Chlorinated Volatile Organic Compound Pre-Design Investigation & Reductive Dechlorination Pilot-Scale Study Work Plan

24 Seneca Avenue, Site No. 828132
Rochester, New York

Prepared for:

Stanley Black & Decker

Prepared by:

EHS Support℠

NATHAN

June 2019

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION

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1st Class Mail
and E-Mail (Kathryn.hinckley@sbdinc.com)

July 30, 2019

Kathryn Hinckley
Stanley Black & Decker
1000 Stanley Drive
New Britain, CT 06053

Re: 24 Seneca Avenue Site No. 828132
Rochester, Monroe County
Chlorinated Volatile Organic Compound Pre-Design Investigation and Reductive Dechlorination Pilot-Scale Study Work Plan

Dear Ms. Hinckley:

The New York State Department of Environmental Conservation (NYSDEC) and New York State Department of Health (NYSDOH) (collectively, the "Departments") have completed their review of the *Chlorinated Volatile Organic Compound Pre-Design Investigation & Reductive Dechlorination Pilot-Scale Study Work Plan* dated June 2019 and prepared by EHS Support LLC and Nathan Associates Inc. The Departments have determined that the Work Plan, with the following modifications, substantially addresses the requirements of the State Superfund Program and can be approved upon the execution of the order on consent.

1. Reporting: The Pre-Design Investigation Report (PDIR) and Pilot-Scale Study Report (PSSR) must be certified in accordance with DER-10, Section 1.5. The PDIR must be certified by a Qualified Environmental Professional or a Professional Engineer as those terms are defined in 6 NYCRR Subpart 375-1.2 and DER-10, Section 1.3. The PSSR must be certified by a Professional Engineer.

2. Injections: The Departments must approve the injection locations for the Pilot Study work prior to implementation.

3. Section 4.2.3: Management of investigation derived wastes will comply with DER-10, Section 3.3 (e).

4. Section 5.3.2: The Department may request additional monitoring if deemed warranted.

5. Section 7: The project schedule is enforceable under the order on consent. If additional time if needed, please send a request with a modified date in writing to the NYSDEC Project Manager.

6. QAPP Tables 1 and 2: Please see attached documents for emerging contaminant sampling procedures. Specifically, 1,4-dioxane will be sampled using analytical method

8270 SIM and perfluoroalkyl substances (PFAS) will be sampled using Modified EPA Method 537.

7. CAMP: Based on the proximity of on-site receptors/walls of occupied tenant spaces to the soil boring SB-33 area, a Special Requirements community air monitoring plan (CAMP) will be designed and implemented when ground intrusive activities commence within the inside of the building (see attached document). If the air monitoring results in the direction of the nearest potential receptor (or next to air intake vents/handling systems) indicate total volatile organic compounds (VOCs) exceed 1 ppm above background or particulates exceed 150 $\mu g/m^3$, additional actions to suppress fugitive VOCs and/or particulates must be taken. Also, consideration should be given to completing the interior investigative work during off-hours or when building occupancy is at a minimum, as well as enclosing the work space with proper emission controls.

8. HASP: Please submit a Health and Safety Plan for work being implemented to the Departments. This must be submitted at least two weeks prior to the start of field work to allow the Departments sufficient time to review it. Field work may not begin until the HASP has been submitted and reviewed.

If these modifications to the Work Plan are acceptable, please inform the Department within 15 days of this letter. In addition, please attach a copy of this letter to the Work Plan and distribute a hard copy to Danielle Miles with an original signature on the certification page.

If you have any questions or concerns, please contact me at danielle.miles@dec.ny.gov or (585) 226-5349.

Sincerely,

Danielle Miles

Danielle Miles, EIT
Assistant Engineer

ecc w/ attachment: Kristin VanLandingham, EHS Support LLC
John Simon, Nathan Associates Inc.
Frank Sowers, NYSDEC
Dudley Loew, NYSDEC
Bernette Schilling, NYSDEC
Mike Cruden, NYSDEC
Mark Sergott, NYSDOH
Justin Deming, NYSDOH

Certification

I, Kristin A. VanLandingham, P.E., certify that I am currently a NYS-registered professional engineer and that this *Chlorinated Volatile Organic Compound Pre-Design Investigation & Reductive Dechlorination Pilot Scale Work Plan* for 24 Seneca Avenue Site No 828132 dated June 2019 was prepared in accordance with all applicable statutes and regulations, and in conformance with the DER *Technical Guidance for Site Investigation and Remediation* (DER-10), where applicable.

Kristin A. VanLandingham, P.E.
NYS License No. 089610

06/06/2019
Date

KRISTIN A. VanLANDINGHAM
089610

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Acronyms

bgs	below ground surface
CAMP	Community Air Monitoring Plan
DO	dissolved oxygen
ECD	electron capture detector
EAB	enhanced anaerobic bioremediation
FID	flame ionization detector
GQS	Groundwater Quality Standards and Guidance Value
HASP	health and safety plan
HPT	high-profile tool
ISCR	in-situ chemical reduction
MIP	membrane interface probe
µg/kg	micrograms per kilogram
NYCRR	New York Codes, Rules and Regulations
NYSDEC	New York State Department of Environmental Conservation
ORP	oxidation-reduction potential
PDI	pre-design investigation
PID	photoionization detector
QAPP	Quality Assurance Project Plan
QA/QC	quality assurance/quality control
ROD	Record of Decision
ROI	radius of influence
Site	24 Seneca Avenue, City of Rochester, Monroe County, New York (Site
SCO	soil cleanup objectives
TCE	trichloroethene
UIC	Underground Injection Control
UST	underground storage tanks
USEPA	U.S. Environmental Protection Agency
VOC	Volatile Organic Compound
Work Plan	Chlorinated Volatile Organic Compound Pre-Design Investigation & Reductive Dechlorination Pilot-Scale Study Work Plan

1 Introduction

This Chlorinated Volatile Organic Compound Pre-Design Investigation & Reductive Dechlorination Pilot-Scale Study Work Plan (Work Plan) presents the scope of work for implementing a pre-design investigation (PDI) and pilot-scale study at a former manufacturing facility located at 24 Seneca Avenue, City of Rochester, Monroe County, New York (Site).[1] Briefly, the PDI will involve conducting delineation activities using high resolution site characterization methods that involve sophisticated field data collection, adaptive management of the investigation scope, and off-site laboratory verification. The pilot-scale study will involve injecting a treatment amendment to promote in-situ contaminant degradation and measuring the effect on the Site geochemistry and contaminant concentrations over time. The number of injection and monitoring points for the pilot-scale study may be revised based on the PDI results.

EHS Support LLC (EHS Support), in cooperation with Nathan Associates Inc. (Nathan), prepared this Work Plan on behalf of Stanley Black & Decker, Inc. for Sargent & Greenleaf, a former owner and occupant of the Site. This Work Plan was prepared in accordance with the New York State Department of Environmental Conservation (NYSDEC) *Remediation Program Regulations* (6 New York Codes, Rules and Regulations [NYCRR] Part 375) requirements, including those specifically outlining work plans at 6 NYCRR §375-1.6(a), 375-3.6, and 375-6. In addition, this Work Plan incorporates the guidance provided in *DER-10 / Technical Guidance for Site Investigation and Remediation*, dated May 3, 2010, specifically Chapter 3, Section 3.3 of DER-10 which specifies the requirements for investigation work plans. In addition, this Work Plan and the associated Quality Assurance Project Plan (QAPP; **Appendix A**) includes the quality assurance/quality control (QA/QC) requirements set forth in Chapter 2.3 of DER-10.

1.1 Report Organization

This Work Plan is designed to be used in concert with the QAPP (**Appendix A**) and describes the field and analytical activities to be conducted during the PDI, and the means and methods for collecting representative data during the PDI and pilot-scale study Following this introductory section, the Work Plan consists of the following sections:

- Section 2 – Site Setting
- Section 3 – Investigation Summary and Rationale for Chlorinated Volatile Organic Compound (VOC) Pre-Design Investigation and Pilot-Scale Study
- Section 4 – Chlorinated VOC Pre-Design Study Scope of Work
- Section 5 – Pilot-Scale Study Scope of Work
- Section 6 – Health and Safety
- Section 7 – Project Schedule
- Section 8 – References

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[1] Based on the scope of work, the Work Plan is analogous to the site characterization and feasibility study work plan categories.

2 Site Setting

The Site is located at 24 Seneca Avenue in the City of Rochester, Monroe County, New York. A Site Location Map is provided as **Figure 2-1**. The City completed a boundary and topographic survey of the Site on November 7, 2008. The Boundary and Topographic Survey Map is presented as **Figure 2-2**.

The Site is an L shaped parcel with tax ID: 91.83-01.10. According to the Monroe County property assessment system, the parcel is owned by 24 Seneca Avenue Inc. The overall Site is approximately 2.29 acres in size. The Site is bounded by Norton Street to the south, Seneca Avenue to the west, Bremen Street to the east, and a one-story masonry building (occupied by Van Hook Service Company, Inc.) to the north. In addition, there is a contiguous parcel at 574 Norton Street that is also owned by 24 Seneca Avenue Inc; however, although there are monitoring wells on the 574 Norton Street parcel, this parcel is not part of the Site.

The primary on-Site structure consists of an approximately 121,000-square-foot building. This building is a brick and masonry one-floor structure with slab on grade construction. A second floor, that encompasses approximately 9,500 square feet, is located on the south end of the Site building. In addition to the Site building, a small-unoccupied shack, formerly used as a guard shack, is located near the southwest corner of the main building.

The footprint of the main building occupies the majority of the Site surface, except for the following areas: the parking lot on the south side of the Site, grass and paved areas along two narrow areas on the eastern and western Site boundaries, and the paved loading dock on the east side of the Site that is accessed from Bremen Street. The parking lot on the south side of the Site consist of gravel and asphalt pavement in poor condition.

2.1 Site History

Based on a March 12, 2007 Phase I Environmental Site Assessment prepared by SGD, the Site has been used for various commercial and industrial uses since the early 1920s. Before 1920, the Site was vacant land. A 1920 map shows the planned construction of a foundry, machine shop, and mill for Sargent & Greenleaf (a lock manufacturer). Sargent & Greenleaf occupied the Site until 1975. During Sargent & Greenleaf's occupancy, the following operations were documented:

- Manufacturing of non-ferrous castings (zinc, aluminum, and brass)
- Heat treating operations
- Welding and machining operations
- Coating processes
- Incineration activities
- Use of underground storage tanks (USTs) which reportedly contained gasoline and heating oil
- Numerous additions to the original 1920s building structure.

Following the sale of the property by Sargent & Greenleaf in 1977, available information indicates that the Site occupants included the following:

- W.P. Stein (metal stamping): 1977 – 1984 (assumed)
- Jay-Ve Tackle: 1982 to at least 2007
- Quality Packaging and Flexseal Packaging (manufacturing, ink and die applications): 1986 – 1997

- 4 Fathoms: 1990 – 1993
- Monroe Window and Door (manufacturing/service): 1991 – 1995
- Motorcycle repair shop: 1995 – 1997
- Seneca Machine (machining): 1997 to at least 201
- Phoenix Machine Repair (janitorial equipment): 1997 – unknown.
- Buckman Equipment: 1997 – unknown
- School House Travel: 1997 – unknown
- Great Northern Association: 1997 – unknown
- Fresh Pasta: 1997 to no later than 2006
- KLS Wood Products (manufacturing): 1998 – 2000
- Dock Hardware (dock component manufacturer and surplus warehousing and distribution of industrial equipment): 1999 – present
- Tae Kwon-Do Gold School: 2006 – unknown
- Bread of Life Church: 2006 – to at least 2011 (no longer present)
- Extra Packaging (packaging supplier, no manufacturing): 2006 – present
- AWR Rigging (building equipment installation): 2011 – present
- Coin Services: 2011 – no longer present
- ENEROC Partners (labor provider): unknown occupancy date – present

Note: all of the above dates are approximate and are based on best available information from historical reports and internet research.

2.2 Current Site Use

Based on historical documents and internet research, the Site is currently occupied by the following businesses:

- Extra Packaging (packaging supplier, no manufacturing)
- Dock Hardware (dock components manufacturer, also specializing in industrial equipment surplus sales)
- AWR Rigging (building equipment installation)
- ENEROC Partners (labor provider)

2.3 Site Topography

The Site is located at approximately 455 feet above mean sea level. The local topography is relatively flat and generally dips to the northwest towards the Genesee River Gorge. Surface water runoff at the Site predominantly drains to catch basins located at the curbs of the surrounding streets and conveys to the Monroe County Storm Water Collection System.

2.4 Site Geology

The overburden geology at the Site can generally be characterized as a dark brown sandy loam topsoil from approximately 0 to 1 feet below ground surface (bgs) at unpaved areas, grading to fine/medium grained silty sand alternating with dense clay/silty clay that contain some coarse lenses of sand and gravel lenses observed at depths generally from 1 to 8 feet bgs, grading to finer grained dense silt and clay and dense till observed generally above bedrock at depths of 8 to 10 feet bgs. Bedrock is encountered at the Site at a depth of approximately 10 feet bgs (O'Brien & Gere, 2011).

2.5 Site Hydrogeology

Overburden Site monitoring wells installed during previous investigations were generally completed to depths of approximately 10 feet bgs at the overburden/bedrock contact. During the monitoring well gauging events conducted by O'Brien & Gere during the remedial investigation activities, water levels were gauged at depths between approximately 7.5 to 9.5 feet bgs in the fall of 2008 and 5 to 8.5 feet bgs in the winter of 2009. The exception was the indoor well (OW-101) where water levels were gauged deeper; 11.29 feet bgs in the fall of 2008 and 9.81 feet bgs in the winter of 2009 (the total depth of this well is 12.25 feet bgs). Water found in overburden at the Site was typically encountered above the dense fine-grained soils and till present above bedrock and is likely the result of local storm water recharge (e.g., perched water) (O'Brien & Gere, 2011).

3 Investigation Summary and Rationale for Chlorinated VOC Pre-Design Investigation and Pilot-Scale Study

A series of investigations have been conducted at the Site from the late 1980s through 2014. These investigations include the following:

- Oil and Hazardous Materials Site Evaluation, Haley & Aldrich, July 1989
- Analytical Data Report, General Testing Corporation, February 2, 1993
- Level 2 Environmental Site Assessment, Rizzo Associates, Inc., April 13, 1993
- Report on Environmental Investigations, Haley & Aldrich, September 14, 1993
- Groundwater Monitoring Well Sampling Results, GZA GeoEnvironmental, September 30, 1996
- Bedrock Supply Well Sampling Results, GZA GeoEnvironmental, September 30, 1996
- Phase II Environmental Investigation, Anson Environmental Ltd., October 1996
- Voluntary Cleanup Program Investigation Report for July 1998 Field Work, Anson Environmental Ltd., December 9, 1998
- Remedial Investigation, Environmental Restoration Project, O'Brien & Gere, February 2011
- Supplemental Remedial Investigation, Environmental Restoration Project, O'Brien & Gere, May 2012
- Supplemental Soil and Vapor Intrusion Sampling, Environmental Restoration Project, O'Brien & Gere, October 2014

The results of these investigations are summarized in the NYSDEC Record of Decision (ROD) for the Site, dated March 10, 2016. Selected figures depicting the extent of VOCs in soil and groundwater are provided in **Appendix B**. The selected remedy in the ROD includes two activities related to chlorinated VOCs that warrant pre-design activities:

- Excavating soil near soil boring SB-33; and,
- In-situ groundwater treatment for VOCs with enhanced anaerobic bioremediation including bioaugmentation and an iron additive.

The extent of each remedy, as shown in the ROD, is repeated in **Figure 3-1** of this Work Plan.

As shown in **Figure 3-1**, the extent of soil remediation for VOCs is based on a single boring, SB-33, which contained concentrations of trichloroethene (TCE) of 41,670 micrograms per kilogram (µg/kg) at a depth of 12 to 13.1 feet. This concentration is indicative of a source area and warrants further delineation before the remedial design.

The area identified in the ROD for groundwater treatment is an ellipse extending from the southern parking lot to the northwest approximately 60 feet past the location of soil boring SB-33, also shown in **Figure 3-1**. This treatment area also encompasses MW-10 next to the south wall of the building where the second highest detection of TCE was detected at the time of the remedial investigation (although MW-10 is a bedrock well). Further groundwater delineation is warranted to assess whether there is a single source of TCE or separate sources to better define the treatment area.

In addition, a pilot-scale study is warranted to evaluate the type of groundwater treatment amendment to be injected, the aquifer's biogeochemical response to the injections, and the ability of the subsurface formation to accept injected fluids. Furthermore, the pilot-scale study will provide information on the in-situ degradability of the contaminants in the presence of the injected amendment.

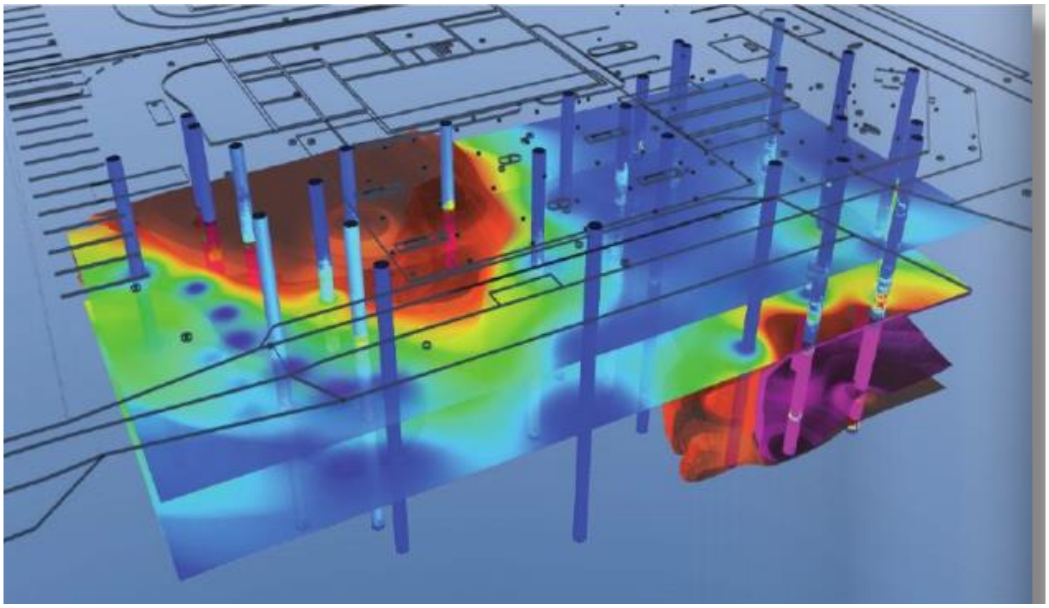
4 Chlorinated VOC Pre-design Investigation

The objectives of the PDI are as follows:

- Delineate the extent of chlorinated VOC-containing soil in the vicinity of soil boring SB-33
- Determine whether there are two distinct TCE sources, one near soil boring SB-33 and a second in the vicinity of MW-10, which will also provide data to better define the treatment area.

The PDI data will be used to develop the soil remediation design and, if necessary, to refine the pilot-scale study scope. The pilot-scale study results will then be used to inform the groundwater remediation design.

The overall approach to the PDI is conducting the delineation using high-resolution site characterization methods, an adaptive management of the investigation scope, and off-site laboratory verification to produce a three-dimension depiction of the extent of contamination (see general example below). This will enable the remedial design to consider data on the source(s) and extent of the TCE in soil and groundwater.



Example of high-resolution site characterization (darker areas have higher contaminant concentrations)

The PDI scope of work is summarized in the following **Table 4-1** and explained in the subsections that follow. Sample locations are provided on **Figure 4-1**.

Table 4-1: Pre-Design Investigation Scope of Work

Proposed Location	Sample Depths	Analytes	Purpose
Southern Portion of Building and Parking Lot	Continuous probes with MIP 0-10/12 ft bgs	VOCs (field screening with ECD)	Delineate extent of VOCs in soil & groundwater on a qualitative basis
Southern Portion of Building and Parking Lot	Soil: 20 direct push sample points (approximately 12 feet deep)	VOCs, iron, ferrous iron, organic carbon[2]	Delineate extent of VOCs and obtain information on iron and organic carbon
Southern Portion of Building and Parking Lot	Groundwater: 25 grab samples	VOCs	Complete groundwater profile in the southern portion of the property
Southern Portion of Building and Parking Lot	Groundwater: 4 samples from newly installed wells and 1 sample from MW-10	VOCs and natural attenuation parameters	Determine baseline conditions for pilot-scale study; confirm data for MW-10

4.1 Confirm Utility Locations

Before any of the PDI activities commence, the locations of underground utilities will be confirmed. O'Brien and Gere mapped the utilities at the Site as part of the RI (**Appendix B**). However, additional utility locating is warranted as part of the PDI to avoid encountering utilities during the subsurface field activities. The utility locating will involve the following activities:

- Contacting Dig Safely New York (1-800-962-7962) for a utility markout. However, this service will only provide utility locating services up to the property line.
- Attempt to obtain and review the historical building diagrams from the building 1965 and 1967 expansions referenced by O'Brien & Gere in its RI report (P. 22); O'Brien & Gere indicated that these diagrams were obtained from the City of Rochester and are maintained in the firm's project files.
- Discuss utility locations with the Site owners, if accessible.
- Retain a private utility locating service, such as On The Mark Utility Locating Services, Inc. (585-733-1748), to mark the exterior and, if possible, interior utility locations using electromagnetic induction and ground penetrating radar methods.

4.2 Pre-Design Investigation Scope of Work

The PDI will consist of two general steps: 1) conducting field screening activities using a membrane interface probe (MIP) and high-profile tool (HPT); and 2) collecting soil and groundwater samples for laboratory confirmation. The field screening will produce a three-dimensional map with indications of where the highest concentrations of chlorinated VOCs are located. This will provide information on

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[2] In addition, two soil and two groundwater samples will be collected for 1,4-dioxane and perfluoroalkyl substances. The samples will be from the locations closest to prior samples SB-33 and MW-10 to bias the samples to areas with high VOC concentrations.

where to collect soil and groundwater samples for off-site laboratory analyses. Each activity is further described below.

4.2.1 Field Screening Procedures

The MIP allows for the real-time semi-quantitative analysis of VOCs in the subsurface. The MIP tool consists of a semi-permeable membrane mounted on the outside of a stainless-steel drive point, which is attached to direct push rods. The membrane is heated to 100 to 120 degrees Celsius and a constant flow of non-reactive carrier gas sweeps behind the membrane. VOCs present in the subsurface (soil or groundwater) diffuse across the membrane and are carried to gas phase detectors at the ground surface via the carrier gas. Different gas phase detectors are available for identifying VOCs, and most commonly include photoionization detector (PID), electron capture detector (ECD), and flame ionization detector (FID). The detectors provide a “screening” response rather than a concentration. The PID and FID are responsive to VOCs; however, the ECD responds only to chlorinated VOCs, such as TCE, and will be the detector used for this PDI.

The MIP system will provide real-time VOC and conductivity profiling to delineate and characterize the distribution of chlorinated VOCs in soil and groundwater. Initially, probe points will be located in the general configuration shown in **Figure 4-1**. This configuration is subject to revision based on the facility layout, accessibility, and utility locations. After the initial probe points are completed, additional probe points will be located based on the results of previously conducted borings and the historical data. It is anticipated that 35 to 50 probe points will be installed during the PDI (**Figure 4-1** only shows the initial probe points).

The probe will also be equipped with an HPT to provide real-time subsurface hydraulic data. The HPT is a sensitive pressure transducer housed in the drive point. The drive point is advanced at approximately two centimeters per second and clean water is injected through a screen in the drive point at a constant rate, usually less than 0.3 liter per minute. The injection pressure is monitored and plotted with depth. The injection pressure is an indication of the formation’s relative permeability. That is, a high pressure reading indicates low permeability, such as a clay lens, and a low pressure indicates high permeability, such as a gravel seam.

The drive point also contains a device for measuring the electrical conductivity of the formation (soil and groundwater), which provides real-time lithology information. The lithology information, in combination with the MIP and HPT results, can be used to potentially identify preferential pathways for contaminants.

4.2.2 Soil and Groundwater Sample Collection

Following the field screening, soil and groundwater samples will be collected for analysis by a New York-state certified commercial laboratory following NYSDEC and U.S. Environmental Protection Agency (USEPA) protocol to produce data packages that can be independently verified by a third-party quality assurance chemist.

The locations of the soil and groundwater samples for laboratory analysis will be selected based on the results of the field screening. At this time, it is anticipated that 20 soil and 25 groundwater grab samples will be collected for laboratory analysis (this assumes that the area of soil boring SB-33 is the only soil source area identified). At this stage, NYSDEC will be engaged to review the results of the field screening and will be afforded the opportunity to comment on the soil and groundwater sample locations, with an understanding that the number of samples will not exceed that provided in this Work Plan, unless Stanley Black & Decker concurs with the increase.

The soil and groundwater samples for VOC analysis will be collected from direct push points following the sampling and analytical procedures described in the QAPP (**Appendix A**). In addition, four groundwater monitoring wells will be installed in the area deemed best suited for the pilot-scale study. These wells will be pre-packed 5-foot long well screens advanced with the direct push rig and will be 1 inch in diameter. The well screens will be set at the base of the bedrock. The wells, which will be 1-inch pre-packed well screens, will be installed, developed, and sampled in accordance with the QAPP (**Appendix A**).

The groundwater samples from the newly installed wells within the pilot-scale study area and a groundwater sample from existing well MW-10 will be analyzed for the following parameters:

- VOCs
- nitrate, sulfate, and sulfide
- ferrous iron, total iron, and manganese
- total organic carbon and dissolved organic carbon
- dissolved gases (methane, ethane, ethene)
- volatile fatty acids
- bacteria and functional genes.

Field parameters for dissolved oxygen (DO), oxidation-reduction potential (ORP), specific conductance, turbidity, and temperature will be collected from the monitoring wells during development and sampling. In addition, three soil samples will be analyzed for fraction of organic carbon following the Lloyd Kahn method as well as ferrous and total iron. The sampling and analysis from the wells will also be conducted in accordance with the QAPP (**Appendix A**).

4.2.3 Investigation-derived Wastes

Investigation-derived waste will be placed into 55-gallon drums, properly labeled, and stored in a secure location. Waste characterization samples will be collected for RCRA characterization purposes and the waste will be disposed of or treated off-site in accordance with applicable laws and regulations.

4.2.4 Survey Sample Locations

A survey will be performed by a New York State licensed land surveyor after completing the fieldwork to locate the probe and temporary monitoring well locations. Horizontal measurements and ground surface elevations will be accurate to within 0.1 foot. The base map for the Site will include pertinent Site features and the investigation exploration locations.

Boring logs and well construction diagrams will be prepared to document the well installation and development activities.

4.3 Pre-Design Investigation Report

A PDI report will be prepared describing the above investigation activities. At a minimum, the PDI report will include the following:

- A description of the pre-design investigation activities, including any deviations from this Work Plan
- A tabulated summary of the laboratory data with a comparison to the NYSDEC's commercial and industrial soil cleanup objectives (SCOs) and protection of groundwater SCOs (which, may be those established by NYSDEC or Site-specific protection of groundwater SCOs)[3]
- A narrative discussion of the laboratory data focusing on compliance with the commercial and industrial SCOs, protection of groundwater SCOs and/or Site-specific SCOs, and NYSDEC's Groundwater Quality Standards and Guidance Values (GQSs)
- Scaled figures showing the sampling locations and the outer extent of soil and groundwater exceeding SCOs and GQSs
- The complete laboratory deliverable package, including a data usability report discussing the data validity that will be prepared by a QA chemist
- Daily field activity logs and notes
- Community Air Monitoring Plan (CAMP) monitoring results (note: the CAMP is included in the QAPP provided in **Appendix A** of this Work Plan)
- Boring logs
- A summary of the microbial ecology data (note: these data do not warrant a full QA/QC review by a QC chemist because the data are microbiological, not chemical, in nature)
- Waste characterization data and disposal documentation
- Conclusions and recommendations which summarize the extent of the areas of concern

Data generated during the PDI will be uploaded to the NYSDEC's Environmental Information Management System in accordance with the NYSDEC Electronic Data Deliverable Manual, V. 4 (NYSDEC, 2018).

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[3] Note: if site-specific protection of groundwater soil cleanup objectives are pursued, they will be developed following the same procedure that NYSDEC used to develop the generic standards.

5 Pilot Scale Study

The objectives of the pilot-scale study are as follows:

- Determine the appropriate injection point spacing
- Evaluate injection amendment pressures and rates
- Assess whether the injection amendment creates geochemical and microbial ecology environments appropriate for treatment
- Determine the extent to which the amendment degrades TCE and its degradation products.

5.1 Technology Description

The technology to be tested in the pilot-scale study is a combination of in-situ chemical reduction (ISCR) and enhanced anaerobic bioremediation (EAB). Applying the technology involves injecting a liquid solution into the area selected for the pilot study using a direct push rig to establish a biogeochemical environment favorable for both ISCR and EAB. The concepts underlying ISCR and EAB are provided below.

5.1.1 In-Situ Chemical Reduction (ISCR)

ISCR generally refers to the category of *in-situ* groundwater remediation technologies where treatment occurs primarily by chemical reduction of contaminants. The emphasis of ISCR is on abiotic degradation processes, but contaminant reduction through biologically mediated processes also falls within the realm of ISCR if the role of microbial activity in the contaminant reduction is indirect (meaning biological processes promote the contaminant degradation but do not degrade the contaminant directly). It is well established in the remediation literature that TCE will degrade abiotically in the presence of certain iron species, including dissolved ferrous iron, which is the foundation of ISCR.

The aquifer geochemistry must be in a reducing environment for ISCR to occur. The reducing conditions necessary for ISCR can arise from natural attenuation via intrinsic biogeochemical processes, be generated by stimulation of *in-situ* microbial activity (i.e., EAB), or be created by addition of chemical reductants. For the pilot-scale study, the reduced aquifer conditions necessary for ISCR to occur will be generated both by the addition of chemical reducing agents, in the form of dissolved iron salt, and by adding a carbon source to enhance in-situ microbial activity.

5.1.2 Enhanced Anaerobic Bioremediation (EAB)

Under anaerobic conditions, certain microorganisms (bacteria) degrade TCE to ethene/ethane, limited amounts of carbon dioxide, and trace amounts of hydrogen gas. In these reactions, bacteria use the chlorinated VOCs as electron acceptors, removing chlorine atoms that are replaced with hydrogen. The source of hydrogen is the fermentation of either native or injected organic carbon material in the subsurface that serves as a food source (electron donor).

During anaerobic biodegradation of chlorinated ethenes, such as TCE, chloride ions are sequentially removed. The more highly chlorinated (more oxidized) compounds, such as TCE, are degraded more readily than the less chlorinated (less oxidized) compounds, such as dichloroethene isomers and vinyl chloride, which require more energy and a more highly anaerobic environment to support the bacterial strains capable of complete reductive dechlorination to ethene and ethane.

The presence of cis-1,2-dichloroethene and vinyl chloride as well as the reduction of TCE over time in many of the Site wells suggests that anaerobic biodegradation is occurring; however, it is not clear whether the removal of TCE is definitively linked to anaerobic biodegradation. Furthermore, the ORP and DO concentrations, which are both relatively low (ORP generally slightly negative and most DO measurements less than 2 milligrams per liter [mg/L]), suggest conditions favorable for anaerobic bioremediation. However, the microbial ecology has not been evaluated and, therefore, no data are available regarding whether the type of bacteria capable of degrading TCE and its degradation products are present. For example, a commonly accepted theory is that the bacteria species *Dehalococcoides* must be present to degrade the TCE breakdown products cis-1,2-dichloroethene and vinyl chloride to non-toxic ethene. The testing to be performed during the PDI is designed to confirm whether or not the reaction is naturally occurring. However, even if *Dehalococcoides* is present, the ability of bacteria to degrade TCE and its degradation products will be enhanced by creating a more reduced aquifer geochemistry than currently exists.

Implementing the EAB technology involves enhancing anaerobic microorganism growth in contaminated groundwater by injecting an electron donor to sustain or increase reducing conditions. Common electron donors include organic substances such as simple sugars (molasses), lactate, vegetable oils, or engineered reagents specifically designed to promote EAB. For the pilot-scale study, the electron donor is lecithin, an organic compound comprised of phospholipids. The following discussion provides information on the liquid to be used as the amendment and its application into the aquifer. In addition, if the naturally occurring *Dehalococcoides* concentrations are low, then the EAB program may warrant augmentation by adding bacteria as part of the injection process.

5.2 Injection Procedures

The first step of the injection process is conducting a distribution test to provide information on the radius of influence. Based on the aquifer properties, an 8-foot injection point spacing is appropriate (4-foot radius of influence [ROI]). However, based on the distribution injection test results, the injection point spacing may be altered.

5.2.1 Distribution Injection Test

The distribution testing will involve injecting bromine-infused water using a direct push rig in an area to be selected based on the PDI results. The solution will contain 250 mg/L of bromine.[4] This will involve advancing injection tooling using a direct push rig and then injecting the solution beginning at the top of the water table surface to the top of bedrock at pressures to be determined in the field based on the delivery efficiency. No more than 1,000 gallons of the bromine solution will be injected at the approximate location shown in **Figure 4-1** (south parking lot). Following the test, the direct push rig will be used to advance a probe with a retractable tip that will enable groundwater samples to be collected from discrete depths from the top of the water table to the top of bedrock. The samples will be screened in the field using a bromine test kit (see QAPP [**Appendix A**] for the field test procedure). The

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[4] The 250 mg/l bromine concentration was derived from: U.S. Department of Defense, Environmental Security Technology Certification Program. 2014. *Enhanced Amendment Delivery to Low Permeability Zones for Chlorinated Solvent Source Area Bioremediation*. U.S. Department of Defense: Alexandria, VA.

data will be reviewed to confirm the 4-foot ROI and the injection spacing will be adjusted to reflect the optimum spacing based on the vertical and horizontal distribution of the chlorinated VOCs identified in PDI.

5.2.2 Reagent Selection

Subject to the results of the PDI investigation, the pilot-scale study will utilize Peroxychem EHC® Liquid Reagent (EHC Liquid) as the treatment reagent.[5] The EHC Liquid consists of a soluble iron salt and ELS™ microemulsion that will be mixed and diluted on-site for injection. Peroxychem will supply the EHC Liquid in powder form in 24.5-pound bags and the ELS™ microemulsion (diluted to 25 percent) in 55-gallon drums.

The EHC Liquid reagent is demonstrated effective at degradation through both ISCR and EAB. Further, the selection of this reagent was based on the higher solubility relative to other ISCR reagents and, thus, associated ease of delivery, and more repeatable and predictable distribution through lower pressure, nonfracturing injections. The material safety data sheets are included in **Appendix C**.

5.2.3 Injection Layout

A reactive zone will be created through an array of injection points with the objective of creating a contiguous treatment zone in the shallow aquifer (targeting the entire saturated zone above the bedrock interface). **Figure 5-1** shows the currently anticipated injection array. As shown in the figure, the plan is to inject the treatment reagent on 8-foot centers through 4 injection points. This assumes a radius of influence (ROI) of 4 feet from each injection point. The location of the injection will be determined based on the PDI results.

Based on this target ROI, an anticipated effective porosity of 25%, and a 5-foot saturated thickness, the volume of reagent to be injected at each point is calculated as 475 gallons.

This configuration will be modified in the field, as necessary, based on the facility layout and current occupant usage patterns. The injection method is described in the following sections.

5.2.4 Reagent Preparation

The reagent formulation will be prepared in 500-gallon batches consisting of 450 gallons of makeup water, 50 gallons of ELS microemulsion, and 25 pounds of EHC Liquid powder. The ELS microemulsion is pre-emulsified and the EHC Liquid soluble; therefore, both reagents will readily mix with water. Each batch will be mixed for a minimum of 10 minutes before injections commence. Facility water will be used for the injections. The injection liquid will be mixed on-site on an as needed basis and will be used the same day as it is mixed.

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[5] Depending on the PDI results, the amendment used may be changed to another product; for example, Peroxychem provides other products, such as EHC-plus and GeoForm, that are designed for a longer lasting application. If Stanley Black & Decker proposes to change the treatment amendment, a written request explaining the proposed change and associated rationale will be submitted to NYSDEC for the Department's concurrence.

A bromine tracer will be added to the injection solution to support evaluation of pilot study objectives identified above. The tracer will be monitored by testing the groundwater for bromine. In addition, if deemed warranted, groundwater samples can be collected from direct push borings during the injection following the procedures for tracer testing used for the distribution injection test in Section 5.2.1.

5.2.5 *Injection Method*

The selected reagent is water soluble; therefore, lower pressure injections and porous distribution are targeted to minimize any fracturing of the aquifer formation. If necessary to achieve target injection volumes and reagent delivery, pressures will be increased and monitored for any indications of fracturing or short circuiting.

Before initiating the injection, monitoring wells located within the pilot-scale study area will be plugged using a temporary inflatable or mechanical packer to prevent short circuiting through the well screens. The direct push injection contractor will utilize a steel probe with the lead rod equipped with pressure activated injection ports. The rods will be driven to the top of the groundwater table and then the injection will be initiated. The probe will be driven downward with continuous pumping of the reagent at the desired flow rate to achieve the design delivery volume.

Each injection point will be abandoned with hydrated bentonite and then repairing the floor or pavement surface with cement or asphalt to match the existing surface.

5.2.6 *Injection Permitting*

The proposed injection points are considered Class V underground injection wells subject to the Underground Injection Control (UIC) Program. In accordance with the requirements of the USEPA's underground injection control (UIC) program, Stanley Black & Decker will submit a letter of notification, and an injection well inventory form (USEPA form number 7520-16) to the USEPA's UIC branch at least 30 days prior to conducting the proposed pilot testing activities. A copy of the notification letter will be provided to NYSDEC.

A notification letter will also be submitted to the local fire department at least one week in advance of the proposed pilot testing activities. This letter will include the general scope of work and the quantity and types of chemicals that will be on-site.

5.3 Monitoring

The monitoring program is designed to evaluate the pilot study objectives previously presented. The following subsections describe two aspects of the monitoring program: 1) operational monitoring during the pilot study; and, 2) performance monitoring following the pilot study to gather data to determine how the aquifer conditions and geochemistry are affected by the amendment injections.

5.3.1 *Operational Monitoring*

Operational monitoring will be conducted during the injections to guide the injection operations and to modify the injection process, as necessary. The operational monitoring elements and objectives consist of:

- Injection rate and volume – the injection rate at each injection point will be monitored continuously using a flow meter that is integrated into the injection equipment. The injection rate will be recorded at least hourly throughout the injections and at any time the rate changes. The injection volume will be calculated by multiplying the injection rate by time of injection at each rate.
- Injection pressure – the injection pressure will be measured at the injection point using a gauge integrated into the injection equipment. The pressure will be recorded at least hourly. The contractor and oversight personnel will work together to establish an injection pressure that is sufficiently high to force the amendment into the aquifer, but low enough to avoid formation fracturing. Formation fracturing is generally indicated by either a loss in pressure and/or associated increase in injection rate.
- Test borings – test borings will be advanced using the direct push rig during the injection process, as deemed necessary, to confirm distribution of the injected amendment. Soil and groundwater from the test borings will be evaluated for visible evidence of the amendment and, in addition, groundwater from grab samples will be analyzed for ferrous iron and bromide using field test kits to assess whether the amendment is distributing within the aquifer zone targeted for treatment. The number of test borings will be determined in the field.

5.3.2 Performance Monitoring

Performance monitoring will be initiated at the end of the pilot study injections tovaluate the objectives described above.

Following the injection, the four monitoring wells installed in the pilot scale test area as part of the PDI will be sampled within one week of completing the injections and then once per month thereafter for six months. If deemed warranted, additional monitoring may be conducted at the discretion of Stanley Black & Decker. The groundwater samples will be analyzed for the analytical parameters listed in **Table 5-1**. The sample collection and analysis will be performed in accordance with the QAPP (**Appendix A**).

Table 5-1: Pilot-Scale Study Performance Monitoring Program

Sampling Event	VOCs	Natural Attenuation Parameters	qPCR
Initial Event (after injections)	X	X	X
Monthly Event 1	X		
Monthly Event 2	X		
Monthly Event 3	X	X	X
Monthly Event 4	X		
Monthly Event 5	X		
Monthly Event 6	X	X	X

Natural attenuation parameters include: nitrate, sulfate, sulfide, ferrous iron, total iron, manganese, total organic carbon, dissolved organic carbon, volatile fatty acids, and dissolved gases (methane, ethane, ethene) (see QAPP for analytical methods)
qPCR = quantitative polymerase chain reaction (used to determine bacteria species)

5.4 Pilot-Scale Study Report

Following completion of the performance testing, a pilot-scale study summary report will be prepared describing the field activities and results. At a minimum, the pilot-scale study report will include the following:

- A description of the pilot-scale study activities, including any deviations from this Work Plan
- A tabulated summary of the laboratory data with a comparison to the commercial and industrial SCOs and protection of groundwater SCOs (which, may be those established by NYSDEC or Site-specific protection of groundwater SCOs)
- A narrative discussion of the laboratory data
- Scaled figures showing the pilot-scale study injection points and sampling locations
- The complete laboratory deliverable packages, including a quality assurance narrative discussing the data validity that will be prepared by a QA chemist
- Daily field activity logs and notes
- Boring logs
- CAMP monitoring results
- A summary of the microbial ecology data (note: these data do not warrant a full QA/QC review by a QC chemist because the data are microbiological, not chemical, in nature)
- Discussion of the efficacy of the injection process, including the distribution injection test and the subsequent injection
- Conclusions and recommendations based on the test results

Data generated during the pilot-scale study will be uploaded to the NYSDEC's Environmental Information Management System in accordance with the NYSDEC Electronic Data Deliverable Manual, V. 4 (NYSDEC, 2018).

6 Health and Safety

The consultant overseeing the work and the contractors conducting the PDI and pilot-scale study will prepare a health and safety plan (HASP) in accordance with 29 CFR 1910.120. At a minimum, the HASP will include the following information required by the OSHA Hazardous Waste Operations and Emergency Response Standard (40 CFR 1910.120(b)(4)):

- A safety and health risk or hazard analysis for each Site task and operation required as part of the PDI or pilot-scale study activities
- Personal protective equipment to be used by employees for each of the Site tasks being conducted
- Frequency and types of air monitoring, personnel monitoring, and environmental sampling techniques and instrumentation to be used, including methods of maintenance and calibration of monitoring and sampling equipment to be used
- Site control measures
- Decontamination procedures
- An emergency response plan for safe and effective responses to emergencies, including the necessary personal protective equipment and other equipment
- Pre-entry briefing to be held prior to initiating any Site activity, and at such other times as necessary to ensure that workers are apprised of the HASP and that the HASP is being followed
- Provisions for inspections by the Site safety and health supervisor and, to the extent required, mechanisms in place to correct deficiencies in the effectiveness of the HASP

The HASP(s) will be reviewed by all on-site personnel and will be maintained on-site at all times when the pre-design investigation or related activities are conducted. Both the contractors and the consulting firm overseeing the work will have HASPs.

In addition, during the PDI and pilot-scale study activities, the Community Air Monitoring Program provided in the QAPP will be implemented.

7 Project Schedule

The PDI and pilot scale study will be conducted within the following schedule:

- Start – Work Plan approval from NYSDEC, execution of consent order (if required), and obtaining access from Site owner and/or tenants
- Week 0 to 4 – PDI field work planning
- Week 5 to 8 – PDI field work implementation, field screening
- Week 11 to 14 – PDI field work implementation, soil and groundwater sampling[6]
- Week 15 to 22 – PDI laboratory analysis, data validation, and report
- Week 23 to 30 – Pilot-scale study planning
- Week 31 to 40 – Pilot-scale study implementation, including operational monitoring
- Week 41 to 67 – Pilot scale study performance monitoring
- Week 68 to 76 – Pilot scale study laboratory analysis, data validation, and report

NYSDEC will be notified a minimum of seven calendar days before commencing any field work.

The above schedule is predicated on the ability to retain contractors. In particular, there are a limited number of contractors with the equipment and expertise to perform the MIP and HPT portion of the investigation which may cause delays due to the lack of contractor availability. Furthermore, it is difficult to conduct field investigations in Rochester, New York in the winter season and weather conditions could cause delays. If these delays occur, Stanley Black & Decker will contact NYSDEC via email explaining the source of the delay and to request an extension.

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[6] Assumes coordination with NYSDEC on soil and groundwater sample locations can be completed within 2 weeks.

8 References

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SGD Environmental Services. (2007, March 12). Phase I Environmental Site Assessment, 24 Seneca Avenue.

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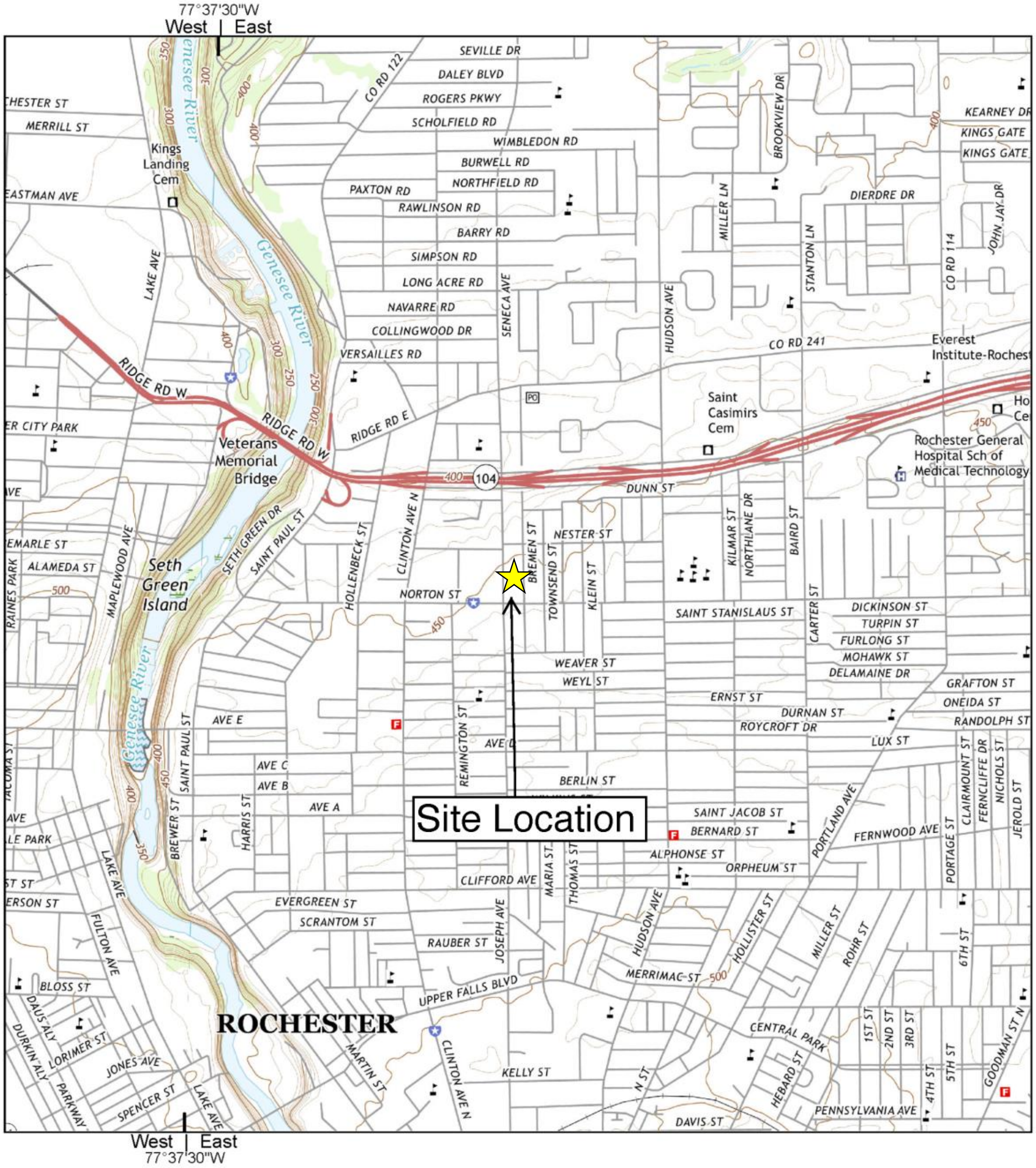
Figures



2016

0 Distance in Miles 1

1: 24,000 (1"=2,000') NAD 1983 UTM Zone 18N

Site information:
Former Sargent & Greenleaf
24 Seneca Avenue
Rochester, NY 14621

HIG

Unified maps show subdued modern topo features where corresponding maps of the same year were not published.

Gnarus Advisors project #SGROCNY-18023.00
HIG #2015773 completed: 05/07/2018

Zone	Topographic Map Name	Publisher	Map Size	Base Map	Aerial Photo Topo Updates Photo Year	Inspected	Revised
East	Rochester East, NY	USGS	7½' x 7½'	2016	--	--	--
West	Rochester West, NY	USGS	7½' x 7½'	2016	--	--	--

FIGURE
2-1

Site Location Map

24 Seneca Avenue, Rochester, New York

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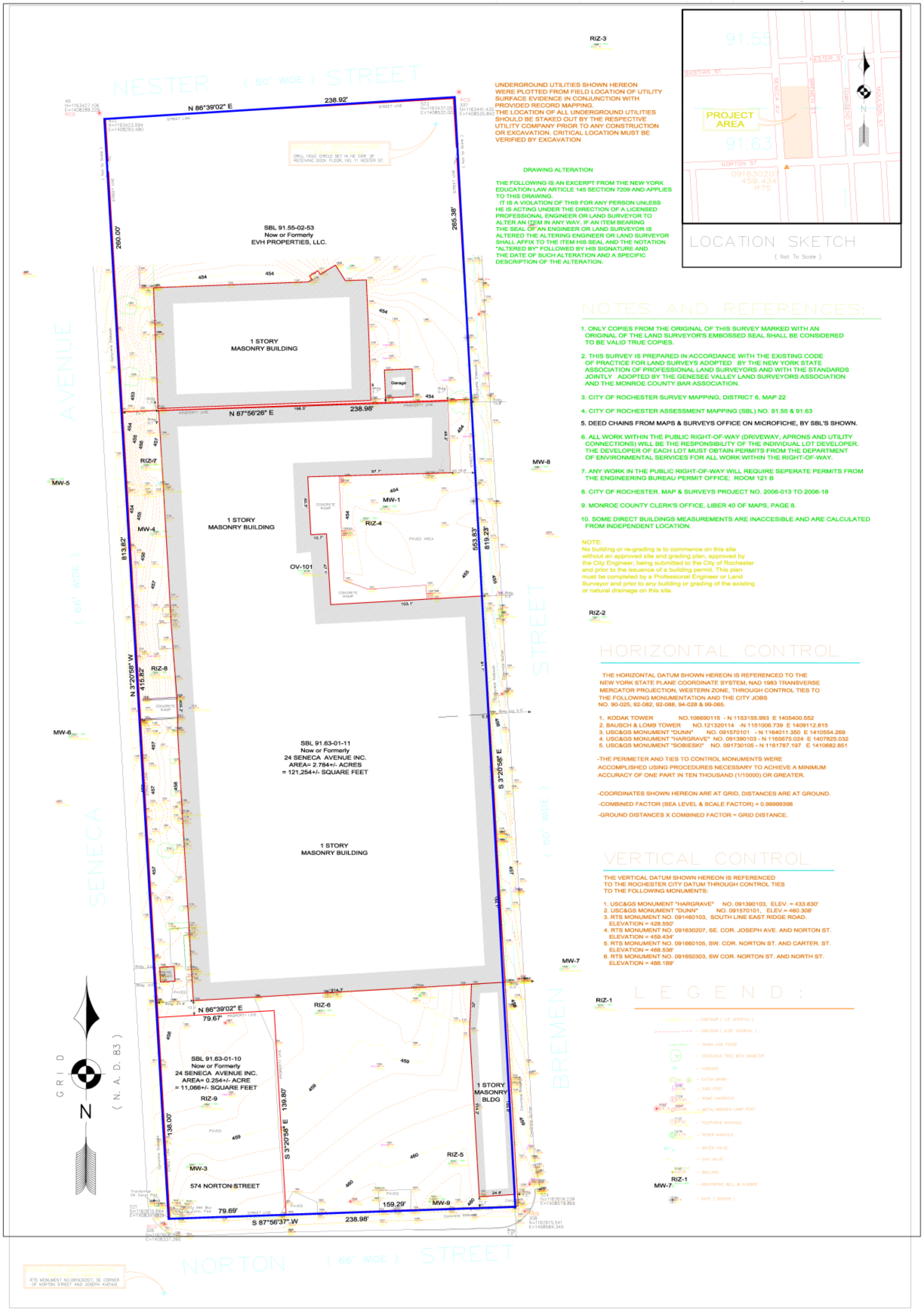

UNDERGROUND UTILITIES SHOWN HEREON WERE PLOTTED FROM FIELD LOCATION OF UTILITY SURFACE EVIDENCE IN CONJUNCTION WITH PROVIDED RECORD MAPPING.
THE LOCATION OF ALL UNDERGROUND UTILITIES SHOULD BE STAKED OUT BY THE RESPECTIVE UTILITY COMPANY PRIOR TO ANY CONSTRUCTION OR EXCAVATION. CRITICAL LOCATION MUST BE VERIFIED BY EXCAVATION

DRAWING ALTERATION

THE FOLLOWING IS AN EXCERPT FROM THE NEW YORK EDUCATION LAW ARTICLE 145 SECTION 7209 AND APPLIES TO THIS DRAWING.

IT IS A VIOLATION OF THIS FOR ANY PERSON UNLESS HE IS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER OR LAND SURVEYOR TO ALTER AN ITEM IN ANY WAY. IF AN ITEM BEARING THE SEAL OF AN ENGINEER OR LAND SURVEYOR IS ALTERED THE ALTERING ENGINEER OR LAND SURVEYOR SHALL AFFIX TO THE ITEM HIS SEAL AND THE NOTATION "ALTERED BY" FOLLOWED BY HIS SIGNATURE AND THE DATE OF SUCH ALTERATION AND A SPECIFIC DESCRIPTION OF THE ALTERATION.

NOTES AND REFERENCES:

1. ONLY COPIES FROM THE ORIGINAL OF THIS SURVEY MARKED WITH AN ORIGINAL OF THE LAND SURVEYOR'S EMBOSSED SEAL SHALL BE CONSIDERED TO BE VALID TRUE COPIES.
2. THIS SURVEY IS PREPARED IN ACCORDANCE WITH THE EXISTING CODE OF PRACTICE FOR LAND SURVEYS ADOPTED BY THE NEW YORK STATE ASSOCIATION OF PROFESSIONAL LAND SURVEYORS AND WITH THE STANDARDS JOINTLY ADOPTED BY THE GENESEE VALLEY LAND SURVEYORS ASSOCIATION AND THE MONROE COUNTY BAR ASSOCIATION.
3. CITY OF ROCHESTER SURVEY MAPPING, DISTRICT 6, MAP 22
4. CITY OF ROCHESTER ASSESSMENT MAPPING (SBL) NO. 91.55 & 91.63
5. DEED CHAINS FROM MAPS & SURVEYS OFFICE ON MICROFICHE, BY SBL'S SHOWN.
6. ALL WORK WITHIN THE PUBLIC RIGHT-OF-WAY (DRIVEWAY, APRONS AND UTILITY CONNECTIONS) WILL BE THE RESPONSIBILITY OF THE INDIVIDUAL LOT DEVELOPER. THE DEVELOPER OF EACH LOT MUST OBTAIN PERMITS FROM THE DEPARTMENT OF ENVIRONMENTAL SERVICES FOR ALL WORK WITHIN THE RIGHT-OF-WAY.
7. ANY WORK IN THE PUBLIC RIGHT-OF-WAY WILL REQUIRE SEPERATE PERMITS FROM THE ENGINEERING BUREAU PERMIT OFFICE; ROOM 121 B
8. CITY OF ROCHESTER. MAP & SURVEYS PROJECT NO. 2006-013 TO 2006-18
9. MONROE COUNTY CLERK'S OFFICE, LIBER 40 OF MAPS, PAGE 8.
10. SOME DIRECT BUILDINGS MEASUREMENTS ARE INACCESIBLE AND ARE CALCULATED FROM INDEPENDENT LOCATION.

NOTE:
No building or re-grading is to commence on this site without an approved site and grading plan, approved by the City Engineer, being submitted to the City of Rochester and prior to the issuance of a building permit. This plan must be completed by a Professional Engineer or Land Surveyor and prior to any building or grading of the existing or natural drainage on this site.

HORIZONTAL CONTROL

THE HORIZONTAL DATUM SHOWN HEREON IS REFERENCED TO THE NEW YORK STATE PLANE COORDINATE SYSTEM, NAD 1983 TRANSVERSE MERCATOR PROJECTION, WESTERN ZONE, THROUGH CONTROL TIES TO THE FOLLOWING MONUMENTATION AND THE CITY JOBS NO. 90-025, 92-082, 92-088, 94-028 & 99-065.

1. KODAK TOWER	NO.106690115	- N 1153155.993	E 1405400.552
2. BAUSCH & LOMB TOWER	NO.121320114	-N 1151006.739	E 1409112.815
3. USC&GS MONUMENT "DUNN"	NO. 091570101	- N 1164011.350	E 1410554.269
4. USC&GS MONUMENT "HARGRAVE"	NO. 091390103	- N 1165675.024	E 1407825.032
5. USC&GS MONUMENT "SOBIESKI"	NO. 091730105	- N 1161787.197	E 1410682.851

-THE PERIMETER AND TIES TO CONTROL MONUMENTS WERE ACCOMPLISHED USING PROCEDURES NECESSARY TO ACHIEVE A MINIMUM ACCURACY OF ONE PART IN TEN THOUSAND (1/10000) OR GREATER.

-COORDINATES SHOWN HEREON ARE AT GRID, DISTANCES ARE AT GROUND.

-COMBINED FACTOR (SEA LEVEL & SCALE FACTOR) = 0.99999398

-GROUND DISTANCES X COMBINED FACTOR = GRID DISTANCE.

VERTICAL CONTROL

THE VERTICAL DATUM SHOWN HEREON IS REFERENCED TO THE ROCHESTER CITY DATUM THROUGH CONTROL TIES TO THE FOLLOWING MONUMENTS:

1. USC&GS MONUMENT "HARGRAVE" NO. 091390103, ELEV. = 433.830'
2. USC&GS MONUMENT "DUNN" NO. 091570101, ELEV.= 460.308'
3. RTS MONUMENT NO. 091460103, SOUTH LINE EAST RIDGE ROAD. ELEVATION = 428.550'
4. RTS MONUMENT NO. 091630207, SE. COR. JOSEPH AVE. AND NORTON ST. ELEVATION = 459.434'
5. RTS MONUMENT NO. 091660106, SW. COR. NORTON ST. AND CARTER. ST. ELEVATION = 468.536'
6. RTS MONUMENT NO. 091650303, SW COR. NORTON ST. AND NORTH ST. ELEVATION = 466.189'

LEGEND:

- CONTOUR (1.0' INTERVAL)
- CONTOUR (0.25' INTERVAL)
- CHAIN LINK FENCE
- DECIDUOUS TREE WITH DIAMETER
- HYDRANT
- CATCH BASIN
- SIGN POST
- RG&E HANDHOLE
- METAL/WOODEN LAMP POST
- TELEPHONE MANHOLE
- SEWER MANHOLE
- WATER VALVE
- GAS VALVE
- BOLLARD
- MONITORING WELL & NUMBER
- GATE (CENTER)

FIGURE
2-2

Boundary & Topographic Survey Map

24 Seneca Avenue, Rochester, New York

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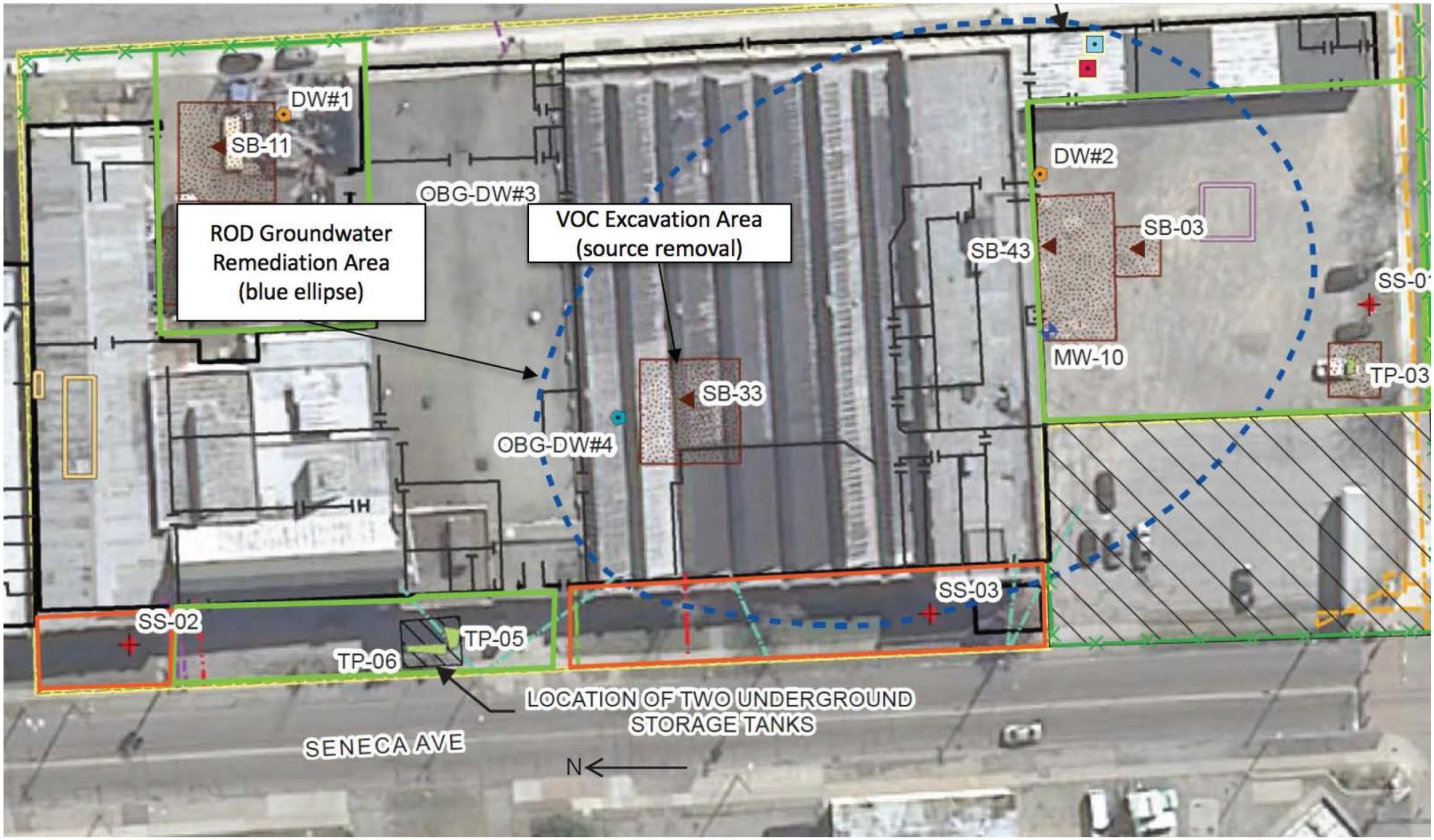

FIGURE
3-1

Remediation Areas from Record of Decision
24 Seneca Avenue, Rochester, New York
(NYSDEC, 2016)

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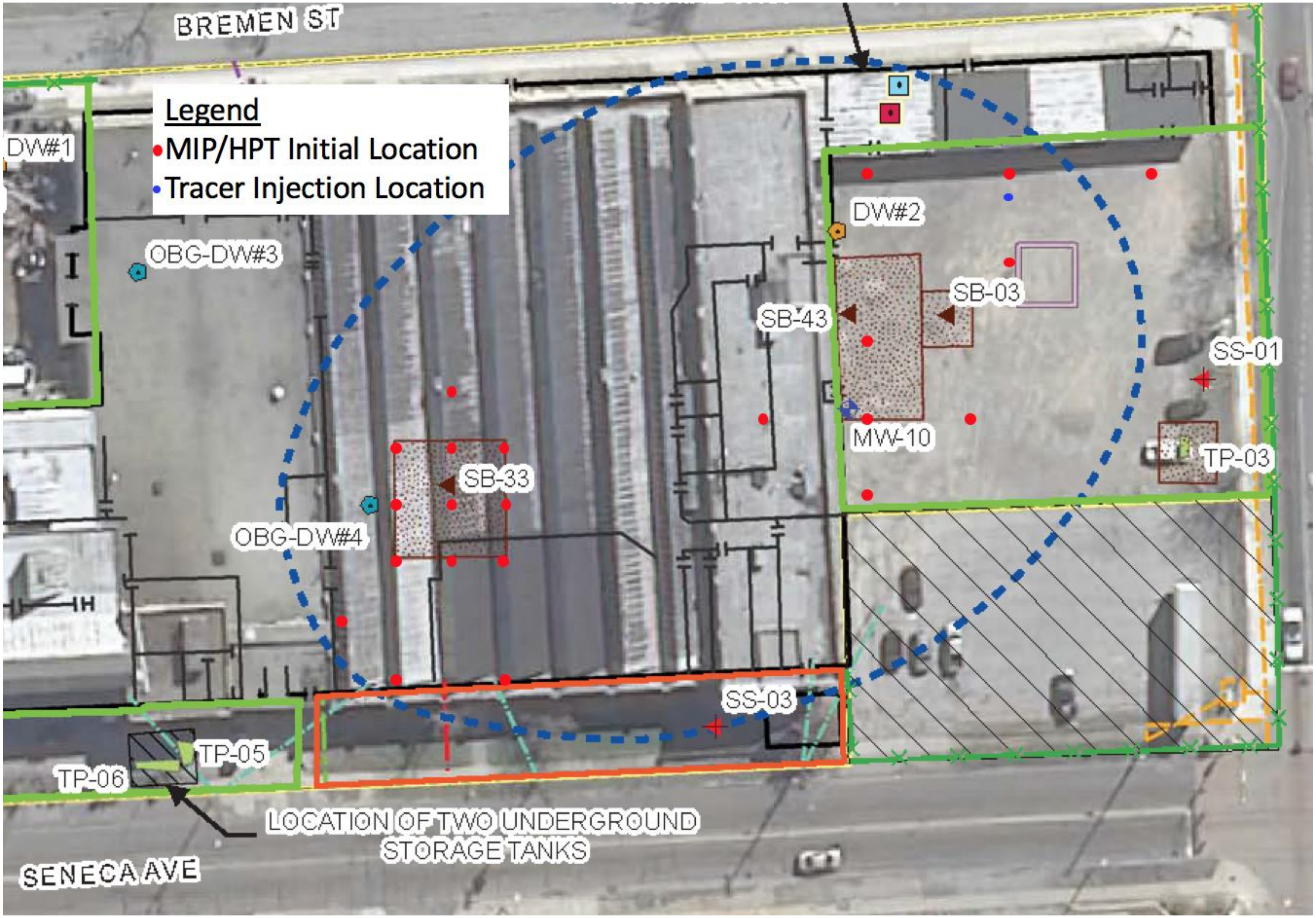

FIGURE
4-1

Soil and Groundwater MIP/HPT Investigation Locations
(Initial)

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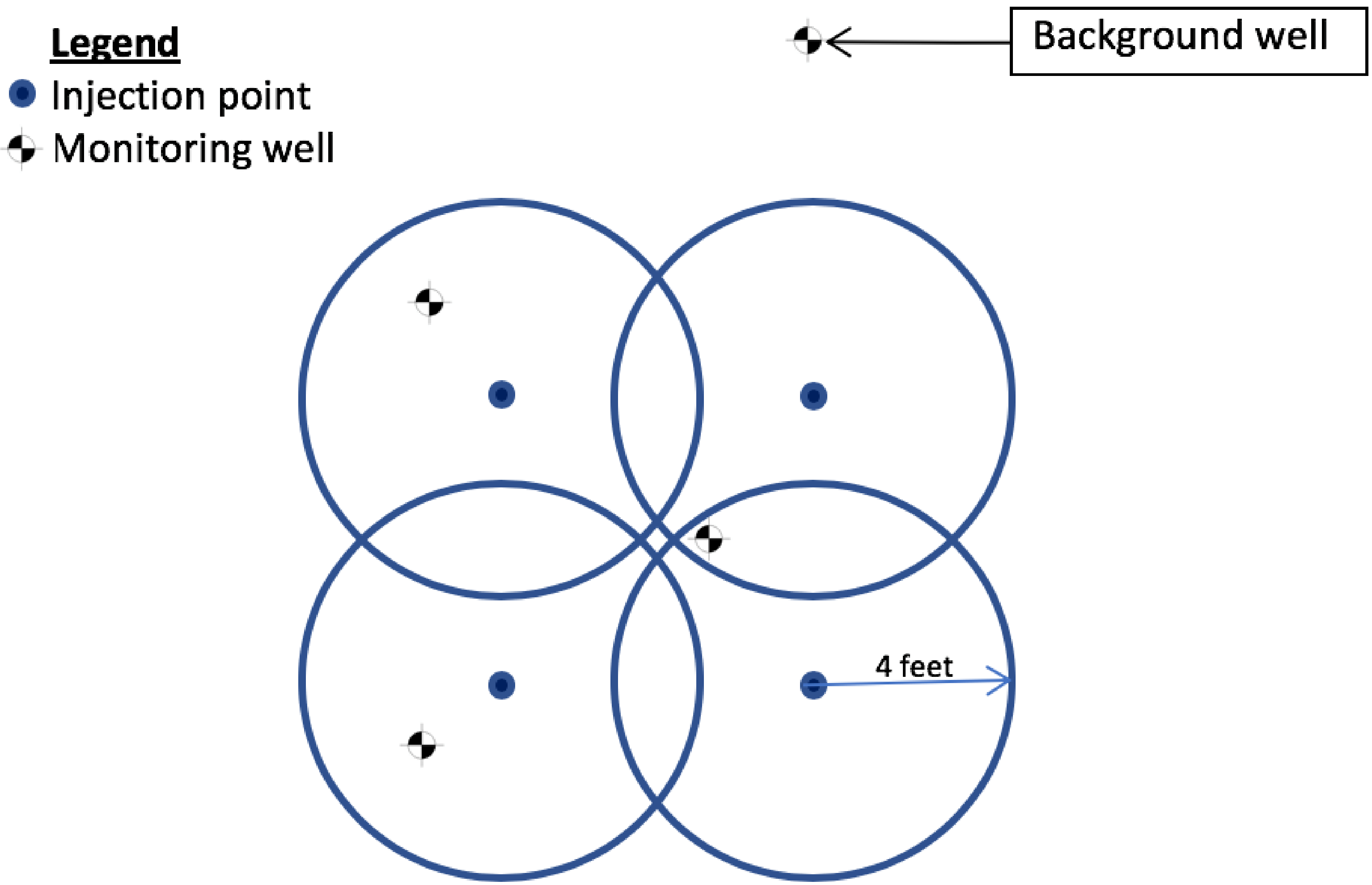

FIGURE
5-1

Pilot Scale Study Injection Layout

24 Seneca Avenue, Rochester, New York

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Appendix A Quality Assurance Project Plan

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Quality Assurance Project Plan
Chlorinated Volatile Organic Compound Pre-Design Investigation and Pilot-Scale Study

24 Seneca Avenue, Site No. 828132
Rochester, New York

June 2019

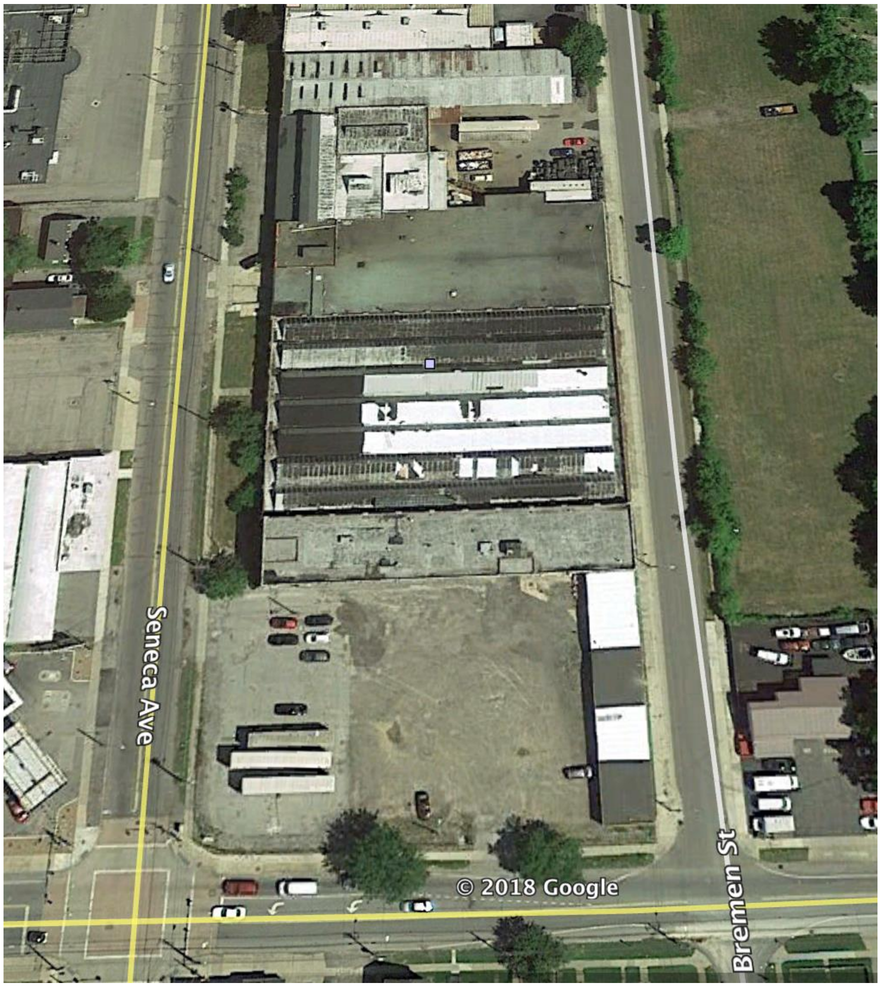

Table of Contents

1. Introduction and Project Definition

Nathan Associates Inc. (Nathan), in cooperation with EHS Support LLC (EHS Support) and on behalf of Stanley Black & Decker, Inc. for Sargent & Greenleaf, plans to implement a focused chlorinated volatile organic compound (VOC) pre-design investigation (PDI) and pilot-scale study at a site located at 24 Seneca Avenue in Rochester, New York (Site). Briefly, the PDI will involve conducting delineation activities using high resolution site characterization methods that involve sophisticated field data collection, adaptive management of the investigation scope, and off-site laboratory verification. The pilot-scale study will involve injecting a treatment amendment to promote in-situ contaminant degradation and measuring the effect on the Site geochemistry and contaminant concentrations over time. This Quality Assurance Project Plan (QAPP) was prepared for the implementation of the PDI and pilot-scale study in accordance with the *Chlorinated Volatile Organic Compound Pre-Design Investigation and Pilot-Scale Study Work Plan* (Work Plan).

In general, the project will involve the following activities:

- Conduct field screening using a direct push rig equipped with a membrane interface probe (MIP) with various field screening detectors and a hydraulic push tool (HPT).
- Collect soil samples from direct push cores for VOCs, 1,4-dioxane, perfluoroalkyl substances (PFAS), ferrous iron, total iron, and fraction organic carbon analyses.[1]
- Collect groundwater samples from direct push sampling points for VOC, 1,4-dioxane, and PFAS analysis.
- Collect groundwater samples from temporary wells and one monitoring well for analysis of: VOCs, nitrate, sulfate, sulfide, ferrous iron, total iron, manganese, total organic carbon, dissolved organic carbon, volatile fatty acids, and bacteria and functional genes.
- Collect groundwater samples for field analysis of dissolved oxygen (DO), oxidation-reduction potential (ORP), turbidity, specific conductivity, and temperature.
- During the injection tracer test, analyze groundwater samples for bromine using a field test kit.
- Collect soil and groundwater investigation-derived waste samples for RCRA characterization parameters
- Oversight of the pilot-scale study field activities.
- Utility locating.
- Surveying sample locations.

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[1] Only two soil and two groundwater samples will be collected for 1,4-dioxane and PFAS analyses. The samples will be from the locations closest to prior samples SB-33 and MW-10 to bias the samples to areas with high VOC concentrations. The PFAS list is: perfluorobutanoic acid, perfluoropentanoic acid, perfluorohexanoic acid, perfluoroheptanoic acid, perfluorooctanoic acid, perfluorononanoic acid, perfluorodecanoic acid, perfluoroundecanoic acid, perfluorododecanoic acid, perfluoro-n-tridecanoic acid, perfluorotetradecanoic acid, perfluorobutane sulfonic acid, perfluorohexane sulfonic acid, perfluoroheptane sulfonic acid, perfluorooctane sulfonic acid, perfluorodecane sulfonic acid, 6:2 fluorotelomersulfonic acid, 8:2 fluorotelomersulfonic acid, perfluorooctanesulfonamide, n-methyl perfluoro-1-octanesulfonamidoacetic acid, and n-ethyl perfluoro-1-octanesulfonamidoacetic acid.

The activities listed above are described in the Work Plan and will be conducted in accordance with applicable New York State Department of Environmental Conservation (NYSDEC) guidance and regulations.

This QAPP sets forth the quality assurance/quality control (QA/QC) procedures to be followed during the execution of the PDI and pilot-scale study , including procedures for sampling, chain of custody, laboratory analysis, data reduction and reporting, internal quality control, preventive maintenance, and corrective action. The purpose of the QAPP is to ensure the generation of valid data or, if the data are not valid, to identify the validity issues and determine appropriate corrective actions.

2. Project Organization

A flowchart depicting the project organization, including the flow of information from the client, project management team, field team, and laboratory, is provided in **Figure 1**.

Project Participants

The personnel responsible for the quality assurance of the field sampling and analysis portion of the project are as follows:

- Stanley Black & Decker Project Representative – Kathryn Hinckley
- Project Director/Manager – John Simon, Nathan Associates, Inc.
- Project Hydrogeologist and Site-Specific Health and Safety Officer – Anton Heitger, EHS Support
- Pilot Scale Study Oversight – Anton Heitger, EHS Support
- Project Health and Safety Director – Aaron Leff, EHS Support
- Project Engineer – Kristin A. VanLandingham, P.E.
- Sampling and Oversight Personnel – Anton Heitger (or designee), EHS Support
- Quality Assurance Chemist – Jodi Zimmerman, Vali-Data of WNY, LLC
- ALS Global Laboratory Project Manager – Meghan Pedro
- ALS Global Laboratory Custodian – Greg LaForce or designee
- Microbial Insights Laboratory Project Manager – Kate Clark
- Microbial Insights Laboratory Project Manager – Casey Brown
- High-Resolution Site Characterization (HRSC) Project Manager – Brian McCann, Columbia Technologies

2.1 Participant Responsibilities

The following subsection describes the relationship among the project participants.

Stanley Black & Decker Project Representative

Kathyrn Hinckley is the Stanley Black & Decker Project Representative for the PDI and pilot-scale study activities. Ms. Hinckley will review documents and provide comments to the project team. She also is responsible for coordinating the field activities with the project director and ensuring that the work area is available for the necessary field activities.

Project Director/Manager

John Simon will serve as the Project Director/Manager and, as such, will work with the project team to develop the overall project strategy. Mr. Simon will also serve as the primary point of contact with the client. He will be responsible for ensuring the field activities are conducted in accordance with the Work Plan and that the appropriate personnel are assigned to complete the project tasks. Mr. Simon will ensure the waste classification is assigned in accordance with applicable laws and regulations. In addition, Mr. Simon will be responsible for the quality of documents submitted to the NYSDEC.

Project Hydrogeologist and Site-Specific Health and Safety Officer

Anton Heitger will have the responsibility of managing the contractors to ensure that the field work is performed in accordance with the Work Plan and QAPP. Mr. Heitger or his designee will be responsible for the following activities:

- PDI sampling tasks
- Coordinating and supervising the drilling and sampling activities, including the contractors retained to conduct the field screening and to install the soil borings and temporary monitoring wells
- Coordinating with the laboratory project manager prior to shipping sample coolers and containers from and to the laboratory
- Either directly collecting or overseeing the collection of the soil and groundwater samples
- Supervising or serving as the field sample custodian
- Ensuring that field measurements and sample collection follow the PDI and pilot-scale study work plan and this QAPP
- Identifying and resolving problems occurring during the field work

As the Site-specific Health and Safety Officer, Mr. Heitger is responsible for ensuring that the site-specific health and safety plan (HASP) is adhered to by all field personnel under his direction (the contractor will have its own HASP and designated health and safety officer). In addition, Mr. Heitger is responsible for overall compliance with the OSHA Hazardous Site Worker Regulations (40 CFR 1910.126) and other applicable regulations.

Each day of field activities must begin with a “tailgate” meeting to discuss the planned activities, the job safety risks involved, and precautions to be taken. The Site-specific Health and Safety Officer or an appropriate designee must record the time of the tailgate meeting and attendees in the field notebook.

Project Health and Safety Director

Aaron Leff will serve as the project health and safety director and will be responsible for developing the HASP, reviewing and approving the contractors’ health and safety programs, and directing EHS Support’s health and safety program.

Project Engineer

Kristin A. VanLandingham, P.E., is a registered professional engineer in the state of New York and will serve as the project engineer. Ms. VanLandingham will be responsible for ensuring that the project design and implementation are performed in accordance with accepted engineering practices and New York State laws, regulations, and guidance.

Sampling and Oversight Personnel

Experienced engineers, geologists, hydrogeologists, environmental scientists, and/or environmental technicians employed by EHS Support will conduct the contractor oversight and sampling tasks set forth in the Work Plan and QAPP. Their responsibilities will include following sample collection, documentation, shipment, chain of custody, and health and safety procedures during all aspects of the field activities. The sampling personnel will report to the Project Hydrogeologist. In addition, the Sampling and Oversight Personnel will oversee as aspects of the pilot-scale study, which will include working with Mr. Simon and the contractor to select sample locations.

Quality Assurance Chemist

Jodi Zimmerman, Vali-Data of WNY, LLC, will serve as an independent third-party consultant, specializing in evaluating the quality of laboratory data, and will be retained to review the data packages produced by the laboratory and validate the data. Ms. Zimmerman will prepare a validation report discussing the usability of the data, identify any concerns or issues, and, if warranted, corrective measures.

Laboratory Project Manager

Meghan Pedro of ALS Global Laboratory (Rochester, New York), will serve as the laboratory project manager. Ms. Pedro will be responsible for the laboratory's adherence to this QAPP (which will be provided to the laboratory). She will coordinate the shipment, acceptance, and laboratory analyses with Mr. Heitger. The laboratory project manager or her designee will be responsible for ensuring the laboratory conducts an assessment of the data and prepares the required analytical data package.

In addition, Microbial Insights (Knoxville, Tennessee) will be retained to analyze groundwater samples for quantitative polymerase chain reaction analysis to quantify the number of *Dehalococcoides* cells are present in groundwater. The Microbial Insights project manager will be Kate Clark and will have the same responsibilities as the ALS Global project manager.

Laboratory Custodian

Greg LaForce will designate an individual to be responsible for properly logging and handling the samples delivered to the ALS Global laboratory.

The Microbial Insights custodian manager will be Casey Brown. Ms. Brown will report to the laboratory project manager.

HRSC Project Manager

Brian McCann of Columbia Technologies will be responsible for ensuring that the HSRC equipment arrives on-site in working order and is functioning as designed throughout the PDI activities.

Direct Push and Pilot-Scale Study Contractor

The direct push and pilot-scale study contractor may consist of one or two firms (the same firm may conduct both phases of the work. The contractor has not yet been selected. The contractor will designate a field project manager who will be responsible for ensuring that the HSRC equipment arrives on-site in working order and is functioning as designed throughout the field activities and that the work is performed in accordance with this QAPP. In addition, the field project manager will oversee the HASP implementation for the contractor and its employees.

3. Data Quality Objectives

The data quality objectives and data assessment techniques will follow relevant US Environmental Protection Agency (USEPA) guidance: *Guidance on Systematic Planning Using the Data Quality Objectives Process* (EPA QA/G-4) (USEPA, 2005). This guidance outlines seven steps for developing data quality objectives. Each step is provided below with a description of how the step will be applied to the PDI and pilotscale study implementation.

1. State the Problem – soil and groundwater in this area contain VOCs at concentrations above the NYSDEC Commercial soil cleanup objectives (SCOs) and the Groundwater Standards and Guidance Values.

2. Identify the Goal of the Study (Project) – for PDI, delineate the extent of soil and groundwater that warrant removal, treatment, or management in place. In addition, collect baseline data on geochemistry and microbial ecology. For pilot-scale study, collect data and information to determine the effectiveness of in-situ reductive dichlorination and inform the project design.

3. Identify Information Inputs – for PDI, the Work Plan scope prescribes an appropriate number of samples to provide the delineation and is intended to provide the information necessary to prepare the remedial design. Based on the delineation, the ability to excavate or treat soil, including the extent of affected soil, will be assessed as well as the treatment extent for groundwater.

   For pilot-scale study, the information inputs include the Site groundwater geochemistry, microbial ecology, and VOC distribution; aquifer geochemistry and VOC reduction in response to treatment amendments; ability to inject fluids and the associated radius of influence; and accessibility of injection rigs and equipment relative to the VOC plume.

4. Define the Boundaries of the Study (Project) – the project boundaries extend from the northern portion of the southern parking lot to approximately 60 feet downgradient of soil boring SB-33; however, due to the adaptive management approach of the PDI, the project boundaries for both the PDI and pilot-scale study are subject to adjustment based on the PDI findings.

5. Develop the Analytical Approach – samples will be collected in accordance with industry guidance, as described in this QAPP, and will be analyzed by an Environmental Laboratory Accreditation Program (ELAP)-certified laboratory for VOCs and industry-accepted methods for parameters that do not have ELAP certifications.

6. Specify Performance or Acceptance Criteria – acceptance criteria will be satisfied by the development of valid data that can be used to compare to the commercial and industrial SCOs and Groundwater Standards and Guidance Values to evaluate the extent of remediation warranted within the study boundaries (although not all groundwater with VOCs exceeding groundwater standards will be treated).

7. Develop Plan for Obtaining Data – The procedures for field sampling, sample management, laboratory analysis, documenting field activities, and reporting, consistent with NYSDEC guidance, are specified in this QAPP.

4. Boring Installation, Well Installation and Sampling Procedures

4.1 Pre-Design Soil Samples

The soil borings will be advanced from the surface to the designated sample depth, which will be at or above the bedrock surface. The borings will be advanced using a small format (i.e., track-mounted) direct-push drill rig (e.g., Geoprobe® 7822DT or similar) equipped with 5-foot-long macro-core soil samplers. Continuous soil samples will be collected for soil classification and headspace screening (using a photoionization detector [PID]) during the boring installation. The sample depth or number of samples may be adjusted based on the PID screening or other indications of potential impact (i.e., visual staining and olfactory evidence). Upon recovery, the liner will be removed from the sampler and split open using a utility knife. When collecting soil samples for PFAS analysis, sampling precautions will be implemented to avoid cross contamination.[2]

The drilling equipment will be decontaminated prior to drilling, between boring locations, and following drilling activities to minimize the risk of cross contamination. Reusable soil sampling equipment will be decontaminated with a liquinox detergent wash, or equivalent, and analyte-free water rinse before collecting each groundwater sample. Decontamination fluids will be containerized and managed as investigation-derived waste. When decontaminating equipment between collecting soil samples for PFAS analysis, decontamination detergents will adhere to best management practices appropriate for PFAS sampling to avoid cross-contamination.[3]

The soil samples will be described for lithology and the description will be recorded in a field notebook. The horizontal location of each soil boring will be measured using a tape measure from two fixed points and recorded in the field notebook or with a hand-held device equipped with global positioning system (GPS).

The Project Hydrogeologist or Sampling Personnel will collect the soil samples for the parameters listed in the Work Plan and placed into the containers specified in **Table 1**. Samples designated for VOC analysis will be using preservation techniques established by the USEPA in SW 846 Method 5035 and following NYSDEC guidance issued on October 17, 2012 (NYSDEC, 2012). The samples will be analyzed for low-level VOCs (detection limits below 200 microgram per kilogram [µg/kg]) following USEPA Method 8260 and, unless there are issues with interferences, the laboratory will use sodium bisulfite as a preservative. Samples for other the analytes listed in **Table 1** will be placed in laboratory provided sample containers as listed in the table. All samples will be placed into a laboratory cooler chilled with ice.

The soil borings will be designated by the letters "SP" and then a two-digit number beginning with soil boring number 01 (SP01 will be the first boring).

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[2] PFAS soil and groundwater sampling will follow recommendations published at: https://alphalab.com/images/stories/PFAA%20Sampling%20Instructions%20Sheet%205_24_2017.pdf

[3] PFAS soil and groundwater sampling will follow recommendations published at: https://alphalab.com/images/stories/PFAA%20Sampling%20Instructions%20Sheet%205_24_2017.pdf

The soil samples will be numbered by boring location and the sample depth interval in feet within parenthesis. Thus, a sample collected from boring SP42 from a depth of 1 to 1.5 feet will be designated as sample number "SP42 (1-1.5)".

The samples will be handled and shipped in accordance with the QA protocol provided in **Section 5**, including trip blanks and equipment blanks, and analyzed for the parameters following the methods listed in **Table 1**.

4.2 Direct-Push Groundwater Sampling Procedures

Groundwater samples from direct-push locations will be collected using a Geoprobe® Screen Point (SP) groundwater sampler or equivalent direct-push groundwater sampler utilizing a retractable screen. At each groundwater monitoring point location, the retractable screen will be pushed into the ground until the screen can be exposed to the water-bearing sediments at the desired sample depth interval.

Reusable groundwater sampling equipment will be decontaminated with a liquinox detergent wash, or equivalent, and analyte-free water rinse before collecting each groundwater sample. Decontamination fluids will be containerized and managed as investigation-derived waste.

Before collecting each groundwater sample, if possible, groundwater will be pumped from the temporary monitoring point using a peristaltic pump and clean 1⁄4-inch nominal diameter low-density polyethylene (LDPE) tubing. The purpose of the pumping is two-fold. First, pumping will help "develop" the temporary monitoring point by removing sediment and enhancing good hydraulic communication with the water-bearing sediments. Second, pumping will "purge" the temporary monitoring point and will ensure fresh groundwater from the water-bearing sediments is used for sampling and analysis. Purge water will be containerized with decontamination fluids for management as investigation-derived waste. After the gross solids are removed, the turbidity will be measured using a nephelometer and recorded in the field notebook. Thus, the samples will be collected after minimal purging that will be sufficient to clear the screen of excess turbidity and ensure that stagnant water is not sampled, but that will not cause the well point to become over pumped (a dry well with lack of water). Also, the well is likely to produce groundwater with some solids due to the lack of a well screen. When collecting groundwater samples for PFAS analysis, sampling and decontamination precautions will be implemented to avoid cross contamination (including not using LDPE tubing, instead use HDPE or silicon tubing).

After collecting each groundwater sample, the borehole will be sealed with clean sand and a minimum of 6 inches of hydrated bentonite. Then, the ground surface will be repaired to match the surrounding material, thickness, and grade.

4.3 Well Installation Procedures

Three monitoring wells will be installed within the injection area and one well will be located in the VOC-affected area but outside the pilot-scale study area, as described in the Work Plan. The wells will be installed by advancing borings using a direct-push rig to the top of bedrock using a 3.25- or 3.5-inch diameter probe. Then, the well screening will be installed in each borehole using a 1-inch diameter polyvinyl chloride (PVC) casing with a 5-foot long 2.5-inch diameter pre-packed screen (see **Appendix A** for a cutout of the pre-packed well screen and assembly). The screen will be set at the bedrock interface, unless the Project Hydrogeologist ascertains that the entire screen should not be submerged. In this case, the well screen will be moved closer to the ground surface, until approximately 1 foot of screen is above the water table (with 4 feet submerged). The wells will be set into the ground surface with a flush mounted well cover.

The wells will be developed by removing a minimum of three well volumes (including the casing diameter) of groundwater. Field parameters for DO, ORP, specific conductance, turbidity, and temperature will be measured using a YSI Model 600XL multi-parameter monitoring device (or similar) and recorded in the field notebook following each purge volume. However, because the wells are 1-inch in diameter, it may not be possible to purge the wells until all the field parameters stabilize. During the injection test, groundwater samples will be tested for bromine using a field test kit.[4]

MW-10 has not been sampled since August 2011. Before developing the newly installed wells, the Project Hydrogeologist will purge well MW-10 and measure the well turbidity using a YSI Model 600XL multi-parameter monitoring device (or similar). If the Project Hydrogeologist determines that the well has become turbid in the intervening years since it was last sampled, the Project Hydrogeologist will direct the drilling subcontractor to redevelop the well in accordance with well development procedures outlined above, except the development will continue until the well field parameters stabilize.

The monitoring wells used for the pilot-scale study will be designated with “PSW” designations and will be sequential based on the most recent boring drilled.

Following the pilot-scale study, if it determined the monitoring wells are no longer necessary, the wells will be decommissioned and abandoned in accordance with NYSDEC guidelines described in CP-43: Groundwater Monitoring Well Decommissioning Policy (NYSDEC, 2009). The surface will be restored using material to match the surrounding grade.

4.4 Groundwater Sampling Procedures

After development, groundwater samples will be collected from the newly installed wells and existing monitoring well MW-10. The Project Hydrogeologist or Sampling Personnel will collect groundwater samples from each well using low-flow sampling techniques. This process will begin by removing the well cap and measuring the organic vapor levels in the top of the well casing using a PID. This level will be recorded in the field notebook and appropriate health and safety precautions taken following the HASP. The low-flow technique then entails first measuring and recording the static water level measurement, which will be compared to the well installation records for reference to well construction and screen depth. Next, 0.25-inch polyethylene tubing will be cut to length for purging. Groundwater purging involves using a peristaltic pump for temporary wells and collecting water quality measurements using a field meter to measure temperature, pH, specific conductivity, ORP, DO, and

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[4] Field test kit procedures can be accessed at: https://www.hach.com/asset-get.download-en.jsa?id=7639983683

turbidity. Groundwater purging will continue until simultaneous readings are observed to be within the following limits:

- Turbidity (+/- 10% for values >10 NTUs)
- DO (+/- 10% for values greater than 0.5 milligram per liter (mg/L). (If three dissolved oxygen values are < 0.5 mg/L, consider the values stabilized.)
- Specific conductivity (+/- 3%)
- Temperature (+/- 3%)
- pH (± 0.1 unit)
- ORP (± 10 millivolts)

If the parameters have not stabilized within five volumes, it is at the discretion of the Project Hydrogeologist or Sampling Personnel whether or not to collect a sample or to continue purging. If, after five well volumes, pH and conductivity have stabilized and the turbidity is still decreasing and approaching an acceptable level, additional purging should be considered to obtain the best sample possible, with respect to turbidity. The sample clarity and any other visual observations during sampling shall be described in the field log.

After purging, the groundwater samples will be collected by slowly filling the sample containers as specified in **Table 2**. For VOC samples, the 40-milliliter (ml) vials will be filled until full, capped, and then inspected for air bubbles by inverting the sample container and inspecting the bottom of the vial, which will be facing upward. If an air bubble(s) is present, the water will be discarded with the other investigation-derived waste and the sample recollected. A minimum of three vials will be filled for each VOC sample. For samples other than VOCs (except for quantitative polymerase chain reaction [qPCR]), the sample containers will be filled to close to the top of the container, but not all the way to the brim. qPCR samples will be collected using a Microbial Insights Bio-Flo apparatus following the protocol in **Appendix B**.

The groundwater samples will be numbered by temporary well location and the sample date within parenthesis. Thus, a groundwater sample collected from pilot-scale study well 2 on December 4, 2019 will be designated as sample number “PSW2 (120419)”. Following sample collection, ensure all field data are properly recorded in the notebook and a groundwater monitoring field form.

4.5 Waste Characterization Samples

The Work Plan specifies collecting waste characterization samples. For soil, two types of waste characterization samples will be collected: composite samples and discrete samples (for VOC analysis only). The composite soil samples will be comprised of a 2-inch portion from the acetate liner of a representative number of the soil boring sleeves (six minimum) placed into a new stainless-steel mixing bowl. The sample aliquots will be thoroughly mixed with a new stainless-steel spoon. The composite sample will be designated as “WC-SOIL 01”. In addition, a sample from the interval deemed to have the highest VOC concentration, as determined using the MIP, will be submitted for VOC analysis for waste characterization purposes (it is not appropriate to composite samples for VOC analysis). This sample will be designated as “WC-SOIL 02 (VOCs)”.

For groundwater, a single waste characterization sample will be collected from a drum of investigation-derived waste using a disposable bailer. The collected water will be placed into laboratory-supplied containers, as with the other samples. These samples will be designated "WC-GW 01".

4.6 Particulate Air Monitoring

As part of the generic community air monitoring program (CAMP), real-time monitoring equipment capable of continuously measuring particulate matter less than 10 micrometers in size and VOCs will be used (**Appendix C**). The monitoring equipment will be equipped with a data logger and the logs will be provided as an appendix to the CAMP monitoring documentation included with the PDI and pilot-scale study report. As required by New York State guidance, the equipment must be equipped with an audible alarm to indicate exceedance of the action level set forth in the generic CAMP. The CAMP sampling will be conducted immediately downwind of the drilling area. In addition, CAMP sampling will be conducted at an upwind location. Field personnel will also note whether there are olfactory indications of odors emanating off-site and, if so, stop field activities and implement corrective measures to control odors.

5. Sample Custody and Management

5.1 Sample Containers, Preservation, and Holding Times

The sample containers, preservation methods, and laboratory holdings times for soil and groundwater samples are provided in **Tables 1 and 2**, respectively.

The holding times begin when the sample is received at the laboratory.

The laboratory will provide pre-cleaned sample containers, including preservative when necessary, sent in the same coolers used for the samples. The coolers will be chilled with a minimum of one gallon of ice placed into double-bagged Zip-lock bags to prevent leakage.

After sampling, each sample container shall be wiped clean with a disposable paper towel. Then, each sample container will be labeled with the following information:

- Project name
- Sample number (described above)
- Analysis
- Date
- Time
- Sampler's name
- Preservative

5.2 Chain of Custody Procedures

A person will be deemed to have custody of samples when the samples are in their possession or control. The sampling crew will retain the chain of custody forms until the samples are shipped or hand delivered to the laboratory. If the person leaves the samples from their sight, the samples must be stored in a closed cooler, and placed in a secured area, such as a locked vehicle, to prevent tampering by third parties.

A chain of custody form will be completed for each sample shipment. At a minimum, the chain of custody form will include the following information in the title block:

- Project name
- Project number
- Contact person and telephone number

In addition, the chain of custody form will include the following information:

- Environmental media sampled
- Sample identification number
- Sample time
- Sample date
- Analytical procedure
- Sample preservative

Entries on the chain of custody form must be made in indelible ink and not pencil or other erasable marking. If an incorrect entry is made, the information will be crossed out with a single strike mark with initials and the date next to the marked-out text.

A signature block with the sample custodian's signature, printed name, and date must be included on the form. In addition, the chain of custody form will include signature blocks for subsequent custodians.

Before shipping from the project site, a copy of the chain of custody form will be made and placed in the project files. Then the original form will be placed into a zip-lock bag and taped to the top of the inside of the cooler. The cooler will then be sealed with a chain-of-custody seal, which will be signed and dated. Finally, the cooler will be taped shut.

Examples of ALS Global and Microbial Insights chain of custody forms are provided in **Appendix D**.

The sample coolers will be delivered to the analytical laboratory by hand delivery, ground courier, or overnight shipping service. The receiving party must sign the chain of custody form and provide a copy of the signed form with the laboratory report.

The Project Hydrogeologist will develop a project-specific database of anticipated sample collection as chain of custody forms are prepared at the end of each day in which samples are shipped. The Project Hydrogeologist will communicate with the Laboratory Custodian during the sampling event to verify that each group of samples that are shipped are received at the laboratory. Immediately after sample receipt, the laboratory will provide the Project Hydrogeologist a summary of samples received at the laboratory and assigned analytical methods. The Project Hydrogeologist will review the sample receipt documentation to verify that all samples and analytical methods were identified by the laboratory. Missing samples or incorrect information will be conveyed to the Laboratory Custodian by the Project Hydrogeologist.

5.3 Field Documentation

The purpose of field documentation is to record the activities and Site conditions to enable a third party who is not present to understand both the Site conditions, such as weather and other nearby activities, and the PDI and pilot-scale study activities that took place on-site. The overall objective of field documentation is to avoid relying on a person's memory to be able to retrospectively understand the field activities.

Each field supervisor or technician will make notes on a daily basis in the individual's own field notebook dedicated to the project. Entries must be made in indelible ink and not pencil or other erasable marking. If an incorrect entry is made, the information will be crossed out with a single strike mark with initials and the date next to the marked-out text.

The field notebook must be stored in a secured, locked location when not in use and should be placed in the project files at the end of that stage of the field activities. In addition, electronic copies of each page used should be made and stored in secure, redundant computer files (such as a cloud-based file system or corporate server with an off-site backup).

The cover or the first page of the field notebook should contain the following information:
- Professional's name
- Professional's employer
- Project name
- Project number
- Contact information (in case the field notebook is lost and recovered)

The notes made for each day must begin on a fresh page and must include, but is not limited to, the following information:
- Date
- Weather conditions (temperature, cloud cover, and precipitation)
- Personnel present on-site, including name and affiliation
- Nearby activities (such as construction)
- Time log of the field activities as the day progresses with new entries as locations or activities move from one location or activity to another
- Sample information, including: location, sample identification, time, type, field measurements, and physical characteristics
- Field duplicate designations
- Equipment used to make field measurements, along with the date and time of calibration, if required
- Information related to sample documentation, including:
  - Dates and method of sample shipments
  - Chain-of-custody record numbers
  - Courier air bill number
  - Other pertinent information and activities

6. Laboratory Analytical Methods

For the chemical analyses (those not involving qPCR testing), the laboratory will follow the October 2016 NYSDEC Analytical Services Protocol document, including the required method detection limits (NYSDEC, 2016). **Tables 1 and 2** provide laboratory methods for soil and groundwater analyses, respectively.

If difficulties arise in achieving the specified method detection limits due to a particular sample matrix, the Laboratory Manager must notify the Project Manager. In order to achieve those detection limits, the laboratory must utilize all appropriate cleanup procedures in an attempt to retain the project required detection limits. If a sample requires dilution due to high levels of target analytes or interferences, the laboratory must document all initial analyses (if possible) and secondary dilution results. Dilution will be permitted only to bring target analytes within the linear range of calibration; however, in the case of metals analysis, dilution may be required for non-target analytes that interfere with target analytes.

The qPCR test results are not addressed in the NYSDEC Analytical Services Protocol document. The results of these analyses will not be compared to a regulatory standard (no such standards exist). Therefore, it is not deemed critical to have an analytical protocol other than what the Microbial Insights laboratory typically follows. As such, the next section, Quality Control Requirements, does not pertain to the qPCR analyses.

7. Quality Control Requirements

7.1 Quality Assurance Indicators

The acceptance/performance criteria for laboratory analyses are assessed by evaluating the precision, accuracy, representativeness, completeness, and comparability of the laboratory data. The definition of each of these terms is provided below.

Precision

Precision is the measure of reproducibility of sample results. The goal is to maintain a level of analytical precision consistent with the project objectives. To maximize precision, sampling and analytical procedures will be followed. All work for this project will adhere to protocols presented in the Work Plan and this QAPP. Checks for analytical precision will include the analysis of matrix spikes (MSs), MS duplicates (MSDs), laboratory duplicates, and field duplicates. Checks for field measurement precision will include obtaining duplicate field measurements.

Accuracy

Accuracy is the deviation of a measurement from the true value of a known standard. Both field and analytical accuracy will be monitored through initial and continuing calibration of instruments. In addition, internal standards, MSs, MSDs, blank spikes, and surrogates (system monitoring compounds) will be used to assess the accuracy of the laboratory analytical data.

Representativeness

Representativeness is the degree to which sampling data accurately and precisely represent Site conditions, and is dependent on sampling and analytical variability and the variability of environmental media at the Site. The Work Plan discusses the sample locations and frequency and, this information combined with this QAPP, will ensure that representative samples are collected.

Completeness

Completeness is defined as a measure of the amount of valid data obtained from an event and/or investigation compared to the total amount that was obtained. This will be determined upon final assessment of the analytical results.

Comparability

Comparability is the degree of confidence with which one data set can be compared to another. Comparability between the PDI and pilot-scale study results, and, to the extent possible, with existing data will be maintained through consistent field and laboratory methods as described in this QAPP and referenced documents.

8. Field and Laboratory Quality Control Checks

8.1 Field Quality Control Samples

The field analytical equipment will be calibrated immediately prior to each day's use. The calibration procedures will conform to manufacturer's standard instructions. This calibration will ensure that the equipment is functioning within the allowable tolerances established by the manufacturer and required by the project. The Project Hydrogeologist or Sampling Personnel will maintain records of all instrument calibration in the field notebook.

Calibration procedures for instruments used for monitoring health and safety hazards (e.g., PID and explosimeter) will be provided in the HASP. More frequent calibration may be needed depending on conditions encountered in the field.

The generic CAMP (**Appendix C**) requires the use of a real-time particulate monitoring instrument capable of measuring 10-micron particulate matter. This equipment is factory-calibrated and, thus, does not require calibration in the field.

Field Duplicates

A field duplicate will be collected at a minimum frequency of one for every 20 samples (5%).

Equipment Rinse Blanks

An equipment blank will be collected from decontaminated equipment by rinsing the equipment with analyte-free water and collecting a sample of the rinsate. One rinsate sample will be collected each day that soil or groundwater samples are collected.

Trip Blanks

The laboratory will place a VOC trip blank in the sample cooler with the other VOC sample containers before being sent to the Site. The trip blank will consist of 40-ml vials containing distilled, deionized water, which accompanies the other water sample bottles into the field and back to the laboratory. A trip blank will be included with each shipment of water samples for VOC analysis. The trip blank will be analyzed for VOCs to assess any contamination from sampling, transport, storage, and internal laboratory procedures. The trip blank samples will be analyzed at a frequency of one per each shipment of VOC samples.

8.2 Analytical Laboratory Quality Control Checks

Internal laboratory quality control checks will be used to monitor data integrity. These checks will include method blanks, MS/MSDs, spike blanks, internal standards, surrogate samples, calibration standards, and reference standards. Laboratory control charts will be used to determine long-term instrument trends.

Method Blanks

Method blanks will be used to assess potential sources of contamination in the analytical process. The method blank is prepared at the start of the analytical process and includes all phases of the laboratory analysis. One method blank will be analyzed with each analytical series associated with no more than 20 samples.

MS/MSDs

MS/MSDs will be used to measure the accuracy of analyte recovery from the sample matrices and will be site-specific. MS/MSD pairs will be analyzed by the laboratory at a minimum frequency of one MS/MSD for every 20 samples or once per week, whichever is more frequent.

If the laboratory results indicate that the MS recoveries are outside of the quality control limits, the control sample and surrogate spike recoveries will be evaluated to identify the reason for the deviation and assess the effect on the reported sample results.

Surrogate Spikes

In the analytical chemistry field, a surrogate is considered a chemical that is not naturally occurring (or rarely occurs in nature), but also has properties similar to the analytes of interest. Surrogates are principally used as an internal check for samples analyzed by gas chromatography/mass spectrometry (GC/MS) and GC methods. The surrogate spike is added to the samples prior to purging or extraction. The surrogate spike provides information related to the accuracy of an analytical method on a sample-specific basis.

If the laboratory results indicate that the surrogate spike recoveries are outside of specified quality control limits, the recoveries will be evaluated to identify the potential sources of the deviation, possibly considering other control information. Surrogate spike compounds will be determined based on information provided by the USEPA analytical methods for the chemicals specified for analysis.

Laboratory Duplicates

Laboratory duplicates will be run for the soil samples to assess laboratory precision. The duplicates will be prepared as a separate aliquot of a sample that will then be analyzed as a separate sample.

Calibration Standards

The laboratory will use calibration standards to assess the instruments’ stability and to provide information regarding the instrumentations’ capability to provide valid quantification results. The laboratory will analyze calibration standards at the beginning and end of each analytical series, as well as throughout a series containing a large number of samples.

In general, the need for calibration standards analysis is specified by the analytical method. In analyses where internal standards are used, a calibration check standard will only be analyzed at the beginning of an analytical series. If results of the calibration check standard exceed specified tolerances, then all samples analyzed since the last acceptable calibration check standard will be reanalyzed.
Laboratory instrument calibration standards will be determined utilizing the guidance provided in the analytical methods.

Internal Standards

The laboratory will monitor internal standard areas and retention times for organic analyses performed by GC/MS and GC methods. Method-specified internal standard compounds will be spiked into all field samples, calibration standards, and quality control samples after preparation and prior to analysis.

If internal standard areas in one or more samples exceed the tolerances specified in the analytical method, the cause will be investigated and, if warranted, the instrument will be recalibrated. In this case, all affected samples will be reanalyzed.

Reference Standards

Reference standards are standards of known concentration and independent in origin from the calibration standards. The intent of reference standard analysis is to provide insight into the analytical proficiency within an analytical series. This includes preparation of calibration standards, validity of calibration, sample preparation, instrument set-up, and the premises inherent in quantitation. Reference standards will be analyzed at the frequencies specified within the analytical methods.

9. Data Precision Assessment Procedures

9.1 Field Precision

Field precision is difficult to measure because of temporal variations in field parameters. However, precision will be controlled through the use of experienced field personnel, properly calibrated meters, and duplicate field measurements. Field duplicates will be used to assess precision for the measurement system.

9.2 Laboratory Precision

Laboratory data precision for organic analyses will be monitored through the use of MS/MSD and laboratory duplicates. The precision of data will be measured by calculating the relative percent difference (RPD) by the following equation:

$RPD = 100*(A-B) /((A+B)/2)$

Where:

A = Analytical result from one of two duplicate measurements
B = Analytical result from the second measurement

Precision objectives for MSD and laboratory duplicate analyses are identified in the NYSDEC ASP Revision 2016.

9.3 Data Accuracy Assessment Procedures

Experienced field personnel, properly calibrated field meters, and adherence to established protocols will control the accuracy of field measurements. The accuracy of field meters will be assessed by review of calibration and maintenance logs.

Laboratory accuracy will be assessed via the use of MSs, surrogate spikes, internal standards, and reference standards. Where available and appropriate, quality assurance performance standards will be analyzed periodically to assess laboratory accuracy.

Accuracy will be calculated in terms of percent recovery as follows:
$\% \text{ Recovery} = 100*(A-X)/B$

Where:

A = Value measured in spiked sample or standard
X = Value measured in original sample
B = True value of amount added to sample or true value of standard

This formula is derived under the assumption of constant accuracy over the original and spiked measurements. If any accuracy calculated by this formula is outside of the acceptable levels, data will be evaluated to determine whether the deviation represents unacceptable accuracy, or variable, but acceptable accuracy. Accuracy objectives for MS recoveries and surrogate recovery objectives are identified in the NYSDEC ASP 2016 Revision.

9.4 Data Completeness Assessment Procedures

The laboratory will calculate the completeness of laboratory data sets by comparing the number of valid sample results generated to the total number of results generated.

Completeness = 100*(Number valid results/Total number of results generated)

As a general guideline, overall project completeness is expected to be at least 90%.

9.5 Corrective Action

The corrective actions typically taken by the laboratory are described below. If the calibration, instrument performance, or blank criteria are not met, the cause of the problem will be investigated and corrected. The analytical system then will be recalibrated. As part of the laboratory's operating protocol, sample analysis does not begin until calibration, instrument performance, and blank criteria are met. If matrix spike, reference standard, or duplicate analyses are found to be out of acceptable limits, the cause of the issue must be researched. Then, depending on the results of the overall QC program for the sample set, the data may be accepted, accepted with qualification, or determined to be unusable. If deemed unusable, the samples either must be reanalyzed or a new set of samples collected and analyzed.

9.6 Preventive Maintenance

Preventative maintenance procedures must be performed by the laboratory on all equipment used for the sample analyses. The maintenance activities must be documented in the laboratory's records.

10. Data Reduction, Assessment, and Reporting

10.1 Data Reduction

The laboratory will reduce the data produced in accordance with SW-846 protocols. The criteria used to reduce the data are specified in the analytical methods.

10.2 Data Quality Assessment

The laboratory deliverables will be NYSDEC ASP Category B. Data for this investigation will be evaluated and qualified in accordance with the USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review, USEPA-540-R-07-003, July 2007 and USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, EPA-540-R-04-004, October 2004, as appropriate for the analytical methods employed.

The validated analytical results reported by the laboratory and validated by the third-party validator will be assigned one of the following USEPA-defined data usability qualifiers:

- U – Not detected at given value
- UJ – Estimated not detected at given value (applied by third party validator)
- J – Estimated value
- N – Presumptive evidence at the value given (applied by third party validator)
- R – Result not useable (applied by third party validator)
- No Flag – Result accepted without qualification

10.3 Data Validation and Data Usability Summary Report

An independent third-party quality assurance chemist will review the laboratory data package and prepare a data validation report. The validation will conform to the USEPA Contract Laboratory Program National Functional Guidelines for Superfund Organic Methods Data Review, USEPA-540-R-07-003, July 2007 and USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, EPA-540-R-04-004, October 2004, as appropriate for the analytical methods employed.

The analytical data review will be summarized by a third-party validator in a Data Usability Summary Report (DUSR), which will include a review and evaluation of all the analytical results. The following parameters will be reviewed to ensure compliance with the analytical method protocols:

- Initial and continuing calibrations
- Blanks
- Laboratory control standards and matrix spikes
- Surrogate recoveries
- Matrix interference checks
- Field and laboratory duplicates
- Sample data
- Chain-of-custody forms
- Holding times

The report will describe the samples and parameters reviewed. Any deficiencies identified during the review will be noted and the effect on the generated data will be discussed. If warranted, the report will include recommendations for re-sampling or re-analysis. The validated data deliverable and the data usability summary report will be included as appendices to the PDI and pilot-scale study reports.

10.4 Data Reporting

The data package provided by the laboratory will contain all of the items discussed above. Data quality issues will be discussed in a case narrative included with the data report. A photocopy of the completed chain of custody forms accompanying each sample shipment will be included with the data package. The analytical data package will be accompanied by an electronic data deliverable (EDD).

Data generated during the pilot scale study will be uploaded to the NYSDEC's Environmental Information Management System in accordance with the NYSDEC Electronic Data Deliverable Manual, V. 4 (NYSDEC, 2018). The EDD format required is current format Earthsoft EQuIS® Environmental Data Management Software. Each EDD must be formatted and copied using an MS-DOS operating system. To avoid transcription errors, data will be loaded directly into the ASCII format from the laboratory information management system (LIMS). The laboratory will perform a QC check on the EDD before delivery. The original data, tabulations, and electronic media must be stored in a secure and retrievable fashion.

11. References

New York State Department of Environmental Conservation (NYSDEC). (2009, November 11). CP-43: Groundwater Monitoring Well Decommissioning Policy.

New York State Department of Environmental Conservation (NYSDEC). (2012, October 17). New York State (NYS) Environmental Laboratory Approval Program (ELAP) accreditation for EPA 5035 and 5035A Guidance.

New York State Department of Environmental Conservation (NYSDEC). (2016, October). Analytical Services Protocol.

New York State Department of Environmental Conservation (NYSDEC). (2018, November). Electronic Data Deliverable Manual, V. 4.

U.S. Environmental Protection Agency (US EPA). (2005). Guidance on Systematic Planning Using the Data Quality Objectives Process (EPA QA/G-4).

U.S. Environmental Protection Agency (US EPA). (1996). Test Methods for Evaluating Solid Waste. SW-846 3rd Edition, Update 3. Office of Solid Waste. December.

U.S. Environmental Protection Agency (US EPA). (1996a). Method 5035: Closed-System Purge-and-Trap and Extraction for Volatile Organics in Soil and Waste Samples. Test Methods for Evaluating Solid Waste: Physical/Chemical Methods (SW-846), Volume 1B.

Tables

Table 1
Analytical Methods and Requirements for Containers, Preservation, Volumes, and Holding Times for Soil Samples

Name	Analytical Methods	Container	Preservation[a]	Minimum Sample Volume or Weight	Maximum Holding Time
Volatile Organic Compounds (VOCs) and 1,4-Dioxane	EPA 8260B	4-oz glass jar with Teflon®-lined lid	4°C	40 mL	14 days
Perfluoroalkyl Substances	EPA 537.1 Modified	4-oz glass jar with Teflon®-lined lid	4°C	1 x 4 oz jar	
RCRA Waste Characteristics	EPA SW 846	500 ml amber glass jar	4°C	500 grams	
Total Iron/Manganese	SW6010B	G, Teflon® septum	4°C	1 x 4 oz jar	180 days
Ferrous Iron	Dionex Tech Nt. Mtd. A or SM 3500-Fe	250 mL, Amber Glass	4°C	50 mL	7 days
Total Organic Carbon (TOC)	Lloyd Kahn Method	100 mL, Glass	4°C	100 mL	28 days

Table 2
Analytical Methods and Requirements for Containers, Preservation, Volumes, and Holding Times for Groundwater Samples

Name	Analytical Methods	Container	Preservation[a]	Minimum Sample Volume or Weight	Maximum Holding Time
Volatile Organic Compounds (VOCs) and 1,4-dioxane	EPA 8260B	3-40-ml vials with Teflon®-lined septum cap	4°C	40 mL	14 days
Perfluoroalkyl Substances	EPA 537.1	3 250 ml HDPE	4°C	250 ml x 3	14 days
RCRA Waste Characteristics	EPA SW 846	VOCs – 3 40 ml vials with Teflon®-lined septum cap Other – 250 ml HDPE	4°C	500 grams	VOCs – 40 ml Other – 250 ml
Dissolved Gases	Microseeps	Pace SOP – AM20GAX	2-40 mL vials	80 ml	14 days
Total Iron/Manganese	SW6010B	G, Teflon® septum	4°C, field filter	1 x 4 oz jar	180 days
Ferrous Iron	Dionex Tech Nt. Mtd. A or SM 3500-Fe	250 mL, Amber Glass	4°C, field filter, no head space	50 mL	7 days
Sulfate, Nitrate	EPA 9056 or EPA 300	100 mL, HDPE	4°C,	100 mL	48 hours (nitrate); 28
Sulfide	EPA 9030B or SM 4500-S^{2-}	100 mL, HDPE	4°C, Zn acetate & NaOH	100 mL	7 days
Total Organic Carbon (TOC)	EPA 9060A	100 mL, HDPE	4°C, H_2SO_4	100 mL	28 days
Dissolved Organic Carbon (DOC)	Standard Methods 5310	100 mL, HDPE	4°C, field filter	100 mL	28 days
Bacteria & Functional Genes	Pace SOP qPCR	Laboratory – supplied BioTrap	4°C	BioTrap	24-48 hours
Volatile Fatty Acids	PACE SOP – AM23G	2-40 mL vials (amber)	4°C, Benalkonium chloride	80 mL	14 days

Figure

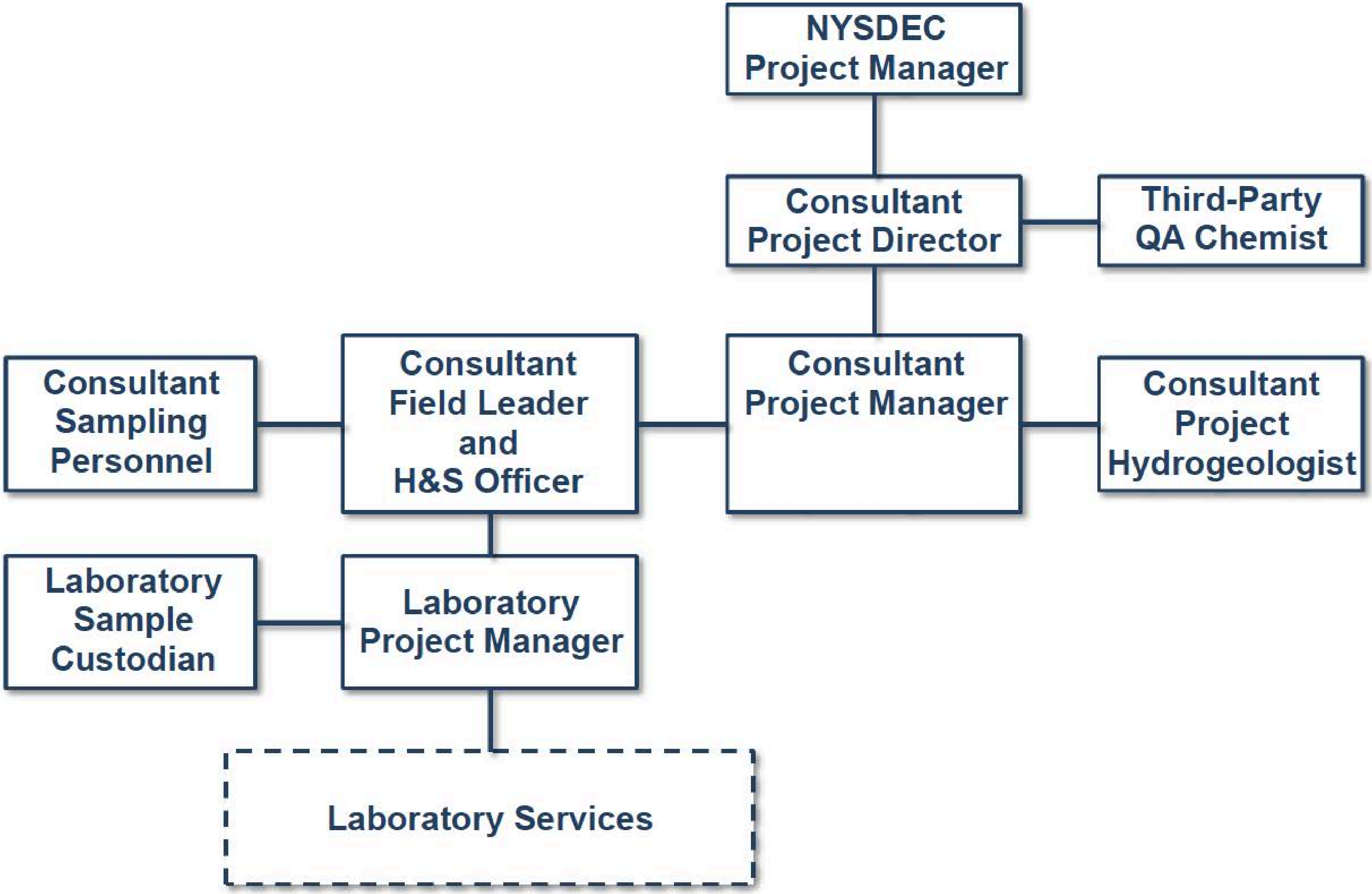


FIGURE 1

Quality Assurance Project Plan
Project Organization

NATHAN
Trusted for Excellence

Appendix A – Cutout of GeoProbe Pre-packed Well Screen and Assembly

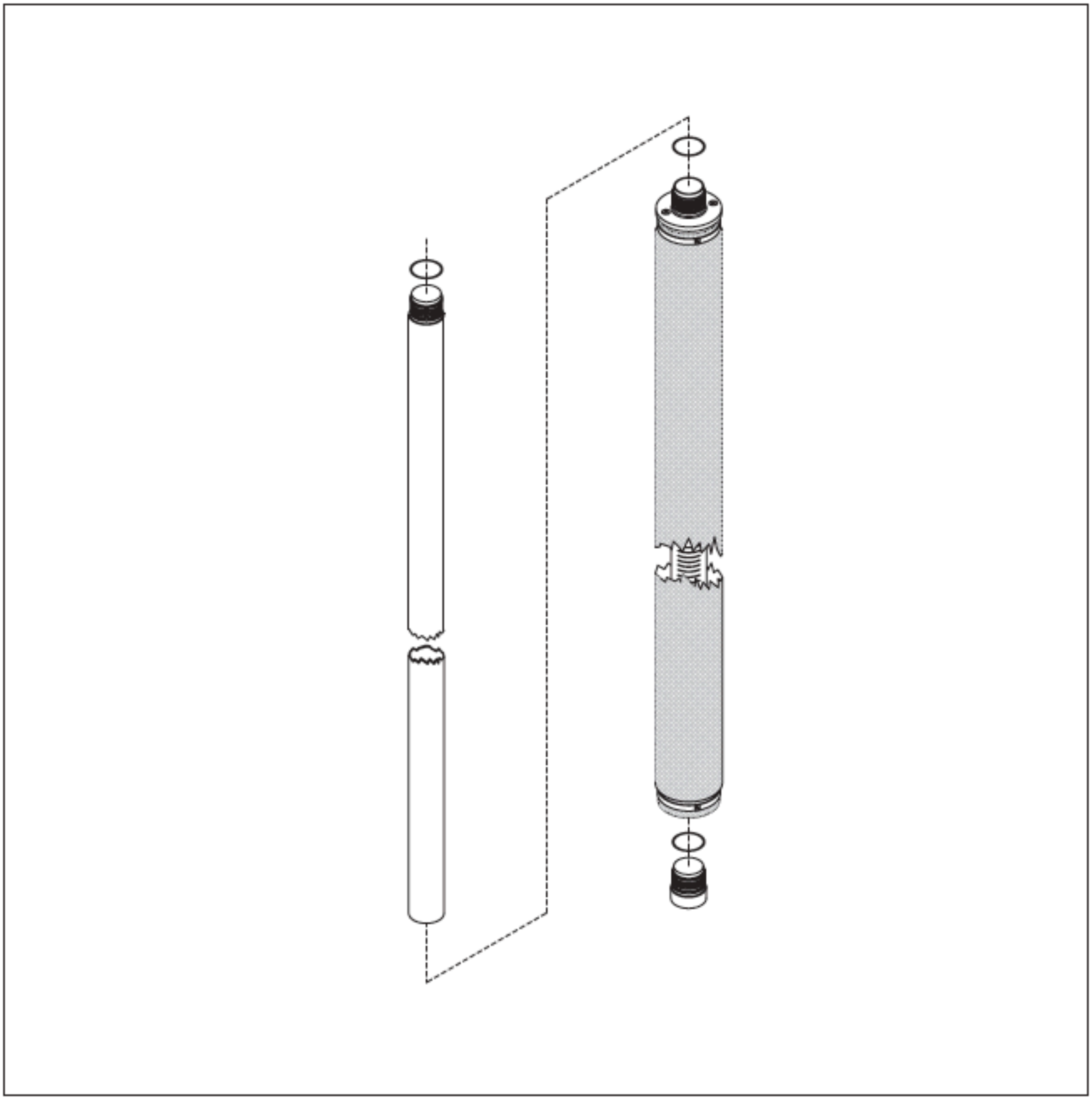
GEOPROBE® 1.0-IN. X 2.5-IN. OD AND 1.5-IN. X 2.5-IN. OD PREPACKED SCREEN MONITORING WELLS

STANDARD OPERATING PROCEDURE

Technical Bulletin No. 992500

PREPARED: August, 1999

REVISED: January, 2011

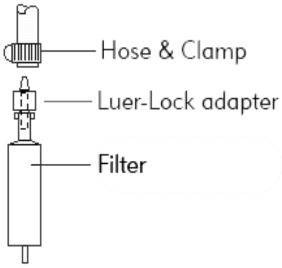


GEOPROBE® 1.0-in. x 2.5-in. O.D. PREPACKED SCREEN AND PVC RISER

Appendix B – Bio-Flo Sampling Protocol

Bio-Flo – DNA Sampling Protocol

SAMPLING INSTRUCTIONS



1. Purge the well.
2. Prepare the pump (Peristaltic preferred, Grundfos, or air bladder) as normal. Use the clamp provided to ensure a leak-proof connection.
3. Remove the filter from the Falcon tube.
4. Attach the inlet of the filter with a 1/4" - 5/16" inner diameter (I.D.) tubing using the clamp to secure.
5. Place the filter within a receiving container so that the amount of water filtered can be measured accurately.
6. The amount of water filtered will vary depending upon the turbidity of the water. We recommend filtering 1-2 L.
7. Record the volume of water that passed through the filter, and then submit the filter for analysis. The water may then be discarded. Please cap the filter on both ends. The thinner end should be closed with the red rubber cap and the thicker end should be closed with the clear luer plug.

Note: If the filter clogs before 1L has been filtered, record how much water was passed through the first filter, and then collect an additional filter, also recording the volume of water that went through the second filter. In this case, both filters are then submitted for testing. For each location there should be **no more than 2 filters** used and there is no need to filter more than 2L of water.

Hold time for this analysis is 24-48 hours.

To Submit Sample:

1. Place the filter in the Falcon tube provided.
2. Affix the label to the Falcon tube and note the amount of water that passed through the filter, the well location, sampling date, and the analyses requested.

SHIPPING INSTRUCTIONS

Packaging Samples:

1. Samples should be shipped in a cooler with ice or blue ice for next day delivery. If regular ice is used, the ice should be double bagged.
2. A chain of custody form must be included with each shipment of samples. Access our chain of custody at www.microbe.com

Shipment for Weekday Delivery:

Samples for weekday delivery should be shipped to:

Sample Custodian
Microbial Insights, Inc.
10515 Research Drive
Knoxville, TN 37932
(865) 573-8188

Shipment for Saturday Delivery:

Coolers to be delivered on Saturday must be sent to our FedEx Drop Location. To ensure proper handling the following steps must be taken:

1. FedEx shipping label should be marked under (6) Special Handling, check Hold Saturday.
2. The cooler must be taped with FedEx SATURDAY tape.
3. The shipping label must be filled out with the Drop Location address below. Our laboratory name must be on the address label.
4. You MUST ***notify by email*** customerservice@microbe.com with the tracking number of the package on Friday (prior to 4pm Eastern Time) to arrange for Saturday pickup. Please make sure you write "Saturday Delivery" in the subject line of the message. Without proper labeling and the tracking number, there is no guarantee that the samples will be collected.

Samples for Saturday delivery should be shipped to:

Microbial Insights, Inc.
FedEx Drop Location
10601 Murdock Drive
Knoxville, TN 37932
(865) 300-8053

Appendix C – Community Air Monitoring Program

Appendix 1A
New York State Department of Health
Generic Community Air Monitoring Plan

Overview

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

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

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

Community Air Monitoring Plan

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

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

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. “Periodic” monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC Monitoring, Response Levels, and Actions

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

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

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

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

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

Particulate Monitoring, Response Levels, and Actions

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

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

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

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

<ins>December 2009</ins>

Appendix D – Alpha Analytical and Microbial Insights Chain-of-Custody Forms

ALS Environmental

Field Chain-of-Custody Record

Page _____ of _____

Client Name & Address:

Phone:

FAX:

e-mail:

Project No.:

Project Name:

Sampler: *(Signature)*

Matrix Codes:
W) Water B) Bulk
L) Liquid F) Filter
S) Soil G) Wipe
C) Solid M) Media

Preservation Codes:
1) Cool to 4°C
2) HCl to pH<2, 4°C
3) H_2SO_4 to pH<2, 4°C
4) HNO_3 to pH<2, 4°C
5) NaOH to pH>12, 4°C
6) ZnOAc/NaOH to pH>9, 4°C

Field Sample Number	**Site ID**	**Date**	**Time**	**Depth**	**ALS Sample Number**	**Preservation Code**	**Sample Matrix Code**	**Sample for Matrix QC**	**Analyses Requested**								**No. of Containers**	**Remarks**

Possible Hazard Identification

☐ Non-Hazard ☐ Skin Irritant ☐ Rad
☐ Flammable ☐ Poison ☐ Unknown

Sample Disposal

☐ Return to Client ☐ Archive for _____ Months
☐ Disposal by Lab
(fees may be assessed if samples are retained longer than 3 months)

Requested Turn Around Time

☐ 2 Days (Rush) ☐ 7 Days (Rush) ☐ 21 Days
☐ 3 Days (Rush) ☐ 14 Days ☐ Other
(Rush = email data by COB on day due. Surcharges assessed.)

Carrier/Airbill #:

Relinquished by: ***(Signature)***	**Received by:** ***(Signature)***	**Date**	**Time**
Relinquished by: ***(Signature)***	**Received by:** ***(Signature)***	**Date**	**Time**
Relinquished by: ***(Signature)***	**Received by:** ***(Signature)***	**Date**	**Time**

Shipped to:

ALS Environmental
960 West LeVoy Drive
Salt Lake City, UT 84123
Phone: (800) 356-9135
Phone: (801) 266-7700
FAX: (801) 268-9992

White - Laboratory Copy ***Yellow - Client Copy***

REPORT TO:

Name: ____________________

Company: ____________________

Address: ____________________

____

____

email: ____________________

Phone: ____________________

Fax: ____________________

INVOICE TO: (For Invoices paid by a third party it is imperative that all information be provided)

Name: ____________________

Company: ____________________

Address: ____________________

____

____

email: ____________________

Phone: ____________________

Fax: ____________________

microbialinsights

10515 Research Dr
Knoxville, TN 37932
865-573-8188

www.microbe.com

Project Manager: ____________________

Project Name: ____________________

Project No.: ____________________

Purchase Order No. ____________________

Subcontract No. ____________________

MI Quote No. ____________________

Please Check One:

☐ More samples to follow

☐ No Additional Samples

Report Type: ☐ Standard (default) ☐ Microbial Insights Level III raw data(15% surcharge) ☐ Microbial Insights Level IV (25% surcharge) ☐ Comprehensive Interpretive(15%) ☐ Historical Interpretive (35%)

EDD type: ☐ Microbial Insights Standard (default) ☐ All other available EDDs (5% surcharge) Specify EDD Type: ____________________

Please contact us with any questions about the analyses or filling out the COC at (865) 573-8188 (9:00 am to 5:00 pm EST, M-F). After hours email: customerservice@microbe.com

Sample Information						**Analyses**				**CENSUS: Please select the target organism/gene**																							
MI ID (Laboratory Use Only)	Sample Name	Date Sampled	Time Sampled	Matrix	Total Number of Containers	**PLFA**	**NGS**	**QuantArray Chlor**	**QuantArray Petro**	**DHC (Dehalococcoides)**	DHC Functional genes (bvc, tce, vcr)	DHBt (Dehalobacter)	DHG (Dehalogenimonas)	DSM (Desulfuromonas)	DSB (Desulfitobacterium)	EBAC (Total)	SRB (Sulfate Reducing Bacteria-APS)	MGN (Methanogens)	MOB (Methanotrophs)	SMMO	DNF (Dentrifiers-nirS and nirK)	AMO (ammonia oxidizing bacteria)	PM1 (MTBE aerobic)	RMO (Toluene Monooxygenase)	RDEG (Toluene Monooxygenase)	PHE (Phenol Hydroxylase)	NAH (Napthalene-aerobic)	BSSA (Toluene/Xylene-Anaerobic)	add. qPCR:	**RNA (Expression Option)***	Other:	Other:	Other:

Relinquished by: **Date** **Received by:** **Date**

It is vital that chain of custody is filled out correctly & that all relative information is provided.
Failure to provide sufficient and/or correct information regarding reporting, invoicing & analyses requested information may result in delays for which MI will not be liable.

Appendix B Selected Figures from Remedial Investigation and Record of Decision

I:\Rochester-C.11862\41933.24-Seneca-Ri-Aa\Docs\DWG\2009-04-22_Figure_3_5_5a.dwg

5/22/2009 3:04:28 PM

FIGURE 3

LEGEND

▨	Storm Grate (Approximate)
—	Building Footprint
—	Approximate Property Boundary
—	Approximate location of interior walls
▨	574 Norton Street Parcel
●	Grate/Floor Drain (approximate location)
●	Pipe, unknown use (approximate location)
⊕	Overburden Monitoring Well (Rizzo, 1993)
⊕	Bedrock Monitoring Well (AEL, 1998)
●	Historical Data/Sample Point
🟩	Reported former UST location
– – –	Utility - Electric
– – –	Utility - Gas
– – –	Utility - Water
– – –	Utility - Fiber Optic
– – –	Utility - Overhead Line
– – –	Utility - 4" Sanitary Sewer
– – –	Utility - Storm Sewer
– – –	Utility - Catch Basin Pipe

NOTES

1. All locations are approximate.
2. Hatched area (574 Norton Street) near southwest corner of Site is not part of the 24 Seneca Avenue parcel but was included in the RI investigation.
3. Interior wall locations identified are based upon O'Brien & Gere field observations conducted on 12/18/07.
4. Map Source: NYSGIS Clearinghouse, 2005
5. Historical data points obtained from the following drawings:

   a) Oil and Hazardous Materials Site Evaluation, H&A, dated July 1989

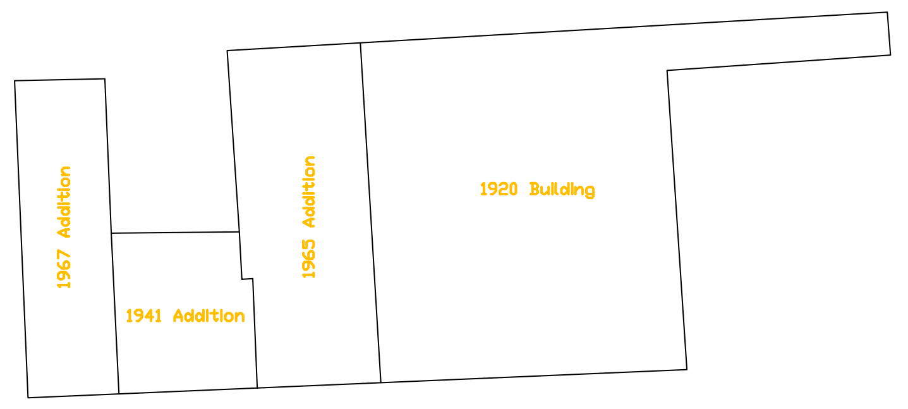
   b) Level 2 Environmental Site Assessment, Rizzo, April 1993

   c) Phase II Environmental Investigation, AEL, October 1996.
6. Locations of Historic Buildings and Site Features Obtained From SGD Phase I ESA, November 2007.

30 0 60

1"=30'

Building Addition Detail



HISTORIC SITE FEATURE MAP
24 SENECA AVENUE
CITY OF ROCHESTER
MONROE COUNTY, NEW YORK

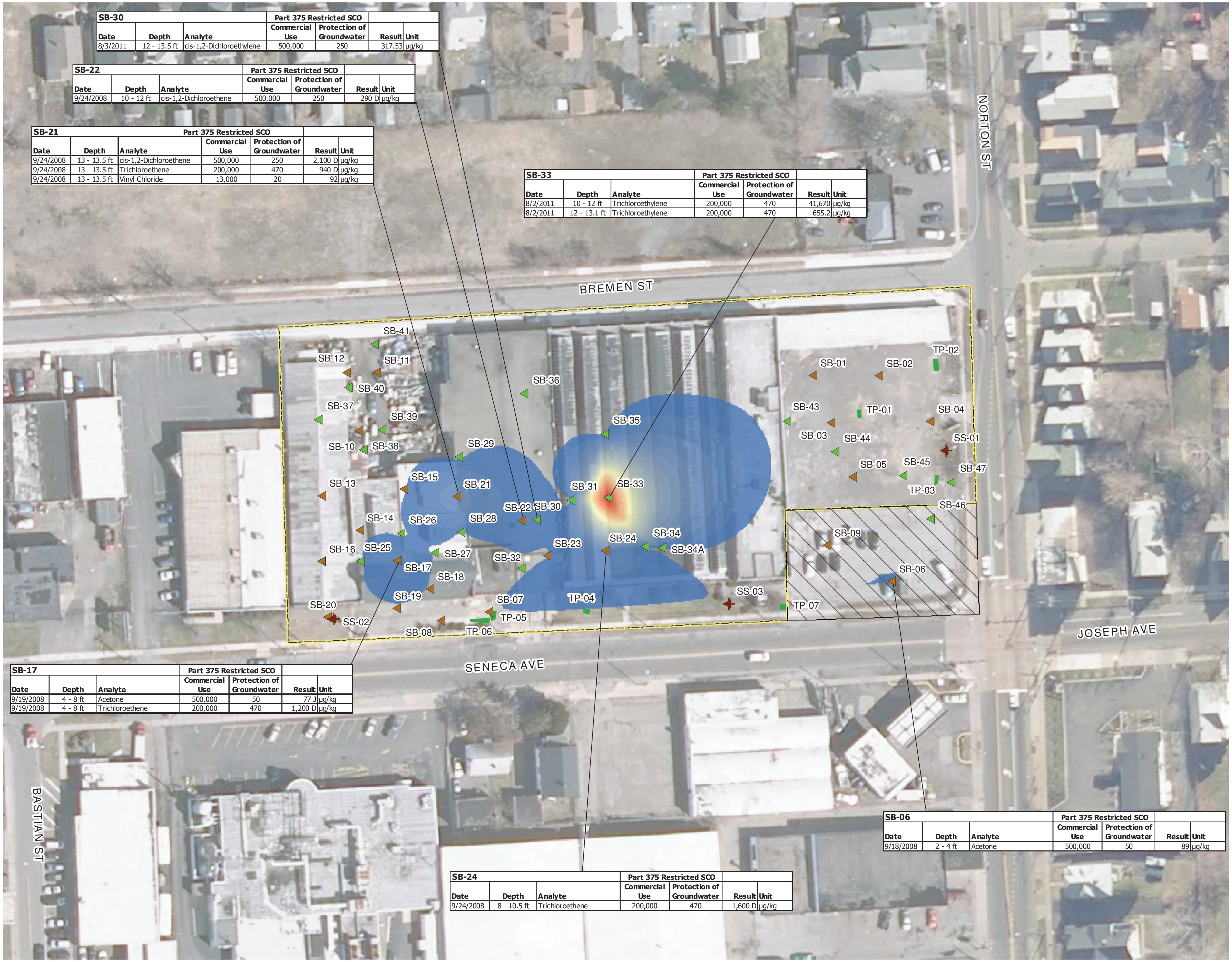
FILE NO. 11862.41933
APRIL 2009

O'BRIEN & GERE

PATH: I:\Rochester-C.11862\47362.24-Seneca-Suppl\Docs\DWG\MXD\SRI_Rpt\So_Excd_Restricted_VOC.mxd

PLOT DATE: 05/01/12 10:16:55 AM ReidLS

FIGURE 2C



SB-30			Part 375 Restricted SCO			
Date	Depth	Analyte	Commercial Use	Protection of Groundwater	Result	Unit
8/3/2011	12 - 13.5 ft	cis-1,2-Dichloroethylene	500,000	250	317.53	µg/kg

SB-22			Part 375 Restricted SCO			
Date	Depth	Analyte	Commercial Use	Protection of Groundwater	Result	Unit
9/24/2008	10 - 12 ft	cis-1,2-Dichloroethene	500,000	250	290 D	µg/kg

SB-21			Part 375 Restricted SCO			
Date	Depth	Analyte	Commercial Use	Protection of Groundwater	Result	Unit
9/24/2008	13 - 13.5 ft	cis-1,2-Dichloroethene	500,000	250	2,100 D	µg/kg
9/24/2008	13 - 13.5 ft	Trichloroethene	200,000	470	940 D	µg/kg
9/24/2008	13 - 13.5 ft	Vinyl Chloride	13,000	20	92	µg/kg

SB-33			Part 375 Restricted SCO			
Date	Depth	Analyte	Commercial Use	Protection of Groundwater	Result	Unit
8/2/2011	10 - 12 ft	Trichloroethylene	200,000	470	41,670	µg/kg
8/2/2011	12 - 13.1 ft	Trichloroethylene	200,000	470	655.2	µg/kg

SB-17			Part 375 Restricted SCO			
Date	Depth	Analyte	Commercial Use	Protection of Groundwater	Result	Unit
9/19/2008	4 - 8 ft	Acetone	500,000	50	77 J	µg/kg
9/19/2008	4 - 8 ft	Trichloroethene	200,000	470	1,200 D	µg/kg

SB-06			Part 375 Restricted SCO			
Date	Depth	Analyte	Commercial Use	Protection of Groundwater	Result	Unit
9/18/2008	2 - 4 ft	Acetone	500,000	50	89	µg/kg

SB-24			Part 375 Restricted SCO			
Date	Depth	Analyte	Commercial Use	Protection of Groundwater	Result	Unit
9/24/2008	8 - 10.5 ft	Trichloroethene	200,000	470	1,600 D	µg/kg

This document was developed in color. Reproduction in B/W may not represent the data as intended.

N

LEGEND

- ▲ AUGUST 2011 GEOPROBE® SOIL BORING
- ✦ SURFACE SOIL SAMPLE LOCATION
- ▲ SEPTEMBER 2008 GEOPROBE® SOIL BORING
- 🟩 TEST PIT

TOTAL VOC RESULTS (ppb)

42000
30000
20000
10000
0

- ▨ 574 NORTON STREET PARCEL
- --- APPROXIMATE PROPERTY BOUNDARY

NOTES:
1. SCO: NYSDEC PART 375 RESTRICTED COMMERCIAL USE AND/OR PROTECTION OF GROUNDWATER
2. ONLY ANALYTICAL RESULTS EXCEEDING SCO WERE USED FOR INTERPOLATION; DATA USED FOR INTERPOLATION ARE SHOWN IN DATABOX.
3. ALL LOCATIONS ARE APPROXIMATE
4. 574 NORTON STREET PARCEL IS NOT PART OF THE 24 SENECA AVENUE PARCEL BUT IS INCLUDED IN THE RI.
5. AERIAL IMAGERY SOURCE: NYS GIS CLEARINGHOUSE, DATE APRIL 2009.

CITY OF ROCHESTER
SUPPLEMENTAL
RI REPORT
24 SENECA AVENUE
ROCHESTER, NEW YORK

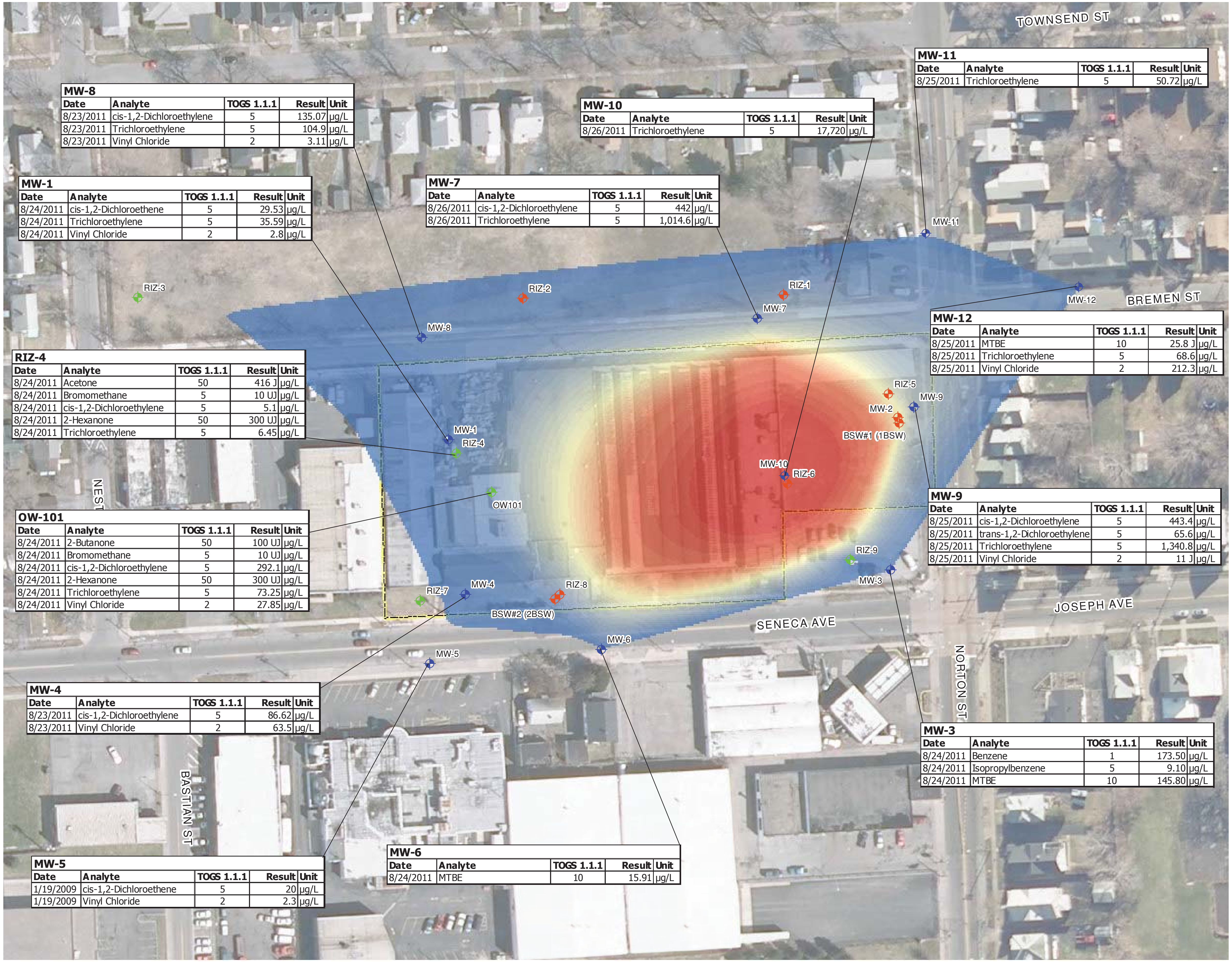
GEOPROBE® SOIL BORING LOCATIONS AND SUBSURFACE SOIL SAMPLE VOLATILE ORGANIC COMPOUND ANALYTICAL EXCEEDANCES (PART 375 RESTRICTED USE)

0 40 80 160
Feet

MAY 2012
11862.47362

O'BRIEN & GERE

FIGURE 3E



MW-8

Date	Analyte	TOGS 1.1.1	Result	Unit
8/23/2011	cis-1,2-Dichloroethylene	5	135.07	µg/L
8/23/2011	Trichloroethylene	5	104.9	µg/L
8/23/2011	Vinyl Chloride	2	3.11	µg/L

MW-10

Date	Analyte	TOGS 1.1.1	Result	Unit
8/26/2011	Trichloroethylene	5	17,720	µg/L

MW-11

Date	Analyte	TOGS 1.1.1	Result	Unit
8/25/2011	Trichloroethylene	5	50.72	µg/L

MW-1

Date	Analyte	TOGS 1.1.1	Result	Unit
8/24/2011	cis-1,2-Dichloroethene	5	29.53	µg/L
8/24/2011	Trichloroethylene	5	35.59	µg/L
8/24/2011	Vinyl Chloride	2	2.8	µg/L

MW-7

Date	Analyte	TOGS 1.1.1	Result	Unit
8/26/2011	cis-1,2-Dichloroethylene	5	442	µg/L
8/26/2011	Trichloroethylene	5	1,014.6	µg/L

MW-12

Date	Analyte	TOGS 1.1.1	Result	Unit
8/25/2011	MTBE	10	25.8 J	µg/L
8/25/2011	Trichloroethylene	5	68.6	µg/L
8/25/2011	Vinyl Chloride	2	212.3	µg/L

RIZ-4

Date	Analyte	TOGS 1.1.1	Result	Unit
8/24/2011	Acetone	50	416 J	µg/L
8/24/2011	Bromomethane	5	10 UJ	µg/L
8/24/2011	cis-1,2-Dichloroethylene	5	5.1	µg/L
8/24/2011	2-Hexanone	50	300 UJ	µg/L
8/24/2011	Trichloroethylene	5	6.45	µg/L

MW-9

Date	Analyte	TOGS 1.1.1	Result	Unit
8/25/2011	cis-1,2-Dichloroethylene	5	443.4	µg/L
8/25/2011	trans-1,2-Dichloroethylene	5	65.6	µg/L
8/25/2011	Trichloroethylene	5	1,340.8	µg/L
8/25/2011	Vinyl Chloride	2	11 J	µg/L

OW-101

Date	Analyte	TOGS 1.1.1	Result	Unit
8/24/2011	2-Butanone	50	100 UJ	µg/L
8/24/2011	Bromomethane	5	10 UJ	µg/L
8/24/2011	cis-1,2-Dichloroethylene	5	292.1	µg/L
8/24/2011	2-Hexanone	50	300 UJ	µg/L
8/24/2011	Trichloroethylene	5	73.25	µg/L
8/24/2011	Vinyl Chloride	2	27.85	µg/L

MW-4

Date	Analyte	TOGS 1.1.1	Result	Unit
8/23/2011	cis-1,2-Dichloroethylene	5	86.62	µg/L
8/23/2011	Vinyl Chloride	2	63.5	µg/L

MW-3

Date	Analyte	TOGS 1.1.1	Result	Unit
8/24/2011	Benzene	1	173.50	µg/L
8/24/2011	Isopropylbenzene	5	9.10	µg/L
8/24/2011	MTBE	10	145.80	µg/L

MW-6

Date	Analyte	TOGS 1.1.1	Result	Unit
8/24/2011	MTBE	10	15.91	µg/L

MW-5

Date	Analyte	TOGS 1.1.1	Result	Unit
1/19/2009	cis-1,2-Dichloroethene	5	20	µg/L
1/19/2009	Vinyl Chloride	2	2.3	µg/L

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PLOT DATE: 05/04/12 9:08:48 AM YoungAS

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LEGEND

⊕ BEDROCK MONITORING WELL
⊕ OVERBURDEN MONITORING WELL
⊕ MONITORING WELL DESTROYED

TOTAL VOC RESULTS (ppb)

>5000 (Max. Conc. 17,700)
4000
3000
2000
1000
0

NOTES:

1. ALL LOCATIONS ARE APPROXIMATE
2. ONLY ANALYTICAL RESULTS EXCEEDING TOGS 1.1.1 WERE USED FOR INTERPOLATION; DATA USED FOR INTERPOLATION ARE SHOWN IN DATABOX FOR EACH LOCATION.
3. 574 NORTON STREET PARCEL IS NOT PART OF THE 24 SENECA AVENUE PARCEL BUT IS INCLUDED IN THE RI.
4. AERIAL IMAGERY SOURCE: NYS GIS CLEARINGHOUSE, DATE APRIL 2009.

CITY OF ROCHESTER
SUPPLEMENTAL
RI REPORT
24 SENECA AVENUE
ROCHESTER, NEW YORK

MONITORING WELL LOCATIONS AND GROUNDWATER SAMPLE VOLATILE ORGANIC COMPOUND ANALYTICAL EXCEEDANCES

2011

0 50 100 200
Feet

MAY 2012
11862.47362

O'BRIEN & GERE

PATH: I:\Rochester-C.11862\49907.Seneca-Supp-S\\Docs\DWG\MXD\AA-SITE_PLAN.mxd

NOTES:
1. HORIZONTAL CONTROL USING A TRIMBLE GEO-XH GLOBAL POSITIONING SYSTEM UNIT AND/OR LOCATED BY A LICENSED SURVEYOR AND REFERENCED TO THE NEW YORK STATE PLANE COORDINATE SYSTEM, NORTH AMERICAN DATUM 1983 TRANSVERSE MERCATOR PROJECTION WESTERN ZONE. INTERIOR SAMPLE LOCATIONS ARE APPROXIMATE.
2. AERIAL IMAGERY SOURCE: NYS GIS CLEARINGHOUSE, SPRING 2012.
3. 574 NORTON STREET PARCEL IS NOT PART OF THE 24 SENECA AVENUE PARCEL, BUT IS INCLUDED IN THE RI.

This document was developed in color. Reproduction in B/W may not represent the data as intended.

PLOT DATE: 11/10/14 8:11:53 AM DiNardAM

FIGURE 2

N

LEGEND

- REMOVE EXISTING SURFACE (8") & REPLACE WITH NEW ASPHALT CAP
- ×—× REPLACE OR REHABILITATE EXISTING CHAIN LINK FENCE
- REMOVE & REPLACE EXISTING TOPSOIL COVER (1')
- ◆ BEDROCK MONITORING WELL
- ▲ GROSSLY IMPACTED SOIL BORINGS (EXCAVATE)
- ✦ IMPACTED SURFACE SOIL SAMPLES (EXCAVATE)
- 🟩 IMPACTED TEST PITS (EXCAVATE)
- ▨ APPROXIMATE LIMITS OF EXCAVATION
- APPROXIMATE *IN-SITU* TREATMENT AREA FOR VOC GROUNDWATER PLUME
- ▨ 574 NORTON STREET PARCEL

PROPOSED SAMPLE LOCATIONS
- 🟩 PROPOSED AMBIENT AIR SAMPLE
- 🟥 PROPOSED INDOOR AIR SAMPLE
- 🟦 PROPOSED SUB-SLAB VAPOR SAMPLE

IMPACTED STORM DRAIN STRUCTURES
- ⬟ TO BE REMOVED
- ⬟ TO BE REHABILITATED OR REPLACED

UNDERGROUND FEATURES
- VAULT
- FORMER UST/ GAS STATION

UTILITIES
- ELECTRIC
- FIBER
- GAS
- OVERHEAD
- WATER AND SEWER

CITY OF ROCHESTER
ALTERNATIVES ANALYSIS
REPORT
24 SENECA AVENUE
ROCHESTER, NEW YORK

SITE PLAN

DRAFT LOCATIONS OF PROPOSED REMEDIAL ACTIONS

0 40 80 160
Feet

NOVEMBER 2014
11862.49907

O'BRIEN & GERE

Appendix C Peroxychem Material Safety Data Sheets for Treatment Reagents

SAFETY DATA SHEET
EHC® Liquid Reagent Mix

SDS # : EHCLM-C
Revision date: 2016-02-03
Format: NA
Version 1.01

PeroxyChem

1. PRODUCT AND COMPANY IDENTIFICATION

Product Identifier

Product Name EHC® Liquid Reagent Mix

Other means of identification

Alternate Commercial Name EHC®-L Mix; EHC® Liquid - Solid Component

Recommended use of the chemical and restrictions on use

Recommended Use: Bioremediation product for the remediation of contaminated soil and groundwater

Restrictions on Use: Not for drinking water purification treatment.

Manufacturer/Supplier

PeroxyChem LLC
2005 Market Street
Suite 3200
Philadelphia, PA 19103
Phone: +1 267/ 422-2400 (General Information)
E-Mail: sdsinfo@peroxychem.com

Emergency telephone number

For leak, fire, spill or accident emergencies, call:
1 800 / 424 9300 (CHEMTREC - U.S.A.)
1 703 / 527 3887 (CHEMTREC - Collect - All Other Countries)
1 303/ 389-1409 (Medical - U.S. - Call Collect)

2. HAZARDS IDENTIFICATION

Classification

OSHA Regulatory Status

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200).

Combustible dust

GHS Label elements, including precautionary statements

EMERGENCY OVERVIEW

Warning

Hazard Statements
May form combustible dust concentrations in air

Precautionary Statements - Prevention
Keep away from all ignition sources including heat,sparks and flame.
Keep container closed and grounded.
Prevent dust accumulations to minimize explosion hazard.

Hazards not otherwise classified (HNOC)
No hazards not otherwise classified were identified.

Other Information

CONTAINMENT HAZARD: Any vessel that contains wet EHC must be vented due to potential pressure build up from fermentation gases

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical name	CAS-No	Weight %
Iron salt	Proprietary	92-97
amino acid	Proprietary	3-7

Occupational exposure limits, if available, are listed in section 8

4. FIRST AID MEASURES

Eye Contact	Rinse thoroughly with plenty of water for at least 15 minutes, lifting lower and upper eyelids intermittently. Consult a physician.
Skin Contact	Wash off with warm water and soap. Get medical attention if irritation develops and persists.
Inhalation	Remove from exposure, lie down. If symptoms persist, call a physician.
Ingestion	If swallowed, do not induce vomiting - seek medical advice.
Protection of first-aiders	No information available.
Most important symptoms and effects, both acute and delayed	Gastrointestinal effects. Inhalation of dust in high concentration may cause irritation of respiratory system.
Indication of immediate medical attention and special treatment needed, if necessary	Treat symptomatically

5. FIRE-FIGHTING MEASURES

Suitable Extinguishing Media	Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
Specific Hazards Arising from the Chemical	Avoid generating dust; fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard.
Hazardous Combustion Products	Carbon oxides (COx).

Explosion data

Sensitivity to Mechanical Impact	Not sensitive.
Sensitivity to Static Discharge	Not sensitive.

Protective equipment and precautions for firefighters	As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions	For personal protection see Section 8. Avoid dispersal of dust in the air (i.e., cleaning dust surfaces with compressed air.).
Other	Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Use only non-sparking tools.
Environmental Precautions	No special environmental precautions required.
Methods for Containment	Sweep or vacuum up spillage and return to container. Avoid wetting dust and clean up as a dry powder with appropriate PPE for handling dry dusty materials; store in containers that keep material dry, segregated but allow to vent. Avoid dispersal of dust in the air (i.e., cleaning dust surfaces with compressed air.). Dust deposits should not be allowed to accumulate on surfaces, as these may form an explosive mixture if they are released into the atmosphere in sufficient concentration. Material may be recycled when contamination is not a problem.
Methods for cleaning up	Following product recovery, flush area with water.

7. HANDLING AND STORAGE

Handling	Avoid contact with skin, eyes and clothing. Do not ingest. Ensure adequate ventilation. Minimize dust generation and accumulation. Routine housekeeping should be instituted to ensure that dusts do not accumulate on surfaces. Dry powdered material can build static electricity when subjected to the friction of transfer and mixing operations. Provide adequate precautions, such as electrical grounding and bonding, or inert atmosphere.
Storage	Keep tightly closed in a dry and cool place. Keep away from open flames, hot surfaces and sources of ignition.
Incompatible products	. Strong oxidizing agents

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Guidelines	Ingredients with workplace control parameters.

Chemical name	ACGIH TLV	OSHA PEL	NIOSH	Mexico
Iron salt	TWA: 1 mg/m³	-	-	-
Chemical name	**British Columbia**	**Quebec**	**Ontario TWAEV**	**Alberta**
Iron salt	TWA: 1 mg/m³	TWA: 1.0 mg/m³	TWA: 1 mg/m³	TWA: 1 mg/m³

Appropriate engineering controls

Engineering measures	Ensure adequate ventilation, especially in confined areas. It is recommended that all dust control equipment such as local exhaust ventilation and material transport systems involved in the handling of this product contain explosion relief vents or an explosion suppression or an oxygen-deficient environment. Ensure that dust-handling systems (such as exhaust ducts, dust collectors, vessels, and processing equipment) are designed in a manner to prevent the escape of dust into the work area (i.e., there is no leakage from the equipment). Use only appropriately classified electrical equipment and powered industrial trucks.

Individual protection measures, such as personal protective equipment

Eye/Face Protection	Safety glasses with side-shields.
Skin and Body Protection	Wear suitable protective clothing.
Hand Protection	Protective gloves
Respiratory Protection	When workers are facing concentrations above the exposure limit they must use appropriate certified respirators.
Hygiene measures	Handle in accordance with good industrial hygiene and safety practice.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Appearance	Dry powder
Physical State	Solid
Color	light gray
Odor	Slight
Odor threshold	No information available
pH	4.5 (1% solution)
Melting point/freezing point	100 °C
Boiling Point/Range	No information available
Flash point	Not applicable
Evaporation Rate	No information available
Flammability (solid, gas)	May be combustible at high temperatures
Flammability Limit in Air	
Upper flammability limit:	No information available
Lower flammability limit:	No information available
Vapor pressure	No information available
Vapor density	No information available
Density	No information available
Specific gravity	No information available
Water solubility	Fairly soluble
Solubility in other solvents	
Partition coefficient	No information available
Autoignition temperature	
Decomposition temperature	No information available
Viscosity, kinematic	No information available
Viscosity, dynamic	No information available
Explosive properties	Low level dust explosion hazard
K_{st}	76 bar-m/sec: St1 Class dust
Oxidizing properties	No information available
Molecular weight	No information available
Bulk density	Not applicable

10. STABILITY AND REACTIVITY

None under normal use conditions

Chemical Stability	Stable under recommended storage conditions. Decomposes on heating.
Possibility of Hazardous Reactions	None under normal processing.
Hazardous polymerization	Hazardous polymerization does not occur.
Conditions to avoid	To avoid thermal decomposition, do not overheat.
Incompatible materials	Strong oxidizing agents.
Hazardous Decomposition Products	Carbon oxides (COx).

11. TOXICOLOGICAL INFORMATION

Product Information

LD50 Oral	Iron Salt: 2100 mg/kg (guinea pig) Cysteine: 1890 mg/kg (rat)
LD50 Dermal	No information available
LC50 Inhalation	No information available

Sensitization	Not expected to be sensitizing based on the components.

Information on toxicological effects

Symptoms	Dust is irritating eyes, nose, throat, and lungs.

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Carcinogenicity	Contains no ingredient listed as a carcinogen.
Mutagenicity	This product is not recognized as mutagenic by Research Agencies
Reproductive toxicity	This product does not contain any known or suspected reproductive hazards.
STOT - single exposure	No information available.
STOT - repeated exposure	No information available.
Aspiration hazard	Not applicable.

12. ECOLOGICAL INFORMATION

Ecotoxicity

Ecotoxicity effects	Not expected to have significant environmental effects
Persistence and degradability	No information available.
Bioaccumulation	No information available.
Mobility	No information available.
Other Adverse Effects	None known.

13. DISPOSAL CONSIDERATIONS

Waste disposal methods	It must undergo special treatment, e.g. at suitable disposal site, to comply with local regulations.
Contaminated Packaging	Dispose of in accordance with local regulations.

14. TRANSPORT INFORMATION

DOT	NOT REGULATED

15. REGULATORY INFORMATION

U.S. Federal Regulations

SARA 313

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372

SARA 311/312 Hazard Categories

Acute health hazard	No
Chronic health hazard	No
Fire hazard	No
Sudden release of pressure hazard	No
Reactive Hazard	No

Clean Water Act

This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42)

CERCLA/EPCRA

This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material

International Inventories

Component	TSCA (United States)	DSL (Canada)	EINECS/ELINCS (Europe)	ENCS (Japan)	China (IECSC)	KECL (Korea)	PICCS (Philippines)	AICS (Australia)	NZIoC (New Zealand)
Iron salt (92-97)	X	X	X			X	X	X	X
amino acid (3-7)	X	X	X	X	X	X	X	X	X

CANADA

WHMIS Hazard Class Non-controlled

16. OTHER INFORMATION

NFPA	**Health Hazards** 1	**Flammability** 1	**Stability** 0	**Special Hazards** -
HMIS	**Health Hazards** 1	**Flammability** 1	**Physical hazard** 0	**Special precautions** -

NFPA/HMIS Ratings Legend Severe = 4; Serious = 3; Moderate = 2; Slight = 1; Minimal = 0

Uniform Fire Code COMBUSTIBLE DUST/POWDER
References Refer to NFPA 654, *Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids* , for safe handling.

Revision date: 2016-02-03
Revision note (M)SDS sections updated 9
Issuing Date: 2016-01-26

Disclaimer

PeroxyChem believes that the information and recommendations contained herein (including data and statements) are accurate as of the date hereof. NO WARRANTY OF FITNESS FOR ANY PARTICULAR PURPOSE, WARRANTY OF MERCHANTABILITY OR ANY OTHER WARRANTY, EXPRESSED OR IMPLIED, IS MADE CONCERNING THE INFORMATION PROVIDED HEREIN. The information provided herein relates only to the specified product designated and may not be applicable where such product is used in combination with any other materials or in any process. Further, since the conditions and methods of use are beyond the control of PeroxyChem, PeroxyChem expressly disclaims any and all liability as to any results obtained or arising from any use of the products or reliance on such information.

Prepared By:

PeroxyChem

End of Safety Data Sheet

SAFETY DATA SHEET
ELS™ Microemulsion

SDS # : ELS-C
Revision date: 2015-07-22
Format: NA
Version 1

1. PRODUCT AND COMPANY IDENTIFICATION

Product Identifier

Product Name ELS™ Microemulsion

Other means of identification

Synonyms Lecithin: L-α-Phosphatidylcholine, Azolectin; Sodium Benzoate: Benzoic acid sodium salt; Sorbitan monooleate, ethoxylated: Polyoxyethylenesorbitan monooleate

Recommended use of the chemical and restrictions on use

Recommended Use: Bioremediation product for the remediation of contaminated soil and groundwater

Restrictions on Use: Not for drinking water purification treatment.

Manufacturer/Supplier

PeroxyChem LLC
2005 Market Street
Suite 3200
Philadelphia, PA 19103
Phone: +1 267/ 422-2400 (General Information)
E-Mail: sdsinfo@peroxychem.com

Emergency telephone number

For leak, fire, spill or accident emergencies, call:
1 800 / 424 9300 (CHEMTREC - U.S.A.)
1 703 / 527 3887 (CHEMTREC - Collect - All Other Countries)
1 303/ 389-1409 (Medical - U.S. - Call Collect)

2. HAZARDS IDENTIFICATION

Classification

OSHA Regulatory Status

This material is not considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200).

GHS Label elements, including precautionary statements

EMERGENCY OVERVIEW

Hazards not otherwise classified (HNOC)
No hazards not otherwise classified were identified.

Other Information

CONTAINMENT HAZARD: Any vessel that contains wet ELS must be vented due to potential pressure build up from fermentation gases

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical name	CAS-No	Weight %
Sorbitan monooleate, ethoxylated	9005-65-6	2-4
Lecithin	8002-43-5	20-30
Water	7732-18-5	60-80
Sodium Benzoate	532-32-1	2-4

Synonyms are provided in Section 1.

4. FIRST AID MEASURES

Eye Contact	In case of contact, immediately flush eyes with plenty of water. Get medical attention if irritation develops and persists.
Skin Contact	Wash skin with soap and water. Get medical attention if irritation develops and persists.
Inhalation	Move to fresh air in case of accidental inhalation of vapors. Consult a physician if necessary.
Ingestion	Drink 1 or 2 glasses of water. Get medical attention if symptoms occur. If swallowed, do not induce vomiting - seek medical advice. Never give anything by mouth to an unconscious person.
Most important symptoms and effects, both acute and delayed	None known
Indication of immediate medical attention and special treatment needed, if necessary	Treat symptomatically

5. FIRE-FIGHTING MEASURES

Suitable Extinguishing Media	Carbon dioxide (CO_2). Dry chemical. Dry powder.
Specific Hazards Arising from the Chemical	. Combustible material: may burn but does not ignite readily

Explosion data

Sensitivity to Mechanical Impact	Not sensitive.
Sensitivity to Static Discharge	Not sensitive.
Protective equipment and precautions for firefighters	As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions	For personal protection see Section 8.

Other	For further clean-up instructions, call PeroxyChem Emergency Hotline number listed in Section 1 "Product and Company Identification" above.
Environmental Precautions	No special environmental precautions required.
Methods for Containment	Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal.
Methods for cleaning up	After cleaning, flush away traces with water.

7. HANDLING AND STORAGE

Handling	Handle in accordance with good industrial hygiene and safety practice.
Storage	Any vessel that contains wet ELS must be vented due to potential pressure build up from fermentation gases. Keep away from open flames, hot surfaces and sources of ignition.
Incompatible products	Water, Alkalis

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Guidelines	This product, as supplied, does not contain any hazardous materials with occupational exposure limits established by the region specific regulatory bodies.

Appropriate engineering controls

Engineering measures	None under normal use conditions.

Individual protection measures, such as personal protective equipment

Eye/Face Protection	Safety glasses with side-shields.
Skin and Body Protection	Wear suitable protective clothing.
Hand Protection	Protective gloves
Respiratory Protection	Use only with adequate ventilation.
Hygiene measures	Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and immediately after handling the product.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Appearance	Light amber emulsion
Physical State	Liquid
Color	No information available
Odor	odorless
Odor threshold	No information available
pH	6.5 - 6.9
Melting point/freezing point	Not applicable No data available
Boiling Point/Range	No information available
Flash point	> 200 °F
Evaporation Rate	No information available
Flammability (solid, gas)	No information available
Flammability Limit in Air	
Upper flammability limit:	No information available
Lower flammability limit:	No information available
Vapor pressure	No information available

Vapor density	No information available
Density	No information available
Specific gravity	No information available
Water solubility	Dispersible in water
Solubility in other solvents	No information available
Partition coefficient	No information available
Autoignition temperature	No information available
Decomposition temperature	No information available
Viscosity, kinematic	No information available
Viscosity, dynamic	No information available
Explosive properties	Not explosive
Oxidizing properties	Non-oxidizing
Molecular weight	No information available
Bulk density	Not applicable

10. STABILITY AND REACTIVITY

Reactivity	None under normal use conditions
Chemical Stability	Stable under recommended storage conditions.
Possibility of Hazardous Reactions	None under normal processing.
Hazardous polymerization	Hazardous polymerization does not occur.
Conditions to avoid	Temperatures above 71°C
Incompatible materials	Water, Alkalis.
Hazardous Decomposition Products	None under normal use.

11. TOXICOLOGICAL INFORMATION

Product Information

Ingredients in this product have been designated as GRAS (Generally Recognized as Safe) by govenment agencies.

LD50 Oral	There are no data available for this product
LD50 Dermal	There are no data available for this product
LC50 Inhalation	No information available
Sensitization	Not expected to be sensitizing based on the components.

Information on toxicological effects

Symptoms	No information available.

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Carcinogenicity	Contains no ingredient listed as a carcinogen.
Mutagenicity	No information available
Reproductive toxicity	No information available.
STOT - single exposure	No information available.
STOT - repeated exposure	No information available.

Aspiration hazard	No information available.

12. ECOLOGICAL INFORMATION

Ecotoxicity

Ecotoxicity effects	Contains no substances known to be hazardous to the environment or that are not degradable in waste water treatment plants
Persistence and degradability	Expected to biodegrade, based on component information.
Bioaccumulation	Bioaccumulation is unlikely.
Mobility	Will likely be mobile in the environment due to its water solubility but will likely degrade over time.
Other Adverse Effects	None known.

13. DISPOSAL CONSIDERATIONS

Waste disposal methods	Can be landfilled or incinerated, when in compliance with local regulations.
Contaminated Packaging	Dispose of in accordance with local regulations.

14. TRANSPORT INFORMATION

DOT	NOT REGULATED

15. REGULATORY INFORMATION

U.S. Federal Regulations

SARA 313

Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372

SARA 311/312 Hazard Categories

Acute health hazard	No
Chronic health hazard	NO
Fire hazard	NO
Sudden release of pressure hazard	NO
Reactive Hazard	NO

Clean Water Act

This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42)

CERCLA

This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material

International Inventories

Component	TSCA (United States)	DSL (Canada)	EINECS/ELINCS (Europe)	ENCS (Japan)	China (IECSC)	KECL (Korea)	PICCS (Philippines)	AICS (Australia)	NZIoC (New Zealand)
Sorbitan monooleate, ethoxylated 9005-65-6 (2-4)	X	X	X	X	X	X	X	X	X
Lecithin 8002-43-5 (20-30)	X	X	X		X	X	X	X	X
Sodium Benzoate 532-32-1 (2-4)	X	X	X	X	X	X	X	X	X

Mexico - Grade Minimum risk, Grade 0

CANADA

WHMIS Hazard Class Non-controlled

16. OTHER INFORMATION

NFPA	**Health Hazards** 1	**Flammability** 0	**Stability** 0	**Special Hazards** -
HMIS	**Health Hazards** 1	**Flammability** 0	**Physical hazard** 0	**Special precautions** -

NFPA/HMIS Ratings Legend Severe = 4; Serious = 3; Moderate = 2; Slight = 1; Minimal = 0

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End of Safety Data Sheet