to drive with your shoulders relaxed and your arms close to the sides of your body.
        iv. **One arm propped on your window** – This posture decreases circulation at the neck and shoulder and may compress soft tissue on the arm/wrist.

Appendix A — Symptom Solver

Symptom Solver

Discomfort Associated with Hands or Wrists

Possible Cause of Symptoms	Suggested Solutions
• Resting heavily on the hand, forearm or elbow that hurts. • Heavy use of a calculator. • High force when using the space bar. • Mouse size is too big or too small. • Heavy use of the mouse with one hand. • Heavy use of the number pad on the keyboard. • “Planting” your palms or wrists in a fixed position when typing or using the mouse. • Dropping your wrists to the work surface when typing • Resting wrists when typing. • Working surface or keyboard is too high or too low. • The wrist rest is too high or the edges are square and hard. • Typing or mousing on hard work surfaces with blunt edges. • The keyboard is sloping towards you.	• Do not rest heavily on either hand. • Use a wrist rest for your calculator. • Avoid high force when using the space bar. • Change mouse to one that fits you correctly. • Alternate hands using the mouse and switch to keyboard shortcuts (page 5). • Use proper keyboard and mouse techniques (page 5). • Use auto-text entries to minimize typing (page 5). • Use the wrist rest correctly (page 6). • Adjust the keyboard, keyboard platform or desk surface to just below your elbow height with the upper arm in line and comfortable against the body. • Adjust the keyboard so the keyboard lies flat.

Discomfort Associated with Headaches or Blurry Vision

Possible Cause of Symptoms	Suggested Solutions
• Image on the screen is not clear. • Staring or concentrating on your monitor for long periods of time. • Dry eyes.	• Position your monitor to reduce reflection. • Adjust the brightness and contrast settings to fit you. • Rest your eyes occasionally by switching tasks or looking away from the monitor. • The distance between your eyes and your monitor should be one arm’s length away from you. • Blink frequently to keep your eyes lubricated when doing computer work.

Discomfort Associated with Head or Neck

Possible Cause of Symptoms	Suggested Solutions
• Holding your head at an awkward angle. • Monitor is too high and/or is not centered with your keyboard. • Looking up and down between the keyboard and screen as you type. • Leaning forward to view the monitor. • Tilting your head back to accommodate your eye glasses. • Cradling the telephone between your head and shoulder. • Twisting your neck to look at a copy on your desk.	• Adjust the monitor correctly. (Pg. 6) • Take a touch-typing course. • Enlarge the font size. • Center the monitor with your keyboard. • Do not cradle the telephone. Hold the phone, use a headset or use your speaker phone. • Use a copy holder to avoid twisting your neck as you type.

Discomfort Associated with the Forearms or Elbows

Possible Cause of Symptoms	Suggested Solutions
• The position of your mouse or keyboard is causing you to extend your reach. • Leaning on your work surface while typing or using the mouse. • Resting your forearms heavily on the arms of your chair. • Extended reach of the mouse.	• Position the mouse close to and on the same level as your keyboard. • Sit up straight and allow your hands to “float” above the keyboard without resting your wrists. • Adjust the arm rests of the chair so your forearms are just barely touching them. • Do not lean heavily on arm rests.

Discomfort Associated with the Shoulders

Possible Cause of Symptoms	Suggested Solutions
• The position of your mouse is causing you to extend your reach. • Leaning to one side while you are using the keyboard or mouse. • Cradling the telephone between your head and shoulder. • Extended reaching ether side or behind you for the telephone.	• Position the mouse to and on the same level as the keyboard. • Sit up straight with your back against the back of your chair with your feet on the ground. • Center the keyboard with your monitor. • Hold the telephone, use a headset, or use speaker phone. • Reposition frequently used items closer to you.

Discomfort Associated with Upper and Lower Back

Possible Causes of Symptoms	**Suggested Solutions**
• Leaning forward to type or write. • Improperly supported back. • Cradling the phone between your head and shoulder.	• Adjust the monitor correctly. • Adjust the chair so that your lumber back is supported by the chair. • Position your keyboard and mouse close to the body. • Do not cradle the telephone. Hold the phone, use a headset, or use speaker phone. • Sit with your shoulders and hips directly in front of the keyboard and monitor. • Sit up straight with your back against the back of your chair with your feet on the ground or on a footrest.

Discomfort Associated with Legs/Feet

Possible Causes of Symptoms	**Suggested Solutions**
• Awkward posture of your feet or legs. • Tucking your feet under your legs or chair. • Feet not touching the floor or your legs are extended out in front of you.	• Sit up straight and do not lean to one side or the other. • Adjust the chair seat pan so there is space between your knees and the seat. • Place feet flat on the floor. • Use a footrest if your feet do not reach. • Clear the area below your desk so there is room for your legs and feet.

APPENDIX G

Quality Assurance Project Plan and Field Sampling Plan

Quality Assurance Project Plan / Field Sampling Plan

27-10 49th Avenue Site
Queens, New York
NYSDEC BCP #C241219

October 9, 2025

Prepared for:

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1. Introduction

Roux Environmental Engineering and Geology, D.P.C. (Roux), on behalf of Hunters Point SG, LLC, has prepared this Quality Assurance Project Plan/Field Sampling Plan (QAPP/FSP) to describe the measures that will be taken to ensure that the data generated during performance of the Site Management Plan (SMP) for the 27-10 49th Avenue Site (Site), located in Queens, are of quality sufficient to meet project-specific data quality objectives (DQOs). The Site is comprised of Block 113 Lot 35 of the New York City Tax Map and bounded by 49th Avenue to the north, commercial properties and Dutch Kills Creek to the south, Dutch Kills Creek to the east, and 27th Street to the west. This QAPP/FSP also includes field sampling procedures.

Hunter Point SG, LLC is a Volunteer in the Brownfield Cleanup Program (BCP). SMP activities will be conducted under the New York State Department of Environmental Conservation (NYSDEC) BCP (Site #C241219). This QAPP/FSP was prepared in accordance with the guidance provided in NYSDEC Technical Guidance DER-10 Technical Guidance for Site Investigation and Remediation (DER-10), the NYSDEC BCP Guide, and the United States Environmental Protection Agency's (USEPA's) Guidance for the Data Quality Objectives Process (EPA QA/G 4).

1.1 Purpose

The QAPP/FSP describes in detail the quality assurance/quality control (QA/QC) and field sampling methods to be used during sampling tasks performed during the SMP phase.

This QAPP/FSP was prepared in accordance with the NYSDEC's DER-10 and provides guidelines and procedures to be followed by field personnel during performance of sampling during the RAWP/SMP implementation. Information contained in this QAPP/FSP relates to:

- sampling objectives (Section 2);
- project organization (Section 3);
- sample media, sampling locations, analytical suites, sampling frequencies, and analytical laboratory (Section 4);
- field sampling procedures (Section 5);
- sample handling, sample analysis, and quality assurance/quality control (Section 6); and
- site control procedures and decontamination (Section 7).

2. Sampling Objectives

The objective of the sampling program is designed to meet the DQOs set forth in DER-10. Specifically, analytical parameter selected for each sample, as described in Section 4, is comprehensive, and is intended to meet the objective of analyzing onsite sub-slab soil vapor, indoor air, and Expanded SVES discharge stream samples to evaluate the potential for vapor intrusion inside of the building at the Site. Soil vapor intrusion sampling will be used to determine if conditions warrant discontinuing the SSDS/SVES, and soil vapor sampling will be used to determine if conditions warrant discontinuing the Expanded SVES.

Sampling procedures are discussed in Section 5 of this QAPP/FSP. A discussion of the DQOs and quality assurance/quality control is provided in Section 6.

3. Project Organization

A general and generic summary of the overall management structure and responsibilities of project team members are presented below. Professional profiles for the team are provided in Attachment 1.

Project Principal

Christopher Proce, P.G. of Roux, will serve as Project Principal. The Project Principal is responsible for defining project objectives and bears ultimate responsibility for the successful completion of the project.

Remedial Engineer

The Remedial Engineer for this project will be David Kaiser, P.E. The Remedial Engineer is a registered professional engineer licensed by the State of New York. The Remedial Engineer will have primary direct responsibility for implementation of the Remedial Actions (RAs) and future remedial program elements for the Site. The Remedial Engineer will certify in the Final Engineering Report (FER) that the RAs were observed by qualified environmental professionals under her supervision as well as any other relevant provisions of ECL 27-1419 have been achieved in full conformance with the RAWP.

Project Manager

Joyce Wang of Roux will serve as Project Manager. The Project Manager is responsible for defining project objectives and bears ultimate responsibility for the successful completion of the work. This individual will provide overall management for the implementation of the scope of work and will coordinate all field activities. The Project Manager is also responsible for data review/interpretation and report preparation.

Field Team Leader

The Field Team Leader is TBD. The Field Team Leader bears the responsibility for the successful execution of the field program. The Field Team Leader will direct the activities of the technical staff in the field, as well as all subcontractors. The Field Team Leader will also assist in the interpretation of data and in report preparation. The Field Team Leader reports to the Project Manager.

Laboratory Project Manager

Laboratory analysis will be completed by Eurofins TestAmerica Laboratories of Burlington, Vermont, NYSDOH Environmental Laboratory Accreditation Program (ELAP)-certified laboratory 10391. The Laboratory Project Manager is Melissa Haas. The Laboratory Project Manager is responsible for sample container preparation, sample custody in the laboratory, and completion of the required analysis through oversight of the laboratory staff. The Laboratory Project Manager will ensure that quality assurance procedures are followed and that an acceptable laboratory report is prepared and submitted. The Laboratory Project Manager reports to the Project Manager.

Quality Assurance Officer

Noelle Clarke, P.E. of Roux, will serve as the Quality Assurance Officer (QAO) for this project. The QAO is responsible for conducting reviews, inspections, and audits to ensure that the data collection is conducted in accordance with the QAPP/FSP. The QAO's responsibilities range from ensuring effective field equipment decontamination procedures and proper sample collection to the review of all laboratory analytical data for completeness and usefulness. The QAO reports to the Project Manager and makes independent recommendations to the Field Team Leader.

Data Validator

Judy Harry of Data Validation Services, Inc. (DVS) who is independent from the project implementation team, will review the analytical data for quality assurance and quality control in accordance with NYSDEC standards. The Data Validator will prepare a Data Usability Summary Report (DUSR) meeting the requirements in Section 2.2(a)1.ii and Appendix 2B of DER-10 for all data packages generated for the RA.

4. Sample Media, Locations, Analytical Suites, and Frequency

The media to be sampled during the SMP activities include soil vapor, Expanded SVES effluent and indoor air. A discussion of the sampling schedule is provided below, while the assumed number of field samples to be collected, including quality control (QC) samples, is shown in Tables 1 and 2. Specifics regarding the collection of samples at each location and for each task are provided in Section 5 of this QAPP/FSP.

4.1 Soil Vapor, Indoor Air and Effluent Sampling

The effluent and indoor air samples to be collected are described in detail in the SMP. Soil vapor intrusion samples will be used when evaluating the SSDS/SVES discontinuation and soil vapor samples shall be collected when evaluating the Expanded SVES to be discontinued. The proposed samples to be collected and sampling frequency are also summarized in the following table:

Sampling Location	Analytical Parameter	Schedule
VOCs (EPA Method TO-15 / TO-15 SIM)		
Soil Vapor Intrusion Sampling (TBD)*	**X**	**Upon SSDS/SVES Shutdown Request**
Soil Vapor Sampling(2)	**X**	**Upon Expanded SVES Shutdown Request**
Indoor Air (3)	**X**	**Annually (during heating season)**
Expanded SVES Effluent Samples (1)	**X**	**Annually**

*Numbers in parentheses indicate the number of samples to be collected.

All soil vapor samples will be collected in accordance with the October 2006 New York State Department of Health (NYSDOH) Guidance for Evaluating Soil Vapor Intrusion in the State of New York (NYSDOH Guidance) and June 2015 USEPA Soil Vapor Guidance. SSDS/SVES soil vapor monitoring points were previously installed and construction details are included on the as-built drawing in Appendix D of the SMP. The locations of the soil vapor monitoring points and indoor air samples are included on the as-built drawing in Appendix D of the SMP. All soil vapor samples will be analyzed for VOCs using USEPA Method TO-15. Several compounds in indoor air samples require lower laboratory reporting limits of 0.20 micrograms per cubic meter (mcg/m^3) or less, specifically, trichloroethene, *cis*-1,2- dichloroethene, 1, 1-dichloroethene, carbon tetrachloride and vinyl chloride, which will be achieved by using EPA Method TO-15, Select Ion Monitoring (SIM).

5. Field Sampling Procedures

This section provides a detailed discussion of the field procedures to be used during sampling activities during the SMP phase. The sample locations are discussed in the SMP. Additional details regarding sampling procedures and protocols are described in Roux's relevant Standard Operating Procedures (SOPs), which are provided in Attachment 3.

When sub-slab soil vapor, effluent, and indoor air samples are collected, the following actions/conditions will be documented to aid in the interpretation of the sampling results:

- Current photographs of the sample locations and surrounding areas;
- Weather conditions (e.g., precipitation, indoor and outdoor temperature, and barometric pressure) and ventilation conditions (e.g., windows/doors closed) will be reported; and
- Any pertinent observations such as floor stains or odors will be recorded.

The soil vapor intrusion investigation must be completed during the heating season, in accordance with Section 2.4 of the NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York (NYSDOH SVI Guidance).

5.1 Sub-Slab Soil Vapor Samples

Soil vapor samples shall be collected when evaluating the system to be discontinued. Prior to the collection of the sub-slab soil vapor samples collection event using the previously installed SSDS/SVES soil vapor monitoring points, the monitoring points will be purged of approximately two volumes using a vacuum pump set at a rate of 0.2 liters per minute. A tracer gas (i.e., helium) will be used to enrich the atmosphere in the immediate vicinity of the sampling location in order to test the monitoring point seal and verify that ambient air is not being drawn into the sample in accordance with the procedures outlined in the NYSDOH Guidance. Following purging and verification with the tracer gas, tubing will be used to connect the monitoring point access point to the pre-cleaned (batch-certified) laboratory supplied six-liter summa canister. All soil vapor samples will be collected using the canisters with regulators calibrated to collect samples over an 8-hour period and submitted for laboratory analysis under chain of custody procedures for analysis using USEPA Method TO-15 / TO-15 SIM for VOCs.

Per the NYSDOH SVI Guidance Section 2.7.2, when sub-slab vapor samples are collected, the following actions should be taken to document conditions during sampling and ultimately to aid in the interpretation of the sampling results:

a. historic and current storage and uses of volatile chemicals should be identified, especially if sampling within a commercial or industrial building (e.g., use of volatile chemicals in commercial or industrial processes and/or during building maintenance);
b. the use of heating or air conditioning systems during sampling should be noted;
c. floor plan sketches should be drawn that include the floor layout with sampling locations, chemical storage areas, garages, doorways, stairways, location of basement sumps or subsurface drains and utility perforations through building foundations, HVAC system air supply and return registers, compass orientation (north), footings that create separate foundation sections, and any other pertinent information should be completed;
d. outdoor plot sketches should be drawn that include the building site, area streets, outdoor air sampling locations (if applicable), compass orientation (north), and paved areas;

e. weather conditions (e.g., precipitation and indoor and outdoor temperature) and ventilation conditions (e.g., heating system active and windows closed) should be reported; and

f. any pertinent observations, such as spills, floor stains, smoke tube results, odors and readings from field instrumentation (e.g., vapors via PID, ppbRAE, Jerome Mercury Vapor Analyzer, etc.), should be recorded.

Additional documentation that could be gathered to assist in the interpretation of the results includes information about air flow patterns and pressure relationships obtained by using smoke tubes or other devices (especially between floor levels and between suspected contaminant sources and other areas), the barometric pressure and photographs to accompany floor plan sketches.

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

a. sample identification,

b. date and time of sample collection,

c. sampling depth,

d. identity of samplers,

e. sampling methods and devices,

f. soil vapor purge volumes,

g. volume of soil vapor extracted,

h. if canisters used, vacuum of canisters before and after samples collected,

i. apparent moisture content (dry, moist, saturated, etc.) of the sampling zone, and

j. chain of custody protocols and records used to track samples from sampling point to analysis.

5.2 Indoor Air Samples

An indoor air sample will be collected after SSDS/SVES start-up and before the building is occupied and then annually during the heating season. Additionally, upon system shutdown request, indoor air samples will be collected concurrently with the sub-slab soil vapor sampling to characterize exposures to air within the building. All indoor air samples will be collected in summa canisters over an 8-hour interval and analyzed for VOCs using USEPA method TO-15 / TO-15 SIM. These canisters will be placed in locations chosen to provide representative background results based on Site conditions at the time of sampling and placed four to five feet above the ground in the normal breathing zone.

Per the NYSDOH SVI Guidance Section 2.7.3, the following actions should be taken to document conditions during indoor air sampling and ultimately to aid in the interpretation of the sampling results:

a. historic and current uses and storage of volatile chemicals should be identified, especially if sampling within a commercial or industrial building (e.g., use of volatile chemicals in commercial or industrial processes and/or during building maintenance);

b. a product inventory survey documenting sources of volatile chemicals present in the building during the indoor air sampling that could potentially influence the sample results should be completed;

c. the use of heating or air conditioning systems during sampling should be noted;

d. floor plan sketches should be drawn that include the floor layout with sampling locations, chemical storage areas, garages, doorways, stairways, location of basement sumps or subsurface drains and utility perforations through building foundations, HVAC system supply and return registers, compass

orientation (north), footings that create separate foundation sections, and any other pertinent information should be completed;

e. outdoor plot sketches should be drawn that include the building site, area streets, outdoor air sampling locations (if applicable), compass orientation (north), and paved areas;

f. weather conditions (e.g., precipitation and indoor and outdoor temperature) and ventilation conditions (e.g., heating system active and windows closed) should be reported; and

g. any pertinent observations, such as spills, floor stains, smoke tube results, odors and readings from field instrumentation (e.g., vapors via PID, ppbRAE, Jerome Mercury Vapor Analyzer, etc.), should be recorded.

Additional documentation that could be gathered to assist in the interpretation of the results includes information about air flow patterns and pressure relationships obtained by using smoke tubes or other devices (especially between floor levels and between suspected contaminant sources and other areas), the barometric pressure and photographs to accompany floor plan sketches.

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

a. sample identification,

b. date and time of sample collection,

c. sampling height,

d. identity of samplers,

e. sampling methods and devices,

f. depending upon the method, volume of air sampled,

g. if canisters are used, vacuum of canisters before and after samples collected, and

h. chain of custody protocols and records used to track samples from sampling point to analysis.

5.3 Expanded SVES Effluent Samples

Prior to the collection of the Expanded SVES effluent samples, the system will be inspected to ensure it is operational. Tubing will be used to connect the effluent line sample port to the pre-cleaned (batch-certified) laboratory supplied six-liter summa canister. All effluent samples will be collected using the canisters with regulators calibrated to collect samples over a 2-hour period and submitted for laboratory analysis under chain of custody procedures for analysis using USEPA Method TO-15 / TO-15 SIM for VOCs.

6. Sample Handling and Analysis

To ensure quality data acquisition and collection of representative samples, there are selective procedures to minimize sample degradation or contamination. These include procedures for preservation of the samples, as well as sample packaging, shipping procedures, and QA/QC.

6.1 Field Sample Handling

A discussion of the proposed number and types of samples to be collected during each task, as well as the analyses to be performed, can be found in Section 4 of this QAPP/FSP. The types of containers, volumes, and preservation techniques for the aforementioned testing parameters are presented in Table 3.

6.2 Sample Custody Documentation

The purpose of documenting sample custody is to ensure that the integrity and handling of the samples is not subject to question. Sample custody will be maintained from the point of sampling through the analysis as described in Roux's SOP for Sample Handling included in Attachment 3.

Each individual collecting samples is personally responsible for the care and custody of the samples. All sample labels should be pre printed or filled out using waterproof ink. The technical staff will review all field activities with the Field Team Leader to determine whether proper custody procedures were followed during the field work and to decide if additional samples are required.

All samples being shipped offsite for analysis must be accompanied by a properly completed chain of custody form. The sample numbers will be listed on the chain of custody form. When transferring the possession of samples, individuals relinquishing and receiving will sign, date, and note the time on the record. This record documents transfer of custody of samples from the sampler to another person, to/from a secure storage area, and to the laboratory.

Samples will be packaged for shipment and dispatched to the appropriate laboratory for analysis with a separate signed custody record enclosed in each sample box or cooler. Shipping containers will be locked and/or secured with strapping tape in at least two locations for shipment to the laboratory.

6.3 Sample Shipment

Laboratory analysis will be completed by Eurofins TestAmerica Laboratories of Burlington, Vermont, NYSDOH ELAP-certified laboratory 10391. Sample packaging and shipping procedures are based upon USEPA specifications, as well as DOT regulations. The procedures vary according to potential sample analytes, concentration, and matrix and are designed to provide optimum protection for the samples and the public. Sample packaging and shipment must be performed using the general outline described below.

All samples will be shipped within 24 hours of collection and will be preserved appropriately from the time of sample collection. A description of the sample packing and shipping procedures is presented below:

- Ensure that all summa canister labels are completed correctly. Place clear tape over bottle labels to prevent moisture accumulation from causing the label to peel off.
- Ensure all summa canisters are firmly packed in packaging material.
- Sign chain of custody form (or obtain signature) and indicate the time and date it was relinquished to courier as appropriate.

- Separate chain of custody forms. Seal proper copies within a large Ziploc® bag. Retain copies of all forms.
- Secure each box using custody seals.
- Relinquish to courier or overnight delivery service or laboratory courier as appropriate. Retain air bill receipt for project records. (Note: All samples will be shipped for "NEXT A.M." delivery).

6.4 Quality Assurance / Quality Control

Judy Harry will review the analytical data for QA/QC and prepare the DUSR in accordance with NYSDEC standards.

The primary DQO of the soil vapor, effluent, and indoor air sampling program, therefore, is that data be accurate and precise, and hence representative of the actual Site conditions. Accuracy refers to the ability of the laboratory to obtain a true value (i.e., compared to a standard) and is assessed through the use of laboratory quality control (QC) samples, including laboratory control samples and matrix spike samples, as well as through the use of surrogates, which are compounds not typically found in the environment that are injected into the samples prior to analysis. Precision refers to the ability to replicate a value and is assessed through both field and laboratory duplicate samples.

Sensitivity is also a critical issue in generating representative data. Laboratory equipment must be of sufficient sensitivity to detect target compounds and analytes at levels below NYSDEC standards and guidelines whenever possible. Equipment sensitivity can be decreased by field or laboratory contamination of samples, and by sample matrix effects. Assessment of instrument sensitivity is performed through the analysis of reagent blanks, near-detection-limit standards, and response factors. Sampling canisters will be batch-certified clean by the laboratory before use in the field.

Table 1 lists the requirements for field and laboratory QC samples that will be analyzed to assess data accuracy and precision, as well as to determine if equipment sensitivity has been compromised. Table 2 lists the number/type of field and QA/QC samples that will be collected. Table 3 lists the preservation, holding times and sample container information.

All Method TO-15 / TO-15 SIM analyses for VOCs will be performed in accordance with the NYSDEC Analytical Services Protocol (ASP), using USEPA SW 846 methods.

All laboratory data are to be reported in NYSDEC ASP Category B deliverables and will be delivered to NYSDEC in electronic data deliverable (EDD) format as described on NYSDEC's website (http://www.dec.ny.gov/chemical/62440.html). A Data Usability Report will be prepared meeting the requirements in Section 2.2(a)1.ii and Appendix 2B of DER-10 for all data packages generated for the RI.

7. Site Control Procedures

Site control procedures, including decontamination and waste handling and disposal, are discussed below. Site control procedures have been developed to minimize both the risk of exposure to contamination and the spread of contamination during field activities at the Site. All personnel who come into designated work areas, including contractors and observers, will be required to adhere strictly to the conditions imposed herein and to the provisions of a Site-Specific Health and Safety Plan (HASP). The HASP is included as Appendix F to the SMP.

7.1 Decontamination

In an attempt to avoid the spread of contamination, all sampling equipment must be decontaminated at a reasonable frequency in a properly designed and located decontamination area. Althought not anticipated, detailed procedures for the decontamination of field and sampling equipment are included in Roux's SOPs for the Decontamination of Field Equipment located in Attachment 3.

7.2 Waste Handling and Disposal

Contaminated waste is not anticipated to be generated during sub-slab soil vapor, effluent, and indoor air sampling activities. Sampling canisters used during sampling will be returned to the laboratory.

TABLES

1. Field and Laboratory QC Summary
2. Site Management Plan Sampling Summary
3. Preservation, Holding Times, and Sample Containers

Table 1. Field and Laboratory QC Summary

QC Check Type	Minimum Frequency	Use
Field QC		
Duplicate	1 per matrix per 20 samples or SDG*	Precision
Laboratory QC		
Laboratory Control Sample	1 per matrix per SDG	Accuracy
Matrix Spike/Matrix Spike Duplicate/Matrix Duplicate**	1 per matrix per SDG	Accuracy/Precision
Surrogate Spike	All organics samples	Accuracy
Laboratory Duplicate	1 per matrix per SDG	Precision
Method Blank	1 per matrix per SDG	Sensitivity

Notes:
* SDG - Sample Delivery Group - Assumes a single extraction or preparation
** Provided to lab by field sampling personnel

Table 2. Site Management Plan Sampling Summary

Sample Medium	Target Analytes	Maximum No. of Field Samples	Duplicates[1]	Maximum No. of Samples
Sub-slab Soil Vapor, Effluent and Indoor Air Samples	TO-15 VOCs / TO-15 SIM VOCs	15	5	20

Totals are estimated based on scope of work as written; two indoor air sample and one effluent sample per year for up to five years. Sub-slab will only be collected for system shutdown evaluation.

[1] Based on 1 per 20 samples or 1 per Sample Delivery Group (3 days max)

VOCs - Volatile Organic Compounds

Table 3. Preservation, Holding Times and Sample Containers

Analysis	Matrix	Bottle Type	Preservation(b)	Holding Time(a)
TO-15	Air	6 liter Summa Canister	None	14 days from sample collection
TO-15 (SIM)	Air	6 liter Summa Canister	None	14 days from sample collection

[a] Days from date of sample collection.

ATTACHMENTS

1. Professional Profiles
2. Laboratory's Standard Operating Procedures
3. Roux's Standard Operating Procedures

ATTACHMENT 1

Professional Profiles

PROFESSIONAL PROFILE



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EDUCATION

MS, Hydrogeology, Wright State University, 2002
BS, Geology, Binghamton University, 2000
BS, Environmental Science, Binghamton University, 2000

PROFESSIONAL LICENSES

Certified Safety Professional
New York State Licensed Professional Geologist

Christopher Proce, PG, CSP

National Director of Energy Services
Vice President | Principal Hydrogeologist

EXPERIENCE SUMMARY

Over twenty years of experience: Principal Hydrogeologist with Roux, Islandia, New York, specializing in soil and groundwater investigations and large-scale remediation.

TECHNICAL SPECIALTIES

Development, implementation, and management of comprehensive site investigations. Implementation of remedial action work plans and construction management. Development of long-term remedial strategies and optimization of ongoing operations. Development and evaluation of groundwater and LNAPL analytical models. Integration of site remediation and redevelopment activities at industrial and brownfield sites.

REPRESENTATIVE PROJECTS

- Principal-In-Charge for the ongoing investigation and remediation of a multi-million-gallon release of petroleum hydrocarbon product from a former refinery and petroleum storage terminal in New York City. The project involved meeting numerous consent order and consent decree deadlines for investigation activities, reports, and design submittals, with significant penalty stipulations if work was not performed on schedule and according to specifications. Mr. Proce's technical and management responsibilities included oversight of field investigations, remediation system design and construction, data analysis, report preparation, and permitting negotiations with NYSDEC, NYCDEP, NYCDOB, NYCDOT, and the NYC Fire Department. Technical aspects included detailed spill volume modeling, aquifer testing, numerical groundwater modeling, and evaluation of remedial alternatives. Remediation design and construction included a 27-well, dual-phase (LNAPL and water) extraction system, force mains through NYC streets, two 500-gpm groundwater treatment plants, discharge facilities, and product storage facilities. Evaluation of soil vapor intrusion and development and implementation of targeted soil vapor mitigation measures in a complex urban environment. More recently, he provides strategic consulting on the divestment of real estate assets and environmental liabilities as well as the development of long term plans to minimize life cycle costs.
- Mr. Proce was retained by a major petroleum company as a temporary (6 months) in-house project manager directing a portfolio of remediation projects across the US and Australia, providing direction to consultants' other company staff while reporting directly to senior management. Specific components included remediation of LNAPL in bedrock, fate and transport evaluation of PFAS, closure of SWMUs, and in-situ soil treatment.
- Principal-In-Charge providing ongoing environmental consulting for a major petroleum company in New York City. Mr. Proce's primary role is as the leader of an interdisciplinary team that provides strategy development in limiting the company's long-term liability of a major USEPA Federal Superfund Sediment Site. In this role, he provides technical review of each phase of the project, develops cost allocation models/strategies, and advises on the interaction of various PRPs, citizen groups, and regulatory agencies.
- Principal-In-Charge for the ongoing investigation and remediation of a multi-million-gallon release of petroleum hydrocarbon product from a former refinery and petroleum storage terminal in northern New Jersey. The project is under LSRP oversight, and Mr. Proce was instrumental in bringing the project into compliance with NJDEP 2019/21 deadlines by developing a comprehensive remedial strategy. Includes the investigation of >100 acres of

chromium ore landfilling and development of remedial design. Optimization of extensive, existing LNPAL systems led to removal of infrastructure and reduction in long term O&M costs.

- Principal-In-Charge for on-call environmental services contract with NYC electric utility, focused on the management of legacy remedial sites throughout NYC. Responsible for the stewardship environmental remediation of a portfolio of active/historic substations involving emergency response, assessment, large scale remediation, and long term O&M, to bring sites to regulatory closure.
- Technical Expert testifying in litigation proceedings related to the fate and transport of LNAPL, subsequent remediation, and associated cost recovery related to multi-million dollar mitigation dispute.
- Principal-In-Charge providing ongoing environmental consulting for a major energy generating facility in New York City. Mr. Proce's primary role is to consolidate a long history of spills/liability and implement a long-term site management plan. More recently, he has provided strategic consulting expertise to assist in the closure of the facility and the transition of the facility to a Offshore Wind interconnection facility.
- Principal-In-Charge providing ongoing environmental consulting for a major petroleum company in New York City under a joint consent order with NYC. Mr. Proce's primary role is to provide environmental strategy development support in developing lost cost remedial approach to bring the property to beneficial use and avoiding adjacent USEPA Federal Superfund entanglements. Includes media/sediment data collection, assessment, development of remedial strategies, and negotiations with multiple PRPs and regulatory agencies.
- Principal-In-Charge of the investigation and monitoring of dissolved groundwater contamination associated with historic industrial landfilling in Long Island, New York. Mr. Proce developed sampling strategy and conducted data evaluation to demonstrate that any observed impacts were not migrating off site. Received NFA and closure of Consent Order.
- Principal-In-Charge for the ongoing investigation and remediation of a former lube and wax refinery and petroleum storage terminal in Queens, New York. Mr. Proce serves as technical consultant for this client reviewing all regulatory submittals and advising overall strategy to achieve site closure through the NY State Spills Programs. Mr. Proce serves as liaison to regulators, local property owners and stakeholders. Awarded project by demonstrating significant cost efficiencies and operational improvements over former consultant.
- Principal-In-Charge of the investigation and remediation of a former industrial property in Glen Cove, New York. Mr. Proce achieved the extraction of the site from existing USEPA oversight by determining a lack of connection to adjacent Federal Superfund Site. Incorporation of project into NYSDEC BCP and development of remedial strategies.
- Retained as a technical expert to provide strategic consulting for evaluation of site investigation and remediation strategy at former petroleum storage terminal in the Los Angeles area. Mr. Proce performed review of all data and reports prepared by the primary consultant and provided strategic recommendations to reduce project implementation costs and long-term risk/liability.
- Project Principal for the investigation and evaluation of a site with TSCA-level PCB soil contamination. Utilized soil data, historic surveys, aerial photography, and ancillary research to develop a complex site conceptual model. Mr. Proce was successful in demonstrating to the regulators that the contamination was a result of filling following the client's sale of the property, eliminating their liability.
- Project Principal and consulting expert to evaluate ongoing recovery efforts of former lube refinery in Germany. Mr. Proce was tasked with evaluating existing remedial infrastructure, identifying inefficiencies, and developing a revised remedial approach to satisfy regulatory deadlines.
- Project Principal and part of an expert consulting team tasked with the development of a plan to remove UST systems from 115 retail service stations throughout New Jersey over a two-year timeframe. Mr. Proce was responsible for coordinating a team of client stakeholders (including legal, commercial, public affairs, technical, and safety leads) and creating a framework by which the above project would be executed.
- Retained as a technical expert to provide strategic review of EPA Federal Superfund Site by a major oil company to evaluate groundwater system performance, applicability of ROD amendments, and beneficial reuse plans.
- Principal-In-Charge of a portfolio of retail service stations that were transitioned from other consultants as being too difficult to close. Responsible for developing revised remedial approaches and negotiating with regulatory agencies to achieve closure in an expedited timeframe.
- Principal in Charge of numerous due diligence projects for owners, developers, managers, municipalities, and lenders at commercial and industrial properties throughout the Northeast. Activities included performance of UST evaluations and closures, hot spot remediations, Phase I and Phase II Site Assessments, vapor intrusion studies and mitigation, lead based paint, asbestos and hazardous materials surveys, interaction with regulatory agencies on behalf of clients and development of remedial cost estimates for planning and negotiation.

- Senior Manager and groundwater modeler for a former television production facility in Taoyuan, Taiwan. Project included coordination of a soil and groundwater investigation using Taiwanese consultants and contractors. Investigation included use of a MIP probe to delineate a DNAPL source for 9,000-ft dissolved PCE and TCE plume, installation of 20 monitoring wells, two 48-hour pump tests, construction of a MODFLOW groundwater flow model and MT3D contaminant fate and transport model, and reporting.

PROFESSIONAL TRAININGS

OSHA 40, OSHA 10, DOT HM-181/126F, Red Cross Certified, First Aid, and CPR

PROFESSIONAL AFFILIATIONS

American Institute of Professional Geologists

National Ground Water Association

PUBLICATIONS

Modeling Multiscale Heterogeneity and Aquifer Interconnectivity, Ritzi, R.W., Dominic, D.F., Dai, Z. Groundwater, Vol 42, Issue 5, September 2004.

PROFESSIONAL PROFILE



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EDUCATION

BS, Civil Engineering,
Manhattan College, 1991
ME, Environmental Engineering,
Manhattan College, 1994

PROFESSIONAL LICENSES

Professional Engineer in New York

Noelle M. Clarke, PE

Principal Engineer

EXPERIENCE SUMMARY

Thirty-two years' experience: Principal Engineer/Senior Engineer at Remedial Engineering, P.C./Roux; Project Engineer at Camp Dresser & McKee.

TECHNICAL SPECIALTIES

Feasibility studies, pilot testing, remedial design, implementation, construction management, and startup evaluations for remediation of soil, groundwater, soil vapor and sediment. Phase I/Phase II Environmental Site Assessments (ESA). Extensive experience at brownfields redevelopment sites, former industrial facilities, and public works facilities. Evaluation and design of storm water drainage systems. Evaluation, design, and construction management for new and existing wastewater treatment processes.

REPRESENTATIVE PROJECTS

- Principal Engineer providing due diligence support for real estate transactions on multiple projects in the New York metropolitan area. Projects have included multi-family housing (both affordable and market rate), retail/ commercial, community services and industrial properties. Services have included Phase I and Phase II ESAs.
- Principal Engineer for a Brownfield redevelopment of a property adjacent to a dry cleaning solvent distribution facility in Brooklyn, New York under the NYSDEC BCP. The site was previously a warehouse built on a former freight railyard that serviced the dry cleaning solvent facility. Offloading spillage on site and migration from the offsite facility resulted in significant soil, groundwater, and vapor contamination with chlorinated VOCs. The site was developed into multifamily housing with first floor retail use. Pre-remediation and posts-remediation Phase I ESAs were prepared by Roux. The remedy, as summarized in the Remedial Action Work Plan, consisted of soil hot spot removal, a physical barrier to limit on site groundwater migration, a permeable reactive wall to treat groundwater and mitigate offsite migration, and a sub slab depressurization system. Roux, under the direction of Ms. Clarke, provided full-time oversight of the remediation and prepared the Final Engineering Report and Site management Plan. The Certificate of Completion for the Site was obtained in October 2015 and Roux is currently providing post-remediation monitoring services.
- Principal Engineer for a Brownfield redevelopment in Brooklyn, New York at a mixed-use multifamily housing/neighborhood retail complex with a former onsite dry cleaner under the NYSDEC BCP. There is soil, groundwater, and vapor contamination from chlorinated VOCs from the former onsite dry cleaner, as well as groundwater contamination from offsite dry cleaners. The remedy, described in the Remedial Action Work Plan prepared by Roux, consisted of hot spot soil removal, *in situ* groundwater treatment and a sub slab depressurization system for vapor mitigation in the existing buildings. The NYSDEC accepted the Final Engineering Report prepared by Roux and the Site received a Certificate of Completion from NYSDEC in 2016 and Roux is currently providing post-remediation monitoring services.
- Principal Engineer for a complex dredging project for a major petroleum company on the Allegheny River in New York. The goal of the project was to remove 1,000 tons of petroleum impacted sediments from the river. Work included Site investigation, remedial investigation, alternatives evaluation, remedial design, planning and extensive regulatory permitting with multiple federal, state, and local agencies. The remediation work was completed in 2021.

- Principal engineer for the investigation and remediation of a former petroleum refinery located in Olean, New York under the NYSDEC BCP. The work included site investigation and preparation of an Alternatives Analysis Report (to document analysis of engineering options and remedy recommendation), Remedial Action Work Plan and remedial design documents to address the environmental impacts associated with the historical operations. The selected remedy includes excavation of shallow soil, in-situ stabilization of 25,000 cubic yards of deep petroleum impacted soil and capping. The work is being completed in phases beginning in 2022, with an anticipated completion date of 2024.
- Principal Engineer for the alternatives evaluation, remedy selection, regulatory negotiation, preparation of design documents (drawings, specifications, and permit applications) and permitting for all remedial components in support of redevelopment at a former metals manufacturing site in Staten Island, New York under the NYSDEC Voluntary Cleanup Program (VCP). The remedy included dredging and onsite disposal of stream sediments; consolidation and capping of fill material across the site; in-place abandonment of the Site's former sewer system; installation of drainage swales for storm water management; and wetland bank stabilization and mitigation/restoration. Required permits and regulatory approvals for the project included a Joint Permit from the USACE and NYSDEC; a NYSDEC SPDES equivalency permit for discharge of treated water to the Arthur Kill, a New York State Department of State Coastal Management Program (CMP) Federal Consistency Assessment; a New York City Waterfront Revitalization Program Consistency Assessment, a modification of topography authorization from New York City Department of City Planning; and a New York City Department of Environmental Protection permit for temporary discharge to a combined sewer. Also required by the USACE and National Marine Fisheries, was preparation of an Essential Fish Habitat Study, in support of the Joint Permit application. Permitting activities included preparation of the various permit applications, forms and supporting documentation, as well as follow up meetings and correspondence to finalize the authorizations.
- Principal Engineer for the design, bidding, contractor selection, and remedial construction phase at a former metals manufacturing facility in Staten Island under the NYSDEC VCP. Responsibilities included finalizing biddable construction documents, issuing to bidders, preparing addenda, and evaluating bids for presentation to the client. Following contractor selection Roux was heavily involved in coordinating with the client, regulators, and contractor for mobilization to the site in late 2006. During the construction Ms. Clarke provided support to the onsite construction manager regarding field changes, design revisions to account for unexpected conditions and contractor questions. The Final Engineering Report summarizing the construction activities was accepted by NYSDEC.
- Principal-in-Charge of an investigation and remediation project at a former petroleum refinery and current distribution facility located in Buffalo, New York. The site entered the NYSDEC BCP in 2006. Roux completed the BCP application and supported the application process. The work included assessing and remediating the potential environmental impacts associated with historical Site operations. These activities have included preparing multiple work plans and directing the activities of another consultant performing the fieldwork and preparing reports of results for field investigations including soil boring and sampling, well installation and groundwater sampling, aquifer pump testing, and groundwater/separate phase modeling. An in situ chemical oxidation system was designed, installed, and was operated as an IRM to remediate an area of free product and impacted groundwater discharging to the Buffalo River in OU-4.
- For the same petroleum Site in Buffalo, New York, multiple Alternatives Analysis Reports (to document analysis of engineering options and remedy recommendation), Remedial Action Work Plans and remedial design documents have been prepared to address the environmental impacts associated with the five Operable Units (OU) on the Site. Remedial construction for OU-1 was completed in 2007 and included excavation and disposal of impacted soil. The Final Construction Certification Report for OU-1 was accepted by the NYSDEC. The Alternatives Analysis Report and Remedial Design for OU-4 were submitted and approved by NYSDEC. The remedy for OU-4 included excavation and onsite consolidation of river sediments and site soil, stabilization of 1,400 linear feet of river embankment using tiered slopes, rip rap, and reinforced bioengineering, slurry wall groundwater containment, low permeability capping, a stormwater collection system and constructed wetland treatment for stormwater. Various vegetative measures were incorporated into the design in order to promote vegetative growth and enhance wildlife habitats. The remedial construction was completed in 2013 and 2014 and preparation of the Final Construction Completion Report was completed in 2015. The Alternatives Analysis Reports for OU-2 and OU-3 were submitted to NYSDEC. For OU-2, bench scale studies of stabilization/solidification agents were completed and evaluated for treatment of lead and petroleum impacted soil. In addition, field pilot studies of multiple options to treat petroleum impacted soils were completed and evaluated. Design of a stormwater collection system for portions of OU-2 and OU-3 was completed in 2010 and construction was completed in 2014 under the direction of Ms. Clarke.

- For the same petroleum terminal in Buffalo, New York, the work also included performing activities related to the operation of the remediation systems at the Site. These activities have included preparing a feasibility study work plan for improving water management systems at the site; preparing a work plan, directing the field work, and preparing an evaluation summary report for startup and testing of a portion of the groundwater extraction system at the Site; and assisting in preparation of plans to upgrade the existing treatment facilities at the Site.
- For the same petroleum terminal in Buffalo, New York, the work also included preparation of design documents and a completion report for in-place closure of the site's former in-ground oil water separator. In addition, a vapor enhanced extraction pilot study work plan was prepared and implemented at the site for recovery of separate-phase product in one portion of the site located adjacent to the Buffalo River. The results of the VER pilot testing, along with the results of chemical oxidation pilot testing conducted at the site, have been summarized in a Remedial Action Selection report, which recommended implementation of chemical oxidation in this portion of the site. A conceptual plan for implementation of chemical oxidation was submitted with the selection document. The work also included maintaining contact with regulatory agencies regarding the status of activities at the Terminal; preparing compliance monitoring reports for submittal to the regulatory agencies; overall project coordination; and budget management and tracking.
- Principal Engineer for the investigation, design, and implementation of a soil remediation project at a 4-acre former oil terminal in Cold Spring Harbor, New York under the NYSDEC spills program. The remedy completed included excavation and offsite disposal of approximately 20,000 tons of petroleum contaminated and/or hazardous lead contaminated soil in accordance with the future use of the site under an Environmental Easement. Additional activities completed by Roux at the site included asbestos remediation followed by building demolition, UST removal, and cesspool remediation. Roux prepared a Final Engineering Report, which was accepted by NYSDEC and resulted in the closure of the spill number for the Site.
- Principal Engineer for the investigation, design, and implementation of a soil remediation project at a portion of a former oil terminal in Sag Harbor, New York. The remedy completed included excavation and offsite disposal of approximately 2,000 tons of petroleum contaminated soil from beneath an active public roadway under the NYSDEC spills program. The remedy included extensive traffic control and coordination with Village of Sag Harbor officials, dewatering, water treatment, temporary water discharge of treated water to Sag Harbor and restoration of the public roadway in accordance with the Village of Sag Harbor Department of Public Works requirements. Roux prepared a Final Engineering Report, which was accepted by NYSDEC and resulted in the closure of the spill number for the Site.
- Project Manager for preparation of a work plan, direction the field activities and preparation of a summary report for investigation of the storm-water collection system at a petroleum terminal in Buffalo, New York. The objectives of the storm sewer investigation were to: prepare a detailed map of the Site's sewer system; re-establish connections that may have become blocked by debris; investigate the structural integrity of the storm sewers; locate areas of groundwater infiltration and assess infiltration rate and quality; assess wet and dry-weather flow and quality; and identify areas contributing surface water to the collection system, including hydrologic modeling using TR-55. Based on the results of the investigation, several improvements to the sewer system were recommended, including eliminating inlets to the system in areas of the site where no active operations currently take place and rehabilitation and/or installation of new sewers to restore flow by gravity to the treatment system.
- Principal Engineer for the investigation, remedial design, construction oversight and operation and maintenance of a bioventing and soil vapor extraction system at the Site of a diesel UST failure in Brooklyn. A free product recovery system was also designed, installed, and operated by Roux. Investigation activities included the use of the sonic drilling technique to advance twelve wells to 85 feet below grade through cobbles and boulders for delineation of separate phase product, soil, and groundwater impacts. Eight wells were converted to combination biovent/SVE wells. Design included specification of SVE and biovent blowers, piping, valves, and an automatic control system. Product only pumps were also designed and installed in three wells. Approximately 2,000 gallons of product were recovered by the two systems and the spill was closed by NYSDEC in 2011.
- Principal Engineer for a Brownfield redevelopment in Staten Island, New York of a former retail service station site under the NYSDEC BCP. There is soil, groundwater, and vapor contamination from petroleum-related constituents in the vicinity of the former gasoline piping and pump island (the petroleum source area), as well as historic fill across the entire site. The remedy, described in the Remedial Action Work Plan prepared by Roux, consisted of a sealed sheet pile containment wall around the petroleum source area, a Site Cover System across the entire site, comprised of concrete building slab/walkways, asphalt parking areas and limited landscaped areas and a sub-slab depressurization system to prevent vapor intrusion into the proposed retail building. A certificate of completion from NYSDEC was obtained in 2020.

- Project Manager for the remedial design at a Superfund Site in Nanuet, New York for the New York State Department of Environmental Conservation. The work included preparation of a preliminary design report, which evaluated two alternatives for handling hazardous soils and sediments at the site contaminated with volatile organic compounds. Each alternative was evaluated on the basis of technical feasibility, cost, and schedule for implementation. Based upon this evaluation, off-site disposal was recommended over on-site treatment. The report presented a site-wide conceptual plan for remediation, including soil/sediment excavation, staging and sampling; stream diversion; excavation dewatering; temporary on-site groundwater treatment; and long term monitoring. Duties also included managing and tracking all project budgets and serving as the main client contact.
- Principal Engineer for the design and specification of a large-scale (750 scfm) soil vapor extraction (SVE) pilot system with thermal oxidation off-gas treatment for a client in Brazil. Responsibilities included equipment sizing and specification, selection of materials of construction, SVE well and equipment layout, description of general startup procedures and preparation of a pilot test work plan. The pilot test work plan included a description of the pilot test operating procedures to be followed, operating parameters to be monitored and data to be collected and analyzed. The work also included conducting the pilot test activities and generating a report that included plans for expanding the SVE system across the Site. The work also included technical support for evaluating and optimizing system performance.
- Project Manager for a storm sewer study at the former metals manufacturing facility in Staten Island, New York as part of the Voluntary Cleanup Program for the Site to identify contaminated infiltration sources, provide an accurate site drainage map, and verify contributing areas to each outfall. The investigation included field inspections, surveying, dye testing, and sampling during varying tidal conditions. The storm sewer map prepared was used for future sewer closure and site redevelopment planning.
- Principal engineer for the design of a new storm water collection system for a metals manufacturing site in Staten Island, New York under the NYSDEC VCP. The design included evaluation and hydrologic modeling of the system using the USG Soil Conservation Service TR-55 hydrologic analysis model, inlet structure and pipe sizing and layout, outfall design and specification of materials and methods of construction for all system components.
- Principal-in-Charge of the operation, maintenance, monitoring and reporting activities at multiple active and former petroleum storage and distribution terminals located in New York for a large petroleum company. The work includes operation, maintenance, and performance/compliance monitoring services at the sites that currently have active remediation systems installed and monitoring, sampling, and reporting services at sites without systems. The remediation systems include groundwater extraction and treatment, free product recovery, bio-sparging, and soil vapor extraction/air sparging. At these sites, Roux is responsible for: maintaining and troubleshooting the various system components to reduce downtime to the extent possible; repairing and/or replacing equipment as needed; coordinating the upgrading of the electrical systems, as needed, to meet current building code requirements; expanding systems to meet regulatory requirements, as needed; optimizing system performance; collecting performance monitoring samples and data to track the efficiency of the treatment systems; and collecting compliance monitoring data.
- Principal Engineer for at multiple petroleum terminals in New York State for groundwater quality and surface water quality sampling and monitoring well gauging as required by the New York State Department of Environmental Conservation, as well as quarterly reporting for all sites. The work has also included collection of soil quality data at several sites and performance of an electromagnetic survey to support the divestiture and redevelopment of one of these sites. Based on these results, soil removal activities were performed at one of the former terminals in order to obtain regulatory closure of the site. Roux successfully completed the remedial activities to the satisfaction of the regulator and received closure for the client of the open spill number. Regulatory closure of another of these former terminals was obtained based upon the results of ongoing groundwater monitoring and reporting.
- Project Engineer for design of a 2.6-mgd groundwater treatment system at the Fireman's Training Center for Nassau County Department of Public Works on Long Island. The work included design of air strippers, exhaust stacks, liquid-phase GAC treatment units, and all chemical feed and storage facilities, including unit sizing, selection of materials of construction, equipment layout, and coordination with other disciplines. The work also included development of the "mass balance" for the facility.
- Task leader in charge of overseeing a bioventing pilot study conducted by a subconsultant, to treat contaminated vadose zone soils at the Fireman’s Training Center site in Nassau County, New York. The work included development of a preliminary design report for the full-scale implementation of bioventing at the site based upon the results of the pilot study.
- Project Engineer for the design, specification, construction, and operation of an air sparging and soil vapor extraction pilot at

the Long Island terminal of a large petrochemical distributor. The pilot was designed to treat contaminated ground water and vadose zone soils resulting from a one-million-gallon gasoline spill at the site. The work included development of the field sampling program and sampling and evaluation of various parameters to determine the pilot's radius of influence and effectiveness. The work also included performing data analysis and preparation of the pilot study report, which recommended full scale implementation of air sparging at the site. The site-wide implementation of air sparging and expansion of the site's existing vapor extraction system at the same Long Island petrochemical terminal was also part of the work. Responsibilities included design, specification, and layout of all mechanical equipment, vapor extraction, and air sparging wells and new vapor extraction/air sparging piping.

- Task leader responsible for investigating alternatives for the treatment of gasoline contaminated off-gas from air stripping operations a Long Island petrochemical terminal. Based on this evaluation, biofiltration was selected for piloting. Responsibilities included design of a pilot unit; development of sampling and data collection procedures; construction oversight and "troubleshooting" for the unit; coordination of data collection activities; and compilation and analysis of the pilot data.
- Project Engineer for the design of a 0.50-mgd groundwater treatment facility at a Long Island petrochemical terminal. Responsibilities included the design, specification, and layout of mechanical equipment, including the air stripping tower, vapor phase granular activated carbon off-gas treatment, centrifugal blowers, ductwork, influent pump, and concrete wet well. Responsible for shop drawing review during the construction phase.
- Project Manager for an investigation at a gasoline service station with soil and groundwater contamination. Responsible for reviewing and evaluating the work of another consultant that performed the soil and groundwater sampling and conducted remedial activities at the site including investigation summary reports; remedial designs; remediation progress reports; correspondence with regulators; and plans for future work at the Site. The work also included mapping the groundwater flow patterns in the area of the service station and mapping the areal and vertical extent of the groundwater contamination. Responsible for project coordination and budget management and tracking.
- Project Manager for the field investigation, feasibility evaluation, and remedial design at Superfund Site in Spring Valley, New York for the New York State Department of Environmental Conservation. The work included development of a work plan and site operations plan. The field investigations included Geoprobe soil borings; groundwater monitoring well installation; groundwater sampling; aquifer pump testing; and vapor extraction pilot testing. Work also included conducting the field operations for the vapor extraction pilot and producing a summary report of the field investigation results. The report presented an evaluation of the cost and feasibility of several alternatives for remediation of the site. It recommended reducing the level of effort of the remediation presented in the Record of Decision, based on lower levels of contamination encountered during the investigation. Duties also included project coordination, budget management and tracking, and development of subcontract agreements.
- Project Engineer for upgrades to the Spring Creek Auxiliary Water Pollution Control Plant for the City of New York. The work included the evaluation, design, and specification of a two-stage odor control system, chemical storage and feed facilities and new effluent disinfection system.
- Project Engineer responsible for preparation of design documents for the replacement of the sodium hypochlorite pumps and piping at the Mamaroneck Wastewater Treatment Plant for Westchester County Department of Environmental Facilities in New York.
- Project Engineer for design of upgrades to the New Rochelle Wastewater Treatment Facility for Westchester County Department of Environmental Facilities in New York. Designed upgrades to the main influent pump station, including rehabilitation of the existing influent pumps and replacement of the magnetic drives with new variable frequency drives. Responsibilities also included design of a submersible automatic duplex sump pump system, new primary sludge pumps and piping and new primary and secondary settling tank equipment. The work also included assisting the County during the bidding and contractor selection phase and preparing addenda to the contract documents.
- Project Manager for the construction of upgrades to the New Rochelle Wastewater Treatment Facility. Responsibilities included overseeing the shop drawing logging and distribution process; reviewing mechanical equipment shop drawings; addressing contractor questions regarding the contract documents; and coordinating with the resident engineer in the field and the electrical and general contractors.
- Project Engineer for the performance evaluation of the Harriman Wastewater Treatment Plant for the Orange County Department of Environmental Facilities and Services. Responsibilities included documentation of the existing conditions at the plant and evaluation of the historical and current performance of the plant with respect to its potential for expansion. A summary report was prepared, which included evaluations of the existing plant processes with respect to

standard design criteria, typical design practices and receiving water considerations. This summary report served as the basis for the facilities plan prepared as the next phase of the project.

- Project Engineer for the facilities plan for the upgrade of the Harriman Wastewater Treatment Plant. Responsibilities included evaluation of alternatives for expanding the plant's treatment capacity. A report was prepared, which recommended the conversion of the existing oxidation ditches to sequencing batch reactors (SBR) in order to increase the plant's treatment capacity to 6.0 mgd within the limited space available on the site.
- Project Engineer for the Gates-Chili-Ogden Pump Station and Force main design for Monroe County, New York. The design consisted of a new 36 mgd wet pit/dry pit pump station, influent sewer, and force main. Responsibilities included evaluating influent pumping conditions, and design of the influent sewer, manual influent bar racks and a duplex automatic submersible sump pump system for the station.
- Project Manager for the Flow Augmentation Needs Study (FANS) for Suffolk County Department of Public Works, New York. Responsibilities included coordinating and implementing the annual wetland monitoring effort for collection of data to characterize the vegetation communities and surface water and groundwater conditions at four freshwater wetland sites in Suffolk County. Duties also included maintaining a database of all vegetation data collected; developing and refining equations to characterize the groundwater table and wetlands vegetation in all monitoring areas; evaluating potential impacts of sewering on sensitive wetlands; and evaluating the need for any mitigation of these sites as triggered by vegetation changes correlated to groundwater drawdown. Responsibilities also included coordinating the production of a draft and final annual monitoring report summarizing the findings of the program.

PRESENTATIONS

Sparging Targets Submerged Residual Saturation Contamination, written with D. Bennett and L. Buchanan. Presented at the 66th New York Water Environment Federation Association Annual Meeting, New York, New York, February 1994.

Suffolk County Wetlands – Flow Augmentation Needs Study, written with M. A. Taylor and R. Southard. In Proceedings of the Annual Meeting, Hydrology and Hydrogeology of Urban and Urbanizing Areas. American Institute of Hydrology, April 1996.

PROFESSIONAL PROFILE



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EDUCATION
BS, Civil Engineering, Hofstra University, 2006

PROFESSIONAL LICENSES
Professional Engineer (NY), 2017
Fundamentals of Engineering EIT, 2006

David E. Kaiser, PE

Senior Engineer I

EXPERIENCE SUMMARY
Seventeen years of experience: Senior Engineer, Project Engineer, Staff Engineer with Roux; previously Design Engineer with Bohler Engineering.

TECHNICAL SPECIALTIES
Engineering services including development and review of design drawings, implementation of design, development of technical specifications, review of construction submittals, development of SWPPPs, field management and site safety of various heavy construction projects, and civil/remediation engineering construction management. Designs have included sub slab depressurization systems, soil vapor extraction systems, stormwater drainage systems, NYCDEP sewer system, NYCDOB/DOT sidewalk project, and remedial system design. Additional services including budget management, permitting, project coordination, project scheduling, development of bid packages and cost estimating. Field management and construction oversight of heavy equipment construction including sewer construction, drainage construction, crane lift activities and remedial construction activities. Environmental site assessments focusing on soil, soil vapor, groundwater, and excavation dewatering investigations.

REPRESENTATIVE PROJECTS

- **Soil Vapor Mitigation Systems Design.** Senior Engineer for the design and development of sub slab depressurization systems (SSDS) and soil vapor extraction systems (SVES) for various sites including residential, commercial, and industrial in Suffolk County, Nassau County and New York City Boroughs. Project sites have included system design for new construction buildings, retrofit system for existing buildings and existing system takeovers with troubleshooting and optimization. Designs included strategic layouts and coordination with architects and MEPs to reduce piping conflicts; head loss calculations to ensure adequate vacuum influence on the sub slab via SSDSs comprised of solid headers, perforated laterals and suction points; blower and in-line fan design and sizing appropriate for anticipated head loss and building configuration; and accompanying vapor barrier system to prevent vapor intrusion.

- **Suffolk County Drywell Closure.** Senior Engineer for the planning and coordination of closing existing drywell structures serving as sanitary and industrial retention basins for an industrial facility. The project consisted of developing a sampling plan for the site, coordinating sampling and inspection of existing sanitary and industrial drywells in accordance with Suffolk County Department of Health Services Article 12, SOP No. 9-95 Pumpout and Soil Cleanup Criteria. Following the sampling event, a summary of results was prepared and sent to the SCDHS for review. Due to exceedances that were present within the septic tanks, a remedial action work plan was developed to identify the required steps for successful closure which included coordinating the SCDHS field inspection, extraction of contaminated liquids and solids, and proper disposal of the waste.

- **SPDES Outfall Control Structure Design and Construction.** Senior Engineer for the design and construction of a new SPDES outfall control structure utilizing a precast concrete vault formerly used as a subgrade tank enclosure in Brooklyn, NY. Design included retrofitting an existing precast concrete tank vault to serve as an effluent control structure; and a poured in place concrete compound weir wall to allow control of effluent, flow monitoring to SPDES outfall as well as prevent tidal influx from backflowing into the system. Construction required the management of several trades both landside and waterside to perform an SOE, custom concrete pour for compound weir, dewatering, new steel bulkhead penetration, and sealing of the entire system.

- **NYSDEC Spills Project Remediation.** Senior Engineer for the development, implementation and reporting of Remedial Action Work Plan for a former gasoline retail facility in Greenwich, NY. Remediation included: UST removal, excavation and disposal of approximately 7,000 tons of petroleum hydrocarbon impacted soil via a complex slide rail SOE system, and application of approximately 8,000 pounds of oxygen release compound (ORC) to the groundwater zone across the excavation to enhance the *in situ* aerobic bioremediation.
- **Shooting Range Lead Sampling and Abatement.** Senior Engineer for the development, implementation and reporting of Lead Sampling and Abatement of an indoor state government operated shooting range. Sampling and abatement included: review of surface wipe sampling, live fire air monitoring, assessment of results in accordance with OSHA Action Levels and Permissible Exposure Limits, coordination and management of cleaning and abatement of the range with post-cleaning clearance sampling.
- **Property Drainage System Design and Construction.** Project Engineer for the design and development of a new on-site stormwater treatment system located at a former petroleum terminal in Brooklyn, NY. Design included drainage improvements and modifications for the former petroleum terminal to support ongoing remediation activities that were being conducted to facilitate the future closure of an existing in-ground oil/water separator and removal of associated piping, and to support the anticipated long-term remedy for, and potential future redevelopment of, the subject property. The proposed drainage modifications included the installation of new drainage structures, Contech treatment structures and conveyance piping to collect and treat stormwater runoff within the property, and bypass the existing in-ground oil/water separator, prior to discharging the stormwater via an existing SPDES outfall.
- **Oil/Water Separator Closure.** Project Engineer for engineering support and review for the closure of an existing in-ground oil/water separator at a former petroleum terminal in Brooklyn, NY. The closure and abandonment of the oil/water separator was deemed the long-term remedy as approved by the NYSDEC. The oil/water separator was originally constructed in the early 1900s and has served the property by providing stormwater runoff treatment. The closure project includes the following tasks: dewatering and treatment of separator water; excavation of existing sludge in separator; dewatering and drying/stabilization of the sludge removed; power washing of interior; backfill and compaction of clean fill inside separator; removal of all existing above grade structures including catwalks, guardrails and piping; proper shipping and disposal of sludge contents; installation of a final cover system consisting of a geosynthetic clay liner (GCL) and filter fabric barrier; and final site grading.
- **Utility Tunnel Extension.** Project Engineer for construction management of a utility tunnel extension and modification project. The project consisted of installation of a precast concrete stairway access to an existing utility tunnel, installation of a structural slab to span the tunnel extension, installation of a new base slab, installation of cast-in-place concrete walls and top slab, installation of sidewalks and relocation of all existing system piping and conduits. The work was performed in accordance with the requirements of the New York City Department of Buildings (NYCDOB) and the New York City Department of Transportation (NYCDOT).
- **Treatment System Building Upgrades.** Project Engineer for the review and implementation of engineering drawings for a metals removal system upgrade to an existing 450-gpm groundwater treatment system. The upgrades consisted of: relocating and reinstalling the existing oil/water separator tank on a steel spacer via crane; lifting and installing the existing 10,000 gallon equalization tank to be repurposed as a filter backwash solids removal tank; lifting and installing prefabricated concrete pads with a subbase of Geogrid BX1200 and 6” of aggregate size number 57 (as per NYCDDC Highway Specifications and ASTM C33) compacted to 95% Standard Proctor, under proposed tank locations; locating a new 20,000 gallon equalization/aeration tank on the new pad; installing of new blower motor and enclosure; and installing of new piping and appurtenances.
- **Recovery Well Construction.** Staff Engineer for the construction of aspects of a dual-phase free-phase petroleum product (free-product) and groundwater recovery well at a former petroleum terminal in Brooklyn, NY. Groundwater extracted from the recovery well would be conveyed through 4-inch diameter high density polyethylene standard dimension ratio 11 (HDPE SDR 11) piping and connected to an existing 6-inch HPDE SDR 11 force main piping network that transports the groundwater to an existing on-site groundwater treatment system. Any free-product recovered would be sent to an existing 2,000 gallon above ground storage tank (AST) via 1-inch double wall product piping. Electrical and signal conduits were routed to an existing well house where the system control components were housed.
- **Treatment System Building Roof Rehabilitation and Platform Installation.** Project/Staff Engineer for providing engineering design, review, and construction management of the rehabilitation of a roof and installation of an internal platform in an existing remediation groundwater treatment system building located at a former petroleum terminal in Brooklyn, NY. The roof rehabilitation project included the

replacement of approximately 1,200 square feet of stainless steel decking, insulation and waterproofing. The project also included the construction of three new skylights and access ladders. The platform installation project included the installation of new steel members and fiberglass reinforced polymer (FRP) molded grating within the existing remediation groundwater treatment to provide a working platform for on-site technicians. The new steel members were bolted to existing infrastructure to limit on-site welding and the platform was installed with tubular steel handrails. Responsibilities included: ensuring that the development of the plans and technical specifications were in accordance with the New York City Construction Codes, New York State Building Standards and Codes, various ASTM standards, American Institute of Steel Construction (AISC) "Code of Standard Practice for Steel Buildings and Bridges," and Steel Structures Painting Council (SSPC) Publications.

- **NYCDEP Private Storm and Sanitary Sewer System.** Project/Staff Engineer for the design and development of a New York City Department of Environmental Protection (NYCDEP) Private Storm and Sanitary Sewer System located at a former petroleum terminal in Brooklyn, NY. The sewer system comprised of over 2,600 LF of sewer in Greenpoint Brooklyn over two phases of construction. During the duration of this project responsibilities included: develop/revise NYCDEP sewer design plans and construction notes, address NYCDEP comments and markups, develop Bill of Materials, develop cost estimates, develop technical specifications, develop bid package, ensure compliance with NYCDEP and NYCDOT specifications and requirements, develop/revise NYCDOT Builder's Pavement Plan (BPP), develop NYCDOT Maintenance and Protection of Traffic plans, conduct/participate in design construction meetings, review subcontractor submittals and cut sheets, address NYCDEP punch list items, management/oversight/coordination of subcontractor construction activities.
- **NYCDOB/NYCDOT Sidewalk Installation.** Project/Staff Engineer for the design, development, and installation of over 4,000 linear feet of new sidewalks over various phases located at a former petroleum terminal in Brooklyn, NY. The design, development, and installation of these sidewalks were in accordance with the New York City Department of Buildings and New York City Department of Transportation specifications and details of construction. During the duration of these projects my major responsibilities included: develop/revise NYCDOT Builder's Pavement Plans, develop cost estimates, develop technical specifications, develop bid package, ensure compliance with NYCDOB and NYCDOT specifications and requirements, develop NYCDOT Maintenance and Protection of Traffic plans, conduct/participate in design construction meetings, ensure proper installation and testing of sidewalks in accordance with NYCDOB and NYCDOT, management/oversight/coordination of subcontractor construction activities.
- **Sub Slab Depressurization System.** Staff Engineer for the design and construction of two sub slab depressurization systems (SSDS) located within the footprint of a petroleum remediation site where a new building was proposed to be built. These projects were part of an Interim Remedial Measure (IRM) Action Plan as approved by the NYSDEC to provide a preventative proactive measure to address potential soil vapor issues. The SSDSs were designed to operate passively; however, header piping was installed to allow for the installation of the necessary equipment if an active system was required. The SSDSs consisted of ¾-inch gravel with 4-inch diameter polyvinyl chloride (PVC) schedule 40 well screen used as soil gas collection piping and 6-inch diameter solid PVC used as the header piping. A vapor barrier/waterproofing membrane and nonwoven geotextile fabric were installed between the venting layer and the floor slab. All penetrations through the floor slab were sealed using a silicone based waterproof sealant. The scope of work included excavation and trench work for the SSDS; placement of pipe bedding; jointing and installation of the pipe fittings, valves, and appurtenances; installation of pipe sleeves and mechanical seals; and installation of nonwoven geotextile fabric and silicone based waterproof sealant.
- **Remediation System Signal Network Utility Expansion Oversight and Management.** Staff Engineer and Field Manager for the completion of a signal communication network expansion as part of a petroleum remediation system. My responsibilities included oversight of a subcontractor while installing level sensors within the product pull boxes to improve the safety of the system operations by continuously monitoring the underground product piping network for potential leaks, and programming, testing and verification of operation of sensors. The scope of work also included the installation of signal and control wiring from recovery well houses to subsurface vaults through existing conduit located beneath New York City streets located in Greenpoint Brooklyn. The signal expansion was part of an effort to integrate the sensor/components within the vaults with the existing remediation system's programmable logic controllers (PLCs). The scope of work also included: development of programming to integrate input infrastructure to existing PLCs, development of human machine interface (HMI) screens to allow for remote viewing at the system control buildings, and installation of power supplies and other apparatuses as required for the operation of the new infrastructure. My responsibilities for this work included: subcontractor management, submittal and cut

sheet review, scheduling management, 3rd party coordination, and construction meetings.

- **New York City Transit Plan Submission.** Staff Engineer for researching, preparing, and submitting New York City Transit (NYCT) Plans for various sites to seek approval for drilling and other subsurface activities in proximity to NYC Subways. The scope of work included visiting the Microfilm Room at the NYCT Office to obtain copies of the as-built plans, roof plans, profiles, sections, and alignments adjacent to the properties that our clients were proposing to perform subsurface work. Using these plans, develop proposed boring location plans and cross section plans, overlaying the NYCT plans to determine the proposed distance to adjacent NYCT structures. Ensured that these plans had the most up to date NYCT construction notes since these drawing became part of the projects' contract drawings. Submitted the plans and fees to the NYCT and coordinated with the NYCT inspectors assigned to each project ensuring that all requirements and questions were satisfied. Procured the associated NYCT approvals and distributed to the client so that they may proceed.
- **Stormwater Pollution Prevention Plan (SWPPP) Reports.** Staff Engineer for preparing and submitting Stormwater Pollution Prevention Plans (SWPPP) for various residential and commercial development sites in New York City and Long Island. The scope of work included preparation of SWPPP Reports in accordance with the most current New York State Department of Environmental Conservation (NYSDEC) regulations at the time including the 'General Permit for Stormwater Discharges from Construction Activity' and the 'New York State Stormwater Management Design Manual.' Preparation of the SWPPP Reports included: summarizing the site history and project description, soil geology, potential pollutants, erosion and sediment control practices, inspection and maintenance procedures, water quantity and water quality control plans, construction sequence scheduling, and the Notice of Intent (NOI) for each project as required by the NYSDEC.
- **Former Petroleum Storage Wetland and Canal Remediation Site.** Staff Engineer for daily construction oversight of subcontractors as a field manager and implementation of the site-specific health and safety plan as a Community Air Monitoring Program manager. The scope of work included conducting an on-site Community Air Monitoring Program monitoring for airborne dust and VOCs that were potentially generated by remedial and construction work activities. Stopping work and implementing best engineering/control practices if action levels were exceeded. Recording and providing QA/QC analysis of on-site weather and air monitoring data, as well as ensuring the proper operation of all instruments/monitors on a daily basis. Inspections were conducted of three on-site aboveground API concrete oil/water separators. Stormwater Pollution Prevention Plan (SWPPP) inspections were performed, ensuring compliance with NYSDEC State Pollutant Discharge Elimination System (SPDES) General Permit for Stormwater Discharges from Construction Activity and daily reports were generated which would comprehensively document daily work activities and CAMP data and exceedances.
- **Land Development Site Plan Preparation.** Design Engineer for the design and development of residential, commercial, and industrial site plan packages for Suffolk County, Nassau County and New York City Boroughs. Site plan packages for the various municipalities within Suffolk County, Nassau County and New York City included components such as: zoning analysis, site removals plan, site design and construction documents, water, and sewer system design (detention and retention systems), site grading and drainage plans, and lighting analysis and design.

PROFESSIONAL TRAININGS

OSHA 40-Hour HAZWOPER Training: 2008

OSHA 30-Hour Construction Safety Training: 2011

OSHA 10-Hour Construction Safety Training: 2018

NYSDOT Hazardous Materials Awareness Training: 2017

NYSDEC Erosion and Sediment Control Training: 2016

Loss Prevention Systems Training Certification: 2008

JUDY V. HARRY
P. O. Box 208
120 Cobble Creek Rd.
North Creek, NY 12853

Occupation: Data Validator/Environmental Technical Consultant

Years Experience: 48

Education: B.S., Chemistry, Magna cum laude, 1976, Phi Beta Kappa

Certifications: New York State Woman-Owned Business Enterprise (WBE)

Relevant Work History:

Data Validation Services: September 1989 - present

Sole proprietor of Data Validation Services, a woman-owned small business registered with SAM, providing consultation/validation services to regulatory and commercial clients.

These services include the review of analytical laboratory data for compliance with respect to specific protocols, accuracy and defensibility of data, verification of reported values, and evaluation of quality parameters for analytical usability of results. Approved by USEPA, NYSDEC, NJDEP, NYSERDA, and NYCDEP as a data validator for projects, including USEPA Superfund, Brownfield, and lead sites, and those contracted through the NYSDEC Division of Hazardous Waste Remediation, Division of Solid Waste, and Division of Water Quality.

Performed validation for compliance with laboratory analytical protocols including USEPA OLM, USEPA OLC, USEPA ILM, USEPA DFLM, USEPA SOW3/90, USEPA SOW 7/87 CLP, USEPA SOW 2/88 CLP, USEPA SW846, RCRA, AFCEE, NYS 6 NYCRR Part 360, 40 CFR, Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, including TO-15, 1989/1991/1995/2000/2005 NYSDEC ASPs, and 1987 NYSDEC CLP.

Performed validation according to the USEPA National and Regional SOPs and Functional Guidelines, AFCEE requirements, NYSDEC Validation Scope of Work, NYS DUSR, and NJDEP Division of Hazardous Site Mitigation/Publicly Funded Site Remediation SOPs.

Performed validation for USEPA Superfund Sites including Salem Acres, York Oil, Port Washington L-4 Landfill, Bridgeport Rental and Oil Services, GE-MRFA, MMR/ OTIS AFB, LCP, and Peter Cooper site; and for USEPA lead sites including SJ&J Piconne, Maska, Bowe System, Jones Sanitation, and Syossett Landfill, involving CLP, RAS, and SAS protocols.

Contracted for NYSDEC Superfund Standby Contracts with LMS Engineers/HDR, CDM Smith, Malcolm-Pirnie/ARCADIS, Ecology & Environment, Shaw Environmental/APTIM, CG&I, O'Brien & Gere Engineers, and EC Jordan, involving samples collected at NYS Superfund Sites and analyzed under the NYSDEC ASP.

Performed validation services for NYSDEC Phase II remedial investigations, RI/FS projects, Brownfield sites, and PRP over-site projects for hazardous waste sites.

Performed validation services for clients conducting RI/FS activities involving samples of many matrices, including waste, air, sludges, leachates, solids/sediments, aqueous, and biota.

Clients have included AECOM, Arcadis, Barton & Loguidice, Benchmark Engineering, Bergmann Associates, Blasland, Bouck & Lee, Brown and Caldwell, CDM Smith, CB&I Shaw Environmental, C&S Consulting Engineers, Chazen Companies, Clough Harbour & Associates, Columbia Analytical Services, C.T. Male, Dames & Moore, Day Engineering, EA Engineering, EcolSciences, Ecology & Environment, Ecosystems, EC Jordan, Environmental Chemical Corporation, EHRT, ENSR Consulting, ELM, ERM-Northeast, Fagan Engineers, Fanning Phillips & Molnar, FluorDaniel GTI, Frontier, Foster Wheeler Environmental Corp, Frontier Technical, Galson Consultants, GEI, GE&R, Geomatrix Consultants, GZA Environmental, Handex of N, Hazard Evaluations, H2M Group, HDR, HRP, IT Corp, Jacques Whitford, JTM Associates, JMT, LaBella Associates, Langan Engineers, Leader Environmental, Lockwood, Kessler & Bartlett, LMS Engineers, Malcolm-Pirnie, Metcalf & Eddy, NWEC&C, O'Brien & Gere Engineers, Pace, Parsons Engineering-Science, Plumley Engineering, Prescott Environmental, P. W. Grosser, Ramboll, Rizzo Associates, Roux Associates, Sear Brown Group, SECOR, Sovereign Consulting, Shaw Environmental, Stantec, ThermoRemediation Inc., TRC Environmental, Turnkey Environmental Restoration, TVGA Engineering, URS Consultants, Wehran Emcon, Weston, Wittman Geosciences, YEC, and private firms.

Provided consultation services to laboratories regarding analytical procedures and protocol interpretation, and to law firms for litigation support.

Provided services to firms involving audits of environmental analytical laboratories to determine analytical capability, particularly for compliance with NYSDEC ASP and AFCEE requirements.

Guest speaker on a panel discussing Data Review/Compliance and Usability, for an analysis workshop for the New York Association of Approved Environmental Laboratories, 1993.

Adirondack Environmental Services: June 1987 - August 1989

Senior mass spectroscopist for AES. Responsible for GC/MS analyses of environmental samples by USEPA and NYSDEC protocols, development of the GC/MS laboratory, initiating the instrumental and computer operations from the point of installation, and for implementing the procedures and methodologies for Contract Laboratory Protocol.

CompuChem Laboratories: May 1982 - January 1987

Managed a GC/MS production laboratory; developed, implemented, and supervised QA/QC criteria at three different levels of review; and was responsible for the development and production of the analysis of environmental and clinical samples. Directed a staff of 23 technical and clerical personnel, and managed the extraction and GC/MS labs and data review operations.

Research Triangle Institute (RTI): December 1979 - May 1982

Worked as an analytical research chemist responsible for development of analytical methods for the EPA Federal Register at RTI. This involved analysis of biological and environmental samples for priority pollutants, primarily relating to wastewaters and to human sampling studies. Method development included modification and interfacing of the initially developed Tekmar volatile purge apparatus to GC/MS, development and refinement of methods for entrapment and concentration of the air medium for subsequent volatile analysis, and the analysis and resolution/ identification of individual PCB congeners within Aroclor mixtures by capillary column and mass spectra.

Guardsman Chemical Company: February 1977 - November 1979

Performed all quality control functions for the manufacturing plant. Performed research and development on coatings and dyes.

Almay Cosmetics: May 1976 - December 1976

Product evaluation chemist. Responsible for analytical QC of manufactured products.

Publication

Pellizzzari, E.D., Moseley, M.A., Cooper, S.D., Harry, J.V., Demian, B., & Mullin, M. D. (1985). Recent Advances in the Analysis of Polychlorinated Biphenyls in Environmental and Biological Media. *Journal of Chromatography*, 334(3) 277-314.

ATTACHMENT 2

Laboratory's Standard Operating Procedures

eurofins	Always check on-line for validity. **EPA Methods TO-15 and TO-3, Determinations of VOCs in Ambient Air**	Level: **Standard Operating Procedure**
Document number: **AIR-SOP48257**		
Old Reference: **BR-AT-004**		
Version: **16**		Organisation level: **4-Business Unit**
Approved by: **J8TG, YE6O** Effective Date: **13-FEB-2024**	Document users: **6_EUUS80_BUR_Organic Inst_GCMS VOA_Air**	Responsible: **5_EUUS80_BUR_GCMS VOA and Air Supervisor**

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Revision Log

Revision: 16.0	**Effective Date**	This version
Section	**Justification**	**Changes**
Throughout	Added	Cross-reference links to related documents in D4
Section 5	Updated	Current standard Safety language
Sections 6 & 7	Added	Catalog # disclaimer and storage conditions
Section 10.2.2.1	Added	Percent Error acceptance criteria for individual points in the calibration

Revision: 15.0	**Effective Date**	21 April 2023
Section	**Justification**	**Changes**
Entire Document	Format	Update to D4 format
Section 10.2.4	Updated	Removed reference to DoD specific QA requirements.
Section 10.3.4	Added	Client specific QA requirements

Previous revisions maintained by QA Department

References

- EPA Compendium Method TO-15, "Determination of Volatile Organic Compounds in Ambient Air using Specially Prepared Canisters and Analyzed by Gas Chromatography/Mass Spectrometry", US EPA, January, 1999.
- USEPA Compendium Method TO-3 “Method for the Determination of Volatile Organic Compounds In Ambient Air Using Cryogenic Pre Concentration Techniques and Gas Chromatography with Flame Ionization and Electron Capture Detection”, USEPA, April 1984
- New Jersey Department of Environmental Protection Site Remediation Program Vapor Intrusion Technical Guidance, Version 3.1, March 2013.

Cross References

- *SOP52862 Quality Assurance Manual*
- *SOP48255 Canister Cleaning, Certification and Sampling Kit Preparation*
- *QP46060 NDSC HSE Manual*
- *SOP49961 Burlington Corporate Safety Manual Addendum*
- *SOP52272 Traceability, Handling and Storage of Standards and Reagents*
- *SOP49959 Sample Management*
- *SOP49967 Nonconformance and Corrective Action Procedures*
- *SOP43862: Manual Integrations*
- *SOP49966 Management, Retention Storage and Archive of Data Records*
- *SOP52264 Employee Training and Analyst Demonstration of Proficiency*
- *SOP47863 Tracking and Collecting of Hazardous Waste*
- *SOP48269 Procedure for Acceptance and Handling of USDA Regulated Domestic and Foreign Soil*

1) Scope and Application

This SOP describes the laboratory procedure for the analysis of polar and non-polar volatile organic compounds (VOCs) in ambient and non-ambient air. The procedure is applicable to those VOCs that have been evaluated by the laboratory for their consistent performance in meeting the control criteria put forth in Compendium Method TO-15.

While the compendium method is specifically written for the analysis of ambient air samples collected in leak-free passivated stainless-steel canisters, it may be applied to the analysis of samples that have employed the use of other collection devices such as Tedlar bags and are from sources other than ambient air such as indoor air, vapor intrusion impacted air, soil gas, landfill gas, gas cleaning apparatuses and stack emissions.

This procedure may also be used to report a variety of carbon ranges, constituent groups like TVOC (total volatile organic compounds), or as unresolved complex mixtures (e.g. Total Hydrocarbons).

1.1) Analytes, Matrix(s), and Reporting Limits

The target compound list and reporting limits for each compound are provided in the Appendix.

2) Summary of Method

An aliquot of sample is pulled from the canister through a solid multi sorbent bed trap which reduces the water content of the sample. The sample is thermally desorbed, and the VOCs are carried onto a GC column coupled to a mass spectrometer. Compounds are identified by comparison of the mass spectra for individual peaks in the total ion chromatogram to the fragmentation patterns of ions corresponding to VOCs including the intensity of primary and secondary ions as well as the patterns of stored spectra acquired under similar conditions.

The concentration of the target compound is calculated by internal standard technique using the average response factor or slope and intercept of that compound as determined by the initial calibration.

If the laboratory has modified the method, a list of these adjustments may be found in the Method Modifications section of this SOP.

3) Definitions

A list of terms and definitions are provided in the Appendix. Refer to the Laboratory *SOP52862 Quality Assurance Manual* (QAM) for additional Glossary of Terms, Definitions, and Acronyms.

4) Interferences

Contamination may occur if canisters or other equipment is not properly cleaned before use. The laboratory procedures for canister and flow controller cleaning are provided in *SOP48255 Canister Cleaning, Certification and Sampling Kit Preparation*.

5) Safety

Employees must abide by the policies and procedures in the Eurofins NDSC-US EHS-*QP46060 NDSC HSE Manual*, the *SOP49961 Burlington Corporate Safety Manual Addendum* and this document. This procedure may involve hazardous material, operations and equipment.

This SOP does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of the method to follow appropriate safety, waste disposal and health practices under the assumption that all samples and reagents are potentially hazardous. Safety glasses, gloves, lab coats and closed-toe, nonabsorbent shoes are a minimum.

A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the SDS for each material before using it for the first time or when there are major changes to the SDS.

5.1) Specific Safety Concerns or Requirements

The analytical system contains zones with elevated or depressed temperatures that are capable of causing injury upon direct contact. The analyst needs to be aware of the locations of those zones and allow them to return to room temperature prior to maintenance activities or take measures to avoid contact with hot and/or cold surfaces. There are areas of high voltage in the analytical system. Depending on the type of work involved, either turn the power to the instrument off, or disconnect it from its source of power.

Liquid nitrogen (LN2) is used for cryogenic purposes. In addition to avoiding contact with LN2 cooled surfaces, analysts must be aware of the potential for oxygen depletion in a confined space in the event of an unexpected large release of the product. Users should evacuate a confined space in which large amounts of LN2 have been released.

Sample canisters are occasionally pressurized for cleaning or sample dilution purposes. Lab systems are designed to ensure that the cans are not pressurized above 40 psi. Eye protection must be worn when cans are pressurized in the event of a canister failure.

5.2) Primary Materials Used

There are no materials used in this method which have a serious or significant hazard rating.
NOTE: This section does not include all materials used in the method. A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the SDS for each material before using it for the first time or when there are major changes to the SDS.

6) Equipment and Supplies

Catalog numbers listed in this SOP are subject to change at the discretion of the vendor. Analysts are cautioned to be sure equipment meets the specification of this SOP.

6.1) Sampling Equipment

- 6L and 1L SUMMA® Canisters: Leak-Free, Passivated Stainless Steel, with Swagelok DSS4 Valves, or equivalent. Maximum rated pressure 40 psig.
- 6L SUMMA® Canisters: Silicon Lined-Leak-Free, Passivated Stainless Steel, with Swagelok DSS4 valves or equivalent. Maximum rated pressure 40 psig.
- Flow Controllers: Restek Catalog #24239 or equivalent.
- Flow Controller Orifice: Various sizes ranging from 0.008” to 0.060”, Restek or equivalent.
- Flow Controller Vacuum Gauges: Capable of measuring vacuum to an absolute vacuum of -30” Hg, and pressure up to 30 psi, Grainger Catalog #5WZ37 or equivalent
- Rain Guard: Stainless Steel Tubing ¼”, 10ft. Grainger or Equivalent. Cut 8” and bend into a J shape using a pipe bender.
- Stainless Steel Pre-Filter (7 um): Swagelok Catalog# SS-4F-T7-7 or equivalent
- Teflon Tape: Home Depot Brand or equivalent.

6.2) Analytical System

- Mass Spectrometer: Agilent 5973, 5975, 5975B, 5977C MSD or equivalent.
- Gas Chromatograph: Agilent 6890, 7890, 8890 or equivalent.
- VOC Autosampler: Entech 7016CA or equivalent.
- Cryogenic Concentrator: Equipped with an electronic mass flow controller that maintains a constant flow for carrier gas and sample over a range of 0-200 cc/min. Entech 7100A, 7200, 7200A or equivalent.
- Low Pressure Liquid Nitrogen: Air Gas or equivalent.
- Glass Bead Cryotrap: Capable of effectively removing water while trapping polar and non-polar compounds. Entech catalog# 01-04-11320.
- TENAX Sorbent Trap: Capable of removing CO2 and trapping the polar and non-polar compounds. Entech catalog # 01-04-11330.Primary Column: Fused silica capillary column (60 m x 0.32 mm x 1.8 µm), Restek RTX-624 or equivalent.
- Data System: PC software for Entech instrumentation. Hewlett-Packard ChemStation data acquisition software, Environment Testing Chrom and Environment Testing LIMS (TALS).
- NIST Mass Spectral Library and Search Program, 2020 release or newer

6.3) Cleaning System

- Canister Cleaner Module and Software: Capable of filling canisters with humidified air and evacuating canisters to 50 mtorr, Entech Model 3100A or equivalent.
- Vacuum Pump: Capable of evacuating sample canisters to full vacuum. Vacuubrand or equivalent.
- Cleaning Manifold: Equipped with stainless steel and Teflon transfer lines and connections for cleaning up to twelve canisters simultaneously.
- Heating Belts: Individual thermal-stated heating belts used to heat canisters to 100ºC during the manifolds cleaning cycles. Entech or equivalent.
- Cleaning oven: Capable of cleaning 6 Summa Cans simultaneously at a temperature of 100ºC. Entech or equivalent.
- Flow Controller Cleaning Manifold: Capable of flushing hot Nitrogen through 24 flow controllers simultaneously for cleaning.

6.4) Miscellaneous Supplies

- Mass Flow Controller, NIST Traceable: Capable of flow rate of 70 mL/min, Alicat MC5005CCM or equivalent. Use for the preparation of calibration and working standards.
- Syringes: Gas tight with a Luer-Lok tip, assorted sizes ranging from 1.0 mL to 1.0 L, SGE or equivalent.
- Digital Pressure Gauges, NIST Traceable: Capable of measuring pressure in the range of -30" Hg to 100 psi, Dwyer Models DPGA-12 and 67100 or equivalent
- Digital Flow Meter, NIST Traceable: Alltech or equivalent.

- Nitrogen Gas
- Digital Stop watch, NIST traceable, Thomas Scientific or equivalent

7) Reagents and Standards

Catalog numbers listed in this SOP are subject to change at the discretion of the vendor. Analysts may use equivalent-quality materials based on factors including availability. Permanent changes will be noted in future SOP revisions. All reagent and standards must be labeled with their Name and/or ID #; the Expiration Date; and the Date Prepared.

All reagents and standards are stored at room temperature in the Air Lab work area, unless noted otherwise.

For additional information refer to the *SOP52272 Traceability, Handling and Storage of Standards and Reagents*

7.1) Reagents

- Argon - Gas off bulk Liquid Argon tank. UHP Air Gas or equivalent vendor
- Nitrogen- Gas off bulk Liquid Nitrogen tank. UHP Air Gas or equivalent vendor
- Helium- UHP from Airgas or equivalent
- VOA free water

7.2) Standards

Certified stock standard solutions are purchased from approved commercial vendors. From these, intermediate and working standard solutions are prepared by diluting a known volume of standard in an appropriate solvent to the desired final concentration.

Formulations for the preparation of intermediate and working standard solutions are provided in the Appendix. Unless otherwise specified, assign an expiration date of 12 months from date of preparation, unless the parent component expires earlier in which case use the earliest expiration date.

There are small variations in analyte concentrations in the preparation of air standards. For simplicity, the nominal concentrations are referenced in this SOP.

Note: *When entering the concentrations of source standards in TALS, use the nominal concentration and not the actual concentration. Unless the actual has a > 15% difference from the nominal value. In these cases, use the actual value.*

Purchase the following stock standard mixtures from commercial vendors:

- Mixed Gas Stock Standard: - Commercially prepared standard that includes internal standard and tune standard compounds: Bromofluorobenzene, Bromochloromethane, 1,4-Difluorobenzene, and Chlorobenzene-d5, at a concentration of 100 ppbv each. Linde or equivalent.
- Calibration Stock Standard: - Commercially prepared custom gaseous stock standard that includes all target analytes except ethanol at a concentration of 1.0 ppmv. Linde or equivalent.
- Calibration Ethanol Neat Material. >99.5%
- ICV / LCS Stock Standard: - Custom made gaseous stock standard prepared from a different lot(s) of the source material(s) used to manufacture the calibration stock standard. The ICV/LCS stock standard includes all target analytes at a concentration of 1.0 ppmv. Linde.
- ICV/LCS Ethanol Neat material. >99.5% from a source other than the calibration source.

Prepare calibration and working standards mixtures by diluting a known volume of the stock standard with nitrogen to a specified volume into a humidified summa canister. The summa canister is humidified by adding 100ul of VOA free reagent water. The volume of the standard added to the canister is calculated using the set flow rate of 70mL/min using a mass flow meter multiplied by the time of the standard addition, plus the inclusion of the 25ml volume for the tubing connecting the mass flow meter to the summa canister. The formulations for standard preparation are provided in the Appendix along with recommended expiration dates and storage conditions.

Each stock standard is assigned a 1-year expiration date from manufacture and recertified annually. See *SOP52272 Traceability, Handling, and Storage of Standards and Reagents* for details on the recertification process. The ethanol neat material is assigned the expiration date given by the manufacturer.

If a new standard cannot be received prior to the expiration of the standard presently in use, the lab will notify the QA manager. The QA manager will perform a control chart review (see *SOP49965 Control Charts*). If the standard is determined to be acceptable, the lab may assign a new expiration date of not more than 30 days from the date of the last data point in the control chart review. When the new standard ID is created in TALS, the COA and the Control Chart verifying the standards stability will be attached to the reagent ID.

8) Sample Collection, Preservation, Shipment and Storage

The laboratory does not perform sample collection, so these procedures are not included in this SOP. Sampling requirements may be found in the published reference method.

Matrix	Sample Container	Minimum Sample Size	Preservation	Holding Time	Reference
Air	1L or 6L Passivated Summa Canister	1L	NA	30 days from collection	EPA TO-15

1-liter Tedlar bags are only provided upon client request; however, clients are discouraged from using Tedlar bags due to the shortened holding time of 72 hours from collection.

All samples should be collected in passivated stainless-steel canisters that have been certified clean prior to sampling. The laboratory will provide certified clean canisters to the client upon request. The procedures for clean canister certification are provided in Laboratory SOP 48255: Canister Cleaning, Certification and Sampling Kit Preparation.

The laboratory can also provide flow controllers set to the appropriate flow rate for the sampling time required by the client.

The laboratory ships air canisters in custom made boxes. The boxes are equipped with custom-made foam inserts to hold the pre-set flow-controllers. The shipping materials are designed to prevent damage of equipment to and from the sampling site. The laboratory checks the equipment to ensure it is in proper working order before shipment to the client and additional checks are performed on return of the equipment to the laboratory. Sampling instructions are provided with each sampling kit. The sampling crew is advised to handle the sampling equipment using the instructions provided by the laboratory to ensure optimum performance.

The laboratory's sample acceptance policy for air samples in canisters requires that the sampling crew record the ID of the flow controller used for sample collection on the tag attached to each canister, but the association may also be recorded on the Field Test Data Sheet or a COC. With this information the laboratory can review the history of use of the FC as needed to troubleshoot potential equipment problems. Without the association, the history of use of the FC is unknown. The laboratory strongly recommends that field samplers be instructed to provide this information for each sampling event.

The return pressure of each canister should be between -10" Hg to -1"Hg, except for "grab" samples or samples with a collection rate of 100 or 200 mL/min, which must have a pressure greater than or equal to -10" Hg. The residual vacuum criteria ensure that the sample was collected over the time period the flow controller was calibrated for.

9) Quality Control

9.1) Sample QC

The following quality control samples are prepared with each batch of samples.

QC Item	Frequency	Acceptance Criteria
Method Blank (MB)	1 in 20 or fewer samples	See QC Summary Table
Laboratory Control Sample (LCS)	1 in 20 or fewer samples	See QC Summary Table
Internal Standard (ISTD)	Every Sample	See QC Summary Table
Laboratory Control Sample Duplicate (LCSD)	Client request or if insufficient sample for Sample Duplicate	See QC Summary Table
Sample Duplicate (SD)	1 in 20 or fewer samples if sample volume allows	See QC Summary Table
Trip Blank (TB)	Client Request	See QC Summary Table

NOTE: *The compendium reference method does not require the analysis of a laboratory control sample (LCS) or provide criteria for the evaluation of an LCS. The laboratory performs an LCS at the above-mentioned frequency as an evaluation of percent recovery in a blank matrix. The laboratory uses statistically derived control limits for the LCS.*

Unless otherwise specified by the client during project initiation, the LCSD will be used to measure precision only. The LCS will be used for evaluations for percent recovery and to determine if corrective action is necessary.

9.2) Instrument QC

The following instrument QC is performed:

QC Item	Frequency	Acceptance Criteria
Tune Standard (BFB)	Each Analytical Window	See Appendices
Initial Calibration (ICAL)	Initially; when ICV or CCV fail	See Appendices
Initial Calibration Verification (ICV)	Once, after each ICAL	See Appendices
RT Window Establishment	Once per ICAL	See Appendices

Relative Retention Time (RRT)	With each sample	See Appendices
Continuing Calibration Verification (CCV)	Daily, after each BFB	See Appendices

10) Procedure

10.1) Support Equipment Calibration

Verify the calibration is valid for the following;

- Mass flow controller used to prepare standards.
- Digital flow meter used to set and check the flow rates of the FC(s) used for sample collection.
- Digital pressure gauges used to check return canister pressure.
- Stopwatch used to measure standard addition time is current to the year.

Immediately notify the QA department if the calibration is not current and wait for further instruction. Equipment whose calibration has expired may not be used without documented approval from the QA department.

NOTE: *The QA department schedules the annual calibrations of the support equipment and maintains all Certificates of Calibration. The flow controllers are checked against a NIST traceable standard. This check is performed by the manufacturer of the equipment, when possible, or by an approved vendor that provides certification service.*

10.2) Instrument Calibration

All Calibration Standards and Quality Control samples have the same concentration of Internal Standards and Surrogates that are added for field sample analysis. Refer to the Analytical Sequence section for additional information.

10.2.1) Tune Standard

Analyze a tune standard (BFB) prior at the beginning of each analytical window. The tune standard is a commercially prepared mixed gas stock standard that includes Bromofluorobenzene (BFB) at a concentration of 100 ppbv.

To analyze the tune standard:

1. Establish the instrument operating conditions specified in the Sample Analysis section of this SOP. Once established these settings must be maintained for the analysis of all quality control and environmental samples.
2. Attach the mixed gas stock standard to the Entech concentrator by attaching the cylinder to the line dedicated for introduction of the internal standard (ISTD). The concentrator directly injects 20 mL of the 100 ppbv stock standard onto the instrument to yield an on-column concentration of 10 ppbv.
3. Acquire the data and evaluate the results against the acceptance criteria in the Tune Standard Criteria table in the appendix.
4. Criteria must be met prior to further analysis.
5. The official start time of the 24-hour analytical window is the injection time of a passing tune standard. All samples must be injected within 24 hours of that time.

NOTE: *The data processing system averages three scans (apex scan, scan prior, and scan following) and performs background subtraction of the single scan prior to the elution of BFB.*

10.2.2) Initial Calibration (ICAL)

The instrument must be calibrated with a minimum of five calibration standards for each target analyte at concentrations that span the working range of the method.

The laboratory routinely analyzes 8 standards at the recommended concentrations of 0.035, 0.20, 0.50, 5.0, 10.0, 15.0, 20 and 40 ppbv, except for Ethanol. For Ethanol, a 6-point curve is analyzed at the following concentrations: 5, 10, 15, 20, 40, and 100 ppbv.

Note: *These are nominal concentrations, dependent on parent can stock concentrations. The nominal 0.035 ppbv concentration is prepared to ensure the actual low calibration standard is below the reporting limit (RL).*

Even though eight calibration standards are routinely analyzed not every calibration standard is used for each analyte. Each analyte has been assigned to an analyte group that includes a calibration range of at least five standards. The analyte group associations for each target analyte are provided in Tables in the appendix. The calibration range for each analyte group is as follows:

- Group A: This analyte group is associated with a seven-point calibration curve. The calibration range is 0.20 to 40 ppbv with the 0.035 ppbv standard excluded. The limit of quantitation (LOQ) for this group of analytes is 0.20 ppbv

- Group B: This analyte group is associated with a six-point calibration curve. The calibration range is 0.50 to 40 ppbv with the 0.04 and 0.20ppbv standards excluded. The limit of quantitation (LOQ) for this group of analytes is 0.50 ppbv.

- Group C: This analyte group is associated with a five-point calibration curve. The calibration range is 5.0 to 40 ppbv with the 0.04, 0.20, and 0.50ppbv standards excluded. The limit of quantitation (LOQ) for this group of analytes is 5.0 ppbv.

- Group D: This analyte group is an eight-point calibration curve. The calibration range is 0.035 to 40 ppbv. The limit of quantitation (LOQ) for this group of analytes is 0.035 ppbv.

- Group E: (Ethanol): This analyte has a six-point calibration curve. The calibration range is 5 to 100 ppbv. The limit of quantitation (LOQ) for this analyte is 5 ppbv.

Prepare the calibration standards using the formulations provided in Appendix B.

Analyze the standards in a sequence from lowest to highest concentration using the instructions provided in the Sample Analysis section.

10.2.2.1) Initial Calibration Acceptance Criteria

The data processing system calculates a relative response factor (RRF), for each analyte and isomer pair using the assigned internal standard. The internal standard associations for each target analyte are provided in tables in the Appendix. The data processing system also calculates a mean relative response factor, relative standard deviation (RSD), relative retention time (RRT) and the mean RRT.

The following criteria must be met for a calibration to be considered acceptable:

- The RSD for each target analyte must be <30% with at most 2 exceptions up to a limit of 40%. If linear regression is used the R2 must be greater than 0.996

- The area response for the primary quantitation ion for the internal standard for each ICAL standard must be within 40% of the mean area response over the calibration range for each internal standard.

    - The RRT for each target compound at each calibration level must be within 0.06 RRT units of the mean RRT for the compound. The retention time shift for each of the internal standards at each calibration level must be within 20 seconds of the mean retention time over the initial calibration range for each internal standard.

If these criteria are not met inspect the system for problems and perform corrective action. See the corrective action section and the QC Summary Table in the appendix for guidance.

Whichever calibration model is selected, it must be subjected to an additional check to establish the representativeness of the data that were used to produce it. This check is the refitting of each calibration point response back to the calibration model, or the comparison of the calculated amount of the standard against the expected amount.

Calculate the concentration of each calibration standard from the final calibration curve. Calculate the %Error for each point. All points must have an absolute %Error of < 30%, except the low point % Error must be < 50%.

If these conditions are not met, perform corrective action and recalibrate the instrument.

The laboratory CHROM software provides an Initial Calibration %Drift report which shows the % Error for each calibration point. This report must be reviewed in addition to the %RSD / Linear Response Factor.
%Error is the absolute value of the difference between the calculated concentration and the true concentration divided by the true concentration x100%.

- For example, if the 0.20mg/L standard reads back as 0.17mg/L:
  $[(0.20 - 0.17)/0.20] \times 100\% = 15\%$

Repeat initial calibration whenever instrument operating conditions are changed, a new column is installed, when significant instrument maintenance has been performed, and when the result of the CCV indicate the calibration is no longer valid.

10.2.3) Second Source Calibration Verification (ICV)

Immediately following an acceptable initial calibration verify the accuracy of the calibration by the analysis of the second source calibration verification standard (ICV).

Prepare the ICV following the formulation provided in the Appendix.

Analyze the ICV following the instructions provided in Sample Analysis section.

The percent recovery (%R) for each target analyte must be within 70-130%. If criteria are not met, perform corrective action. Recommended corrective actions are provided in QC Summary Table. If corrective action is not successful, remake your standards and recalibrate.

If after successful analysis of the ICV, time remains in the 24-hour analytical window, QC and field samples may be analyzed without analysis of a continuing calibration verification check standard. If time does not remain in the analytical window, a new analytical sequence must be initiated with a Tune Standard followed by daily calibration (CCV).

10.2.4) Continuing Calibration Verification (CCV)

Analyze the CCV immediately after the tune standard unless the analytical window includes ICAL, in which case, a CCV is not required.

Prepare the CCV standard using the formulation given in the Appendix. The recommended concentration of the CCV for each target analyte is 10.0 ppbv.

Analyze the CCV following the instructions provided in Sample Analysis section. The data system calculates a response factor for each analyte and calculates the percent difference (%D) of the RRF relative to the mean RRF in the most recent initial calibration.

- The %D for each target analyte must be within ±30%. If the above criteria are not met, repeat the analysis of the CCV once. If the second CCV meets criteria, continue with the analytical sequence. If it fails, evaluate the data to determine if one of the following conditions is met. If these conditions are not met corrective action must be taken. Guidance for troubleshooting is provided in the Troubleshooting and Corrective Action sections. After corrective action the analytical sequence may be continued only if two immediate, consecutive CCVs at different concentrations are within acceptance criteria. If these two CCVs do not meet the criteria, recalibration is required prior to further analysis.

- If the CCV criteria are exceeded high, indicating a high bias, and the associated samples have non-detects for those analytes, the analytical data may be considered usable. In the absence of instructions otherwise, proceed with analysis.

- If the CCV criteria are exceeded low, indicating a low bias, analytical results may be reported if those results exceed the project's regulatory decision level. In other words, if the analytical results are sufficiently high to counter the low bias, results may be reported. Consult with the project manager to determine if the exception is allowable for each project.

10.2.5) Troubleshooting

Check the following items in case of calibration failures:

- Loss of sensitivity or unstable ISTD recoveries are usually the result of a leak. Check the union between the GC column and Entech transfer line.
- Loss of sensitivity for individual compounds may be a result of either an active site in a transfer line or a bad trap. Troubleshoot and perform maintenance as necessary.
- Poor chromatography usually requires GC column maintenance, perform as necessary.
- Carryover is usually caused by excessive amounts of analyte introduced to the system. Analyze blanks until the system is cleaned or replace the traps and transfer lines if necessary.

10.3) Sample Preparation

10.3.1) Post Sampling Canister Pressure Check Procedure

The post-sampling canister pressure check is performed at the time of sample login by sample management staff so that any problems found are quickly identified and communicated to the client.

Refer to the current version of *SOP49959 Sample Management* for the procedure to take and record the post sampling canister pressure check.

10.3.2) Sample Screening

At the laboratory's discretion unknown samples may be screened prior to initial analysis to determine if the sample requires dilution. Unless otherwise requested by the client the laboratory does not provide screen data with the data package report even when primary dilutions are performed based on the results of the screen analysis.

To prepare a sample for screen analysis, connect the sample canister to the autosampler connected to screening instrument and analyze 20 mL of sample. Acquire and evaluate the results. If the results of screen analysis indicate that a target compound is above its upper range of calibration, calculate a recommended dilution factor (DF) by dividing the concentration of analyte found by 30. Record the recommended DF on the screen worksheet.

NOTE: *Samples are screened on a GC/MS instrument that is programmed with the operating conditions referenced in this SOP. The calibration is checked weekly with a single point calibration standard at a concentration of 10 ppbv for all target analytes. The calibration is checked more frequently when the results of instrument analysis do not correlate well with the results of the screen analysis.*

10.3.3) Sample Dilutions & Pressure Adjustment

Field samples should be diluted prior to initial analysis when the screen results indicate that the concentrations are above calibration range or when the laboratory has sufficient knowledge of the sample (history) to know that the sample will require dilution. Field samples must be reanalyzed at a dilution when the concentration of target compounds in initial analysis exceed of the upper range of calibration.

When the return negative pressure of a canister is greater than -10” Hg, make-up gas may be added to provide sufficient volume of make-up gas in order to have an adequate sample volume for analysis. The addition of make-up gas is considered a canister dilution. Some concentrators are able to pull full sample volume even if the residual vacuum is lower than -10” Hg so make-up air may not be necessary.

For samples analyzed for constituent groups (e.g., TVOC as Toluene), ranges, and or unresolved complex mixtures (Total Hydrocarbons), samples must be diluted such that the maximum peak height of any sample constituent under consideration does not exceed the equivalent peak height generated by highest calibration level standard. For evaluation it may be useful to graphically overlay sample chromatograms with that of the high point calibration standard.
To dilute the sample:

1) Attach the sample canister to the nitrogen gas line equipped with a pressure gauge that reads negative pressure in (“Hg) and positive pressure in (psig).

2) Ensure the valve of the nitrogen gas line is closed then open the valve of the sample canister. Record the negative pressure reading in the Canister Dilution Worksheet or on the canister’s tag.

3) Slowly open the valve of the nitrogen gas line and fill the canister until canister pressure gauge reads -10” Hg. Do not open the valve to such an extent that the nitrogen gas line pressure drops below 15 psig and do not allow the nitrogen gas line to reach equilibrium otherwise you will contaminate the nitrogen gas line.

4) When the desired pressure is achieved, close the canister valve and the valve on the nitrogen gas line; wait 15 seconds. The pressure should not exceed 40 psig.

5) Open the canister valve and record the final pressure reading in psig.

6) Close the canister valve and remove the valve from the zero air-line.

7) Record the initial and final pressure readings in the TALS canister dilution tracking module. If the final pressure is below ambient, the pressure will be in “Hg. Be sure to change the units in the TALS dilution tracking module.

When the return pressure of a canister is positive, the pressure must be adjusted to near ambient (0” Hg) prior to analysis. To adjust the pressure to ambient, vent the canister to ambient in a fume hood by opening the canister value for ~4-5 seconds, close the valve. For higher pressure canisters, open the valve and listen for a release of air then close the valve when the sound recedes.

If a trip blank is provided under vacuum, pressurize the trip blank canister to 10 psig. The pressurization of the trip blank is not considered a dilution.

10.3.4) QC Sample Preparation

To prepare the method blank (MB): Fill a clean canister that has never been used to collect environmental samples and has never left the laboratory to 20 psig with nitrogen gas. Continue to use this canister as the MB until the pressure of the canister reaches 0 psig, at which time, recharge with nitrogen gas to 20 psig and reuse.

To prepare the LCS: Follow the instructions provided in the Appendix for preparation of the working ICV/LCS standard. If an LCSD is requested, analyze the LCSD from the same canister as the LCS, unless client makes a specific request for an independent LCSD can.

10.4) Sample Analysis

10.4.1) Instrument Operating Conditions

Optimize the GC and MS conditions for compound separation and sensitivity.

The recommended operating conditions are as follows:

Thermal Desorb:	Initial Trap #1 Temperature: -110ºC. Desorb Temperature from Trap #1 to #2: 0 ºC. Total Volume Transfer by Mass Flow Controller: 40 mL Initial Trap #2 Temperature: -15 ºC Desorb Temperature from Trap #2 to #3: 200ºC. Transfer time 3.5 minutes Initial Trap #3 Temperature: -165 ºC Injection Trap #3 Temperature: 70ºC Injection Time: 1.5 minutes Trap #3 Temperature after Injection: -165 ºC
Carrier Gas:	Helium, Ultra High Purity
Cryogenic Focusing Gas:	Liquid Nitrogen
Flow Rate:	~1.5 mL/min
Temperature Program:	Initial Temperature: 40ºC Initial Hold Time: 4 minutes Ramp1 Rate: 20ºC/min. to 200ºC. Ramp 2 Rate: 40ºC/min. to 220ºC Final Temperature: 220ºC Final Hold Time: 6.5 minutes
Electron Energy:	70 electron volts
Mass Range:	35-265 amu
Scan Time:	≥1 scan per second.

These operating conditions may be changed but once the operating conditions are established for initial calibration the same conditions must be used until a new calibration is performed.

The mass spec tune profile may be changed to optimize the BFB tune analysis but once set, it cannot be changed until another BFB tune is analyzed.

10.4.2) Daily Instrument Maintenance

Prior to analysis initiate the flushing sequence using the Entech software. Then initiate the bake program using the Entech software.

10.4.3) Bi-Weekly Instrument Maintenance

At a minimum frequency of once every two weeks, perform an autosampler leak check. Cap all autosampler ports and initiate the leak check program using the Entech software. Record this check in the instrument maintenance log.

10.4.4) Analytical Sequence

All Calibration Standards, batch QA and field samples, except for the BFB analysis, have 20mls of the Mixed Gas Stock Standard added in conjunction with any other additions. This addition adds the internal standards and surrogates.

An example analytical sequence that includes initial calibration (ICAL) is provided below. When ICAL is not performed, the sequence begins with the tune standard and is followed by the CCV, LCS, LCSD, and method blank. If sufficient time remains in the 24 hours analytical window after initial calibration, QC and field samples may be analyzed without the CCV and the ICV will serve as the LCS for the sequence. The MB, LCS and LSCD must be analyzed at a frequency of every 20 samples or with each analytical sequence whichever is more frequent.

1. Tune Standard (BFB)
2. ICAL
3. ICV
4. CCV
5. LCS (repeat every 20 samples)
6. LCSD (when requested)
7. MB (repeat every 20 samples)
8. Field Samples (including trip blanks)

Attach the canisters to the autosampler inlet in the order of the analytical sequence then initiate the analytical sequence. The autosampler introduces 200 mL of sample volume from each canister to the instrument system and adds 20 mL of the mixed gas

standard to each sample.

Acquire the data and evaluate the results to confirm qualitative identification and quantification.

10.5) Corrective Action

An out-of-control situation may occur that is not adequately addressed in the corrective action table or troubleshooting section. The analyst must use their best analytical judgment and available resources to determine the corrective action to be taken. The analyst should seek the assistance of their immediate supervisor, QA manager or other experienced staff if they are uncertain of the cause of the out-of-control situation.

The analysis must not be resumed until the source of the problem and an in-control status is re-established. All samples associated with the out-of-control situation must be reanalyzed after in-control status has been re-established.

If authorization is received from the Supervisor or QA Manager for release with data qualification, a Non-Conformance Memo (NCM) must be created to notify the project manager, who then notifies the client of the out-of-control situation. Also, the situation may be significant enough that the Supervisor or QA Manager would create a Corrective Action Report (CAR). Refer to the *SOP49967 Nonconformance and Corrective Action Procedures* for further guidance.

11) Calculations/Data Reduction

11.1) Qualitative Identification

The data processing system tentatively identifies target analytes by comparing the retention time of the peaks to the window set around the continuing calibration standard, and searches in that area for the primary ion and up to two secondary ions characteristic of the target analyte.

All tentative identifications made by the computer are reviewed and either accepted or rejected by the primary analyst. The identification made by the system is accepted when the following criteria are met:

- The target analyte is identified by comparison of its background subtracted mass spectrum to a reference spectrum in the NIST14 database. In general, all ions that are present above 10% relative abundance in the mass spectrum of the standard should be present in the mass spectrum of the sample component and their relative abundances should agree within 20%. For example, if an ion has a relative abundance of 30% in the standard spectrum, its abundance in the sample spectrum should be in the range of 10-50%. Some ions, particularly the molecular ion, are of special importance if a tentative identification is to be made and should be evaluated even if they are below 10% relative abundance.
- The GC retention time for the target analyte should be within 0.06 RRT units of the daily standard.

Identification requires expert judgment when sample components are not resolved chromatographically and produce mass spectra containing ions contributed by more than one analyte. When GC peaks obviously represent more than one sample component (i.e., broadened peak with shoulder(s) or valley between two or more maxima), appropriate analyte spectra and background spectra can be selected by examining plots of characteristic ions for tentatively identified components.

When analytes coelute (i.e., only one GC peak is apparent), the identification criteria can be met but each analyte spectrum will contain extraneous ions contributed by the coeluting compound. If the data system does not properly integrate a peak, perform manual integration. All manual integration must be performed and documented in accordance with corporate *SOP43862 Manual Integrations*.

11.2) Quantification of Target Analytes

After a compound has been identified, the data system quantifies the on-column concentration of the target compound based on the integrated abundance of the characteristic ion from the EICP. If there is matrix interference with the primary ion, a secondary ion may be used for quantification by calculating a mean RF factor for that ion and using that ion to quantify the analyte in the sample. When secondary ion calculations are required, include this information in the non-conformance report and project narrative.

Samples analyzed for constituent groups, ranges, and or unresolved complex mixtures are quantified as follows;

11.2.1) TVOC as Toluene

An internal standard type of quantification response factor is generated using the RIC peak response measured for Toluene and its associated internal standard (as detailed in the calculation section). That response factor is used to quantify all RIC chromatographic sample response with the exception of those peak responses associated with internal standards. The results are reported as 'TVOC (as Toluene)'.

Retention Time Range: Propene to Naphthalene

11.2.2) GRO as Octane

An internal standard type of quantification response factor is generated using the RIC peak response measured for Octane and its associated internal standard (as detailed in the calculation section). That response factor is used to quantify all RIC chromatographic sample response with the exception of those peak responses associated with internal standards that eluted within the retention time range as defined by the elution of 2-Methyl-Butane through Decane (C5-C10). The results are reported as 'GRO (as Octane).

Retention Time Range: 2-Methyl-Butane to n-Decane

11.2.3) Unresolved Complex mixtures

An internal standard type of quantification response factor is generated using the RIC peak response measured for the un-resolved complex mixture (i.e. the gasoline envelope) and its associated internal standard (as detailed in the calculation section). That response factor is used to quantify all similarly chromatographing RIC sample response with the exception of those peak responses associated with internal standards. The results are reported using the name of the unresolved complex mixture used in the calibration (e.g. Total Hydrocarbons).

Retention Time Range: Propene to Naphthalene

Final results are calculated in TALS

11.3) Calculations

Analytical results are calculated as follows:

Dilution Factor

DF = (V2/V1) x (V4/V3)

Where:
V1 = Pre-Dilution Canister Volume
V2 = Post-Dilution Canister Volume
V4 = Base Sample Amount (200 mL)

Relative Response Factor (RRF)

RRF = (Ax)(Cis)/(Ais)(Cx)

Where:
Ax = Area of the quantitation ion of the analyte
Ais = Area of the quantitation ion of the internal standard
Cx = Concentration of analyte in concentration units (ppbv)
Cis = Concentration of internal standard in concentration units (ppbv)

Sample Concentration

Cx = [(Ax)(Cis)/(Ais)(Mean RRF)] x (DF)

Where:
Cx = Compound concentration (ppbv)
Cis = Concentration of associated internal standard (ppbv)
Ais = Area of quantitation ion for associated internal standard
Ax = Area of quantitation ion for compound
DF = Dilution Factor
Mean RRF = Average Relative Response Factor from initial calibration.

Unit Conversion from ppbv to ugm3

Analytical Result(ug/m3) = Result(ppbv) x (MW/24.45)

Where:
MW = molecular Weight

Example:
Benzene Result = 56 ppbv
Benzene mw = 78.108

Analytical Result(ug/m3) = 56ppbv x (78.108/24.45)

Result(ug/m3) = 178.9 ug/m3 reported as 180 ug/m3

Percent Recovery (%R)

%R = (Cs/Cn) x 100

Where:
Cs = Concentration of the spiked sample (ppbv)
Cn = Nominal concentration of spike added (ppbv)

Precision (%RPD)

%RPD = [(|C1-C2|)/((C1+C2)/2) x 100

Where:
C1 = Measured concentration of the first sample aliquot
C2 = Measured concentration of the second sample aliquot

Formula of Standard Addition:

Volume (mL) = (FR x T) + 25 mL

Where:
FR = flow rate in mL/min
T= time in minutes

Example:
FR = 70ml/min
Time = 10.69 minutes
Volume = 25+ (70 x 10.69) = 773 mL

Total Volume of diluted standard

Volume (mL) = CV x P

Where:
CV = canister volume in mL
P = pressure in Bar (14.7psi per Bar)

Example:
CV = 6185 mL
P= 2.5 Bar
Volume = 15462 mL

11.4) Data Review

11.4.1) Primary Review (Performed by Primary Analyst)

Upload the data files to TALS. Enter batch editor information and add the standards and reagents to the TALS batch. Review the results against acceptance criteria. If acceptance criteria are not met, make arrangements to perform corrective action.

Check the results of samples analyzed immediately after high concentration samples for signs of carry-over. Reanalyze the sample if carry over is suspected.

Dilute and reanalyze samples whose results exceed the calibration range. The diluted analysis should result in a determination within the upper half of the calibration curve.

If samples are run at dilution, there should be a target peak that is at least 20% of the calibrated range but preferably in the upper half of the range or there should be an abundance of TICs which preclude a more concentrated analysis, or the sample should show matrix effects which preclude a more concentrated analysis. If a sample is diluted due to TICs or matrix, an NCM should be written explaining the reason for dilution.

Set results to primary, secondary, acceptable or rejected as appropriate.

Verify corrective action was taken for all results not within acceptance criteria. If corrective action is not taken or was unsuccessful, record all instances where criteria are not met with a nonconformance memo (NCM). Be sure to provide

explanation of your decision making in the internal comment section of the NCM. The internal comment section should list the reason the NCM is suspected, which action (if any) was taken and why, and the outcome of the action taken. Refer to the *SOP49967 Nonconformance and Corrective Action Procedures* for further guidance.

Review project documents such as the Project Plan (PP), Project Memo or any other document/process used to communicate project requirements to ensure those project requirements were met. If project requirements were not met, immediately notify the project manager (PM) to determine an appropriate course of action.

Review that QC links have been properly made and run the data review checker (DRC) and address any anomalies.

Set the batch to 1st level review and record your review on the data review checklist.

11.4.2) Secondary Review (Performed by Peer Reviewer)

Review the project documents such as the Project Plan (PP), Project Memo or any other document/process used to communicate project requirements and verify project requirements were met. If project requirements were not met, immediately notify the project manager (PM) to determine an appropriate course of action.

Review records (these records include but are not limited to the Pre-Shipment Clean Canister Certification Report, Flow Controller Set Flow Rate and Leak Check Record, Field Test Data Sheets, and the Air Canister Return Pressure Check Record) associated with release and return of air sampling equipment to ensure all anomalies are properly recorded. Compare any problems noted in these documents with the analytical results and record any findings in the narrative note program or otherwise communicate your findings to the PM for inclusion in the project narrative.

Review the TALS batch editor to verify information is complete. Review the batch to verify that the procedures in this SOP were followed. If discrepancy is found, resolve the discrepancy and verify any modifications to the SOP were approved and properly documented.

Spot-check 15% of samples in the batch to verify quantitative and qualitative identification. If the samples are being analyzed under DoD methods 100% of data must be checked during secondary review.

If manual integrations were performed:

- Review all integrations to verify that the integration meets the requirements for manual integration as specified in corporate SOP CA-Q-S-002. If an error is suspected or found, consult with the analyst that performed the integration and request correction or notify the Department Manager or QA Manager. Do not "fix" the integration. Reintegration by a secondary data reviewer must not be performed except in limited circumstances as approved by the department supervisor or other laboratory management. If those instances where the secondary reviewer performs the integration, this person is now considered the primary analyst and each integration performed by the secondary reviewer must be subsequently reviewed by a peer analyst or the department supervisor to verify the integration is consistent and compliant with the requirements specified in corporate SOP CA-Q-S-002.
- Check to ensure an appropriate technical reason code is provided for all manual integrations.

Verify that the performance criteria for the QC items listed in TO15 QC Summary & Recommended Corrective Action table in Appendix were met. If the results do not fall within the established limits, verify that corrective actions were performed. If corrective action was not performed; verify the reason is provided and that the situation is properly documented with an NCM. Set samples to 2nd level review. Record second level review on the data review checklist.

Run and review the deliverable. Fix any problems found. When complete set the method chain to lab complete and forward any paperwork to report/project management.

11.5) TO15 Poor Performing Analytes

NOTE: *Statistically derived limits will be no wider than 50-150%R for poor performing compounds.*

Compounds with a high boiling point which is beyond the range of typical gas compounds.

- Dodecane
- 1,2,4-Trichlorobenzene
- Hexachlorobutadiene
- Naphthalene
- 1,2,3-Trichlorobenzene

The following compounds change how they act on the traps depending on the humidity of the standard.

- 3-chloro-1-propene
- Bromoform

The following compounds are very polar and are linked to the water in the standard. Since we remove most of the water during the trapping process, a little change can produce a big result. For example removing 95% of the water instead of 94% of the water will have a negligible affect on non-polar compounds, but a 20% difference for polar compounds.

- Ethanol (made from neat material and is not part of the standard TO-15 calibration gas mix due to high reactivity
- Ethyl ether
- Acrolein
- Acetone
- Isopropyl alcohol
- 2-butanone
- Tetrahydrofuran
- 2-hexanone

11.6) Data Reporting

Report analytical results above the reporting limit (RL) as the value found. Report analytical results less than the RL, to the adjusted RL with a "U" data qualifier. If the data is to be reported to the method detection limit (MDL) the analytical results between the RL and the MDL are reported with an "estimated" footnote. Adjust the RL and MDL for sample dilution/concentration. The unadjusted RL for each target analyte is provided in Routine Compound List and TO-3 Analyte List tables. For Method TO3 the laboratory does not report values below the reporting limit.

Data reporting and creation of the data deliverable is performed by TALS using the formatters set by the project manager during project initiation.

Electronic and hardcopy data are maintained as described in laboratory *SOP49966 Management, Retention Storage and Archive of Data Records*.

12) Method Performance

12.1) Method Detection Limit Study (MDL)

Perform a method detection limit (MDL) study at initial method set-up following the procedures specified in laboratory SOP BR-QA-005,

12.2) Training Requirements and Demonstration of Capabilities

The Group Leader is responsible for ensuring that this procedure is performed by an associate who has been properly trained in its use and has the required experience. The Group Leader is also responsible for the documentation of this training.

All personnel are required to perform an initial demonstration of proficiency (IDOC) on the portion of the method they will be performing prior to working independently. Annually thereafter, the analyst must document continuing demonstration of capability (CDOC). See requirements for demonstration of analyst proficiency in *SOP52264 Employee Training and Analyst Demonstration of Proficiency*.

13) Pollution Control

It is Eurofins Burlington's policy to evaluate each method and look for opportunities to minimize waste generated (i.e., examine recycling options, ordering chemicals based on quantity needed, preparation of reagents based on anticipated usage and reagent stability). Employees must abide by the policies in NDSC-USEHS-*QP46060 NDSC HSE Manual*.

14) Waste Management

Waste management practices are conducted consistent with all applicable rules and regulations. Excess reagents, samples and method process wastes are disposed of in an accepted manner. Waste description rules and land disposal restrictions are followed. Waste disposal procedures are incorporated by reference to *SOP47863 Tracking and Collecting of Hazardous Waste* and *SOP48269 Procedure for Acceptance and Handling of USDA Regulated Domestic and Foreign Soil*.

The following waste streams are produced when this method is carried out:

- None

15) Method Modifications

- This SOP utilizes and alternative detector (mass spectrometer) vs that of a FID and/or ECD as listed in the published method. (TO3)

- This SOP describes a method where an aliquot of a whole air sample collected in a passivated stainless-steel canister is cryogenically trapped and concentrated prior to injection into the MS detector equipped GC. (TO3)
- This Method SOP utilizes an RTX-624 capillary column (60M x 0.32 mm ID x 0.18um). (TO3, TO15)
- Additional quality control aspects are employed in the use of this method based on the alternative detector type, specifically, the detector tune is verified at the beginning of each period of analysis prior to the acquisition on any standard, blank, QC sample or field sample. (TO3)
- This Method SOP does not utilize sub ambient column oven temperature programming. (TO3, TO15)
- Sample traps consist of a multi bed system employing Tenax and glass beads (see manufactures system description: Entech Model 7100 Sample Pre-Concentrator). (TO15)
- Sampling apparatus consists of passivated stainless-steel canister specifically design for the collection of ambient air samples for volatile analysis (TO3)
- Nafion dryers are not used. The analytical pre-concentration system employs a moisture control system consisting of multi sorbent bed traps. (TO15)
- System calibration is verified every 24 hours within which samples are analyzed. System linearity is not verified every 4-6 hours as described. (TO3)
- Published Method requires weekly multi-point calibration be performed. Laboratory performs multi-point calibrations as necessary see section 10.2 (TO3)
- System linearity is determined through multi point calibration utilizing average response factors and internal standard technique quantification (see Section 10).(TO3)
- This SOP is applied to more than just the ambient air listed as a matrix by the method (TO15)

16) Appendices

16.1) Routine Compound List, Reporting Limit, Internal Standard and Ion Assignments

Analyte	CAS #	6L RL (ppbv)	1L RL (ppbv)	Quantifier Mass	Qualifier Mass	Qualifier Mass	ISTD Group	Analyte Group
Dichlorodifluoromethane	75-71-8	0.5	5	85	87		1	B
Chlorodifluoromethane	75-45-6	0.5	5	51	67	69	1	B
1,2-Dichlorotetrafluoroethane	76-14-2	0.2	2	85	135	87	1	A
Chloromethane	74-87-3	0.5	5	50	52		1	B
n-Butane	106-97-8	0.5	5	43	41	58	1	B
Vinyl Chloride	75-01-4	0.035	0.35	62	64		1	D
1,3-Butadiene	106-99-0	0.035	0.35	54			1	D
Bromomethane	74-83-9	0.2	2	94	96		1	A
Chloroethane	75-00-3	0.5	5	64	66		1	B
Isopentane	78-78-4	0.2	2	43	57	56	1	A
Bromoethene (Vinyl Bromide)	593-60-2	0.2	2	106	108	81	1	A
Trichlorofluoromethane	75-69-4	0.2	2	101	103		1	A
Pentane	109-66-0	0.5	5	43	57	56	1	B
EthylEther	60-29-7	0.2	2	59	45	74	1	A
Acrolein	107-02-8	5	50	56	55	37	1	C
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	0.2	2	101	151	103	1	A
1,1-Dichloroethene	75-35-4	0.035	0.35	96	161	63	1	A
Acetone	67-64-1	5	50	43	58		1	C
Isopropyl Alcohol	67-63-0	5	50	45	43		1	C
Carbon Disulfide	75-15-0	0.5	5	76			1	B
3-Chloropropene (Allyl Chloride)	107-05-1	0.5	5	41	76		1	B
Acetonitrile	75-05-8	5	50	41	40	39	1	C
Methylene Chloride	75-09-2	0.5	5	49	84	86	1	B
tert-Butyl Alcohol	75-65-0	5	50	59	41	43	1	C
Methyl tert-Butyl Ether	1634-04-4	0.5	5	73	43		1	B
trans-1,2-Dichloroethene	156-60-5	0.2	2	61	96		1	A
n-Hexane	110-54-3	0.2	2	57	86		1	B
1,1-Dichloroethane	75-34-3	0.035	0.35	63	65	83	1	A
Methyl Ethyl Ketone	78-93-3	0.5	5	72	43		1	B
cis-1,2-Dichloroethene	156-59-2	0.035	0.35	96	98	83	1	A
Tetrahydrofuran	109-99-9	5	50	42	72		2	C
Chloroform	67-66-3	0.2	2	83	85		1	A

1,1,1-Trichloroethane	71-55-6	0.2	2	97	99	61	2	A
Cyclohexane	110-82-7	0.2	2	84	56		2	A
Carbon Tetrachloride	56-23-5	0.035	0.35	117	119		2	D
2,2,4-Trimethylpentane	540-84-1	0.2	2	57	41	43	2	A
1,2-Dichloroethene (total)	540-59-0	0.2	2	61	96		1	A
Benzene	71-43-2	0.2	2	78	77		2	A
1,2-Dichloroethane	107-06-2	0.2	2	62	98		2	A
n-Heptane	142-82-5	0.2	2	43	71		2	A
Trichloroethene	79-01-6	0.035	0.35	95	130	132	2	D
Methyl Methacrylate	80-62-6	0.5	56	69	41	39	2	B
1,2-Dichloropropane	78-87-5	0.2	2	63	41		2	A
1,4-Dioxane	123-91-1	5	50	88	58		2	C
Dibromomethane	74-95-3	0.2	2	174	93	172	2	A
Bromodichloromethane	75-27-4	0.2	2	83	85		2	A
cis-1,3-Dichloropropene	10061-01-5	0.2	2	75	110		2	A
Methyl Isobutyl Ketone	108-10-1	0.5	5	43	58		2	B
n-Octane	111-65-9	0.2	2	43	57	114	2	A
Toluene	108-88-3	0.2	2	92	91		3	A
trans-1,3-Dichloropropene	10061-02-6	0.2	2	75	110		2	A
1,1,2-Trichloroethane	79-00-5	0.2	2	83	97	85	3	A
Tetrachloroethene	127-18-4	0.035	0.35	166	168	129	3	D
Methyl Butyl Ketone	591-78-6	0.5	5	43	58		3	B
Dibromochloromethane	124-48-1	0.2	2	129	127		3	A
1,2-Dibromoethane	106-93-4	0.2	2	107	109		3	A
Nonane	111-84-2	0.2	2	57	71	128	3	A
Chlorobenzene	108-90-7	0.2	2	112	77	114	3	A
Ethylbenzene	100-41-4	0.2	2	91	106		3	A
Xylene (m,p)	1330-20-7	0.5	5	106	91		3	A
Xylene (o)	95-47-6	0.2	2	106	91		3	A
Styrene	100-42-5	0.2	2	104	78		3	A
Bromoform	75-25-2	0.2	2	173	175	171	3	A
Cumene	98-82-8	0.2	2	105	120	77	3	A
1,1,2,2-Tetrachloroethane	79-34-5	0.2	2	83	131	85	3	A
Xylene (total)	1330-20-7	0.2	2	106	91		3	A
n-Decane	124-18-5	0.5	5	57	71	142	3	B
n-Propylbenzene	103-65-1	0.2	2	91	120	92	3	A
1,2,3-Trichoropropane	96-18-4	0.5	5	75	110	112	3	B
4-Ethyltoluene	622-96-8	0.2	2	105	120		3	A
1,3,5-Trimethylbenzene	108-67-8	0.2	2	105	120		3	A
2-Chlorotoluene	95-49-8	0.2	2	91	63		3	A
tert-Butylbenzene	98-06-6	0.2	2	119	91	134	3	A
1,2,4-Trimethylbenzene	95-63-6	0.2	2	105	120		3	A
sec-Butylbenzene	135-98-8	0.2	2	105	134	91	3	A
4-Isopropyltoluene	99-87-6	0.2	2	119	134	91	3	A
1,3-Dichlorobenzene	541-73-1	0.2	2	146	111	148	3	A
1,4-Dichlorobenzene	106-46-7	0.2	2	146	111	148	3	A
n-Undecane	1120-21-4	5	50	57	71	156	3	C
Benzyl Chloride	100-44-7	0.2	2	91	126	65	3	A
n-Butylbenzene	104-51-8	0.2	2	91	134	92	3	A
1,2-Dichlorobenzene	95-50-1	0.2	2	146	111	148	3	A
n-Dodecane	112-40-3	5	50	57	71	170	3	C
1,2,4-Trichlorobenzene	120-82-1	0.5	5	180	182		3	B
1,3-Hexachlorobutadiene	87-68-3	0.2	2	225	223		3	A
Naphthalene	91-20-3	0.5	5	128			3	B
1,2,3-Trichlorobenzene	87-61-6	0.2	2	180	182	145	3	A
Propylene	115-07-1	5	50	41	42	39	1	C

Vinyl Acetate	108-05-4	5	50	43	86		1	C
Ethyl Acetate	141-78-6	5	50	43	74		1	C
Ethanol	64-17-5	5	50	46	45		1	E
Bromochloromethane	74-97-5	NA	NA	128	49	130	1	NA
1,4-Difluorobenzene	540-36-3	NA	NA	114			2	NA
Chlorobenzene-d5	3114-55-4	NA	NA	117			3	NA

16.2) TO-3 Analyte List, Reporting Limit, Internal Standard and Ion Assignments

Analyte	CAS No.	RL (ppbv)	Qualifier Ion	Qualifier Ion	Qualifier Ion	ISTD Group
n-Octane	111-65-9	0.2	43	57	114	2
Toluene	108-88-3	0.2	92	91		3
TVOC as Toluene	NA	11				NA
GRO as Octane	NA	14				NA
Total Hydrocarbons	NA	76 ug/m3				NA
Internal Standards						
Bromochloromethane	74-97-5	NA	128	49	130	1
1,4-Difluorobenzene	540-36-3	NA	114			2
Chlorobenzene-d5	3114-55-4	NA	117			3

16.3) Tune Standard Criteria

Mass	Ion Abundance Criteria
50	8.0 to 40.0 percent of mass 95
75	30.0 to 66.0 percent of mass 95
95	Base Peak, 100 percent relative abundance
96	5.0 to 9.0 percent of mass 95
173	Less than 2.0 percent of mass 174
174	50.0 to 120.0 percent of mass 95
175	4.0 to 9.0 percent of mass 174
176	93.0 to 101.0 percent of mass 174
177	5.0 to 9.0 percent of mass 176

16.4) QC Summary & Recommended Corrective Action (Routine and DoD)

QC Check	Frequency	Acceptance Criteria	Recommended Corrective Action
Tune Standard	Prior to calibration and every 24 hours	See Tune Standard Criteria table	Correct Problem. Reanalyze. No samples may be analyzed without a valid tune.
Initial Calibration	Prior to sample analysis and when CCV fails	RSD for each analyte ≤ 30% with 2 exceptions up to 40% (if allowed). Individual Calibration points: < 30% Error, except < 50% for the lowest calibration point	Correct problem and repeat calibration

RRT	With each calibration	RRT of each target analyte in each calibration standard within ± 0.006 RRT units	Correct Problem. Repeat ICAL
ICV	Once after each ICAL	%R 70-130 for all analytes	Correct Problem. Reanalyze, re-make, re-verify & re-analyze. If that fails, re-make all standards and repeat calibration
CCV	Daily before sample analysis after tune standard	%Difference ≤ 30	Correct Problem. Reanalyze once. If that fails, see Section 10.3.9 for instruction.
LCS	Each batch or every 20 samples, whichever is sooner.	%Recovery 70-130%	Reanalyze LCS, re-prep and reanalyze LCS, and all associated samples if sufficient sample volume is available. If corrective action not successful, initiate nonconformance report and qualify sample results.
LCSD	Each batch or every 20 samples, only if there is no Sample Duplicate, or per client request	Relative Percent Difference (RPD) ≤ 25%	Reanalyze LCSD, re-prep and reanalyze LCS, LCSD and all associated samples if sufficient sample volume is available. If corrective action not successful, initiate nonconformance report and qualify sample results.
Method Blank	Each batch or every 20 samples, whichever is sooner.	< Reporting Limit	Reanalyze along with associated samples, unless detects for same compounds found in blank are greater than 10X the concentration found in the blank.
Internal Standards	All standards, field and QC samples	+/- 40% area response from last acceptable calibration. RT +/- 0.33 min (20 seconds) from last acceptable calibration.	Inspect system for malfunction. Reanalyze samples. Qualify data.
Sample Duplicate	Each batch or every 20 samples, if volume allows	Relative Percent Difference (RPD) ≤ 25%	Consult with PM. Reanalyze or qualify data.

16.5) In-house LCS limits

Analyte	CAS #	In-House Lower Limit (%R)	In-House Upper Limit (%R)	Relative Percent Difference (%)
Dichlorodifluoromethane	75-71-8	61	142	25
Chlorodifluoromethane	75-45-6	60	147	25
1,2-Dichloro-1,1,2,2-tetrafluoroethane	76-14-2	71	141	25
Chloromethane	74-87-3	56	141	25
n-Butane	106-97-8	53	151	25
Vinyl Chloride	75-01-4	61	135	25
1,3-Butadiene	106-99-0	58	139	25
Bromomethane	74-83-9	72	124	25
Chloroethane	75-00-3	68	130	25
Isopentane	78-78-4	56	150	25
Bromoethene (Vinyl Bromide)	593-60-2	75	125	25
Trichlorofluoromethane	75-69-4	70	129	25
Pentane	109-66-0	59	152	25
EthylEther	60-29-7	71	143	25
Acrolein	107-02-8	50*	150*	25
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	70	121	25
1,1-Dichloroethene	75-35-4	68	120	25
Acetone	67-64-1	54	154	25
Isopropyl Alcohol	67-63-0	53	142	25
Carbon Disulfide	75-15-0	71	138	25
3-Chloropropene (Allyl Chloride)	107-05-1	50*	150*	25

Acetonitrile	75-05-8	60	154	25
Methylene Chloride	75-09-2	59	137	25
tert-Butyl Alcohol	75-65-0	66	132	25
Methyl tert-Butyl Ether	1634-04-4	70	127	25
trans-1,2-Dichloroethene	156-60-5	69	137	25
n-Hexane	110-54-3	63	138	25
1,1-Dichloroethane	75-34-3	66	130	25
Methyl Ethyl Ketone	78-93-3	72	124	25
cis-1,2-Dichloroethene	156-59-2	72	121	25
Tetrahydrofuran	109-99-9	60	149	25
Chloroform	67-66-3	73	124	25
1,1,1-Trichloroethane	71-55-6	72	127	25
Cyclohexane	110-82-7	76	124	25
Carbon Tetrachloride	56-23-5	71	133	25
2,2,4-Trimethylpentane	540-84-1	68	131	25
1,2-Dichloroethene (total)	540-59-0	73	126	25
Benzene	71-43-2	73	119	25
1,2-Dichloroethane	107-06-2	68	135	25
n-Heptane	142-82-5	60	142	25
Trichloroethene	79-01-6	73	122	25
Methyl Methacrylate	80-62-6	73	129	25
1,2-Dichloropropane	78-87-5	69	128	25
1,4-Dioxane	123-91-1	66	129	25
Dibromomethane	74-95-3	68	126	25
Bromodichloromethane	75-27-4	75	127	25
cis-1,3-Dichloropropene	10061-01-5	74	125	25
Methyl Isobutyl Ketone	108-10-1	58	144	25
n-Octane	111-65-9	62	144	25
Toluene	108-88-3	75	122	25
trans-1,3-Dichloropropene	10061-02-6	74	128	25
1,1,2-Trichloroethane	79-00-5	75	126	25
Tetrachloroethene	127-18-4	70	125	25
Methyl Butyl Ketone	591-78-6	57	143	25
Dibromochloromethane	124-48-1	73	125	25
1,2-Dibromoethane	106-93-4	78	122	25
Nonane	111-84-2	70	131	25
Chlorobenzene	108-90-7	76	119	25
Ethylbenzene	100-41-4	74	122	25
Xylene (m,p)	1330-20-7	76	121	25
Xylene (o)	95-47-6	73	123	25
Styrene	100-42-5	74	125	25
Bromoform	75-25-2	53	149	25
Cumene	98-82-8	73	123	25
1,1,2,2-Tetrachloroethane	79-34-5	74	126	25
Xylene (total)	1330-20-7	75	122	25
n-Decane	124-18-5	68	134	25
n-Propylbenzene	103-65-1	73	127	25
1,2,3-Trichoropropane	96-18-4	71	125	25
4-Ethyltoluene	622-96-8	75	129	25
1,3,5-Trimethylbenzene	108-67-8	72	126	25
2-Chlorotoluene	95-49-8	74	126	25
tert-Butylbenzene	98-06-6	71	125	25
1,2,4-Trimethylbenzene	95-63-6	71	129	25
sec-Butylbenzene	135-98-8	70	128	25
4-Isopropyltoluene	99-87-6	68	130	25
1,3-Dichlorobenzene	541-73-1	69	131	25
1,4-Dichlorobenzene	106-46-7	67	132	25
n-Undecane	1120-21-4	62	136	25
Benzyl Chloride	100-44-7	60	136	25
n-Butylbenzene	104-51-8	65	137	25

1,2-Dichlorobenzene	95-50-1	68	129	25
n-Dodecane	112-40-3	50*	150*	25
1,2,4-Trichlorobenzene	120-82-1	50*	150*	25
1,3-Hexachlorobutadiene	87-68-3	58	130	25
Naphthalene	91-20-3	50*	150*	25
1,2,3-Trichlorobenzene	87-61-6	50*	150*	25
Propylene	115-07-1	50*	150*	25
Vinyl Acetate	108-05-4	59	149	25
Ethyl Acetate	141-78-6	70	131	25
Ethanol	64-17-5	50*	150*	25

*These are poor performing compounds. Limits for poor performing compounds will be no wider than 50-150%.
**The limits in this table are those in effect as of the published date of this SOP. These limits are based on historical data and are subject to change. Current in-house limits are populated in the LIMS database. Contact a laboratory representative for the most current set of limits. Limit Ref: 2019CCTO15

16.6) Appendix A: Terms and Definitions

Acceptance Criteria: Specified limits placed on characteristics of an item, process or service defined in requirement documents.
Accuracy: The degree of agreement between an observed value and an accepted reference value. Accuracy includes a combination of random error (precision) and systematic error (bias) components which are due to sampling and analytical operations; a data quality indicator.
Analyte: The specific chemicals or components for which a sample is analyzed. (EPA Risk Assessment Guide for Superfund, OSHA Glossary).
Batch: Environmental samples that are prepared and/or analyzed together with the same process, using the same lot(s) of reagents. A preparation/digestion batch is composed of one to 20 environmental samples of similar matrix, meeting the above criteria. An analytical batch is composed of prepared environmental samples (extracts, digestates and concentrates), which are analyzed together as a group.
Calibration: a set of operations that establish, under specified conditions, the relationship between values of quantities indicated by a measuring instrument or measuring system, or values represented by a material measure or a reference material and the corresponding values realized by the standards.
Calibration Curve: the graphical relationship between the known values or a series of calibration standards and their instrument response.
Calibration Standard: A substance or reference used to calibrate an instrument.
Continuing Calibration Verification (CCV): An analytical standard gas mixture containing all target analytes and internal standard compounds that is used to evaluate the performance of the instrument system with respect to a defined set of method criteria.
Corrective Action: the action taken to eliminate the cause of an existing nonconformity, defect or other undesirable occurrence in order to prevent recurrence.
Cryogen: A refrigerant used to obtain very low temperatures in the cryogenic trap of the analytical system. A typical cryogen is liquid nitrogen (bp -195.8°C) or liquid argon (bp -185.7°C).
Demonstration of Capability (DOC): procedure to establish the ability to generate acceptable accuracy and precision.
Holding Time: the maximum time that a sample may be held before preparation and/or analysis as promulgated by regulation or as specified in a test method.
Initial Calibration: Analysis of analytical standards for a series of different specified concentrations used to define the quantitative response, linearity and dynamic range of the instrument to target analytes.
Initial Calibration Verification (ICV): An analytical standard mixture containing all target analytes and internal standard compounds that are prepared from a source independent of the source of the initial calibration standards. The purpose of the ICV is to verify that the initial calibration is in control.
Intermediate Standard: a solution made from one or more stock standards at a concentration between the stock and working standard. Intermediate standards may be certified stock standard solutions purchased from a vendor and are also known as secondary standards.
Internal Standards (IS): Non-target analytes that are similar to the target analytes but are not expected to be found in environmental media (generally, isotopically labeled target analytes are used for this purpose). IS are added to every standard, quality control sample, and field sample at a known concentration prior to analysis. IS responses are used as the basis for quantitation of target analytes.
Laboratory Control Sample (LCS): A QC sample of known composition spiked with analytes of interest. The LCS evaluates method performance and ability to successfully recover target analytes from a clean matrix. LCS recovery is typically expressed as percent recovery and provides a measure of accuracy. A LCSD is a duplicate LCS prepared and analyzed from a separate canister to provide a measure of replicate precision.
Method Blank (MB): A canister of humidified ultra pure zero air that is treated exactly as a sample. The MBLK is used to determine if method analytes or other interferences are present in the laboratory environment, the reagents, or the apparatus.
Method Detection Limit (MDL): the minimum amount of a substance that can be measured with a specified degree of confidence that the amount is greater than zero using a specific measurement system. The MDL is a statistical estimation at a specified confidence interval of the concentration at which relative uncertainty is ±100%. The MDL represents a range where qualitative detection occurs. Quantitative results are not produced in this range.
Non-conformance: an indication, judgment, or state of not having met the requirements of the relevant specification, contract or regulation.

Precision: the degree to which a set of observations or measurements of the same property, obtained under similar conditions, conform to themselves.
Quality Control Sample (QC): a sample used to assess the performance of all or a portion of the measurement system.
Reporting Limit (RL): the level to which data is reported for a specific test method and/or sample.
Stock Gas Mixture: A Commercially purchased concentrated gas mixture containing one or more method analytes

16.7) Appendix B: Standard Preparation Tables

The standard formulations contained in this appendix are recommended and are subject to change. If the concentration or volume of any of the stock standard changes, the standard preparation instructions must be adjusted accordingly. See laboratory *SOP52272 Traceability, Handling, and Storage of Standards and Reagents* for further guidance on the preparation of standard solutions.

Prepare all standards using the McMillan Company 80SD mass flow controller. Prepare the standard in zero air, demonstrated to be analyte free. Store the standard at ambient temperature. Unless otherwise specified, assign an expiration date of 30 days from date of preparation unless the parent standard expires earlier, in which case, use the earliest expiration date.

Intermediate Calibration Standard

Parent Standard	Vendor	Stock Standard Concentration (ppmv)	Volume Added (mL)	Final Volume (L)	Final Concentration (ppbv)
Custom Calibration Stock Standard	Spectra Gases Custom Made	1.0	7500	37.5	200

Prepare in 15 L Summa Canister. Expiration Period 3months
This standard contains all the target analytes listed in the Routine Compound Table.

Working Calibration Standards

Parent Standard	Calibration Standard	Parent Standard Concentration (ppbv)	Volume Added (mL)	Final Volume (L)	Final Concentration (ppbv)
Cal Standard 20 ppbv	Cal Standard 0.2 ppbv	20	155	15.46	0.2
Cal Standard 20 ppbv	Cal Standard 0.5 ppbv	20	386	15.46	0.5
Intermediate Calibration Standard	Cal Standard 5 ppbv	200	386	15.46	5
Intermediate Calibration Standard	Cal Standard 10 ppbv	200	773	15.46	10
Intermediate Calibration Standard	Cal Standard 15 ppbv	200	1160	15.46	15
Intermediate Calibration Standard	Cal Standard 20 ppbv	200	1546	15.46	20
Intermediate Calibration Standard	Cal Standard 40 ppbv	200	3092	15.46	40

Prepare in 6 L Summa Canister Expiration Period 3 months
Each calibration standard contains all the analytes listed in the Routine Compound Table at the above concentrations.

Intermediate ICV/LCS Standard

Parent Standard	Vendor	Stock Standard Concentration (ppmv)	Volume Added (mL)	Final Volume (L)	Final Concentration (ppbv)
ICV Stock Standard	Spectra Gases Custom Made	1.0	7500	37.5	200

Prepare in 15L Summa Canister Expiration period 3 months
This standard contains all target analytes listed in Routine Compound Table.

Working ICV/LCS Standard

Parent Standard	Calibration Standard	Stock Standard Concentration (ppbv)	Volume Added (mL)	Final Volume (L)	Final Concentration (ppbv)
Intermediate ICV/LCS Standard	ICV Standard 10 ppbv	200	773	15.46	10

Prepare in 6L Summa Canister Expiration period 3 months
This standard contains all target analytes listed in Routine Compound Table.

Calibration Level	Working Calibration Standard	Volume Analyzed (mL)	Concentration on Column (ppbv)
Calibration Level 1	Cal Standard 0.2 ppbv	40	0.04
Calibration Level 2	Cal Standard 0.2 ppbv	200	0.2

Calibration Level 3	Cal Standard 0.5 ppbv	200	0.5
Calibration Level 4	Cal Standard 5 ppbv	200	5
Calibration Level 5	Cal Standard 10 ppbv	200	10
Calibration Level 6	Cal Standard 15 ppbv	200	15
Calibration Level 7	Cal Standard 20 ppbv	200	20
Calibration Level 8	Cal Standard 40 ppbv	200	40
ICV	Intermediate ICV 10ppb	200	10

Prepare in 6L Summa Canister

Intermediate Ethanol Calibration Standard at 500ppbv/v

1. Fill a 44 ml VOA vial with VOA free water. Remove 197ul of water from the vial.
2. Add 197 ul of >99.5% Ethanol neat material
3. Cap and shake/roll vial for 1 minute
4. Inject 10ul of the prepared water/ethanol mix into a fully evacuated 15 liter summa canister
5. Pump the syringe plunger 5 times to insure complete transfer of material
6. Immediately fill the canister to 22 psig with zero air.

Calibration Level	Working Calibration Standard	Volume added (mL)	Concentration on Column (ppbv)
Calibration Level 1	Cal Standard 0.5 ppbv	124	5
Calibration Level 2	Cal Standard 5.0 ppbv	309	10
Calibration Level 3	Cal Standard 10ppbv	464	15
Calibration Level 4	Cal Standard 15 ppbv	618	20
Calibration Level 5	Cal Standard 20 ppbv	1237	40
Calibration Level 6	Cal Standard 40 ppbv	3092	100

DC-SOP49966 Management, Retention, Storage and Archive of Data Records
EHS-SOP47863 Tracking and Collecting of Hazardous Waste
EHS-SOP48269 Procedure for Acceptance and Handling of USDA Regulated Domestic and Foreign Soil
EHS-SOP49961 Burlington Laboratory Corporate Safety Manual Addendum and Contingency Plan
EQ-SOP48255 Canister Cleaning, Certification and Sampling Kit Preparation
EQ-SOP52272 Traceability, Handling, & Storage of Standards & Reagents
ML-SOP49965 Procedures for Control Charts, Trend Analysis and In-House Limits
NC-SOP49967 Nonconformance and Corrective Action Procedures
QA-QM52862 Quality Assurance Manual
SM-SOP49959 Sample Management
TR-SOP52264 Employee Training and Analyst Demonstration of Competence
NDSC-ETHC-SOP43862 Manual Integrations
NDSC-US-EHS-QP46060 NDSC HSE Manual

End of document

Version history

Version	Approval	Revision information	
14	03.FEB.2022		
15	21.APR.2023	Conversion to HTML format and full review	
16	29.JAN.2024	SOP Review & Update. Due to database migration, some review by analysts and approval by supervisors are documented outside of D4 in QA SOP directory.	

ATTACHMENT 3

Roux's Standard Operating Procedures

Date: May 5, 2000

1.0 PURPOSE

The purpose of this standard operating procedure (SOP) is to establish guidelines for sample handling which will allow consistent and accurate results. Valid chemistry data are integral to investigations that characterize media-quality conditions. Thus, this SOP is designed to ensure that once samples are collected, they are preserved, packed and delivered in a manner which will maintain sample integrity to as great an extent as possible. The procedures outlined are applicable to most sampling events and any required modifications must be clearly described in the work plan.

2.0 CONSIDERATIONS

Sample containers, sampling equipment decontamination, quality assurance/quality control (QA/QC), sample preservation, and sample handling are all components of this SOP.

2.1 Sample Containers

Prior to collection of a sample, considerations must be given to the type of container that will be used to store and transport the sample. The type and number of containers selected is usually based on factors such as sample matrix, potential contaminants to be encountered, analytical methods requested, and the laboratory's internal quality assurance requirements. In most cases, the overriding considerations will be the analytical methodology, or the state or federal regulatory requirements because these regulations generally encompass the other factors. The sample container selected is usually based on some combination of the following criteria:

a. Reactivity of Container Material with Sample

Choosing the proper composition of sample containers will help to ensure that the chemical and physical integrity of the sample is maintained. For sampling potentially hazardous material, glass is the recommended container type because it is chemically inert to most substances. Plastic containers are not recommended for most hazardous wastes because the potential exists for contaminants to adsorb to the surface of the plastic or for the plasticizer to leach into the sample.

In some instances, however, the sample characteristics or analytes of interest may dictate that plastic containers be used instead of glass. Because some metals species will adhere to the sides of the glass containers in an aqueous matrix, plastic bottles (e.g., nalgene) must be used for samples collected for metals analysis. A separate, plastic container should accompany glass containers if metals analysis is to be

performed along with other analyses. Likewise, other sample characteristics may dictate that glass cannot be used. For example, in the case of a strong alkali waste or hydrofluoric solution, plastic containers may be more suitable because glass containers may be etched by these compounds and create adsorptive sites on the container's surface.

b. Volume of the Container

The volume of sample to be collected will be dictated by the analysis being performed and the sample matrix. The laboratory must supply bottles of sufficient volume to perform the required analysis. In most cases, the methodology dictates the volume of sample material required to complete the analysis. However, individual laboratories may provide larger volume containers for various analytes to ensure sufficient quantities for duplicates or other QC checks.

To facilitate transfer of the sample from the sampler into the container and to minimize spillage and sample disturbance, wide-mouth containers are recommended. Aqueous volatile organic samples must be placed into 40-milliliter (ml) glass vials with polytetrafluoroethylene (PTFE) (e.g., TeflonTM) septums. Non-aqueous volatile organic samples should be collected in the same type of vials or in 4-ounce (oz) wide-mouth jars provided by the laboratory. These jars should have PTFE-lined screw caps.

c. Color of Container

Whenever possible, amber glass containers should be used to prevent photodegradation of the sample, except when samples are being collected for metals analysis. If amber containers are not available, then containers holding samples should be protected from light (i.e., place in cooler with ice immediately after filling).

d. Container Closures

Container closures must screw on and off the containers and form a leak-proof seal. Container caps must not be removed until the container is ready to be filled with the sample, and the container cap must be replaced (securely) immediately after filling it. Closures should be constructed of a material which is inert with respect to the sampled material, such as PTFE (e.g., TeflonTM). Alternately, the closure may be separated from the sample by a closure liner that is inert to the sample material such as PTFE sheeting. If soil or sediment samples are being collected, the threads of the container must be wiped clean with a dedicated paper towel or cloth so the cap can be threaded properly.

e. Decontamination of Sample Containers

Sample containers must be laboratory cleaned by the laboratory performing the analysis. The cleaning procedure is dictated by the specific analysis to be performed on the sample. Sample containers must be carefully examined to ensure that all containers appear clean. Do not mistake the preservative as unwanted residue. The bottles should not be field cleaned. If there is any question regarding the integrity of the bottle, then the laboratory must be contacted immediately and the bottle(s) replaced.

f. Sample Bottle Storage and Transport

No matter where the sample bottles are, whether at the laboratory waiting to be packed for shipment or in the field waiting to be filled with sample, care must be taken to avoid contamination. Sample shuttles or coolers, and sample bottles must be stored and transported in clean environments. Sample bottles and clean sampling equipment must never be stored near solvents, gasoline, or other equipment that is a potential source of cross-contamination. When under chain of custody, sample bottles must be secured in locked vehicles, and custody sealed in shuttles or in the presence of authorized personnel. Information which documents that proper storage and transport procedures have been followed must be included in the field notebook and on appropriate field forms.

2.2 Decontamination of Sampling Equipment

Proper decontamination of all re-usable sampling equipment is critical for all sampling episodes. The SOP for Decontamination of Field Equipment and SOPs for method-specific or instrument-specific tasks must also be referred to for guidance for decontamination of various types of equipment.

2.3 Quality Assurance/Quality Control Samples

QA/QC samples are intended to provide control over the proper collection and tracking of environmental measurements, and subsequent review, interpretation and validation of generated analytical data. The SOPs for Collection of Quality Control Samples, for Evaluation and Validation of Data, and for Field Record Keeping and Quality Assurance/Quality Control must be referred to for detailed guidance regarding these respective procedures. SOPs for method-specific or instrument-specific tasks must also be referred to for guidance for QA/QC procedures.

2.4 Sample Preservation Requirements

Certain analytical methodologies for specific analytes require chemical additives in order to stabilize and maintain sample integrity. Generally, this is accomplished under the following two scenarios:

a. Sample bottles are preserved at the laboratory prior to shipment into the field.

b. Preservatives are added in the field immediately after the samples are collected.

Many laboratories provide pre-preserved bottles as a matter of convenience and to help ensure that samples will be preserved immediately upon collection. A problem associated with this method arises if not enough sample could be collected, resulting in too much preservative in the sample. More commonly encountered problems with this method include the possibility of insufficient preservative provided to achieve the desired pH level or the need for additional preservation due to chemical reactions caused by the addition of sample liquids to pre-preserved bottles. The use of pre-preserved bottles is acceptable; however, field sampling teams must always be prepared to add additional preservatives to samples if the aforementioned situations occur. Furthermore, care must be exercised not to overfill sample bottles containing preservatives to prevent the sample and preservative from spilling and therefore diluting the preservative (i.e., not having enough preservative for the volume of sample).

When samples are preserved after collection, special care must be taken. The transportation and handling of concentrated acids in the field requires additional preparation and adherence to appropriate preservation procedures. All preservation acids used in the field should be trace-metal or higher-grade.

2.5 Sample Handling

After the proper sample bottles have been received under chain-of-custody, properly decontaminated equipment has been used to collect the sample, and appropriate preservatives have been added to maintain sample integrity, the final step for the field personnel is checking the sample bottles prior to proper packing and delivery of the samples to the laboratory.

All samples should be organized and the labels checked for accuracy. The caps should be checked for tightness and any 40-ml volatile organic compound (VOC) bottles must be checked for bubbles. Each sample bottle must be placed in an individual "zip-lock" bag to protect the label, and placed on ice. The bottles must be carefully packed to prevent breakage during transport. When several bottles have been collected for an individual sample, they should not be placed adjacent to each other in the cooler to prevent possible breakage of all bottles for a given sample. If there are any samples which are known or suspected to be highly contaminated, these should be placed in an individual cooler under separate chain-of-custody to prevent possible cross contamination. Sufficient ice (wet or blue packs) should be placed in the cooler to maintain the temperature at 4 degrees Celsius (°C) until delivery at the laboratory. Consult the work plan to determine if a particular ice is specified as the preservation for transportation (e.g., the United States Environmental Protection Agency does not like the use of

blue packs because they claim that the samples will not hold at 4°C). Blue ice packs will not be used to transport samples being analyzed for Per- and Polyfluoroalkyl Substances (PFAS). If additional coolers are required, then they should be purchased. The chain-of-custody form should be properly completed, placed in a "zip-lock" bag, and placed in the cooler. One copy must be maintained for the project files. The cooler should be sealed with packing tape and a custody seal. The custody seal number should be noted in the field book. Samples collected from Monday through Friday will be delivered to the laboratory within 24 hours of collection. If Saturday delivery is not available, samples collected on Friday must be delivered by Monday morning. Check the work plan to determine if certain analytes require a shorter delivery time. If overnight mail is utilized, then the shipping bill must be maintained for the files and the laboratory must be called the following day to confirm receipt.

3.0 EQUIPMENT AND MATERIALS

3.1 General equipment and materials may include, but not necessarily be limited to, the following:

a. Sample bottles of proper size and type with labels.

b. Cooler with ice (wet or blue pack; no blue packs for PFAS samples).

c. Field notebook, appropriate field form(s), chain-of-custody form(s), custody seals.

d. Black pen and indelible marker.

e. Packing tape, "bubble wrap," and "zip-lock" bags.

f. Overnight (express) mail forms and laboratory address.

g. Health and safety plan (HASP).

h. Work plan/scope of work.

i. Pertinent SOPs for specified tasks and their respective equipment and materials.

3.2 Preservatives for specific samples/analytes as specified by the laboratory. Preservatives must be stored in secure, spillproof glass containers with their content, concentration, and date of preparation and expiration clearly labeled.

3.3 Miscellaneous equipment and materials including, but not necessarily limited to, the following:

a. Graduated pipettes.

b. Pipette bulbs.

c. Litmus paper.

d. Glass stirring rods.

e. Protective goggles.

f. Disposable gloves.

g. Lab apron.

h. First aid kit.

i. Portable eye wash station.

j. Water supply for immediate flushing of spillage, if appropriate.

k. Shovel and container for immediate containerization of spillage-impacted soils, if appropriate.

4.0 PROCEDURE

4.1 Examine all bottles and verify that they are clean and of the proper type, number, and volume for the sampling to be conducted.

4.2 Label bottles carefully and clearly with project name and number, site location, sample identification, date, time, and the sampler's initials using an indelible marker.

4.3 Collect samples in the proper manner (refer to specific sampling SOPs).

4.4 Conduct preservation activities as required after each sample has been collected. Field preservation must be done immediately and must not be done later than 30 minutes after sample collection.

4.5 Conduct QC sampling, as required.

4.6 Seal each container carefully and place in an individual "zip lock" bag.

4.7 Organize and carefully pack all samples in the cooler immediately after collection (e.g., bubble wrap). Insulate samples so that breakage will not occur.

4.8 Complete and place the chain-of-custody form in the cooler after all samples have been collected. Maintain one copy for the project file. If the cooler is to be transferred several times prior to shipment or delivery to the laboratory, it may be easier to tape the chain-of-custody to the exterior of the sealed cooler. When exceptionally hazardous samples are known or suspected to be present, this should be identified on the chain-of-custody as a courtesy to the laboratory personnel.

4.9 Add additional ice as necessary to ensure that it will last until receipt by the laboratory.

4.10 Seal the cooler with packing tape and a custody seal. Record the number of the custody seal in the field notebook and on the field form. If there are any exceptionally hazardous samples, then shipping regulations should be examined to ensure that the sample containers and coolers are in compliance and properly labeled.

4.11 Samples collected from Monday through Friday will be delivered to the laboratory within 24 hours of collection. If Saturday delivery is not available, samples collected on Friday must be delivered by Monday morning. Check the work plan to determine if certain analytes require a shorter delivery time.

4.12 Maintain the shipping bill for the project files if overnight mail is utilized and call the laboratory the following day to confirm receipt.

END OF PROCEDURE

1.0 PURPOSE

The purpose of this Standard Operating Procedure (SOP) is to establish guidance to obtain accurate and consistent samples of soil gas.

2.0 MATERIALS/EQUIPMENT

- Teflon or Nylaflow tubing, one-quarter or one-eighth inch diameter sample tubing.
- Swagelok® ¼-inch nut and ferrule sets for connecting the probe tubing to the sampling manifold, as appropriate for the collection method
- Helium leak check equipment, as dictated by Site-specific data quality objectives (DQOs), including the enclosure, helium cylinder (high purity helium), and helium detector (Dialectric MGD is preferred). The enclosure and helium detector may be provided by the driller.
- Air pump for purging and electric supply for the pump (either battery, generator, or power inverter with adapter for car battery). Must be capable of a flow of 200 milliliters per minute (mL/min) and a vacuum of 20” Hg.
- Canister, tedlar bag or syringe, as appropriate for the collection method.

3.0 DECONTAMINATION

All reusable sampling equipment will be thoroughly cleaned according to the decontamination SOP. Where possible, thoroughly pre-cleaned and wrapped sampling equipment should be used and dedicated to individual sampling locations. Disposable items such as sampling gloves and plastic sheeting will be changed after each use and discarded in an appropriate manner.

4.0. SITE-SPECIFIC CONSIDERATIONS

Prior to attempting soil gas sampling there should be an understanding of subsurface conditions at the Site. Soil gas samples should be collected in the vadose zone and generally, soil gas samples should not be collected at a depth less than above 5 feet below ground surface (bgs), unless sub-slab soil gas samples are needed. It may also not be feasible to collect soil gas from tighter grain soils with little pore volume, such as clays, and these layers should be avoided.

Soil gas sampling should not be performed until 24-hours after a significant rain event (>1/2 inch of rainfall).

5.0 PROCEDURE

5.1 System Set-up

1. Acquire all the necessary hardware and sampling equipment. Be sure to use one-quarter or one-eighth inch diameter Teflon or Nylaflow sample tubing.

2. Assemble or obtain the necessary fittings and vacuum gauge to create a soil gas probe and sampling manifold (vacuum gauge and valving). This manifold must be clean, free of oils, and flushed free of VOCs prior to use. If appropriate, be sure to place the helium leak check enclosure over the probe, and push the sample tubing through the hole in the cap before attaching the sampling manifold.

3. Adjust the purge system evacuation pump sampling rate to achieve the desired flow rate of 200 mL/min. This should be performed at the outlet of the vacuum pump prior to purging, either by using a suitable flow meter, or determining the amount of time required to fill a 1-liter Tedlar bag.

5.2 Shut-In Test

Prior to purging or sampling, a shut-in test should be conducted to check for leaks in the above-ground sampling system.

1. Assemble the above-ground valves, lines and fittings downstream from the top of the probe.

2. Evacuate the system to a minimum measured vacuum of about 100 inches of water using the purge pump.

3. Observe the vacuum gauge for 1-2 minutes. If there is any observable loss of vacuum, adjust the above-ground sampling system until the vacuum is maintained.

5.3 System Leak Checking and Purging

Perform a leak check of the sample manifold system by:

1. Make sure the gas probe valve is off and the sample valves are closed.

2. Open the purge valve and start the purge pump. Verify that the flow is set to 200 mL/min until a vacuum of approximately 15" Hg is achieved.

3. Turn off the purge pump and observe the vacuum gauge for 1-2 minutes. If there is any observable loss of vacuum, the leaks must be fixed prior to sampling.

4. Record the leak check date and time on the field notebook.

5.4 Purge Volume Test (Mobile Laboratory Only)

The purpose of the purge volume test is to ensure that stagnant air is removed from the sampling system and to ensure that samples are representative of subsurface conditions. The test well should be located where soil gas concentrations are anticipated to be elevated, if possible.

Perform a purge test of the test well by:

1. Purge the well one purge volume and collect a sample.

2. Have the mobile laboratory analyze the sample for target compounds. Sample procedures are explained in Section 5.6, below.

3. Purge an additional two purge volumes (for a total of 3 purge volumes), collect a sample and submit to the mobile laboratory for analysis.

    a. One purge volume is equal to the sum of the following volumes:

        - The internal volume of tubing;
        - The void space of the sand pack around the probe tip;
        - The void space of the dry bentonite in the annular space.

4. Repeat for a purge of 10 total purge volumes.

5. The site purge volume will be chosen based on the sample with the highest concentration of target compounds from the purge test. All of other sample locations will utilize this purge volume (either one, three, or ten).

5.5 Helium Leak Check (as dictated by DQOs)

The helium leak check procedure is accomplished by:

1. Start the flow of helium under the leak check enclosure. Position the tube so the helium is directed at the interface of the probe and the ground. Let the helium fill the enclosure for a couple of minutes.

2. Turn the helium leak detector on and make sure that the detector is not reading any helium before proceeding.

3. Verify that the helium concentration inside the leak check enclosure is >10% by placing the probe of the helium detector into the hole where the sample tubing comes out or under the enclosure wall. It is not necessary to verify that the helium concentration is 100% as this is bad for the detector.

4. Purging is carried out by pulling soil gas through the system at a rate of 200 mL/min for a time period sufficient to achieve three purge volumes, equal to the sum of the internal volume of the in-ground annular space, sample line, and sampling manifold system.

   Note: When calculating the purge volume, be sure to take into account the inside diameter and length of the sample tubing, as well as the probe outside diameter and retract distance for the annular space for temporary probes. If during the purge (or sampling) the vacuum exceeds 7 "Hg, then reduce the pump flow rate. The system vacuum must stay below this level at all times.

5. To start the soil gas probe purge, open the gas probe valve and close the sample valve at the same time, and start timing. Verify that the flow rate is still 200 mL/min.

6. During the last 5 minutes of the purge (or the entire purge time if less than 5 minutes), attach a Tedlar bag to the purge pump exhaust and open the bag's valve.

7. At the end of the purge time, close the purge valve, close the valve to the Tedlar bag, and turn off the pump.

8. Attach the Tedlar bag to the helium detector and open the valve. If a helium reading of greater than or equal to 5% of the helium concentration inside the leak check enclosure is observed, then the probe leak check has failed and corrective action should be taken.

9. Record the purge date, time, purge rate, leak check result, and purge volume on the field sampling log.

10. Immediately move on to the sampling phase. Little to no delay should occur between purging and sampling.

5.6 Sample Collection

'Clean' sampling protocols must be followed when handling and collecting samples. This requires care in the shipping, storage, and use of sampling equipment. Sharpie markers should not be used for labeling or note-taking during sampling.

1. Attach the canister, tedlar bag or syringe to the sample tubing.

2. Before taking the sample, confirm that the sampling system valves are set as follows: the purge valve is confirmed to be closed, gas probe valve is open, and the sample valve is open.

3. After sampling for the appropriate amount of time, close the sample valve and the canister/tedlar bag valve. Remove the sample container from the sampling manifold.

4. Record the sampling date, time, canister identification (ID), flow controller ID, and any other observation pertinent to the sampling event on the field sampling log. The temperature and barometric pressure should be recorded.

5. Fill out all appropriate documentation (sampling forms, sample labels, chain of custody, sample tags, etc.).

6. Disassemble the sampling system.

END OF PROCEDURE

Date: May 5, 2000

1.0 PURPOSE

The purpose for this standard operating procedure (SOP) is to establish the guidelines for decontamination of all field equipment potentially exposed to contamination during drilling, and soil and water sampling. The objective of decontamination is to ensure that all drilling, and soil-sampling and water-sampling equipment is decontaminated (free of potential contaminants): 1) prior to being brought onsite to avoid the introduction of potential contaminants to the site; 2) between drilling and sampling events/activities onsite to eliminate the potential for cross-contamination between boreholes and/or wells; and 3) prior to the removal of equipment from the site to prevent the transportation of potentially contaminated equipment offsite.

In considering decontamination procedures, state and federal regulatory agency requirements must be considered because of potential variability between state and federal requirements and because of variability in the requirements of individual states. Decontamination procedures must be in compliance with state and/or federal protocols in order that regulatory agency(ies) scrutiny of the procedures and data collected do not result in non acceptance (invalidation) of the work undertaken and data collected.

2.0 PROCEDURE FOR DRILLING EQUIPMENT

The following is a minimum decontamination procedure for drilling equipment. Drilling equipment decontamination procedures, especially any variation from the method itemized below, will be documented on an appropriate field form or in the field notebook.

2.1 The rig and all associated equipment should be properly decontaminated by the contractor before arriving at the test site.

2.2 The augers, drilling casings, rods, samplers, tools, rig, and any piece of equipment that can come in contact (directly or indirectly) with the soil, will be steam cleaned onsite prior to set up for drilling to ensure proper decontamination.

2.3 The same steam cleaning procedures will be followed between boreholes (at a fixed on-site location[s], if appropriate) and before leaving the site at the end of the study.

2.4 All on-site steam cleaning (decontamination) activities will be monitored and documented by a member(s) of the staff of Roux Associates, Inc.

2.5 If drilling activities are conducted in the presence of thick, sticky oils (e.g., PCBs) which coat drilling equipment, then special decontamination procedures may have to be utilized before steam cleaning (e.g., hexane scrub and wash).

2.6 Containment of decontamination fluids may be necessary (e.g., rinseate from steam cleaning) or will be required (e.g., hexane), and disposal must be in accordance with state and/or federal procedures.

3.0 PROCEDURE FOR SOIL-SAMPLING EQUIPMENT

The following is a minimum decontamination procedure for soil-sampling equipment (e.g., split spoons, stainless-steel spatulas). Soil-sampling equipment decontamination procedures, especially any variation from the method itemized below, will be documented on an appropriate field form or in the field notebook.

3.1 Wear disposable gloves while cleaning equipment to avoid cross-contamination and change gloves as needed.

3.2 Steam clean the sampler or rinse with potable water. If soil-sampling activities are conducted in the presence of thick, sticky oils (e.g., PCBs) which coat sampling equipment, then special decontamination procedures may have to be utilized before steam cleaning and washing in detergent solution (e.g., hexane scrub and wash).

3.3 Prepare a non-phosphate, laboratory-grade detergent solution and distilled or potable water in a clean bucket.

3.4 Disassemble the sampler, as necessary and immerse all parts and other sampling equipment in the solution.

3.5 Scrub all equipment in the bucket with a brush to remove any adhering particles.

3.6 Rinse all equipment with copious amounts of potable water followed by distilled or deionized water.

3.7 Place clean equipment on a clean plastic sheet (e.g., polyethylene)

3.8 Reassemble the cleaned sampler, as necessary.

3.9 Transfer the sampler to the driller (or helper) making sure that this individual is also wearing clean gloves, or wrap the equipment with a suitable material (e.g., plastic bag, aluminum foil.

As part of the decontamination procedure for soil-sampling equipment, state and/or federal protocols must be considered. These may require procedures above those specified as minimum for Roux Associates, Inc., such as the use of nitric acid, acetone, etc. Furthermore, the containment and proper disposal of decontamination fluids must be considered with respect to regulatory agency(ies) requirements.

4.0 PROCEDURE FOR WATER-SAMPLING EQUIPMENT

The following is a decontamination procedure for water-sampling equipment (e.g., bailers, pumps). Water-sampling equipment decontamination procedures, especially any variation from the method itemized below, will be documented on an appropriate field form or in the field notebook.

4.1 Decontamination procedures for bailers follow:

a. Wear disposable gloves while cleaning bailer to avoid cross-contamination and change gloves as needed.

b. Prepare a non-phosphate, laboratory-grade detergent solution and potable water in a bucket.

c. Disassemble bailer (if applicable) and discard cord in an appropriate manner, and scrub each part of the bailer with a brush and solution.

d. Rinse with potable water and reassemble bailer.

e. Rinse with copious amounts of distilled or deionized water.

f. Air dry.

g. Wrap equipment with a suitable material (e.g., clean plastic bag, aluminum foil).

h. Rinse bailer at least three times with distilled or deionized water before use.

4.2 Decontamination procedures for pumps follow:

a. Wear disposable gloves while cleaning pump to avoid cross-contamination and change gloves as needed.

b. Prepare a non-phosphate, laboratory-grade detergent solution and potable water in a clean bucket, clean garbage can, or clean 55-gallon drum.

c. Flush the pump and discharge hose (if not disposable) with the detergent solution, and discard disposable tubing and/or cord in an appropriate manner.

d. Flush the pump and discharge hose (if not disposable) with potable water.

e. Place the pump on clear plastic sheeting.

f. Wipe any pump-related equipment (e.g., electrical lines, cables, discharge hose) that entered the well with a clean cloth and detergent solution, and rinse or wipe with a clean cloth and potable water.

g. Air dry.

h. Wrap equipment with a suitable material (e.g., clean plastic bag).

As part of the decontamination procedure for water-sampling equipment, state and/or federal protocols must be considered. These may require procedures above those specified as minimum for Roux Associates, Inc., such as the use of nitric acid, acetone, etc. Furthermore, the containment and proper disposal of decontamination fluids must be considered with respect to regulatory agency(ies) requirements.

APPENDIX H

Site Management Forms

Site Inspection Checklist, 27-10 49th Avenue, Queens, New York

Date: _____

Completed By: _____

Description	Status		Actions Taken / Comments
	Ok	Action Req.	
General Site Conditions			
1 Inspect general site conditions.			
Site Cover System (Building Cover, Asphalt and Concrete)			
1 Inspect all buildings.			
2 Inspect buildings, asphalt and concrete for significant cracks.			
3 Inspect cover system for shrubs/trees greater than one-inch diameter.			
4 Inspect cover system for damage.			
5 Inspect cover system for new slab penetrations.			
Sub-Slab Depressurization System			
A. Aboveground Piping on Roof			
1 Inspect aboveground piping for cracks, leaks and support issues.			
2 Inspect vacuum/pressure gauges for proper operation.			
B. Electrical			
1 Check that the electrical control panel is closed/secured.			
Soil Vapor Extraction System			
A. Aboveground Piping on Roof			
1 Inspect aboveground piping for cracks, leaks and support issues.			
2 Inspect vacuum/pressure gauges for proper operation.			
B. Electrical			
1 Check that the electrical control panel is closed/secured.			
C. Blower Enclosure			
1 Inspect condition of blower enclosure, exhaust fan, and gauges.			
D. Knock-out Tank			
1 Check condition of vacuum filter.			
2 Check dilution valve for noises or leaks.			
3 Check for presence of water in knockout tank.			
Institutional Controls			
1 Confirm that the site usage is in compliance with the institutional controls.			
Site Records			
1 Inspect site records and confirm that they are up to date (e.g., Site Inspection Checklists and SSDS/SVES Operations Logs, sampling logs, etc.)			

SSDS/SVES and Expanded SVES Operations and Maintenance Log, 27-10 49th Avenue, Queens, New York

INSPECTION ITEM DESCRIPTION	Yes	Action Req.	Comments/ Actions Taken
Is the system operating normally?	___	___	_____
Are any warning lights on? (Please list those that are on)	___	___	_____
If there is an alarm condition, was it fixed and the system restarted?	___	___	_____
Is the blower enclosure in good condition?	___	___	_____
Is the vacuum filter in good condition?	___	___	_____
Does the knock-out tank need to be drained? (Record amount drained)	___	___	_____
Are aboveground piping free of cracks, leaks, and support issues?	___	___	_____
Are vacuum/pressure gauges at blower operating properly?	___	___	_____
Are interior piping free of cracks, leaks, and support issues?	___	___	_____
List maintenance activities that were performed or other comments about the system:			_____

Source of Reading	Units	Values	Comments
Blower Run Time	Hours		
Blower Inlet Vacuum	Inches of Water		
Blower Discharge Pressure	Inches of Water		
SVE-1 Riser Sample Port	Inches of Water		
SVE-2 Riser Sample Port	Inches of Water		
SVE-3 Riser Sample Port	Inches of Water		
SVE-4 Riser Sample Port	Inches of Water		
SVE-5-8 Riser Sample Port	Inches of Water		
SSDS-1 Riser Sample Port	Inches of Water		
SSDS-2 Riser Sample Port	Inches of Water		
SSDS-3 Riser Sample Port	Inches of Water		
SSDS-4 Riser Sample Port	Inches of Water		
SV-1 Monitoring Point	Inches of Water		
SV-2 Monitoring Point	Inches of Water		
ASV-1 Monitoring Point	Inches of Water		
ASV-2 Monitoring Point	Inches of Water		
ASV-3 Monitoring Point	Inches of Water		
ASV-4 Monitoring Point	Inches of Water		
ASV-5 Monitoring Point	Inches of Water		

Form Completed By: _____ Signature: _____ Date & Time: _____

SDSS/SVES Non-Routine Maintenance Form, 27-10 49th Avenue, Queens, New York

DATE	DESCRIPTION OF WORK DONE	CAUSE (Use as many lines as required to define the problem)	Completed By

Soil Vapor Sampling Form

Date: _____ **Time:** _____

Weather : _____

Temperature: _____ Humidity: _____

Wind Magnitude: _____ Wind Direction: _____

Barometric Pressure: _____ Precipitation: _____

Sampling Team: _____

Sampling Location: _____

Site Condition (i.e. any adjacent questionable facilities, vent pipes, tanks, etc. and what type of basements are present)

_____

_____

_____

Prior to commencing the sampling activity, remove the brass cap from the end of the sample tubing and fit a new brass hose barb fitting onto the sample tubing.

Calibrate the Helium detection meter

Utility Clearance Completed: _____

Sampling Depth: _____ feet below land surface (If ambient air sample, elevate can to approx. 3 ft - 5 ft above land surface)

Sealed with bentonite: _____

Apparent Moisture Content: _____

Purge Rate: _____ Must be less than 0.2 L/min (200 mL/min)

Purge Time: _____

Helium Rate at enclosure: _____

Helium Rate from sample tubing: _____ Is this rate <10% of the rate at the enclosure **Yes / No**

If the Helium readings have a greater ratio than 10% the seals should be rechecked and the tracer gas should be reapplied.

Once the tracer gas screening procedures are completed and no short-circuiting is determined to be present at the location the soil vapor sample can be collected in a lab certified clean summa canister at a rate less than 0.2 L/min.

Is the Summa Canister Certified Clean and within the proper holding time ? Yes

Starting Pressure: _____ in. of Hg

Starting Time: _____

Ending Time: _____

Ending Pressure: _____ in. of Hg

Summa Canister Identification #: _____

Flow Regulator ID # _____

Sample ID # _____

Time _____

Analysis _____

Laboratory _____

ROUX

Summary of Green Remediation Metrics for Site Management

Site Name: _____ Site Code: _____
Address: _____ City: _____
State: _____ Zip Code: _____ County: _____

Initial Report Period (Start Date of period covered by the Initial Report submittal)
Start Date: _____

Current Reporting Period
Reporting Period From: _____ To: _____

Contact Information
Preparer's Name: _____ Phone No.: _____
Preparer's Affiliation: _____

I. Energy Usage: Quantify the amount of energy used directly on-site and the portion of that derived from renewable energy sources.

	Current Reporting Period	**Total to Date**
Fuel Type 1 (e.g. natural gas (cf))		
Fuel Type 2 (e.g. fuel oil, propane (gals))		
Electricity (kWh)		
Of that Electric usage, provide quantity:		
Derived from renewable sources (e.g. solar, wind)		
Other energy sources (e.g. geothermal, solar thermal (Btu))		

Provide a description of all energy usage reduction programs for the site in the space provided on Page 3.

II. Solid Waste Generation: Quantify the management of solid waste generated on-site.

	Current Reporting Period (tons)	**Total to Date (tons)**
Total waste generated on-site		
OM&M generated waste		
Of that total amount, provide quantity:		
Transported off-site to landfills		
Transported off-site to other disposal facilities		
Transported off-site for recycling/reuse		
Reused on-site		

Provide a description of any implemented waste reduction programs for the site in the space provided on Page 3.

III. Transportation/Shipping: Quantify the distances travelled for delivery of supplies and lab-supplied bottles, shipping of laboratory samples, and the removal of waste.

	Current Reporting Period (miles)	**Total to Date (miles)**
Standby Engineer/Contractor		
Laboratory Courier/Delivery Service (bottle and sample delivery)		
Waste Removal/Hauling		

Provide a description of all mileage reduction programs for the site in the space provided on Page 3. Include specifically any local vendor/services utilized that are within 50 miles of the site.

IV. Water Usage: Quantify the volume of water used on-site from various sources.

	Current Reporting Period (gallons)	**Total to Date (gallons)**
Total quantity of water used on-site (not including treated water)		
Of that total amount, provide quantity:		
Public potable water supply usage		
Surface water usage		
On-site groundwater usage		
Collected or diverted storm water usage		

Provide a description of any implemented water consumption reduction programs for the site in the space provided on Page 3.

V. Land Use and Ecosystems: Quantify the amount of land and/or ecosystems disturbed and the area of land and/or ecosystems restored to a pre-development condition (i.e. Green Infrastructure).

	Current Reporting Period (acres)	**Total to Date (acres)**
Land disturbed		
Land restored		

Provide a description of any implemented land restoration/green infrastructure programs for the site in the space provided on Page 3.

Description of green remediation programs reported above (Attach additional sheets if needed)
Energy Usage:
Waste Generation:
Transportation/Shipping:
Water usage:
Land Use and Ecosystems:
Recommendations/Other:

CONTRACTOR CERTIFICATION
I, _____ (**Name**) do hereby certify that I am _____ (**Title**) of _____ (**Contractor Name**), which is responsible for the work documented on this form. According to my knowledge and belief, all of the information provided in this form is accurate and the site management program complies with the DER-10, DER-31, and CP-49 policies. _____ **Date** **Contractor**

NEW YORK STATE DEPARTMENT OF HEALTH
INDOOR AIR QUALITY QUESTIONNAIRE AND BUILDING INVENTORY
CENTER FOR ENVIRONMENTAL HEALTH

This form must be completed for each residence involved in indoor air testing.

Preparer's Name _____ Date/Time Prepared _____

Preparer's Affiliation _____ Phone No._____

Purpose of Investigation_____

1. OCCUPANT:

Interviewed: Y / N

Last Name: _____ First Name: _____

Address: _____

County: _____

Home Phone: _____ Office Phone: _____

Number of Occupants/persons at this location _____ Age of Occupants _____

2. OWNER OR LANDLORD: (Check if same as occupant ___)

Interviewed: Y / N

Last Name: _____ First Name: _____

Address: _____

County: _____

Home Phone: _____ Office Phone: _____

3. BUILDING CHARACTERISTICS

Type of Building: (Circle appropriate response)

Residential	School	Commercial/Multi-use
Industrial	Church	Other: _____

If the property is residential, type? (Circle appropriate response)

Ranch	2-Family	3-Family
Raised Ranch	Split Level	Colonial
Cape Cod	Contemporary	Mobile Home
Duplex	Apartment House	Townhouses/Condos
Modular	Log Home	Other:_____

If multiple units, how many? _____

If the property is commercial, type?

Business Type(s) _____

Does it include residences (i.e., multi-use)? Y / N If yes, how many? _____

Other characteristics:

Number of floors_____ Building age_____

Is the building insulated? Y / N How air tight? Tight / Average / Not Tight

4. AIRFLOW

Use air current tubes or tracer smoke to evaluate airflow patterns and qualitatively describe:

Airflow between floors

_____

_____

_____

Airflow near source

_____

_____

_____

Outdoor air infiltration

_____

_____

_____

Infiltration into air ducts

_____

_____

_____

5. BASEMENT AND CONSTRUCTION CHARACTERISTICS (Circle all that apply)

a. Above grade construction:	wood frame	concrete	stone	brick
b. Basement type:	full	crawlspace	slab	other _____
c. Basement floor:	concrete	dirt	stone	other _____
d. Basement floor:	uncovered	covered	covered with _____	
e. Concrete floor:	unsealed	sealed	sealed with _____	
f. Foundation walls:	poured	block	stone	other _____
g. Foundation walls:	unsealed	sealed	sealed with _____	
h. The basement is:	wet	damp	dry	moldy
i. The basement is:	finished	unfinished	partially finished	
j. Sump present?	Y / N			
k. Water in sump?	Y / N / not applicable			

Basement/Lowest level depth below grade: _____(feet)

Identify potential soil vapor entry points and approximate size (e.g., cracks, utility ports, drains)

_____

_____

6. HEATING, VENTING and AIR CONDITIONING (Circle all that apply)

Type of heating system(s) used in this building: (circle all that apply – note primary)

Hot air circulation	Heat pump	Hot water baseboard	
Space Heaters	Stream radiation	Radiant floor	
Electric baseboard	Wood stove	Outdoor wood boiler	Other _____

The primary type of fuel used is:

Natural Gas	Fuel Oil	Kerosene
Electric	Propane	Solar
Wood	Coal	

Domestic hot water tank fueled by: _____

Boiler/furnace located in:	Basement	Outdoors	Main Floor	Other_____
Air conditioning:	Central Air	Window units	Open Windows	None

Are there air distribution ducts present? Y / N

Describe the supply and cold air return ductwork, and its condition where visible, including whether there is a cold air return and the tightness of duct joints. Indicate the locations on the floor plan diagram.

_____

_____

_____

_____

7. OCCUPANCY

Is basement/lowest level occupied? Full-time Occasionally Seldom Almost Never

Level	**General Use of Each Floor (e.g., familyroom, bedroom, laundry, workshop, storage)**
Basement	_____
1st Floor	_____
2nd Floor	_____
3rd Floor	_____
4th Floor	_____

8. FACTORS THAT MAY INFLUENCE INDOOR AIR QUALITY

a. Is there an attached garage? Y / N

b. Does the garage have a separate heating unit? Y / N / NA

c. Are petroleum-powered machines or vehicles stored in the garage (e.g., lawnmower, atv, car) Y / N / NA
Please specify_____

d. Has the building ever had a fire? Y / N When?_____

e. Is a kerosene or unvented gas space heater present? Y / N Where? _____

f. Is there a workshop or hobby/craft area? Y / N Where & Type? _____

g. Is there smoking in the building? Y / N How frequently? _____

h. Have cleaning products been used recently? Y / N When & Type? _____

i. Have cosmetic products been used recently? Y / N When & Type? _____

j. Has painting/staining been done in the last 6 months? Y / N Where & When? _____

k. Is there new carpet, drapes or other textiles? Y / N Where & When? _____

l. Have air fresheners been used recently? Y / N When & Type? _____

m. Is there a kitchen exhaust fan? Y / N If yes, where vented?_____

n. Is there a bathroom exhaust fan? Y / N If yes, where vented?_____

o. Is there a clothes dryer? Y / N If yes, is it vented outside? Y / N

p. Has there been a pesticide application? Y / N When & Type?_____

Are there odors in the building? Y / N
If yes, please describe: _____

Do any of the building occupants use solvents at work? Y / N
(e.g., chemical manufacturing or laboratory, auto mechanic or auto body shop, painting, fuel oil delivery, boiler mechanic, pesticide application, cosmetologist

If yes, what types of solvents are used? _____

If yes, are their clothes washed at work? Y / N

Do any of the building occupants regularly use or work at a dry-cleaning service? (Circle appropriate response)

Yes, use dry-cleaning regularly (weekly) No
Yes, use dry-cleaning infrequently (monthly or less) Unknown
Yes, work at a dry-cleaning service

Is there a radon mitigation system for the building/structure? Y / N Date of Installation: _____
Is the system active or passive? Active/Passive

9. WATER AND SEWAGE

Water Supply:	Public Water	Drilled Well	Driven Well	Dug Well	Other: _____
Sewage Disposal:	Public Sewer	Septic Tank	Leach Field	Dry Well	Other: _____

10. RELOCATION INFORMATION (for oil spill residential emergency)

a. Provide reasons why relocation is recommended: _____

b. Residents choose to: remain in home relocate to friends/family relocate to hotel/motel

c. Responsibility for costs associated with reimbursement explained? Y / N

d. Relocation package provided and explained to residents? Y / N

11. FLOOR PLANS

Draw a plan view sketch of the basement and first floor of the building. Indicate air sampling locations, possible indoor air pollution sources and PID meter readings. If the building does not have a basement, please note.

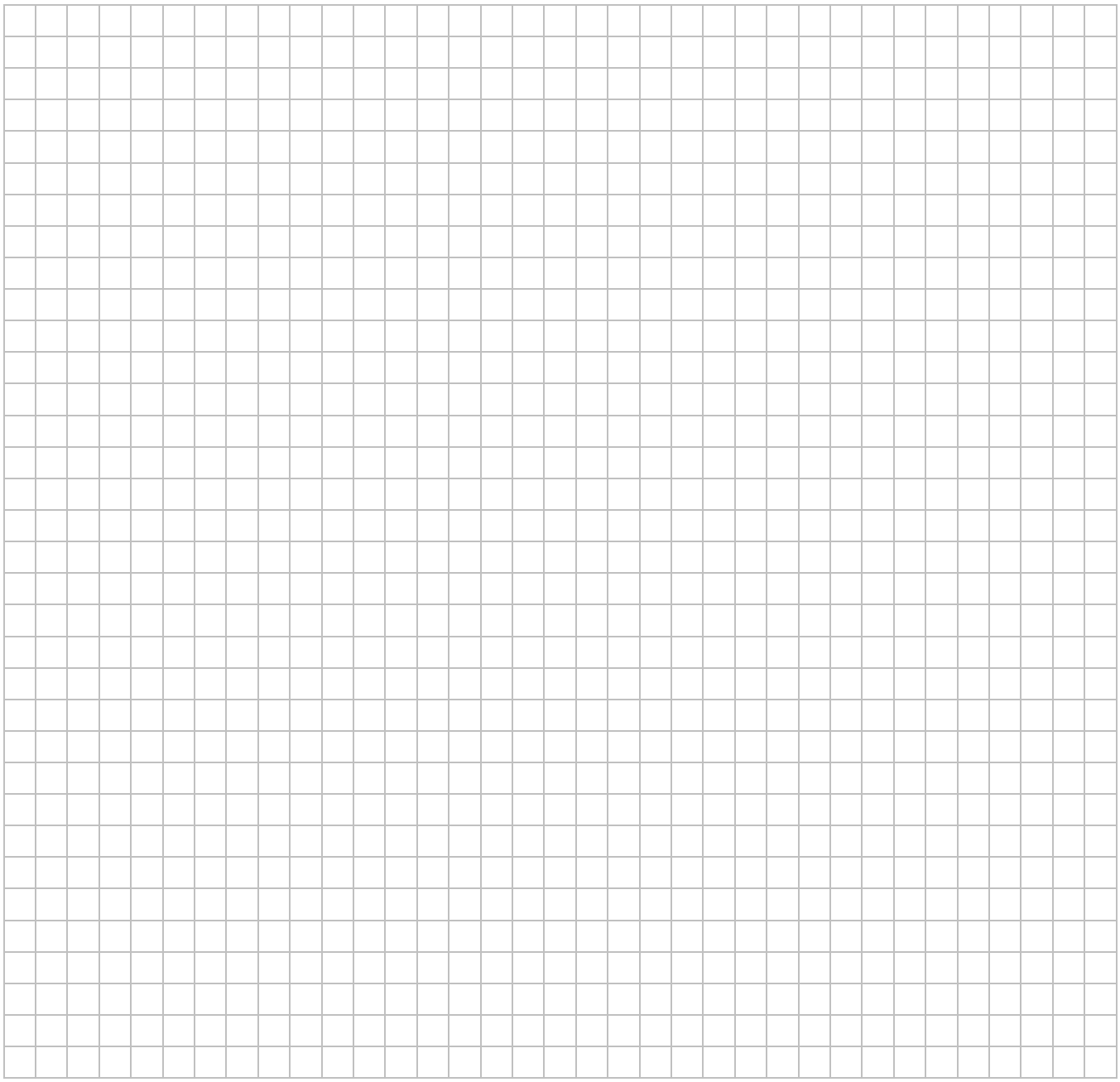
Basement:

First Floor:

12. OUTDOOR PLOT

Draw a sketch of the area surrounding the building being sampled. If applicable, provide information on spill locations, potential air contamination sources (industries, gas stations, repair shops, landfills, etc.), outdoor air sampling location(s) and PID meter readings.

Also indicate compass direction, wind direction and speed during sampling, the locations of the well and septic system, if applicable, and a qualifying statement to help locate the site on a topographic map.



13. PRODUCT INVENTORY FORM

Make & Model of field instrument used: _____

List specific products found in the residence that have the potential to affect indoor air quality.

Location	Product Description	Size (units)	Condition*	Chemical Ingredients	Field Instrument Reading (units)	Photo ** Y / N

* Describe the condition of the product containers as **Unopened (UO), Used (U),** or **Deteriorated (D)**
** Photographs of the **front and back** of product containers can replace the handwritten list of chemical ingredients. However, the photographs must be of good quality and ingredient labels must be legible.

Table X. DER/DAR Air Emissions Analysis Worksheet
27-10 49th Avenue, Long Island City, NY

Calculations based on SVES effluent sample results from _____.

Chemical Name	CAS Number	µg/m3	Molar Mass (g/mol)	PPMv	SGC (µg/m3)	AGC (µg/m3)
1,1,2-Trichlorotrifluoroethane	00076-13-1	4.90	187.370	0.0006	960000.00	180000.00
1,3-Butadiene	00106-99-0	0.87	54.092	0.0004	N/A	0.03
2,2,4-Trimethylpentane (Isooctane)	00540-84-1	8.90	114.232	0.0019	N/A	3300.00
Acetone	00067-64-1	140.00	58.080	0.0580	180000.00	30000.00
Benzene	00071-43-2	3.30	78.114	0.0010	27.00	0.13
Carbon Tetrachloride	00056-23-5	3.50	153.810	0.0005	1900.00	0.17
Chlorodifluoromethane	00075-45-6	12.00	86.470	0.0033	N/A	50000.00
Chloroform	00067-66-3	4.70	119.370	0.0009	150.00	14.70
Chloromethane	00074-87-3	7.20	50.490	0.0034	22000.00	90.00
Dichlorodifluoromethane	00075-71-8	22.00	120.910	0.0044	N/A	12000.00
m,p-Xylene (M-, O- & P- Mixture)	01330-20-7	12.00	106.160	0.0027	22000.00	100.00
Methyl Ethyl Ketone (2-Butanone)	00078-93-3	21.00	72.107	0.0070	13000.00	5000.00
Methylene Chloride (Dichloromethane)	00075-09-2	6.60	84.930	0.0019	14000.00	46.00
n-Butane	00106-97-8	28.00	58.124	0.0116	N/A	N/A
n-Heptane	00142-82-5	4.00	100.205	0.0010	210000.00	3900.00
o-Xylene (1,2-Dimethylbenzene)	00095-47-6	4.00	106.168	0.0009	22000.00	100.00
Tetrachloroethylene (PCE)	00127-18-4	690.00	165.820	0.1001	300.00	3.80
Tetrahydrofuran	00109-99-9	68.00	72.107	0.0227	30000.00	350.00
Toluene	00108-88-3	3.10	92.141	0.0008	37000.00	5000.00
Trans-1,2-Dichloroethene (Dichloroethylene)	00156-60-5	5.40	96.950	0.0013	N/A	63.0
Trichloroethylene (TCE)	00079-01-6	19.00	131.380	0.0035	20.00	0.21
Trichlorofluoromethane	00075-69-4	12.00	137.360	0.0021	9000.00	5000.00

Calculate Emission Rate in Pounds/Hour (lb/hr):

Flow Rate = _____ cfm (max flow of AB-850 blower at design flow/vacuum)

Emission Rate (lb/hr) = Flow Rate (cfm) * Concentration (PPMv) * Molecular Weight (g/mol) * 1.581E-07

Note that 1.581E-07 = $1/10^6$ ppm-v * 60 minutes/hour * 1 lb-mole/379.5 ft^3

Emission Rates for:	Q	Qa	Part 212-2.2 Table 2 HTAC Mass Emission Limit	
1,1,2-Trichlorotrifluoroethane	lb/hr or	lb/yr	N/A lb/yr	OK
1,3-Butadiene	lb/hr or	lb/yr	lb/yr	OK
2,2,4-Trimethylpentane (Isooctane)	lb/hr or	lb/yr	N/A lb/yr	OK
Acetone	lb/hr or	lb/yr	N/A lb/yr	OK
Benzene	lb/hr or	lb/yr	lb/yr	OK
Carbon Tetrachloride	lb/hr or	lb/yr	lb/yr	OK
Chlorodifluoromethane	lb/hr or	lb/yr	N/A lb/yr	OK
Chloroform	lb/hr or	lb/yr	N/A lb/yr	OK
Chloromethane	lb/hr or	lb/yr	N/A lb/yr	OK
Dichlorodifluoromethane	lb/hr or	lb/yr	N/A lb/yr	OK
m,p-Xylene (M-, O- & P- Mixture)	lb/hr or	lb/yr	N/A lb/yr	OK
Methyl Ethyl Ketone (2-Butanone)	lb/hr or	lb/yr	N/A lb/yr	OK
Methylene Chloride (Dichloromethane)	lb/hr or	lb/yr	N/A lb/yr	OK
n-Butane	lb/hr or	lb/yr	N/A lb/yr	OK
n-Heptane	lb/hr or	lb/yr	N/A lb/yr	OK
o-Xylene (1,2-Dimethylbenzene)	lb/hr or	lb/yr	N/A lb/yr	OK
Tetrachloroethylene (PCE)	lb/hr or	lb/yr	lb/yr	OK
Tetrahydrofuran	lb/hr or	lb/yr	N/A lb/yr	OK
Toluene	lb/hr or	lb/yr	N/A lb/yr	OK
Trans-1,2-Dichloroethene (Dichloroethylene)	lb/hr or	lb/yr	N/A lb/yr	OK
Trichloroethylene (TCE)	lb/hr or	lb/yr	lb/yr	OK
Trichlorofluoromethane	lb/hr or	lb/yr	N/A lb/yr	OK

If the remedial system does not have the potential to emit greater than 0.1 lb/hr of a HTAC, nor 0.5 lb/hr of a non-HTAC VOC, and the annual total emissions do not exceed the HTAC Mass Emission Limits, no treatment is necessary.

Guidance on Air Emissions of VOCs at DER Remediation Sites

The below represents technical guidance that has been developed by the Division of Environmental Remediation (DER) and the Division of Air Resources (DAR) technical staff to ensure that remedial systems meet the substantive requirements of DAR regulations. Nothing in this guidance restricts the ability of DEC to require treatment of air discharges from remedial systems which DEC or NYSDOH determines is necessary to protect human health or the environment.

Treatment Requirements for Volatile Organic Chemicals (VOCs):

The High Toxicity Air Contaminant (HTAC) List is provided in 6 NYCRR Part 212-2.2 Table 2. For DER, the most common HTAC chemicals include:

- benzene,
- tetrachloroethylene (PCE),
- trichloroethylene (TCE),
- carbon tetrachloride, and
- vinyl chloride.

Treatment is required (as described in Part 212-2.1) for any remedial system that has a potential to emit greater than 0.1 lbs./hr. of a HTAC. Treatment is required below this level if the annual total emissions exceeds the Mass Emission Limit provided in Table 2 (examples provided below).

Chemical Name	CASRN	Mass Emission Limit (pounds per year)	Calculated average pounds per hour
Carbon tetrachloride	56-23-5	100	0.011
Benzene	71-43-2	100	0.011
Vinyl Chloride	75-01-4	100	0.011
Trichloroethelene (TCE)	79-01-6	500	0.057
Perchloroethylene (PCE)	127-18-4	1000	0.11

If the remedial system does not have the potential to emit greater than 0.1 lbs./hr. of a HTAC and potential emissions are below the Mass Emission Limit, then no treatment and no further evaluation is required. If potential emissions are above the Mass Emission Limit, but below 0.1 lbs./hr., then treatment is required unless a Toxicity Impact Analysis is provided, in accordance with DAR-1, demonstrating compliance with Annual Guideline Concentrations/Short-Term Guidance Concentrations (AGC/SGCs).

For non-HTAC volatile organic chemicals, treatment is required if the system has the potential to emit total VOCs at a rate greater than 0.5 lbs./hr.

The following systems require treatment based on DER experience:

- **Soil vapor extraction (SVE)** systems are expected to require treatment;
- **Thermal remediation** (in- or ex-situ) will generally require treatment;
- **Excavation enclosures:** Temporary structures in place to control vapors and odors from excavation of contaminated soils will generally require treatment.
- **Air strippers** generally would not require treatment, however, for larger systems or systems with HTACs, it is good practice to confirm this; and

- **Sub-slab depressurization systems (SSDS)** This guidance does not alter the requirement for compliance with the minimum requirements of the NYSDOH SVI guidance. Generally, SSDS do not require off-gas treatment. For larger systems or systems with HTACs, the need for treatment to comply with this *Guidance on Air Emissions at DER Remediation Sites* should be evaluated. For SSDS discharges unavoidably near receptors, treatment should be considered (e.g. dense residential/commercial neighborhoods).

Major Sources:

DAR has additional requirements for major sources of contamination, as described in 6NYCRR Part 201-2.1(b)(21).

- For VOCs, the threshold to be considered a major source for the majority of the state is 50 tons/year. In the NY Metro Area (all of Long Island, New York City, Rockland County, Westchester County, and the Orange County towns of Blooming Grove, Chester, Highlands, Monroe, Tuxedo, Warwick, and Woodbury) the threshold is 25 tons/year.

- For hazardous air pollutants (HAPs) statewide, the thresholds are 10 tons/year for any single HAP and 25 tons/year for any combination of HAPs.

If any of these thresholds may potentially be exceeded, DAR must be consulted to ensure that air treatment and discharge meet all applicable requirements.

Ozone Depleting Substances and Greenhouse Gases:

For any remediation option which would discharge chlorofluorocarbons (CFCs) or other ozone depleting substances (ODS), the Feasibility Study or Alternatives Analysis must evaluate the feasibility of treatment to minimize discharge of ODS. If treatment to minimize discharge of ODS is required, it must be called for in the Decision Document (such as the Record of Decision) using the remedy selection criteria found in 6 NYCRR Part 375-1.8(f).

DER-31 and CP-49 require that the cleanup of remedial sites be considered in a larger context, including ODS and greenhouse gas (GHG) emissions. Some CFCs (as well as hydrofluorocarbons (HFC) and methane) are potent GHGs, some of which are thousands of times more potent than CO_2. Unnecessary discharge of these potent GHGs should be avoided.

The most common CFCs are Freons (e.g. Freon 114, Freon 11, Freon 23, Freon 12). Some of these are readily treated with activated carbon, but some are not. The following chart provides a comparison of the adsorption capacities for several Freon compounds relative to PCE and TCE:

Freon 23:	0.0001 gm adsorbed/100 gm carbon
Freon 12:	3.1 gm adsorbed/100 gm carbon
Freon 113:	20.0 gm adsorbed/100 gm carbon
TCE:	16.6 gm adsorbed/100 gm carbon
PCE:	27.5 gm adsorbed/100 gm carbon

APPENDIX I

Remedial System Optimization Table of Contents

APPENDIX I

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REMEDIAL SYSTEM OPTIMIZATION FOR 27-10 49th AVENUE

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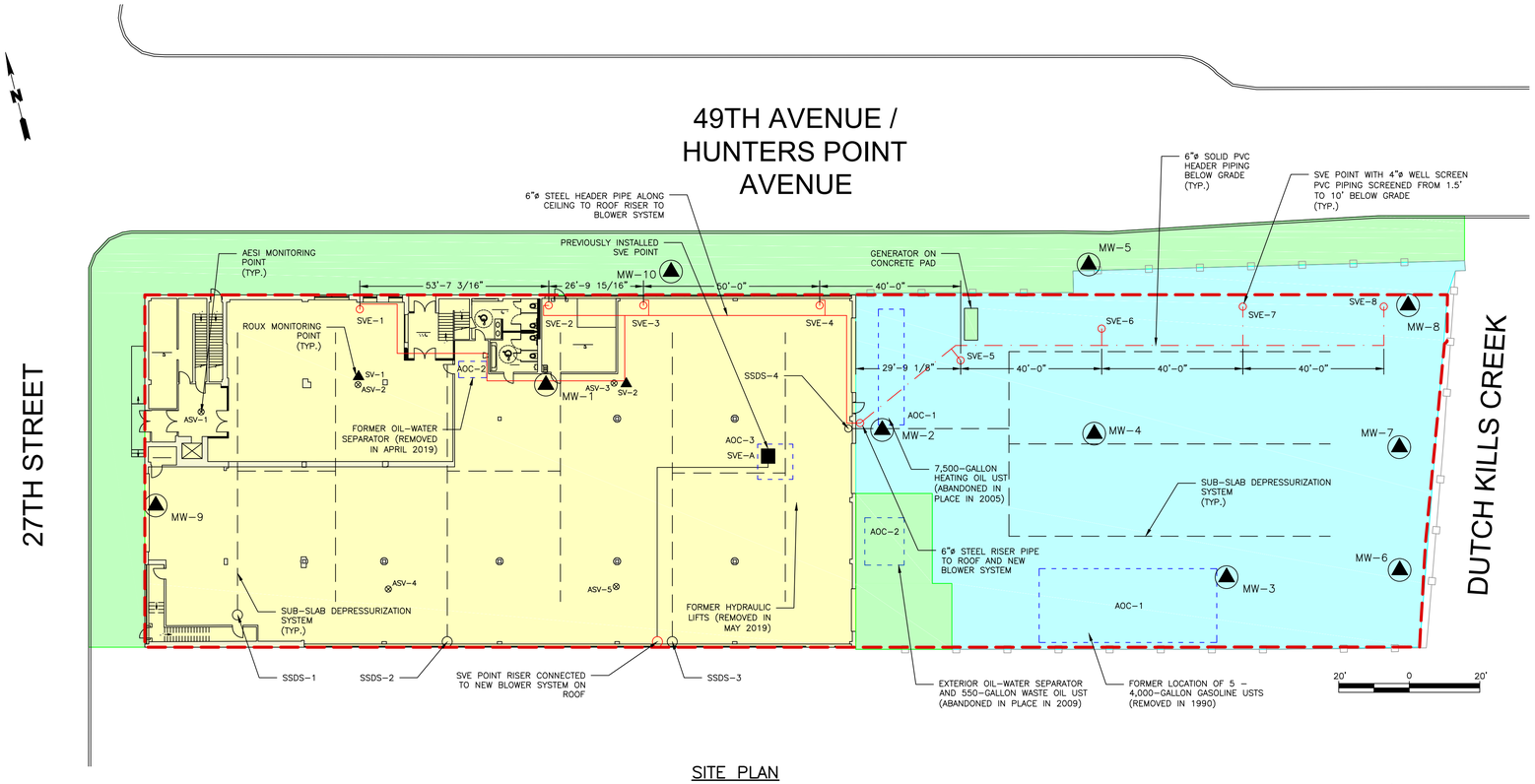
4.3.3 Optimize Monitoring Program

4.3.4 Maintenance and Repairs

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DRAWINGS

1. As-Built Sub-Slab Depressurization System/Soil Vapor Extraction System, Expanded Soil Vapor Extraction System and Site Cover Plan and Details



SITE PLAN

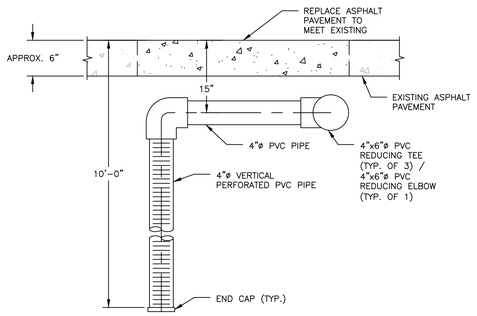
SCALE: 1" = 20'

LEGEND

- BUILDING FOUNDATION
- ASPHALT PARKING LOT
- CONCRETE PAVED AREA
- SITE BOUNDARY
- FENCE
- APPROXIMATE TANK AREAS (AS PER ATLANTIC ENVIRONMENTAL SOLUTIONS, INC.)
- SVES EXPANSION COMPONENTS
- AESI INSTALLED MONITORING POINT
- SV-1 ROUX INSTALLED MONITORING POINT
- MW-8 GROUNDWATER MONITORING WELL
- BUILDING COLUMN

SUB-SLAB DEPRESSURIZATION SYSTEM NOTES

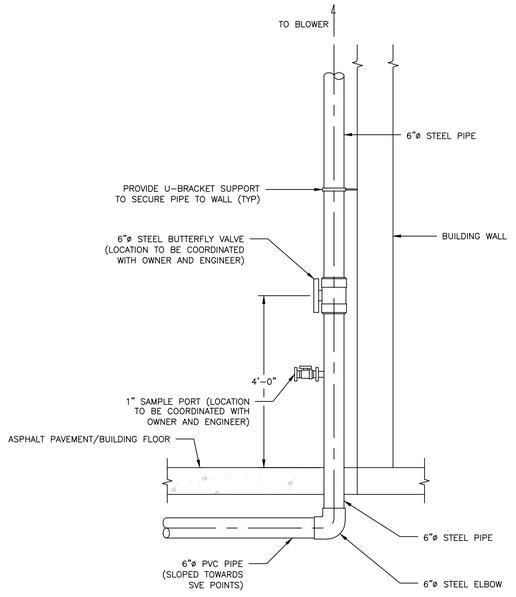
1. CONTRACTOR SHALL COORDINATE WITH PLUMBING, MECHANICAL, CIVIL AND ELECTRICAL CONTRACTORS FOR ALL UTILITY CROSSINGS.
2. THIS SOIL VAPOR EXTRACTION SYSTEM WAS DESIGNED TO MINIMIZE CROSSINGS OF ONSITE FEATURES AND STRUCTURAL FEATURES. FIELD VERIFICATION OF LOCATIONS SHOULD BE MADE TO ENSURE CROSSINGS ARE MINIMIZED.



PROFILE VIEW

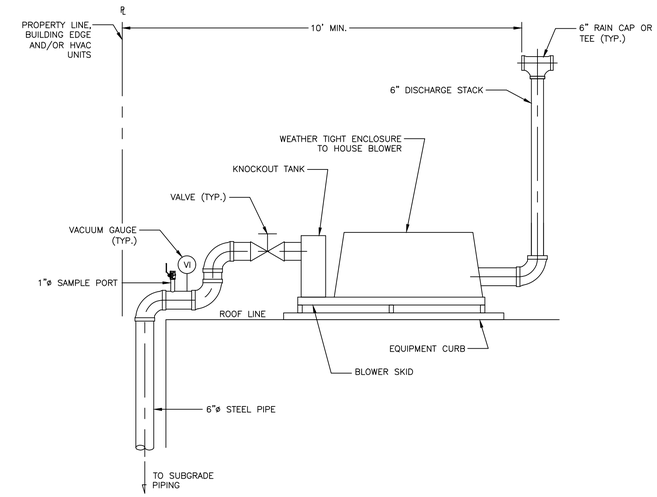
1 SOIL VAPOR EXTRACTION POINT DETAIL

SCALE: NOT TO SCALE



2 RISER DETAIL

SCALE: NOT TO SCALE



BLOWER NOTES

1. PROVIDE ELECTRICAL/CONTROL CONDUIT TO BLOWERS. COORDINATE WITH ELECTRICAL CONTRACTOR.
2. ELECTRICAL CONDUIT SHALL BE SIZED FOR 230/460 VOLT, THREE PHASE, 60 HZ, FOR THE BLOWER MOTOR.
3. SVES VENT EXHAUST SHALL BE OFFSET A MINIMUM OF 10 FEET FROM PROPERTY LINES, BUILDING EDGES, HVAC/AIR INTAKES, OPERABLE OPENINGS AND ANY OUTDOOR RECREATIONAL SPACES IN ACCORDANCE WITH NYC PLUMBING CODE CHAPTER 9 VENTS.
4. THE BLOWER SHALL BE A 10.0 HP, ATLANTIC BLOWERS AB-850 OR APPROVED EQUAL.
5. THE BLOWER SHALL BE PROVIDED WITH A WEATHER TIGHT ALUMINUM CUSTOM ENCLOSURE OR APPROVED EQUAL.
6. THE BLOWER SKID SHALL INCLUDE A WEATHER TIGHT ENCLOSURE, KNOCKOUT TANK (WITH HIGH LEVEL ALARM), VACUUM RELIEF VALVE, LOW VACUUM SWITCH, GAUGES, AND INTERCONNECTING PIPING/FITTINGS.
7. A CONTROL PANEL SHALL BE PROVIDED WITH THE BLOWER SKID. THE CONTROL PANEL SHALL HAVE GREEN OPERATING LIGHTS AND RED ALARM LIGHTS. THE CONTROL PANEL SHALL HAVE AN ALARM FOR WATER LEVEL IN KNOCKOUT TANK, LOW VACUUM AND NO POWER. THE ALARM SIGNAL SHALL BE SENT TO AN APPROPRIATE LOCATION IN THE PROPOSED BUILDING (I.E., SUPERINTENDENT'S OFFICE) AND SHALL ALSO BE AUDIBLE. THE ALARM SHALL BE A MCMASTER-CARR SIGNAL LIGHT WITH AUDIBLE ALARM (PART NO. 5753T71) OR APPROVED EQUAL.
8. PROVIDE ALL NECESSARY PIPE SUPPORTS FOR RISERS FROM THE ASPHALT PAVEMENT AND INSIDE THE BUILDING TO THE BLOWER ON THE ROOF.

3 TYPICAL BLOWER DETAIL

SCALE: NOT TO SCALE

NO.	DATE	REVISION DESCRIPTION	INT.

STATE OF NEW YORK — DAVID ERIC KAISER — 097317 — LICENSED PROFESSIONAL ENGINEER

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ROUX
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209 SHAFTER STREET ISLANDIA NEW YORK 11749
(631) 232-2600

PROJECT NAME:
27-10 49TH AVENUE, QUEENS, NY
NYSDEC BCP SITE NO. C241219

PROJECT FOR:
HUNTERS POINT SG, LLC
10 W FOREST AVENUE, ENGLEWOOD, NJ

TITLE:
AS-BUILT SUB-SLAB DEPRESSURIZATION SYSTEM/SOIL VAPOR EXTRACTION SYSTEM, EXPANDED SOIL VAPOR EXTRACTION SYSTEM AND SITE COVER PLAN AND DETAILS

DRAWING NO.
1
DRAWING 1 OF 1

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