AECOM Environment

Prepared For:
New York State Department
Environmental Conservation
Albany, NY

Prepared by:
AECOM
Latham, NY
60284002
April 2014

Work Plan for Northeast Alloys & Metals ISCO Pilot Study

AECOM Environment

Prepared For:
New York State Department
Environmental Conservation
Albany, NY

Prepared by:
AECOM
Latham, NY
60284002
April 2014

Work Plan for Northeast Alloys & Metals ISCO Pilot Study

Prepared By Chris Norton

Reviewed By Scott Underhill, PE

Contents

List of Appendices

List of Tables

List of Figures

List of Acronyms

bgs	Below Ground Surface
CAMP	Community Air Monitoring Plan
cis-1,2-DCE	cis-1,2-dichloroethene
COC	Contaminants of Concern
cm	centimeter
DER	Division of Environmental Remediation
ELAP	Environmental Laboratory Accreditation Program
FAP	Field Activities Plan
ft	Feet
HASP	Health and Safety Plan (HASP)
ISCO	In-situ Chemical Oxidation
MSDS	Material Safety Data Sheet
NEAM	Northeast Alloy & Metals
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OM&M	Operations Maintenance & Monitoring
PCE	Tetrachloroethene
PNOD	Permanganate Natural Oxidant Demand
POTW	Publicly Owned Treatment Works
PPE	Personal Protection Equipment
ppm	parts per million
RACER	Remedial Action Cost Engineering and Requirements
RAO	Remedial Action Objectives
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision

SCO	Soil Cleanup Objective
sec	second
SI	Subsurface Investigation
SSI	Supplemental subsurface investigation
SSO	Site Safety Officer
TCE	Trichloroethene
UIC	Underground Injection Control Permit
USEPA	United States Environmental Protection Agency
VC	Vinyl Chloride
VOC	Volatile Organic Compound
WP	Work Plan

Executive Summary

This Work Plan (WP) provides information on the proposed pilot study intended to evaluate in-situ chemical oxidation (ISCO) remediation of chlorinated-impacted soils and groundwater at the Northeast Alloys and Metals (NEAM) Site (NYSDEC Site No. 633045) located in Utica, NY. The primary contaminants of concern (COCs) are volatile organic compounds (VOCs): trichloroethene (TCE), cis-1,2-dichloroethene (cis-1,2-DCE), tetrachloroethene (PCE), and vinyl chloride (VC). Contamination was the result of chemical releases initiated by the historical land use of the site for metal alloy manufacturing and dry cleaning chemical storage.

Sodium permanganate has been selected as the chemical to be used for the ISCO injection. Direct push technology will be used to inject 8,800 gallons of 10% solution of sodium permanganate into a total of 26 points from the Courtyard Area (Area A) and the former Degreasing Area (Area B). Injections will occur in the saturated zone from the groundwater table to an underlying glacial till residing at a depth of approximately 14 feet below ground surface (ft bgs). The injections are intended to target the most contaminated soil and groundwater. The objective of the pilot study is to evaluate the performance of using ISCO for contaminant reduction in both the soil and groundwater.

1.0 Introduction

AECOM has been contracted under Contract Work Assignment No. D007626-28 to perform site management at the Northeast Alloys and Metals (NEAM) Site (NYSDEC Site No. 633045) located in Utica, NY (Figure 1). Site management activities include the operations, maintenance and monitoring (OM&M) of the on-site groundwater extraction and treatment system and the implementation of an in-situ chemical oxidation (ISCO) pilot test described in this WP. This WP describes a pilot study to evaluate the ISCO treatment of chlorinated-impacted soils and groundwater associated with the Courtyard Area (Area A) and the former Degreasing Area (Area B) at the NEAM site (Figure 2).

A Record of Decision (ROD) was issued by March 1998 for the remediation of soils and groundwater at the Site. The elements of the ROD included 1) installation of a groundwater collection and treatment system that discharges into the local publicly owned treatment works (POTW), 2) installation of a soil vapor extraction system at RW-1 and RW-2, 3) excavation of contaminated soil in the east gate area in the vicinity of MW-9, 4) implementation of restrictions on groundwater use until groundwater standards are attained and 5) implementation of a site-wide OM&M program.

An interim remedial measure evaluation was conducted in 2011 that proposes ISCO as a feasible solution to treat the contaminated soils. This pilot study is being implemented to evaluate the effectiveness of using sodium permanganate as the ISCO chemical to reduce contamination in the soil to concentrations that meet NYSDEC Part 375 Soil Cleanup Objectives (SCOs) and in groundwater to meet ambient groundwater quality standards.

The three appendices supporting this WP are:

Appendix A Field Activities Plan (FAP)

Appendix B Health and Safety Plan (HASP)

Appendix C Quality Assurance Project Plan (QAPP)

1.1 Site Description

The 3.9 acre NEAM site consists of a former metal fabrication/recycling facility located at 2145 Dwyer Avenue in the City of Utica, New York (Figure 1, Figure 2). The facility operated from the 1950s into the early 1990s and included a commercial laundry facility that operated during the 1970s. These facilities served as the sources of groundwater and soil contamination that was later recognized in the site's history. The primary COCs are VOCs: TCE, cis-1,2-DCE, PCE, and VC.

1.1.1 Site Geology

Based on observations of soil borings advanced in 2008, fill materials (e.g., cinders, slag, ash, and brick) are present in the top 0 to 3 ft in both Area A (Courtyard) and Area B (Former Degreasing Pad). Below the fill interval, soils generally consisting of silt and clay with variable amounts of sand and gravel in the soil matrix are considered the "alluvium" unit. At approximately 10 to 14 ft below bgs, soils transition to a dense, grayish to reddish brown glacial till that contains abundant rock fragments. Figure 2 shows the site layout, including soil boring and cross-section locations; Figure 3 and Figure 4 shows four of the cross-sections: A-A', B-B', C-C', and D-D'.

1.1.2 Site Hydrogeology

Depth to groundwater in the Area A wells MW-5, MW-6 and MW-4 (east of the Courtyard Area) is approximately 3 to 4 ft bgs; while depth to water at other wells on-site ranged from 8 to 14 ft bgs. The hydraulic conductivity of the fill/alluvium soils averages $3x10^{-4}$ cm/sec; the hydraulic conductivity of the underlying till layer is estimated to be no higher than $7x10^{-5}$ cm/sec, and most likely is much lower than this. The groundwater contour map from July 2013 is shown in Figure 5.

1.1.3 Previous Remedial Activities

Previous actions have been taken to reduce the contamination at Area A and Area B. The following subsections summarize previous investigations and remedial actions that have been completed at the NEAM site.

1.1.3.1 Remedial Investigation

In 1989, an underground fuel-oil storage tank was removed from the southwestern portion of the courtyard and the initial presence of VOCs contamination at the site was reported. Subsequent investigations resulted in the detection of VOCs in soil and groundwater. TCE, cis-1,2-DCE, PCE, and VC were identified as the COCs. Later interviews reportedly revealed that a drum of TCE had been pierced in the courtyard by a forklift and had discharged to a storm drain. The site was added to the NYSDEC Registry of Inactive Hazardous Waste Disposal Sites as a Class 2 site (site no. 6-33-045) following an environmental investigation in 1994. The remedial investigation/feasibility study (RI/FS) was completed in 1997 and a ROD was issued in March 1998.

The ROD for the site included 1) installation of a groundwater collection and treatment system that discharges into the local POTW, 2) installation of a soil vapor extraction system at RW-1 and RW-2, 3) excavation of contaminated soil in the east gate area in the vicinity of MW-9, 4) implementation of restrictions on groundwater use until groundwater standards are attained and 5) implementation of a site-wide OM&M program to insure that the remedial program is effective and that the remedial action goals are obtained.

An OM&M program was initiated after elements 1 through 3 listed above was completed in March 2001. Groundwater sampling events were performed in May 2005, October 2005, August 2007, October 2008 (limited sampling), and October 2011 to monitor the effectiveness of the remedy on groundwater quality.

1.1.3.2 Additional Investigations

A subsurface investigation (SI) was performed in February and March 2008, to characterize the degree and extent of soil contamination around MW-6. During this investigation two possible sources of the contamination were identified, one in Area A and another in Area B. A supplemental subsurface investigation (SSI) was performed between August and October 2008 to delineate the vertical and horizontal extent of soil contamination. Figure 6 shows the lateral extent of TCE and DCE above the NYSDEC Part 375 Commercial Use SCOs: ETB-22 (10-10.5 foot interval) and ETB-44 (10-12 foot interval). The estimated volume of the impacted soils above commercial-use SCOs is approximately 300 cubic yards.

In June 2013 additional wells were installed within Area A (MW-17 and MW-18) and Area B (MW-15 and MW-16). Water sampling at these wells measured elevated concentrations of VOCs. MW-17 contains the highest known onsite concentration with VOCs at 253,300 µg/l. MW-6, located between the two source areas, continues to exhibit the highest concentration of total VOCs (3,524 µg/l) among the older monitoring wells. The concentration of VOCs reported in ground water samples collected in July 2013 are shown in Figure 7.

Ground water samples collected from wells within the presumed capture zone of the groundwater recovery trench have much higher total VOC concentrations (up to three orders of magnitude higher) than the water collected from the trench, suggesting the trench is having only marginal recover of impacted groundwater.

1.2 Remedial Action Objectives

As discussed in the 1998 ROD, the remedial action objectives (RAOs) for this site are:

- Reduce, control, or eliminate, to the extent practicable, the contaminated soil present on site.
- Eliminate the potential for direct human or animal contact with the contaminated soils on site.
- Mitigate impacts of contaminated groundwater on the environment.
- Provide for attainment of SCGs for groundwater quality to the extent practicable.

The objective of this pilot study will be to determine the practicability of achieving the RAOs by using ISCO with permanganate. Applicable SCOs from NYSDEC 6 NYCRR Part 375 criteria are listed below in Table 1.

Table 1 Applicable SCOs

Contaminant	Commercial Use SCO (mg/kg)	Groundwater Protection SCO (mg/kg)
Cis-1,2-DCE	500	0.25
PCE	150	1.3
TCE	200	0.47
VC	13	0.02

2.0 Components of Pilot Study

The 2011 Interim Remedial Measure Evaluation (AECOM, 2011) evaluated four alternatives: no action, excavation and disposal of all soil above Protection of Groundwater SCOs, excavation and disposal of all soil above Commercial Use SCOs, and ISCO of overburden soils. The IRM evaluation selected the ISCO alternative to implement. This pilot study is being conducted to evaluate the effectiveness of this remediation technology. The pilot study will consist of injecting a 10% solution of sodium permanganate as the oxidant at Area A and Area B to treat contaminated soils and groundwater. After the injection, soil and groundwater monitoring will be conducted to determine the effectiveness of the ISCO. The following sections describe the major components of the pilot study; Section 3 provides further details on the ISCO injection and Section 5 on the sampling monitoring program.

2.1 Soil Remediation

This pilot study is targeting areas which have VOC concentrations above the NYSDEC Part 375 Commercial Use SCOs at Area A and Area B. Chemical oxidation using sodium permanganate is expected to oxidize the contaminates into carbon dioxide, manganese dioxide, and dissolved salts. The sodium permanganate will be injected through injection points located within the lateral extent of contamination above the NYSDEC Part 375 Commercial Use SCOs detected in both Area A and Area B (Figure 8, Figure 9). Additional information describing the specific details of the proposed ISCO injections is detailed in Section 3.

The sodium permanganate is anticipated to be fully utilized within a year of the injection. Soil samples will be collected 12 months after the completion of injections to determine what if any levels of contamination still exist. Samples will be collected at the locations shown in Figure 9.

2.2 Groundwater Remediation

The ISCO pilot study will focus on groundwater plumes with TCE concentrations measured to be greater than 1,000 ug/L. Chemical oxidation using sodium permanganate will oxidize contaminates into carbon dioxide, manganese dioxide, and dissolved salts. The groundwater will be monitored quarterly for one year when the permanganate solution is expected to be fully consumed. Samples will be collected using existing monitoring wells throughout Area A and Area B shown in Figure 9.

As described in Section 2.1, the permanganate will be injected using direct push technology at proposed injection points located within the lateral extent of contamination observed in Area A and Area B (Figure 8). Additional information describing the specific details of the proposed ISCO injections is detailed in Section 3-In Situ- Chemical Oxidation.

3.0 In Situ Chemical Oxidation

This section presents the basic design and the methods for evaluating ISCO system performance in reducing COCs at Area A and Area B. The ISCO system will consist of permanganate injections delivered by direct push technology. ISCO oxidizes targeted contaminates into carbon dioxide, manganese dioxide, dissolved salts, and water, thereby reducing the concentration of contaminants.

3.1 Basis of Design

Two soil samples were collected from the site in June 2013 and sent to Carus Remediation Technologies to be analyzed for permanganate natural oxidant demand (PNOD), (Attachment 1). The measurement of the PNOD is used to estimate the concentration of permanganate that will be consumed in 48 hours by the naturally-occurring reducing agents present in soil and ground water. The soil samples analyzed for PNOD were collected from MW-15 (10-12 foot interval) from Area B and MW-17 (6-8 foot interval) from Area A (Figure 7). The 48 hour PNOD for MW-15 (Area B) was 22.4 g/kg and for MW-17 (Area A) was 10.4 g/kg. For the purpose of this design, the average PNOD of 16.4 was used.

Injections of permanganate will be performed using direct push technology. The injections would focus on two targeted media:

1. Soils with COCs concentrations above Commercial-Use SCOs
2. Groundwater with COCs concentrations above 1,000 ug/L

3.1.1 Soils

The targeted treatment interval would be saturated alluvium soils with concentrations of contaminants above the Commercial Use SCOs. The two targeted areas, shown in Figure 6, include the soils around the ETB-22 boring 10-10.5 ft bgs (Area A) and the soils around the ETB-44 boring 10-12 ft bgs (Area B) to remediate the soils to levels below the Commercial-Use SCOs. The estimated permanganate requirements are summarized below in Table 2 (calculations provided in Attachment 2).

Table 2 Estimated Permanganate Injection Requirements for Soil Remediation

Area	Treatment Dimensions (ft)	Treatment Volume (CY)	PNOD (g/kg)	TCE (mg/kg)	MnO4- (lbs 40% Solution)	MnO4- (gals 10% solution)
A	15 x 15 x 8	70	16.4	720	3,200	1,400
B	15 x 15 x 10	80	16.4	310	3,900	1,700

Assuming five injection points surrounding each boring location, the approximate injection volume will be 380 and 340 gallons per point for Area A and Area B, respectively, of 10 percent solution of sodium permanganate as shown in Table 3.

Table 3 10% Permanganate Solution Injection Design For Soil Remediation

Area	MnO4- (gals 10% solution)	Number of Points	Injection Vol. Per Point (gal)	Injection Interval (ft)	Injection Rate (gal/ft)	Length of Injections (days)
A	1,400	5	280	8	35	2
B	1,700	5	340	10	34	2

For injections treating soil, the permanganate is expected to distribute at approximately the same rate as the injections.

3.1.2 Groundwater

The targeted media would be the highly impacted groundwater above the alluvium/till interface. The two targeted areas, shown in Figure 7, include the groundwater around MW-6, MW-17 and MW-18 (Area A) and the groundwater around MW-15 and MW-16 (Area B). The estimated permanganate requirements are summarized in Table 4 (calculations provided in Attachment 2).

Table 4 Estimated Permanganate Injection Requirements for Groundwater Remediation

Area	Treatment Dimensions (ft)	Treatment Volume (CY)	PNOD (g/kg)	TCE (ug/L)	MnO4- (lbs 40% solution)	MnO4- (gals 10% solution)
A	25 x 70 x 8	520	16.4	1,000	5,700	2,500
B	40 x 45 x 10	670	16.4	1,000	7,300	3,200

Assuming 40 gallons of permanganate would be injected per foot and a vertical injection interval of 8 ft in Area A and 10 ft in Area B, the number of injection points required would be 8 for both areas as shown in Table 5.

Table 5 10% Permanganate Solution Injection Design For Groundwater Remediation

Area	MnO4- (gals 10% solution)	Injection Rate (gal/ft)	Injection Interval (ft)	Injection Vol. Per Point (gal)	Number of Points	Length of Injections (days)
A	2,500	40	8	320	8	2
B	3,200	40	10	400	8	2

For the injections treating groundwater, the oxidant will initially distribute around the injection point (assume a radius of influence of 10-ft) but then be transported down gradient at the groundwater velocity.

Table 6 summarizes the number of injection points per targeted medium. Ten injection points will be used to treat Area A and Area B soils (ten points total) and sixteen injections points will be used to begin the treatment of impacted groundwater in Area A and Area B, for a total of twenty-six injection points. Proposed locations of the injection points are shown in Figure 8.

Table 6 Permanganate Injection Design Summary

Treatment Area	MnO4- (lbs 40% solution)	MnO4-(gals 10% solution)	Number of points
A-Soils	3,200	1,400	5
A-Groundwater	5,700	2,500	8
B-Soils	3,900	1,700	5
B-Groundwater	7,300	3,200	8
Total	20,100	8,800	26

3.2 Mobilization

All areas around Area A and Area B where injections, drilling or other intrusive activity may occur will be cleared for all utilities one week prior to intrusive activities. Dig Safely NY and potentially affected private utility companies will be notified to identify utilities. A utility locater firm will be contracted to mark out any onsite utilities. Before intrusive activities commence, an underground injection control permit (UIC) will be sent to the United States Environmental Protection Agency (USEPA) Region II UIC coordinator.

Temporary facilities will be installed at the site during mobilization including the chemical storage area, decontamination pad, and equipment storage area. The drill rig will be brought to the Site by the drilling subcontractor for chemical injection using direct push methods. Any other equipment to prepare, mix, store or inject the oxidants will be brought to the site and stored in the equipment storage area when not in use. The 8,800 gallons of 10% permanganate solution will be delivered via tanker and will be stored on-site in a 20,000 gallon frac tank in the designated chemical storage area. All incoming hazardous materials (including the permanganate) will be pre-approved by the NYSDEC and recorded as “contractor usage of chemicals.” A copy of the material safety data sheet (MSDS) for permanganate is included in the Attachment B of the HASP (WP, Appendix B).

3.3 Chemical Oxidation Handling

The chemical injection for both Area A and Area B will consist of distributing of 8,800 gallons of 10% sodium permanganate through direct push injection. As mentioned previously, the sodium permanganate will be delivered to the site via tanker and stored in a frac tank. During injection, the sodium permanganate will be pumped into the injection wells directly from the frac tank using a chemical resistant hose. The injection will require approximately 2 weeks of field time to complete. Proposed locations of the direct push injection points are depicted on Figure 8.

3.4 Monitoring

Monitoring is intended to measure ISCO treatment efficiency at reducing the COCs concentrations within the treatment area. Following the injection period, all existing monitoring wells at Area A and Area B will be sampled quarterly, beginning three months after the conclusion of injections. A round of soil samples will be collected 12 months after the injections. Samples will be analyzed by a NYSDOH Environmental Laboratory Accreditation Program (ELAP) approved laboratory for VOCs in both water and soil with US Environmental Protection Agency (USEPA) Method 8260 and 8260B, respectively; the specifics of the groundwater and soil sampling are discussed in Section 5.

4.0 Pilot Activities

The remedial activities involved in evaluating ISCO efficacy in the reduction of TCE, DCE, PCE, and VC in the soils and groundwater associated with Area A and Area B. The purpose of the pilot study is to evaluate system efficacy in reducing the targeted contaminates below NYSDEC Part 375 SCOs.

4.1 Pilot Study Schedule

Following approval of this WP, pilot study field activities will commence in order as detailed in the Project Schedule (Attachment 3). The pilot study is anticipated to last two weeks and is tentatively scheduled to begin in April 2014. Quarterly groundwater sampling will commence three months following completion of the injections and, given the present schedule, will be performed in July, September, December 2014 and April 2015. The April 2015 sampling event will include both groundwater and soil sampling.

5.0 Sampling & Analysis

Ground water samples will be collected quarterly from both Area A and Area B, beginning three months following injections and soil samples will be collected 12 months after the injections. The purpose of groundwater and soil sampling analysis is to evaluate the effectiveness of the ISCO injections in reducing the concentrations of contaminants. The sampling will consists of field monitoring of groundwater quality parameters, and collection of soil and groundwater samples for laboratory analyses. The sampling protocol and frequencies can be altered in response to changing site conditions, or parameters may be eliminated if they are not providing useful information. NYSDEC approval will be obtained prior to implementing any changes to the sampling program. The groundwater and soil samples will be collected and analyzed in accordance with the FAP (Appendix A).

5.1 Performance Monitoring

Groundwater samples will be collected quarterly for one year from Area A and Area B monitoring wells beginning three months after the conclusion of ISCO injections (Attachment 3, Figure 9). Soil samples will be collected 12 months after the conclusion of ISCO injections (Attachment 3, Figure 9). Pre-existing monitoring wells will be utilized for groundwater sampling and soil samples will be taken from proposed soil borehole locations, as shown in Figure 9. The proposed sample schedule is shown in Attachment 3 of this document and a detailed discussion of the groundwater and soil sample plans is included in Section 3 and 4 of the FAP.

During groundwater sampling, colorimetric testing will be conducted to determine concentrations of permanganate remaining in the groundwater. The groundwater and soil samples collected will be analyzed by a NYSDOH ELAP approved laboratory for VOCs in both water and soil with USEPA Method 8260 and 8260B, respectively.

5.1.1 Sampling Equipment

Groundwater samples will be collected from monitoring wells beginning in areas known or assumed to be least contaminated (Figure 6, Figure 7, and Figure 9) and progress to areas known or assumed to be the most contaminated (Figure 6, Figure 7, and Figure 9). All sampling and purging equipment (pumps, water level indicators, etc.) that come into contact with ground water will be decontaminated before use and between sampling locations.

Groundwater geochemical parameters and collection of groundwater samples will be documented on a monitoring well sample collection form. Low-flow groundwater sampling will be the initial method of groundwater sampling. If low-flow sampling is not possible, the well will be purged of three well volumes or until dry and sampled with a disposable bailer after allowing the well to recharge. The procedures for collecting samples using bailers are presented in further detail in the FAP (Appendix A).

The low-flow (minimum drawdown sampling methods is based on the premise that a pump or pump intake placed within the screened interval of a well and pumped at a rate corresponding to the hydraulic conductivity of the formation will rapidly establish a horizontal laminar flow of groundwater and withdraw fresh formation water without significant mixing or dewatering of the stagnant casing water in the well and without mobilizing naturally occurring colloidal material within the aquifer. Field personnel conducting groundwater sampling will be trained in low-flow sampling procedures and will be provided a copy of the sampling protocols. Groundwater geochemical parameters will be monitored during well purging to determine well stabilization for sampling.

The procedures for collecting groundwater samples using low-flow techniques are presented in further detail in the FAP (Appendix A).

6.0 Residuals Management

Residuals that will be generated during construction, implementation of the pilot study, and subsequent performance monitoring are discussed in this section.

6.1 Soil Cuttings from Drilling Activities

Any soils cutting generated from drilling activities will be backfilled in the same location they were generated from.

6.2 Residuals from ISCO Chemical Handling and Injection Equipment

Once the proposed injections are completed, hoses, pumps, and other used appurtenances will be rinsed with clean water. The resulting wash water will have concentrations of permanganate that will dilute during the rinse process. Wash water will be neutralized with spill mitigation peroxide and vinegar solution and stored in the frac tank for proper disposal. Any residual permanganate remaining in the frac tank will be neutralized. The frac tank will be cleaned and wash water properly disposed of by a waste handling subcontractor.

6.3 Used Personal Protective Equipment and Other Solid Waste

Used PPE (Tyvek, gloves, etc.), food waste, and other solid waste such as paper towels and disposable laboratory items (pipettes, used test papers) will be taken off-site and disposed of with compliant methods that may require containment from 55-gallon drums.

7.0 Health & Safety

The remedial activities outlined within this WP will be performed in accordance with the Site Specific HASP presented in Appendix B.

7.1 Health & Safety Plan

The HASP provides the following information, as required under 29 CFR 1910.120 and applicable standards:

- Identification of tasks and potential hazards associated with each task,
- List of key personnel,
- Personal protective equipment (PPE) that may be used at the site,
- Employee health and safety training requirements,
- Emergency contingency information,
- Medical surveillance program,
- Identification of confined space entry procedures,
- Procedures for spill containment,
- List site control measures, as necessary, and
- Decontamination procedures.

The HASP will be implemented by the Site Safety Officer (SSO) during site work. All AECOM Team personnel and subcontractors who work on projects under this contract are required to comply with this HASP (Appendix B).

7.2 Community Air Monitoring Plan

A Community Air Monitoring Program (CAMP) will be implemented in accordance with DER-10. The Generic NYSDOH CAMP (DER-10, Appendix 1A) is the FAP (Appendix A). The generic CAMP includes methods for the continuous monitoring of VOCs and dust particulates during intrusive site work including soil excavation and handling, as well as for periodic monitoring of VOCs during non-intrusive site work including the collection of soil samples by direct push methods or the collection of groundwater samples from existing wells (NYSDEC. 2010).

The CAMP is intended 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 performed on site. The CAMP action levels 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. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability (NYSDEC 2010).

8.0 Reporting

The following reports will be completed as part of this ISCO pilot study.

8.1 Chemical Oxidation Performance Report

A Chemical Oxidation Performance Monitoring Report will be generated following receipt of the analytical data package from the final (twelve month) post-injection sampling events to summarize the ISCO system performance for the reduction of targeted VOCs. The monitoring report will include a summary of the injection event, sampling results, colormetric testing results, and recommendations for additional injection or initiation of quarterly groundwater sampling events.

9.0 References

AECOM Environment. 2011. Interim Remedial Measure Evaluation. 2011

Carus Remediation Technologies. 2013. RemOx S and L ISCO Reagents Estimation Spreadsheets. October 2013.

New York State Department of Environmental Conservation (NYSDEC). 1998. Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. NYSDEC Division of Water Technical and Operational Guidance Series Memorandum Number 1.1.1., June 1998 (latest amendment April 2000).

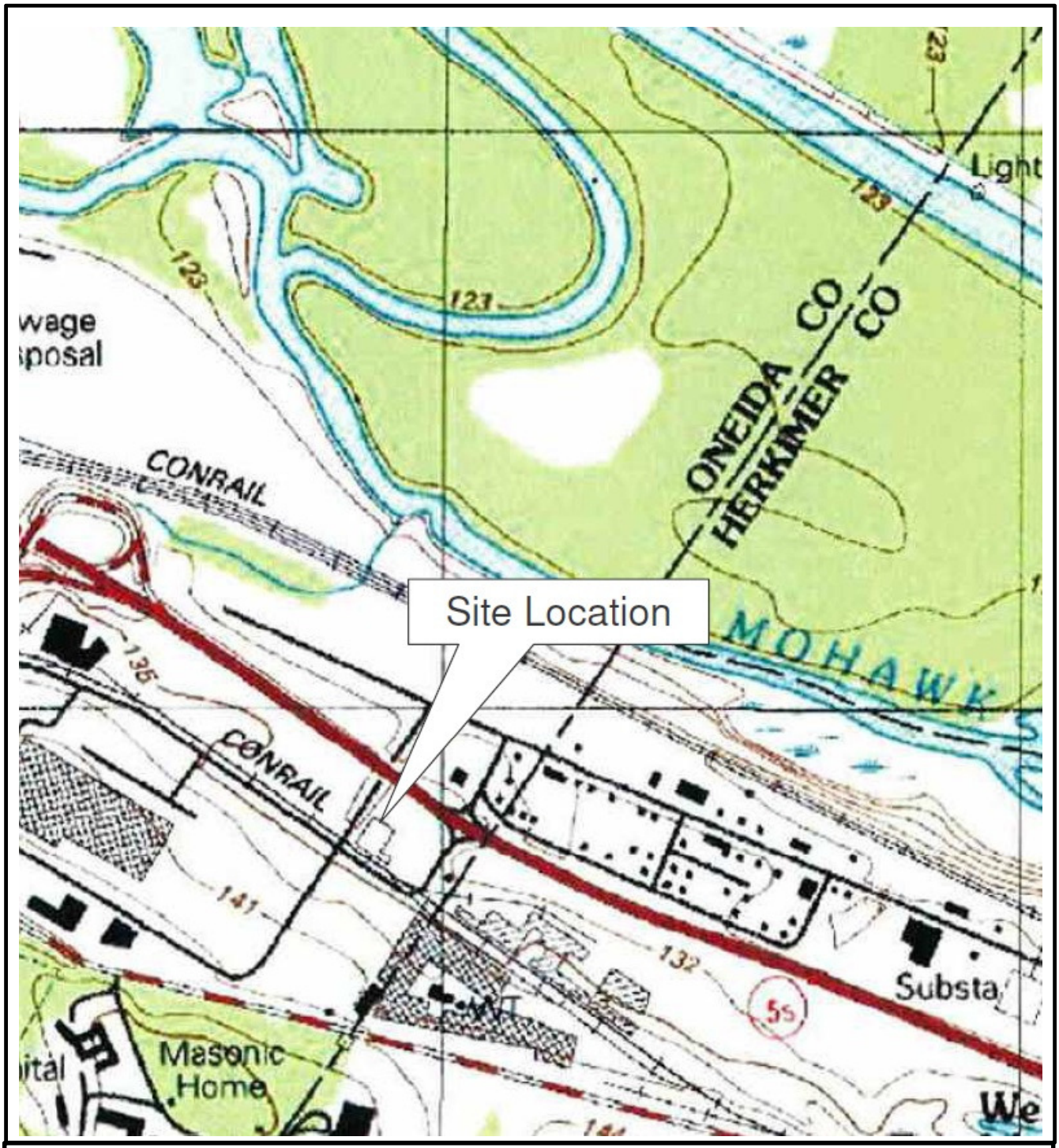
NYSDEC. 2010. DER-10, Final Technical Guidance for Site Investigation and Remediation, Division of Environmental Remediation, May 2010.

Tables

Table 7
ISCO Saturated Soil and Groundwater Treatment Cost (Areas A and B Combined)
Northeast Alloys and Metals

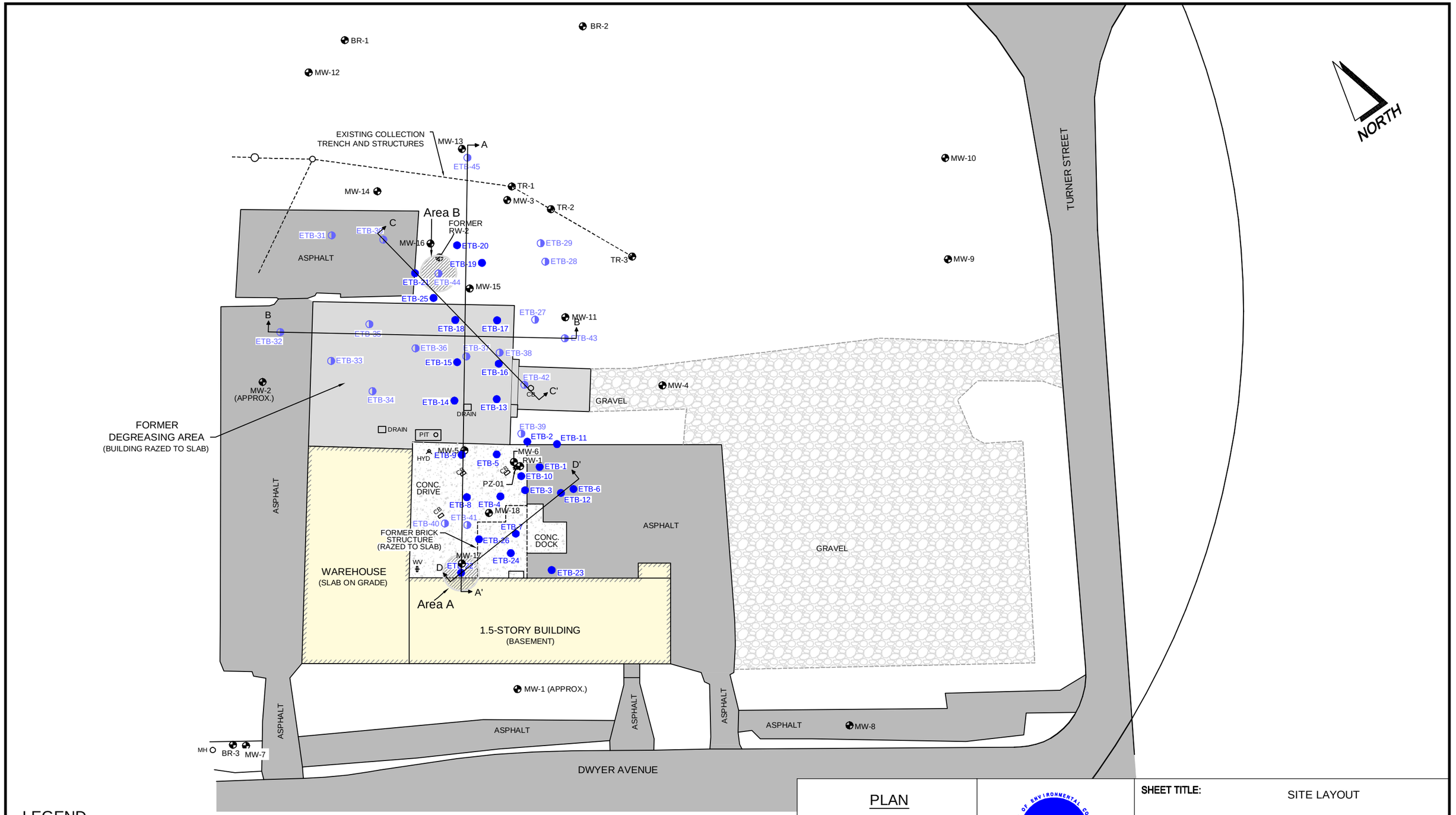
Item	Item Description	Quantity	Unit Cost	Unit	Extension
CAPITAL COSTS					
Mobilization & Common Costs					**$ 17,620**
	Mobilize Injection Equipment	1	$ 4,000.00	LS	$ 4,000
	Temporary Decontamination Pad	1	$ 1,500.00	LS	$ 1,500
	Sodium Permanganate Staging	1	$ 5,000.00	LS	$ 5,000
	Steam Cleaner	8	$ 15.00	Day	$ 120
	Permanganate Delivery	1	$ 7,000.00	LS	$ 7,000
Injection					**$ 99,830**
	Injection Equipment and Labor	8	$ 4,000.00	Day	$ 32,000
	Potassium Permanganate	20,106	$ 2.33	LB	$ 60,830
	Misc Equip, PPE, etc.	1	$ 7,000.00	LS	$ 7,000
Confirmation Sampling					**$ 28,100**
	Direct Push Drilling	2	$ 2,500.00	Day	$ 5,000
	Lab Analysis-VOCs Soil	15	$ 80.00	Sample	$ 1,200
	GW Sampling (8 New Wells Quarterly for 1 year)	4	$ 5,000.00	LS	$ 20,000
	Lab Analysis-VOCs GW	20	$ 95.00	Sample	$ 1,900
	TOTAL CAPITAL COSTS				**$ 145,550**

Figures



AECOM

Figure 1
Site Location
NE Alloys and Metals
Site 633045



LEGEND

- ETB-4 ● SOIL BORING INSTALLED DURING INITIAL INVESTIGATION (FEB. / MAR. 2008)
- ETB-36 ◑ SOIL BORING INSTALLED DURING SUPPLEMENTAL INVESTIGATION (AUG. 2008)
- MW-6 ⊕ MONITORING WELL
- A ↑ GEOLOGIC PROFILE ALIGNMENT
- APPROXIMATE LATERAL EXTENT OF TCE IMPACTED SOILS ABOVE COMMERCIAL USE SCOs

PLAN

0 25 50

SCALE (FEET)

PROJ. NO:	95539
DATE:	01-20-2014
DRAWN:	
APPROVED:	

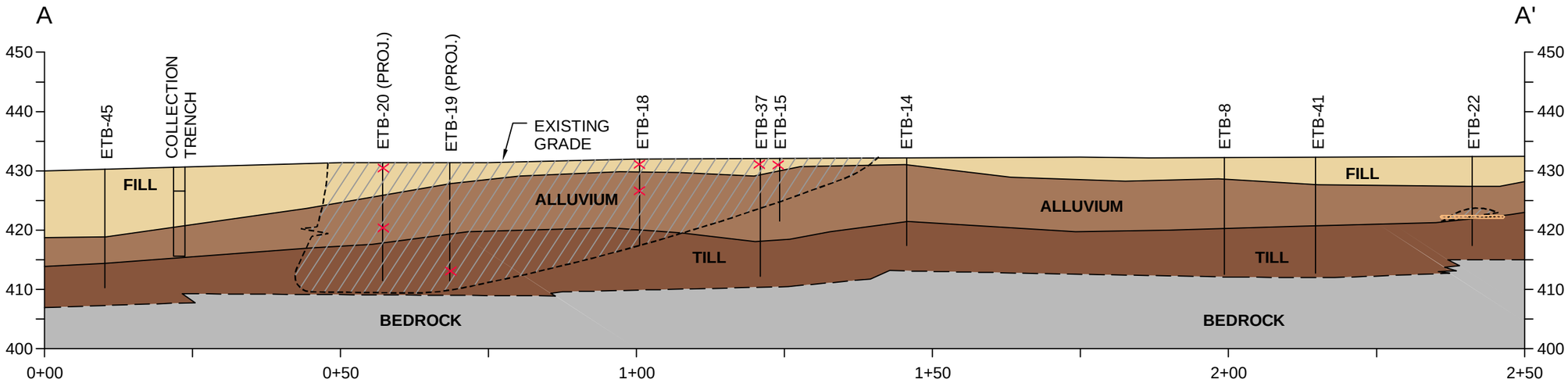
SHEET TITLE: SITE LAYOUT

PROJECT:
NORTHEAST ALLOYS AND METALS SITE
NYSDEC SITE 6-33-045
CITY OF UTICA
ONEIDA COUNTY, NEW YORK

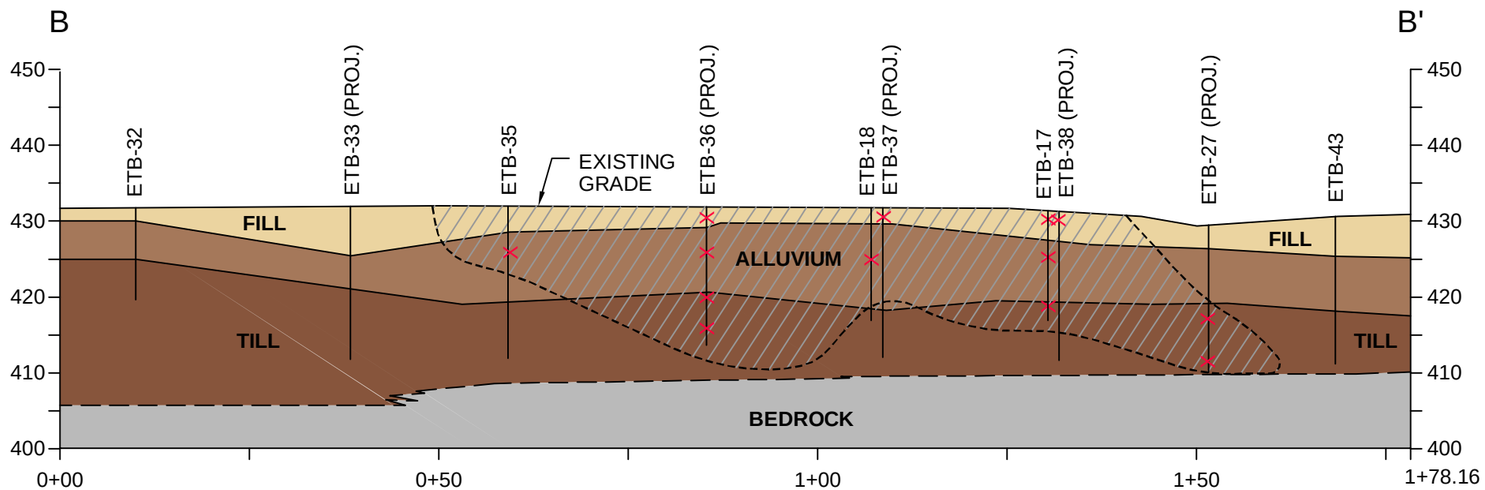
Drawing Reference:
1) Drawing based on DWG. 2, "Site Survey and Topography Prior to Construction", Contract No: D-004178, by URS Greiner Woodward Clyde Group Consultants, Inc., dated October 2001, including all reference therein.

2) A field survey performed by Earthtech / AECOM, October 7, 2008.

FIGURE 2



SECTION A-A'



SECTION B-B'

LEGEND

- × — VOC SAMPLE EXCEEDING PROTECTION OF GROUNDWATER SCO FOR TCE (470 ug/kg) or TCLP SAMPLE IDENTIFYING TCE DETECTION
- VOC SAMPLES EXCEEDING COMMERCIAL SCO FOR TCE (200,000 UG/KG)
- INFERRED LATERAL EXTENT OF TCE IMPACTED SOILS ABOVE SCOs
- (PROJ.) — PROJECTED BORING GREATER THAN 5 FT. AWAY FROM PROFILE ALIGNMENT

0 10 20
SCALE (FEET)
HORZ. & VERT.

PROJ. NO:	95539
DATE:	04-21-2009
DRAWN:	KAM
APPROVED:	CEB

DEPARTMENT OF ENVIRONMENTAL CONSERVATION · NEW YORK STATE

AECOM

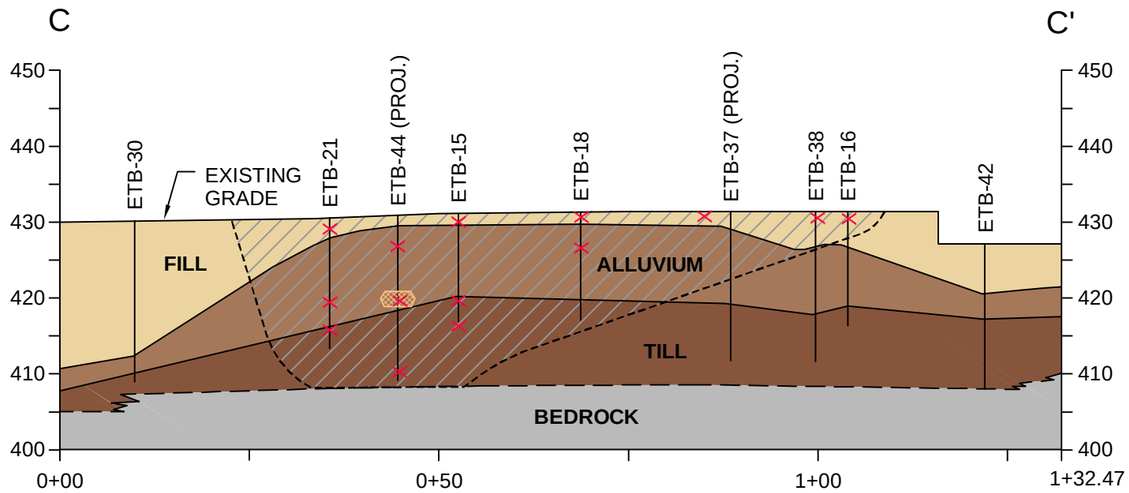
SHEET TITLE: GEOLOGIC PROFILE A - A' & B - B'

PROJECT:
NORTHEAST ALLOYS AND METALS SITE
NYSDEC SITE 6-33-045
CITY OF UTICA
ONEIDA COUNTY, NEW YORK

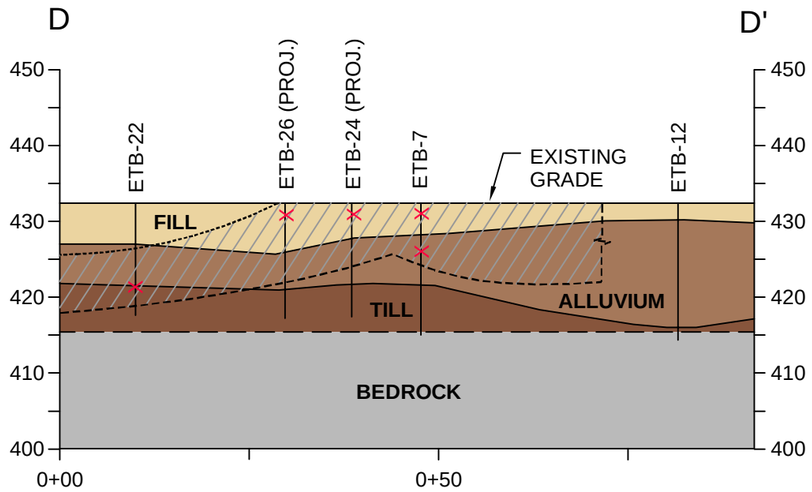
Drawing Reference:
1) Drawing based on DWG. 2, "Site Survey and Topography Prior to Construction", Contract No: D-004178, by URS Greiner Woodward Clyde Group Consultants, Inc., dated October 2001, including all reference therein.

2) A field survey performed by Earthtech / AECOM, October 7, 2008.

FIGURE 3



SECTION C-C'



SECTION D-D'

× GROUNDWATER SCO FOR TCE (470 ug/kg) or TCLP SAMPLE IDENTIFYING TCE DETECTION

VOC SAMPLES EXCEEDING COMMERCIAL SCO FOR TCE (200,000 UG/KG)

INFERRED LATERAL EXTENT OF TCE IMPACTED SOILS ABOVE SCOs

(PROJ.) PROJECTED BORING GREATER THAN 5 FT. AWAY FROM PROFILE ALIGNMENT

0 10 20
SCALE (FEET)
HORZ. & VERT.

PROJ. NO:	95539
DATE:	04-21-2009
DRAWN:	KAM
APPROVED:	CEB

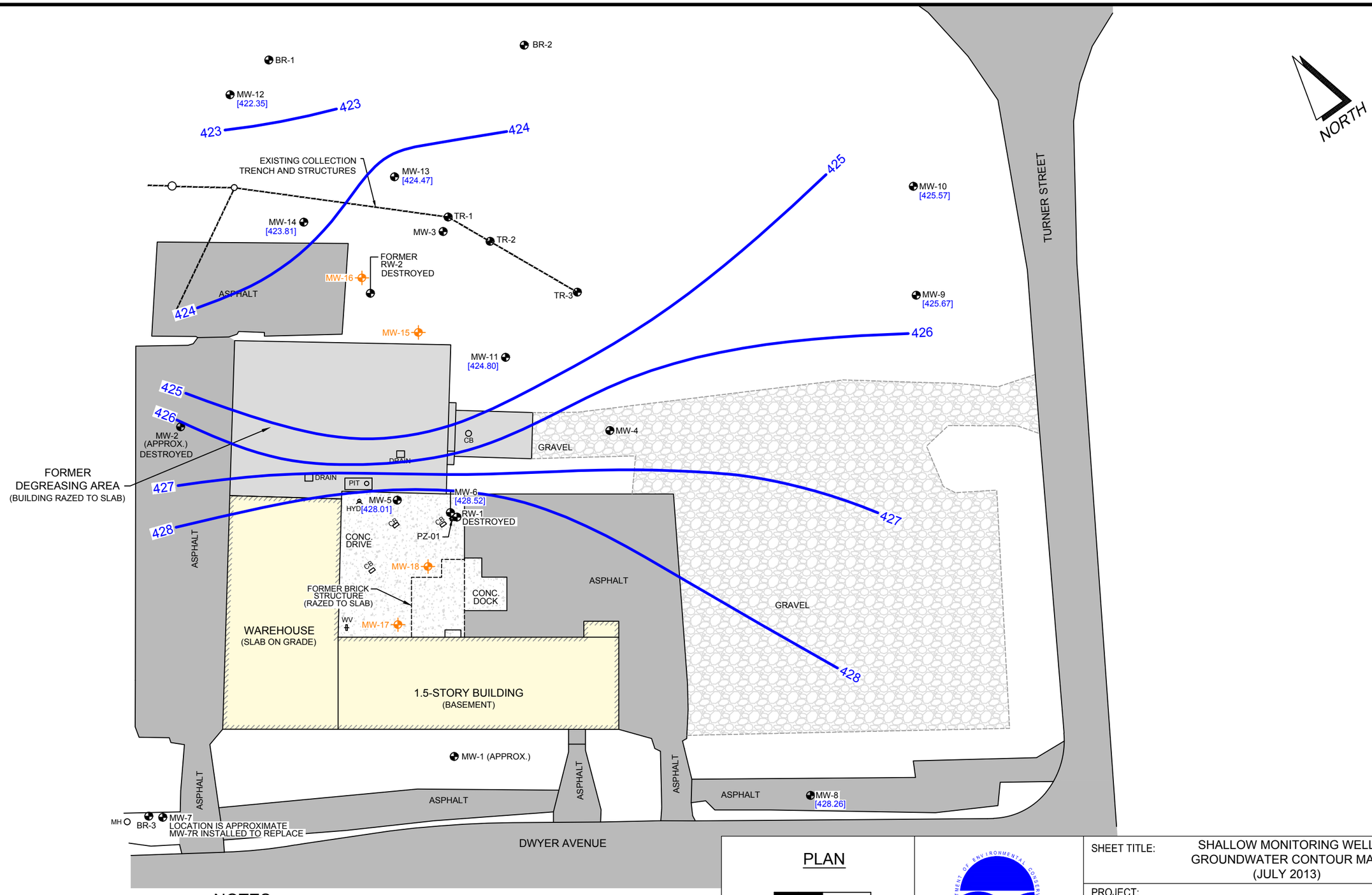
SHEET TITLE: GEOLOGIC PROFILE C - C' & D - D'

PROJECT:
NORTHEAST ALLOYS AND METALS SITE
NYSDEC SITE 6-33-045
CITY OF UTICA
ONEIDA COUNTY, NEW YORK

Drawing Reference:
1) Drawing based on DWG. 2, "Site Survey and Topography Prior to Construction", Contract No: D-004178, by URS Greiner Woodward Clyde Group Consultants, Inc., dated October 2001, including all reference therein.

2) A field survey performed by Earthtech / AECOM, October 7, 2008.

FIGURE 4



LEGEND

- MW-6 — EXISTING MONITORING WELL
- MW-15 — MONITORING WELL (APPROXIMATE)
- [422.35] — GROUNDWATER RESULTS (AUGUST 2013)
- GROUNDWATER CONTOUR (AUGUST 2013)

NOTES

1. MW-15 THROUGH MW-18 LOCATIONS ARE APPROXIMATE AND NEED TO BE SURVEYED.
2. MW-3 AND MW-4 WERE REPAIRED AND NEED TO BE RE-SURVEYED.

PLAN

0 25 50

SCALE (FEET)

PROJ. NO:	60284002
DATE:	9-3-2013
DRAWN:	MS
APPROVED:	MH

SHEET TITLE: SHALLOW MONITORING WELL GROUNDWATER CONTOUR MAP (JULY 2013)

PROJECT:
NORTHEAST ALLOYS AND METALS SITE
NYSDEC SITE 6-33-045
CITY OF UTICA
ONEIDA COUNTY, NEW YORK

Drawing Reference:
1) Drawing based on DWG. 2, "Site Survey and Topography Prior to Construction", Contract No: D-004178, by URS Greiner Woodward Clyde Group Consultants, Inc., dated October 2001, including all reference therein.

2) A field survey performed by Earthtech / AECOM, October 7, 2008.

FIGURE 5

L:\Group\earth\Latham NY Work\NE Alloys\60135721_004 Shallow MW GW Contour Map_July2013.dwg, 10/17/2013 1:57:56 PM, Splawnm

ETB-44 (3-5 FT.)	RESULT
cis-1,2-Dichloroethene	2,700 D
Trichloroethene	6,800 D
ETB-44 (10-12 FT.)	
cis-1,2-Dichloroethene	22,000 D
Trichloroethene	310,000 D
ETB-44 (20-22 FT.)	
cis-1,2-Dichloroethene	2,200 D
Trichloroethene	2,600 D

ETB-21 (1-2.5 FT.)	RESULT
Trichloroethene	35,000 D
ETB-21 (11-13 FT.)	
cis-1,2-Dichloroethene	8,100 E
Trichloroethene	15,000 E
ETB-21 (15-16.5 FT.)	
cis-1,2-Dichloroethene	5,100 E
Trichloroethene	12,000 E

ETB-25 (1-2.5 FT.)	RESULT
cis-1,2-Dichloroethene	2,500 D
Trichloroethene	80,000 D
ETB-25 (10-11.5 FT.)	
cis-1,2-Dichloroethene	4,500 D
Trichloroethene	14,000 D
ETB-25 (11.5-13 FT.)	
cis-1,2-Dichloroethene	250 E
Trichloroethene	2,300 D

ETB-35 (3-5 FT.)	RESULT
Trichloroethene	13,000 D

ETB-36 (3-5 FT.)	RESULT
Trichloroethene	3,500 D
ETB-36 (10-12 FT.)	
cis-1,2-Dichloroethene	920 D
Trichloroethene	3,800 D
ETB-36 (14-16 FT.)	
cis-1,2-Dichloroethene	1,500 D
Trichloroethene	5,700 D

ETB-15 (1-2 FT.)	RESULT
Trichloroethene	180,000 D

ETB-16 (1-2 FT.)	RESULT
Trichloroethene	3,000 D

ETB-22 (10-10.5 FT.)	RESULT
cis-1,2-Dichloroethene	29,000 D
Trichloroethene	720,000 D

ETB-20 (1-3 FT.)	RESULT
cis-1,2-Dichloroethene	1,600 E
Trichloroethene	790 E
ETB-20 (10-11.6 FT.)	
cis-1,2-Dichloroethene	1,800 E
Trichloroethene	8,400 D

ETB-19 (1-3 FT.)	RESULT
cis-1,2-Dichloroethene	400 E
Trichloroethene	7,400 D
ETB-19 (5-6 FT.)	
Trichloroethene	12,000 D

ETB-28 (1-3 FT.)	RESULT
Trichloroethene	5,500 D

ETB-18 (1-2 FT.)	RESULT
Trichloroethene	11,000 D
ETB-18 (5-6.2 FT.)	
cis-1,2-Dichloroethene	650 E
Trichloroethene	1,900 D

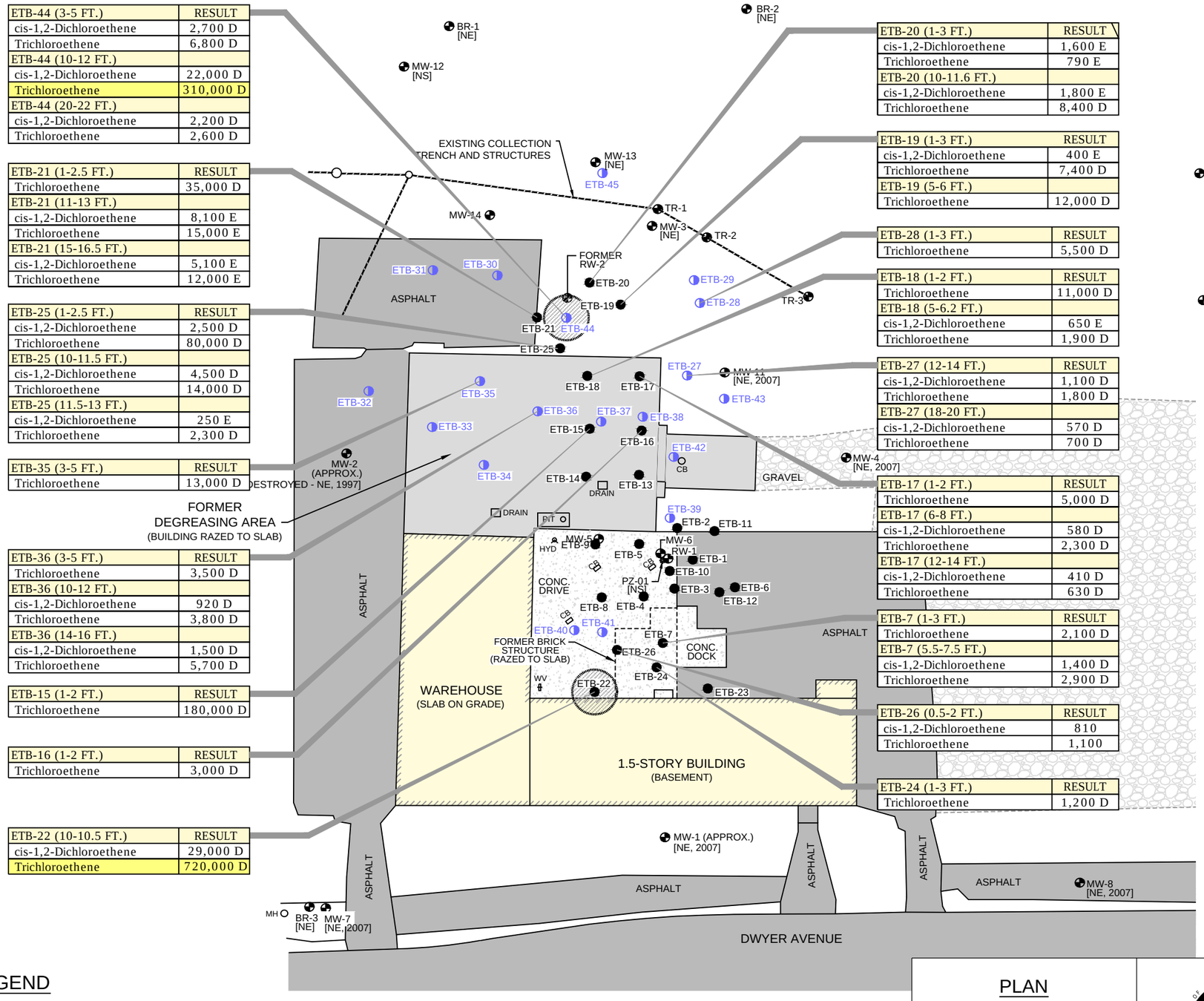
ETB-27 (12-14 FT.)	RESULT
cis-1,2-Dichloroethene	1,100 D
Trichloroethene	1,800 D
ETB-27 (18-20 FT.)	
cis-1,2-Dichloroethene	570 D
Trichloroethene	700 D

ETB-17 (1-2 FT.)	RESULT
Trichloroethene	5,000 D
ETB-17 (6-8 FT.)	
cis-1,2-Dichloroethene	580 D
Trichloroethene	2,300 D
ETB-17 (12-14 FT.)	
cis-1,2-Dichloroethene	410 D
Trichloroethene	630 D

ETB-7 (1-3 FT.)	RESULT
Trichloroethene	2,100 D
ETB-7 (5.5-7.5 FT.)	
cis-1,2-Dichloroethene	1,400 D
Trichloroethene	2,900 D

ETB-26 (0.5-2 FT.)	RESULT
cis-1,2-Dichloroethene	810
Trichloroethene	1,100

ETB-24 (1-3 FT.)	RESULT
Trichloroethene	1,200 D



SAMPLE KEY

SAMPLE POINT
SAMPLE DEPTH

ETB-X (1-3 FT.)	RESULT
cis-1,2-Dichloroethene	8.2 U
Trichloroethene	3,600

QUALIFIER (SEE LEGEND)
REPORTED ANALYTE (VOC)
SAMPLE RESULT (ug/kg) (BOLD VALUE WHERE EXCEEDANCE FOUND) (YELLOW HIGHLIGHTED VALUE SHOWS EXCEEDANCE OF COMMERCIAL SCOs)

SCOs:

Protection of Groundwater SCOs for:
cis-1,2-DCE = 250 µg/kg
TCE = 470 µg/kg

Commercial SCOs for:
cis-1,2-DCE = 500,000 µg/kg
TCE = 200,000 µg/kg

QUALIFIER LEGEND

U - The compound was not detected at the indicated concentration.

J - Data indicates the presence of a compound that meets the identification criteria. The result is less than the quantitation limit but greater than zero. The concentration given is an approximate value.

B - The analyte was found in the laboratory blank as well as the sample. This indicates possible laboratory contamination of the environmental sample.

E (Organics) - Indicates the analyte 's concentration exceeds the calibrated range of the instrument for that specific analysis.

D - The reported value is from a secondary analysis with a dilution factor. The original analysis exceeded the calibration range.

LEGEND

ETB-4 ● SOIL BORING INSTALLED DURING INITIAL INVESTIGATION (FEB. / MAR. 2008)

ETB-36 ◑ SOIL BORING INSTALLED DURING SUPPLEMENTAL INVESTIGATION (AUG. 2008)

APPROXIMATE LATERAL EXTENT OF TCE IMPACTED SOILS ABOVE COMMERCIAL USE SCOs

PLAN

0 20 40
SCALE (FEET)

PROJ. NO:	95539
DATE:	06-09-2009
DRAWN:	KAM
APPROVED:	CEB

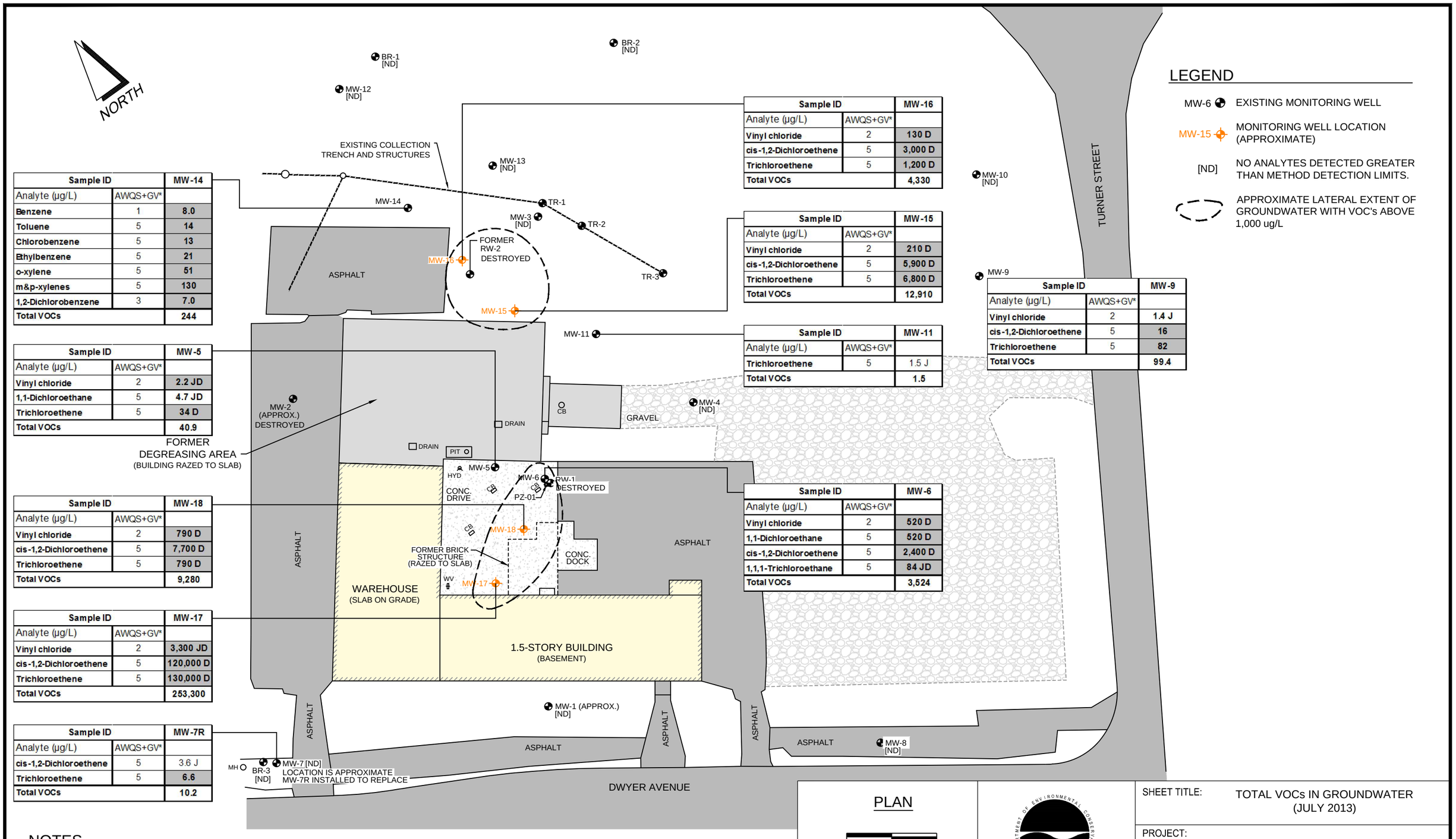
SHEET TITLE: APPROXIMATE LATERAL EXTENT OF SOIL IMPACTS ABOVE COMMERCIAL USE SCOs

PROJECT:
NORTHEAST ALLOYS AND METALS SITE
NYSDEC SITE 6-33-045
CITY OF UTICA
ONEIDA COUNTY, NEW YORK

Drawing Reference:
1) Drawing based on DWG. 2, "Site Survey and Topography Prior to Construction", Contract No: D-004178, by URS Greiner Woodward Clyde Group Consultants, Inc., dated October 2001, including all reference therein.

2) A field survey performed by Earthtech / AECOM, October 7, 2008.

FIGURE 6



Sample ID		MW-14
Analyte (µg/L)	AWQS+GV*	
Benzene	1	8.0
Toluene	5	14
Chlorobenzene	5	13
Ethylbenzene	5	21
o-xylene	5	51
m&p-xylenes	5	130
1,2-Dichlorobenzene	3	7.0
Total VOCs		244

Sample ID		MW-5
Analyte (µg/L)	AWQS+GV*	
Vinyl chloride	2	2.2 JD
1,1-Dichloroethane	5	4.7 JD
Trichloroethene	5	34 D
Total VOCs		40.9

Sample ID		MW-18
Analyte (µg/L)	AWQS+GV*	
Vinyl chloride	2	790 D
cis-1,2-Dichloroethene	5	7,700 D
Trichloroethene	5	790 D
Total VOCs		9,280

Sample ID		MW-17
Analyte (µg/L)	AWQS+GV*	
Vinyl chloride	2	3,300 JD
cis-1,2-Dichloroethene	5	120,000 D
Trichloroethene	5	130,000 D
Total VOCs		253,300

Sample ID		MW-7R
Analyte (µg/L)	AWQS+GV*	
cis-1,2-Dichloroethene	5	3.6 J
Trichloroethene	5	6.6
Total VOCs		10.2

Sample ID		MW-16
Analyte (µg/L)	AWQS+GV*	
Vinyl chloride	2	130 D
cis-1,2-Dichloroethene	5	3,000 D
Trichloroethene	5	1,200 D
Total VOCs		4,330

Sample ID		MW-15
Analyte (µg/L)	AWQS+GV*	
Vinyl chloride	2	210 D
cis-1,2-Dichloroethene	5	5,900 D
Trichloroethene	5	6,800 D
Total VOCs		12,910

Sample ID		MW-11
Analyte (µg/L)	AWQS+GV*	
Trichloroethene	5	1.5 J
Total VOCs		1.5

Sample ID		MW-9
Analyte (µg/L)	AWQS+GV*	
Vinyl chloride	2	1.4 J
cis-1,2-Dichloroethene	5	16
Trichloroethene	5	82
Total VOCs		99.4

Sample ID		MW-6
Analyte (µg/L)	AWQS+GV*	
Vinyl chloride	2	520 D
1,1-Dichloroethane	5	520 D
cis-1,2-Dichloroethene	5	2,400 D
1,1,1-Trichloroethane	5	84 JD
Total VOCs		3,524

LEGEND

- MW-6 — EXISTING MONITORING WELL
- MW-15 — MONITORING WELL LOCATION (APPROXIMATE)
- [ND] — NO ANALYTES DETECTED GREATER THAN METHOD DETECTION LIMITS.
- APPROXIMATE LATERAL EXTENT OF GROUNDWATER WITH VOC's ABOVE 1,000 ug/L

NOTES

1. MW-15 THRU MW-18 LOCATIONS ARE APPROXIMATE AND NEED TO BE SURVEYED.
2. MW-3 AND MW-4 REPAIRED AND NEED TO BE RE-SURVEYED.

PLAN

0 25 50

SCALE (FEET)

PROJ. NO:	60284002
DATE:	9-3-2013
DRAWN:	MS
APPROVED:	MH

DEPARTMENT OF ENVIRONMENTAL CONSERVATION NEW YORK STATE

AECOM

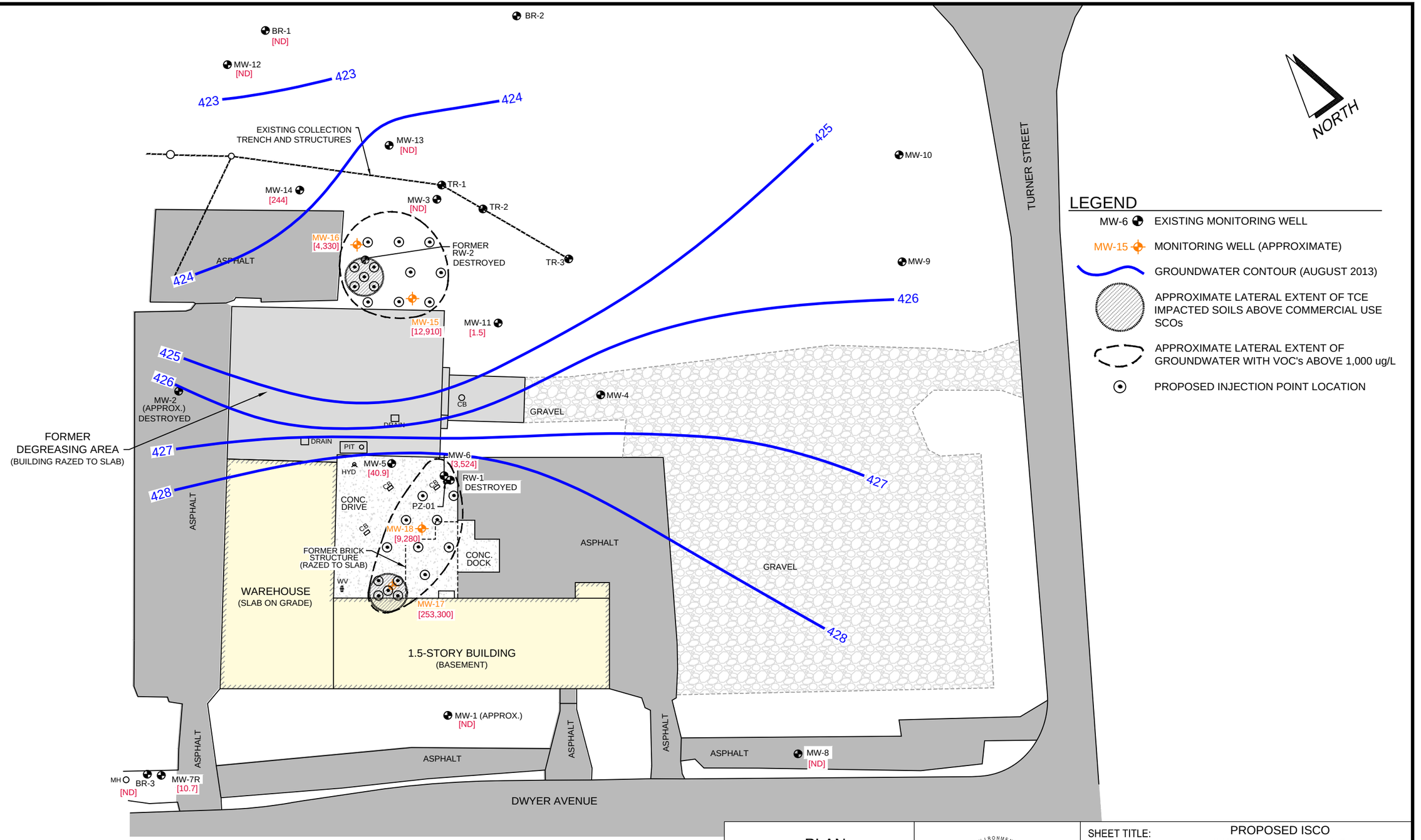
SHEET TITLE: TOTAL VOCs IN GROUNDWATER (JULY 2013)

PROJECT:
NORTHEAST ALLOYS AND METALS SITE
NYSDEC SITE 6-33-045
CITY OF UTICA
ONEIDA COUNTY, NEW YORK

Drawing Reference:
1) Drawing based on DWG. 2, "Site Survey and Topography Prior to Construction", Contract No: D-004178, by URS Greiner Woodward Clyde Group Consultants, Inc., dated October 2001, including all reference therein.

2) A field survey performed by Earthtech / AECOM, October 7, 2008.

FIGURE 7



LEGEND

- MW-6 — EXISTING MONITORING WELL
- MW-15 — MONITORING WELL (APPROXIMATE)
- GROUNDWATER CONTOUR (AUGUST 2013)
- APPROXIMATE LATERAL EXTENT OF TCE IMPACTED SOILS ABOVE COMMERCIAL USE SCOs
- APPROXIMATE LATERAL EXTENT OF GROUNDWATER WITH VOC's ABOVE 1,000 ug/L
- PROPOSED INJECTION POINT LOCATION

NOTES

1. MW-15 THRU MW-18 ARE APPROXIMATE AND NEEDS TO BE SURVEYED.
2. MW-3 AND MW-4 REPAIRED AND NEEDS TO BE RESURVEYED.
3. [ND] - NOT DETECTED, UNITS PPM

PLAN

0 25 50

SCALE (FEET)

PROJ. NO:	60284002
DATE:	9-3-2013
DRAWN:	MS
APPROVED:	MH

DEPARTMENT OF ENVIRONMENTAL CONSERVATION NEW YORK STATE

AECOM

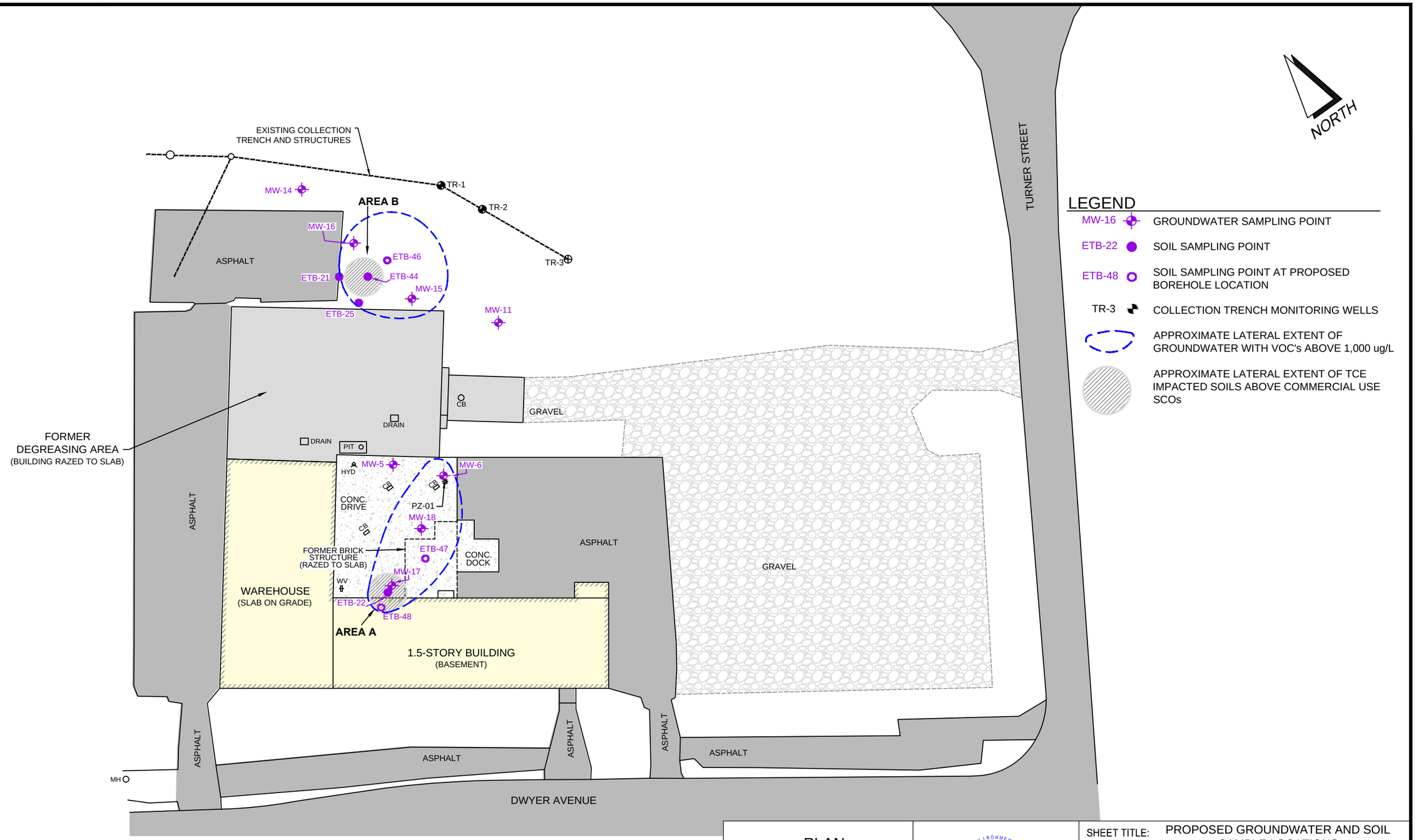
SHEET TITLE: PROPOSED ISCO INJECTION LOCATIONS

PROJECT:
NORTHEAST ALLOYS AND METALS SITE
NYSDEC SITE 6-33-045
CITY OF UTICA
ONEIDA COUNTY, NEW YORK

Drawing Reference:
1) Drawing based on DWG. 2, "Site Survey and Topography Prior to Construction", Contract No: D-004178, by URS Greiner Woodward Clyde Group Consultants, Inc., dated October 2001, including all reference therein.

2) A field survey performed by Earthtech / AECOM, October 7, 2008.

FIGURE 8



LEGEND

MW-16	GROUNDWATER SAMPLING POINT
ETB-22	SOIL SAMPLING POINT
ETB-48	SOIL SAMPLING POINT AT PROPOSED BOREHOLE LOCATION
TR-3	COLLECTION TRENCH MONITORING WELLS
	APPROXIMATE LATERAL EXTENT OF GROUNDWATER WITH VOC's ABOVE 1,000 ug/L
	APPROXIMATE LATERAL EXTENT OF TCE IMPACTED SOILS ABOVE COMMERCIAL USE SCOs

NOTES

1. ETB-46 THRU ETB-48 SOIL SAMPLING LOCATION AT PROPOSED SOIL BOREHOLE LOCATION

2. PROPOSED SOIL BOREHOLE LOCATIONS SELECTED ON THE BASIS OF EVALUATING TREATMENT EFFICACY IN REDUCING SOIL CONCENTRATIONS BELOW COMMERCIAL SCOs.

PLAN

0 25 50

SCALE (FEET)

PROJ. NO:	60284002
DATE:	1-9-2014
DRAWN:	-
APPROVED:	-

SHEET TITLE: PROPOSED GROUNDWATER AND SOIL SAMPLE LOCATIONS

PROJECT:
NORTHEAST ALLOYS AND METALS SITE
NYSDEC SITE 6-33-045
CITY OF UTICA
ONEIDA COUNTY, NEW YORK

Drawing Reference:
1) Drawing based on DWG. 2, "Site Survey and Topography Prior to Construction", Contract No: D-004178, by URS Greiner Woodward Clyde Group Consultants, Inc., dated October 2001, including all reference therein.

2) A field survey performed by Earthtech / AECOM, October 7, 2008.

FIGURE 9

Attachments

ATTACHMENT 1

NATURAL SODIUM PERMANGANATE OXIDANT DEMAND (NPOD) TEST RESULTS

Carus Remediation Technologies
Remediation Report

21 June 2013

Customer: AECOM
40 British American Blvd
Latham, NY 12110

CC: T. Lizer

Attention: Steve Choiniere

From: L. Mueller

TECH # 13-102

Subject: RemOx® S ISCO Reagent Permanganate Natural Oxidant Demand

Summary
The overall average RemOx® S ISCO reagent permanganate natural oxidant demand (PNOD) at 48 hours for the soil samples was determined to be 16.41 g/kg. The average demands ranged from 10.38 g/kg to 22.44 g/kg. These values are calculated on a weight as potassium permanganate ($KMnO_4$) per dry weight of soil.

Background
Two soil samples were received from AECOM in Latham, NY from the 60284002.4 project located in Utica, NY on June 14, 2013. The two soil sample designations were MW-15 1012 and MW-17 0608. The samples were analyzed for permanganate natural oxidant demand. The measurement of the permanganate natural oxidant demand is used to estimate the concentration of permanganate that will be consumed by the natural reducing agents during a given time period of 48 hours.

Experimental
The samples were analyzed for permanganate natural oxidant demand following ASTM D7262-07 Test Method A. A brief summary is as follows:

To determine the PNOD, the soil was baked at 105°C for 24 hours then allowed to cool to room temperature. The soil was then blended and passed through a U.S. 10 sieve (2 mm). Reactors were loaded with 50 grams of soil and 100 mL of 20 g/L $KMnO_4$ for an initial dose of 40 g/kg $KMnO_4$ on a dry soil weight basis at a 1:2 soil to aqueous reagent ratio. Each soil dose was performed in triplicate. The reaction vessels were inverted once to mix the reagents. Residual permanganate (MnO_4^-) was determined at 48 hours. The demands were calculated on a dry weight basis.

Results
The permanganate demand is the amount of permanganate consumed in a given amount of time. It should be noted that in a soil or groundwater sample, the oxidation of any compound by permanganate is dependent on the initial dose of permanganate and the reaction time available. As the permanganate dose is increased, the reaction rate and oxidant consumption may also

increase. Some compounds that are not typically oxidized by permanganate under low doses can become reactive with permanganate at higher concentrations.
The 48-hour PNOD results can be seen in Table 1 (on a dry soil basis).

Table 1: 48-Hour PNOD *

Soil Sample Identification	Average and Standard Deviation (g/kg)	Replicate 1 (g/kg)	Replicate 2 (g/kg)	Replicate 3 (g/kg)
MW-15 1012	22.44 ± 0.38	22.62	22.00	22.71
MW-17 0608	10.38 ± 0.17	10.57	10.24	10.32
Overall Average	16.41			

*Demands were calculated on a weight $KMnO_4$/dry soil weight basis from an initial dose of 40.0 g/kg $KMnO_4$ initial dose at a 1:2 soil to aqueous solution ratio

Conclusions
For this application the amount of permanganate needed will be dependent on the reaction time allowed. On average, the soil samples had a 48-hour permanganate demand value of 16.41 g/kg. The average demands ranged from 10.38 g/kg to 22.44 g/kg. Generally, remediation sites with a soil demand of less than 20.0 g/kg at the time of interest are favorable for *in situ* chemical oxidation with permanganate (see Table 2 for additional information).

Table 2: Correlation of Permanganate Natural Oxidant Demand Results*

PNOD (g/kg)	**Rank**	Comment
<10	Low	ISCO with MnO_4^- is recommended. Soil contribution to MnO_4^- demand is low.
10-20	Moderate	ISCO with MnO_4^- is recommended. Soil contribution to MnO_4^- demand is moderate. Economics should be considered.
>20	High	ISCO with MnO_4^- is technically feasible. Other technologies may provide lower cost alternatives.

*Dry Weight Basis

ATTACHMENT 2

PERMANGANATE CALCULATIONS

RemOx® S and L ISCO Reagents Estimation Spreadsheet

Input data into box with blue font

Site Name: AECOM- Area A
Date: 10/29/2013

	Estimates	Units
Treatment Area Volume		
Length	25	ft
Width	70	ft
Area	1750	sq ft
Thickness	8	ft
Total Volume	519	cu yd
Soil Characteristics/Analysis		
Porosity	30	%
Total Plume Pore Volume	31418	gal
Avg Contaminant Conc	1	ppm
Mass of Contaminant	0.26	lb
PNOD	16.4	g/kg
Effective PNOD	10	%
Effective PNOD Calculated	1.64	
PNOD Oxidant Demand	2525.6	lb
Avg Stoichiometric Demand	2.4	lb/lb
Contaminant Oxidant Demand	0.63	lb
Theoretical Oxidant Demand	2526.23	lb
Confidence Factor	1	
Calculated Oxidant Demand	2526.229	
Injection Volumes for RemOx S		
RemOx S Injection Concentration		%
Total Volume of Injection Fluid	#DIV/0!	gal
Pore Volume Replaced	#DIV/0!	%

Amount of RemOx S ISCO Reagent Estimated **2,526 pounds**

Injection Volumes for RemOx L		
RemOx L Injection Concentration	10.0%	%
Calculated Specific Gravity	1.091623	g/ml
Total Volume of Injection Fluid	2,490	gal
Pore Volume Replaced	0.08	%

Amount of RemOx L ISCO Reagent Estimated **5,671 pounds**
496 gallons

RemOx® S and L ISCO Reagents Estimation Spreadsheet

Input data into box with blue font

Site Name: AECOM- Area A
Date: 10/29/2013

	Estimates	Units
Treatment Area Volume		
Length	15	ft
Width	15	ft
Area	225	sq ft
Thickness	8	ft
Total Volume	67	cu yd
Soil Characteristics/Analysis		
Porosity	30	%
Total Plume Pore Volume	4039	gal
Avg Contaminant Conc	720	ppm
Mass of Contaminant	24.27	lb
PNOD	16.4	g/kg
Effective PNOD	20	%
Effective PNOD Calculated	3.28	
PNOD Oxidant Demand	649.44	lb
Avg Stoichiometric Demand	2.4	lb/lb
Contaminant Oxidant Demand	58.25	lb
Theoretical Oxidant Demand	707.69	lb
Confidence Factor	2	
Calculated Oxidant Demand	1415.385	
Injection Volumes for RemOx S		
RemOx S Injection Concentration		%
Total Volume of Injection Fluid	#DIV/0!	gal
Pore Volume Replaced	#DIV/0!	%
Amount of RemOx S ISCO Reagent Estimated		**1,415 pounds**
Injection Volumes for RemOx L		
RemOx L Injection Concentration	10.0%	%
Calculated Specific Gravity	1.091623	g/ml
Total Volume of Injection Fluid	1,395	gal
Pore Volume Replaced	0.35	%
Amount of RemOx L ISCO Reagent Estimated		**3,178 pounds**
		278 gallons

RemOx® S and L ISCO Reagents Estimation Spreadsheet

Input data into box with blue font

Site Name: AECOM- Area B
Date: 10/29/2013

	Estimates	Units
Treatment Area Volume		
Length	40	ft
Width	45	ft
Area	1800	sq ft
Thickness	10	ft
Total Volume	667	cu yd
Soil Characteristics/Analysis		
Porosity	30	%
Total Plume Pore Volume	40395	gal
Avg Contaminant Conc	1	ppm
Mass of Contaminant	0.34	lb
PNOD	16.4	g/kg
Effective PNOD	10	%
Effective PNOD Calculated	1.64	
PNOD Oxidant Demand	3247.2	lb
Avg Stoichiometric Demand	2.4	lb/lb
Contaminant Oxidant Demand	0.81	lb
Theoretical Oxidant Demand	3248.01	lb
Confidence Factor	1	
Calculated Oxidant Demand	3248.009	
Injection Volumes for RemOx S		
RemOx S Injection Concentration		%
Total Volume of Injection Fluid	#DIV/0!	gal
Pore Volume Replaced	#DIV/0!	%

Amount of RemOx S ISCO Reagent Estimated **3,248 pounds**

Injection Volumes for RemOx L		
RemOx L Injection Concentration	10.0%	%
Calculated Specific Gravity	1.091623	g/ml
Total Volume of Injection Fluid	3,202	gal
Pore Volume Replaced	0.08	%

Amount of RemOx L ISCO Reagent Estimated **7,292 pounds**
638 gallons

RemOx® S and L ISCO Reagents Estimation Spreadsheet

Input data into box with blue font

Site Name: AECOM- Area B
Date: 10/29/2013

	Estimates	Units
Treatment Area Volume		
Length	15	ft
Width	15	ft
Area	225	sq ft
Thickness	10	ft
Total Volume	83	cu yd
Soil Characteristics/Analysis		
Porosity	30	%
Total Plume Pore Volume	5049	gal
Avg Contaminant Conc	310	ppm
Mass of Contaminant	13.06	lb
PNOD	16.4	g/kg
Effective PNOD	20	%
Effective PNOD Calculated	3.28	
PNOD Oxidant Demand	811.8	lb
Avg Stoichiometric Demand	2.4	lb/lb
Contaminant Oxidant Demand	31.35	lb
Theoretical Oxidant Demand	843.15	lb
Confidence Factor	2	
Calculated Oxidant Demand	1686.302	
Injection Volumes for RemOx S		
RemOx S Injection Concentration		%
Total Volume of Injection Fluid	#DIV/0!	gal
Pore Volume Replaced	#DIV/0!	%
Amount of RemOx S ISCO Reagent Estimated		**1,686 pounds**
Injection Volumes for RemOx L		
RemOx L Injection Concentration	10.0%	%
Calculated Specific Gravity	1.091623	g/ml
Total Volume of Injection Fluid	1,662	gal
Pore Volume Replaced	0.33	%
Amount of RemOx L ISCO Reagent Estimated		**3,786 pounds**
		331 gallons

ATTACHMENT 3
PROJECT SCHEDULE

	Month																							
Activity	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Finalize Pilot Study Work Plan																								
UIC Permit Submission																								
Procure Subcontractors																								
Procure and Deliver Chemicals																								
Injection					2 wks																			
Performance Monitoring						1 mo.		3 mo.			6 mo.			9 mo.			12 mo.							
Report																								

Appendix A

Field Activities Plan (FAP)

AECOM Environment

Prepared for:
Superfund Standby Program
NYSDEC
Albany, NY

Prepared by:
AECOM
Latham, NY
April 2014

Field Activities Plan (FAP)

Northeast Alloys & Metals ISCO Pilot Study
Northeast Alloys & Metals
Utica, NY 13501
Work Assignment D007626.60284002

Prepared for:

New York State Department of Environmental Conservation
625 Broadway
Albany, New York 12233

Prepared by:

AECOM Technical Services Northeast, Inc.
40 British American Boulevard
Latham, New York 12110

AECOM Environment

Prepared for:
Superfund Standby Program
NYSDEC
Albany, NY

Prepared by:
AECOM
Latham, NY
April 2014

Field Activities Plan (FAP)

Northeast Alloys & Metals ISCO Pilot Study
Northeast Alloys & Metals
Utica, NY 13501
Work Assignment D007626.60284002

ENGINEERING CERTIFICATION

I, Scott A. Underhill, certify that I am currently a NYS registered professional engineer and that this Generic Field Activities Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

Respectfully submitted,

AECOM Technical Services Northeast, Inc.

Scott G. Underhill

4-8-14

Scott Underhill
Registered Professional Engineer
New York License No. 075332

Date

Contents

List of Appendices

1.0 Introduction

This Generic Field Activities Plan (FAP) describes typical field activities to be conducted by AECOM Technical Services Northeast, INC (AECOM) under New York State Department of Environmental Conservation (NYSDEC) Standby Contract D007626.

1.1 Work Assignment Objectives

The objectives of the work assignment will be established in the Work Assignment issued by NYSDEC under contract D007626 and documented in the Site-specific Work Plan.

Field activities are planned and conducted in general accordance with NYSDEC DER-10, Technical Guidance for Site Investigation and Remediation (NYSDEC, 2010), the United States Environmental Protection Agency (USEPA) Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (USEPA, 1988), and New York State Department of Health (NYSDOH) Guidance for Evaluating Soil Vapor Intrusion in the State of New York (NYSDOH, 2006).

The generic FAP is intended to be a companion document to the site-specific Work Plan prepared for each work assignment. A site-specific FAP will be prepared using the generic FAP and included as an Appendix to the site-specific Work Plan for each Work Assignment to address site-specific conditions and project-specific requirements.

1.2 Site Description and Background Information

Available site information will be presented in the Site-specific Work Plan. Information to be presented in the Site-specific Work Plan will include, to the extent available and relevant, the following:

- Site Description
- Site Location
- Site History
- Previous Investigations, Remedial Actions, and Reports
- Record of Decision
- Current Site Conditions
- Local and Regional Geology and Hydrogeology
- Any other relevant information

2.0 General and Preparatory Field Activities

The scope of work will be established in the work assignment as documented in the site-specific Work Plan.

The work assignment may include a variety of field activities intended to obtain site-specific data pertaining to the extent of contamination and the extent to which releases or potential releases from the site pose a threat to human health and the environment. Typical project objectives include:

- Assess site geology;
- Assess site hydrogeology;
- Evaluate areal and vertical extent of contamination, including transport mechanisms;
- Assess the source(s) of contamination and determine if this source(s) has impacted off-site properties; and
- Collect additional data to support the design and implementation of remedial actions.

To accomplish these objectives, the field subtasks described in this Generic FAP may be utilized. Additional methodology information will be provided in the Quality Assurance Project Plan (QAPP). Unless otherwise noted, it is assumed that all field work will be completed at level D personal protection in accordance with the Health and Safety Plan (HASP). Field activities will be monitored by a qualified AECOM representative(s).

2.1 Mobilization

Following authorization to proceed with the field investigation from NYSDEC, AECOM and its subcontractors will mobilize necessary materials and equipment to the site. If the project involves intrusive work (e.g., monitoring well installation, soil borings), a call will be placed to DigSafely New York and will be the responsibility of the subcontractor performing the intrusive work. Utility clearance is detailed in Section 2.3.

The Site-specific Work Plan will describe the provisions made for providing all necessary facilities and material, independent of the site owners/occupants. For small work assignments and those of short duration, it may be possible to mobilize and store the necessary materials in a vehicle (e.g., cargo van). For larger projects, mobilization may include establishing a site trailer, temporary sanitary facilities and the construction of a temporary decontamination pad that will remain in place during the field effort. If appropriate to the project, a drum storage area will be established for the temporary storage of investigation derived waste, including soil cuttings, monitoring well development water, decontamination fluids and purge water from groundwater sampling. Soil cuttings may be temporarily stored in drums or roll-off containers.

A project kick-off meeting will be held prior to initiating field work to orient field team members and subcontractors with the site and to familiarize all site workers with site background, potential dangers, health and safety requirements and emergency contingencies and other field procedures.

2.2 Health and Safety

It is anticipated that the work to be completed at typical sites will be performed in Level D personal protection with the potential to upgrade to Level C.

Field workers will be instructed to keep Level C equipment available should it be needed. Should health and safety monitoring during field activities indicate a threat to field personnel or warrant an upgrade beyond Level C protection, work will stop and site conditions will be re-evaluated by NYSDEC and AECOM. An upgrade to Level B protection will require modification of the HASP and review by AECOM's district safety manager.

The site-specific HASP will be submitted concurrently with the Site-specific Work Plan, site-specific FAP, and site-specific QAPP.

2.3 Utility Clearance

Intrusive activities that may be conducted during a typical site investigation include soil borings, monitoring well installations, and soil vapor sampling. Prior to the start of intrusive activities, a call will be placed to New York DIG SAFE CALL CENTER at Dig Safely New York (for all areas north of New York City) 811 or 1-800-962-7960; for New York City and Long Island, 811 or 1-800 272-4480 for utility markouts to minimize the risk of encountering subsurface utilities. Site personnel will be contacted to determine if detailed utility plans are available for the Site. Soft dig technologies, such as an air knife, may also be used for utility clearance. In the event that the markouts indicate that utilities are close to a proposed drilling location, the location will be moved to avoid utilities at the discretion of the field personnel and the drilling subcontractor.

2.4 Geophysical Surveys

Geophysical surveys will be conducted to obtain information on subsurface conditions or features, in addition to locating utilities or obstructions, without intrusive work. The rationale, scope, and procedures for any geophysical surveys will be determined on a project-specific basis.

Seismic refraction, ground-penetrating radar and electromagnetic surveys are among the methods often utilized in site investigation. Descriptions of these two survey methods are provided below.

2.4.1 Seismic Refraction

Seismic refraction techniques are used to determine the thickness and depth of geologic layers by measuring the travel time or velocity of seismic waves within the layers. Seismic waves are transmitted into the subsurface by a shock at the ground surface (i.e., a hydraulic hammer striking a metal plate). An array of geophones on the surface measures the travel time of the seismic waves from the source to the geophones at a number of pre-determined spacing. The time required for the wave to complete this path is measured, permitting a determination to be made of the subsurface features.

2.4.2 Ground-Penetrating Radar (GPR)

GPR utilizes high frequency radio waves to acquire subsurface information. From a small antenna, which is moved slowly across the ground surface, energy is radiated downward into the subsurface. This energy is then reflected back to the receiving antenna, where variations in the return signal are continuously recorded. This produces a continuous cross-section of the shallow subsurface conditions. Radar responds well to the different electrical properties between rock units, soils, groundwater, and most importantly for this application, buried pipes, utilities, and foundations.

2.5 Community Air Monitoring

Community air monitoring will be performed as outlined in the NYSDOH Generic Community Air Monitoring Plan (CAMP), unless it is determined by NYSDEC that a site-specific air monitoring plan is required, or that some of the provisions of the CAMP are not appropriate for a specific work assignment. AECOM's approach to implementing the Generic CAMP is provided in Section 7.

2.6 Site Survey

As part of the Site-specific Work Plan, AECOM will utilize available existing site maps and aerial photography to develop a site plan depicting general (existing) site features (e.g., buildings, roadways, etc.) within the vicinity of the site. The site plan will be used to depict planned investigation points. Following (or during, as needed) the field data acquisition phase of work, the locations of all sample points (soil borings, monitoring wells, etc.) will be surveyed by a (NYS-licensed professional land surveyor). The horizontal will be tied in to the North American Datum 1983 and UTM Zone 18N coordinate system. The vertical positions will be tied to the North American Vertical Datum 1988 (NAVD88). The measuring point associated with the existing monitoring wells or other site reference features will be recorded to a vertical accuracy of 0.01 ft. The final survey will be supplied in a digital CAD format (i.e., .dwg or .dxf files in the cited coordinate systems).

2.7 Green and Sustainable Remediation

The work completed as part of this Site-specific Work Plan will comply with all NYSDEC guidance documents including DER-31: Green Remediation (2010b). To ensure compliance with DER-31 the work will be completed using the best practices and techniques (BMPs) described below. In addition to the items discussed in Section 8 – Field Records and Documentation specific reporting methods relative to DER-31 are further described in the following subsection.

2.7.1 Best Practices and Techniques

DER-31 provides some examples of BMPs that could be applied during all phases of remediation (see Attachment 1 of the DER-31 policy). Additional resources to identify potential BMPs and techniques applicable to this work include:

- United States Environmental Protection Agency CLU-IN Green Remediation (www.clu-in.org/greenremediation/);
- Interstate Technology & Regulatory Council Green and Sustainable Remediation (www.itrcweb.org/teampublic_GSR.asp);
- NAVFAC Green and Sustainable Remediation (www.ert2.org/t2gsrportal/);
- Air Force Center for Engineering and the Environment Sustainable Remediation (www.afcee.af.mil/resources/technologytransfer/programsandinitiatives/sustainableremediation/index.asp); and
- Sustainable Remediation Forum (www.sustainableremediation.org).

Lastly, NYSDEC expects that the BMPs identified below will be implemented at sites unless a site-specific evaluation demonstrates impracticability or favors an alternative green approach:

- Use renewable energy where possible or purchase Renewable Energy Credits (RECs);
- Use of remediation technologies with an intermittent energy supply (i.e., energy use during peak energy generation only);
- Incorporate green building design;
- Reuse existing buildings and infrastructure to reduce waste;

- Reuse and Recycle construction and demolition (C&D) debris and other materials (i.e., grind waste wood and other organics for on-site use);
- Design cover systems to be usable (i.e., habitat or recreation);
- Reduce vehicle idling;
- Use of Low Sulfur Diesel Fuel (LSDF) or alternate fuels (i.e., biodiesel or E85);
- Sequence work to minimize double-handling of materials; and
- Use energy efficient systems and office equipment in the job trailer.

Prior to initiating any field work the Project Manager will identify applicable BMPs to be used for each work assignment. At a minimum, each BMP identified above will be included in the site-specific work plan with a discussion of how each practice or technique will be implemented or why a practice or technique is not appropriate to the work anticipated at the site.

2.7.2 Reporting

All Green and Sustainable BMPs employed during field activities will be discussed within the field log books described in Section 8.0 – Field Records and Documentation. Specifically, the field log books will acknowledge that the practices and techniques identified for the site work were taken each day (if applicable). In addition, the following information will be recorded within the field log books at the close of each day:

- The estimated quantity of fuel consumed by onsite vehicles and equipment;
- The estimated distance traveled by trucks and equipment delivering goods or removing waste; and
- The estimated water use during onsite activities.

The information will be compiled and presented to NYSDEC in a form suitable to the site-specific work completed.

3.0 Groundwater Investigation Tasks

Groundwater Investigations are typically part of a site investigation. Field activities which may be implemented as part of groundwater investigation include (but are not limited to) the following:

- Existing Well Condition Survey
- Groundwater Elevation Survey
- Direct Push Groundwater Sampling
- Monitoring Well Installation
- Monitoring Well Development
- Groundwater Sampling from Monitoring Wells
- Aquifer Properties Testing (hydraulic conductivity “slug” testing)
- Aquifer Properties Testing (pumping test)

3.1 Existing Monitoring Well Condition Survey

For some projects, an assessment of the condition of existing monitoring wells may be necessary. As monitoring wells may have been installed over an extended period and by different organizations, the available data varies and in some cases is contradictory. It is possible that some of the wells can no longer be found. In addition, the condition of the wells (and suitability for sampling) may not be known. Therefore, prior to initiating any sampling at the site, an initial well condition survey may be conducted if requested by NYSDEC; or if determined to be appropriate by AECOM and with NYSDEC concurrence. The following will be part of this survey.

- Contact the responsible organization (e.g., the consultants for potentially responsible parties [PRPs] or site owners; local or county officials; etc.) for as much information as is available with regard to the location and status of the well.
- Utilize available information to locate the well. If the well is found, and in a location where acceptable to the site owner, an identifying marker will be placed adjacent to the well (e.g., if in pavement, spray-paint well number; if lawn or unimproved area, place pin flag or lathe).
- Record the approximate location using field GPS (the exact location will be surveyed later).
- Record surface completion and integrity, condition/attitude of casing, and presence of lock.
- Inspect the well cover or cap for evidence of biological hazards such as wasp nests or spider webs; record if present.
- Prior to opening the well, screen around the well cover or cap for organic vapors (using MultiRAE photoionization detector (PID) or similar instrument). If safe, carefully open the well and repeat the screen. Record all data.
- After opening the well, record, as a minimum, the following information
    - Evidence of depth measurement reference point (e.g., notch in casing)
        - If a reference point does not exist, and it is likely that the well will be suitable for use in the investigation, establish a reference point on the casing.

  - Well diameter
  - Material of construction
  - Depth to water (0.01 ft)
  - Total depth of well (0.1 ft)
- Secure the well cover and decontaminate water level monitoring probe.

The information obtained will be recorded on a well condition survey form (example provided in Appendix A). The information from the well condition survey will be used to refine, and if necessary modify, the list of wells to be sampled or the number or location of new wells to be installed as part of the subsequent field activities.

3.2 Groundwater Elevation Survey

In order to better understand the hydrogeologic conditions, one or more rounds of synoptic water level readings may be collected by AECOM. A groundwater elevation survey may be taken as an initial task (e.g., concurrent with the existing well condition survey), or it may be performed at the conclusion of a well installation program, or both. Elevation surveys may be taken over several years, over several times of year to assess seasonal factors, or multiple times in a day to assess tidal or diurnal cycles which may influence groundwater elevations and flow directions.

Multiple teams may be used in order to obtain the elevation data within as narrow a time period as practical. The AECOM field crew will form multiple teams in order to meet site-specific objectives, if necessary. At each well, the water level will be measured using an electronic water level meter and the water level will be recorded on the NYSDEC Field Monitoring Well Field Inspection Log and in the field notebook to the nearest 0.01 ft. The water level meter will be field decontaminated between monitoring locations.

Field data will be converted into elevations using available survey reference data. These elevations will be used to prepare a groundwater contour map for each synoptic event which will be included in project reports.

3.3 Direct Push Groundwater Sampling

A direct push sampling investigation may be conducted for the purpose of collecting stratified groundwater samples without installing (or prior to installing) permanent monitoring wells. The need for such an investigation will be documented in the Site-specific Work Plan. If a direct push investigation is conducted, the Site-specific Work Plan or site-specific FAP will (as a minimum) specify the following:

- The number of direct push borings
- Locations of direct push borings
- Target boring depth of each boring
- Sampling interval(s) and number of samples per boring
- Analytical parameters for each sample

Groundwater samples will be collected at specified intervals using a HydroPunch® type device such as a Geoprobe® S-15 sampler. The HydroPunch® device will be advanced to the targeted depth and retracted to expose the stainless steel screened interval. A peristaltic pump will be used to purge groundwater from the HydroPunch® with the goal of obtaining clear water prior to sampling. Field measurements (temperature, pH, conductivity, dissolved oxygen (DO), oxidation-reduction potential (ORP) are not typically recorded during HydroPunch® sampling due to limited purge/sample volume.

However, if sufficient volume exists following collection of the groundwater sample, a separate aliquot will be used to record as many of the field parameters as possible. After several minutes of purging, a groundwater sample will be collected using the peristaltic pump; refer to Section 3.6 for preferred sample collection methods. The sample will be packaged in accordance with Section 8 and submitted to the laboratory for analysis.

Only one sample will be collected per direct-push location. If multiple zones are to be sampled in a particular location, a discrete direct-push boring will be completed for each interval. Refer to Section 3.9 for proper borehole abandonment.

3.4 Monitoring Well Installation

Monitoring well installation is part of many site investigations. The number and locations of proposed monitoring wells will be shown on a figure in the site-specific Work Plan or site-specific FAP.

The default method for advancing overburden borings for monitoring well installation will be using 4¼-inch hollow stem augers (HSAs) with a center plug. The HSAs will be advanced to the target depth for well installation. If difficulties with running sands are encountered which hinder drilling, potable water may be introduced into the HSAs to maintain a positive hydrostatic head. For very difficult overburden drilling or for wells installed in bedrock, water rotary drilling methods will be employed.

Monitoring well borings will be advanced to the target depths listed in the Site-specific Work Plan. Subsurface soil samples will be obtained in accordance with Section 4.2.2 and logged in accordance with Section 4.2.3. Soil cuttings will be screened for organic vapors using a PID.

3.4.1 Single-Cased Monitoring Wells

Single-cased monitoring wells are the default monitoring well type. These monitoring wells will typically be constructed of 2-inch, schedule 40, flush-threaded, PVC casing and matching factory-slot PVC well screen. Specific construction details and appropriate screen-slot size will be recommended in the site-specific work plan to match the formation in which the well is screened. For wells with greater than 100 feet of riser, schedule 80 PVC screen will be used for increased strength. Each well screen will be 10 ft long unless noted otherwise in the Site-specific Work Plan or FAP.

Upon completion of borehole advancement, the well screen and riser pipe will be inserted into the HSAs and set to the desired depth. A clean sand filter pack consisting of Morie sand (or equivalent), sized to match the screen and formation, will be placed into the annular space around the screen from approximately one foot below the screen to a minimum 2 ft above the top of the screen. A minimum one foot thick bentonite (pellet, chip?) seal will be placed above the filter pack and allowed to hydrate. If the bentonite seal is located in a saturated zone, native groundwater will be allowed to hydrate the seal for 30 minutes. If the bentonite seal is located in an unsaturated zone, potable water obtained from a certified source will be added slowly to the borehole for 30 minutes to promote hydration. The remaining borehole annulus will be grouted using cement-bentonite grout (94 pounds cement, 5 pounds powdered bentonite, 6.5 gallons water; thoroughly mix cement and water prior to adding bentonite). Grout will be tremmied into the annular space extending from the bentonite seal to just below ground surface. Wells will be completed as conventional (stickup) completion whenever possible. Flushmount well covers will be installed when traffic or aesthetic situations dictate. Refer to Section 3.4.3 for surface completion descriptions.

As noted above, the primary method for borehole advancement will be the HSA method. Occasionally, boreholes may need to be advanced and wells constructed using the water rotary drilling method, depending on the drilling conditions encountered. If the water rotary method is required, a minimum 6-inch diameter roller bit will be utilized to advance the borehole. The AECOM field scientist will record the amount of potable water used, noting also the intervals where water is lost to or gained from the formation during drilling (may indicate voids, highly permeable zones, or highly artesian zones). Water rotary is preferred over mud rotary; however, if there are problems with running sands or collapsing intervals, drilling mud (such as Benseal) may be used to stabilize the borehole. Mud rotary techniques will be used only if HSA or water rotary methods to advance the borehole are unsuccessful. The filter pack, bentonite seal, grout and well cover for deep wells will be installed in the same manner as previously described.

A copy of the standard single-cased monitoring well installation log is included in Appendix A of this Generic FAP.

3.4.2 Double-Cased Monitoring Wells

In situations where a monitoring well will be installed through a confining layer or a shallow contamination zone, a double-cased monitoring well may be installed to minimize the potential for vertical migration of contaminants. The default outer-casing will be 6-inch ID steel. The decision to install double-cased monitoring wells will be established in the Site-specific Work Plan and detailed in the FAP.

The site-specific work plan will establish the target depths for the outer 6-inch ID casing of a double-cased well. An initial minimum 10-inch ID borehole will be advanced to the target depth for installation of the 6-inch ID steel casing. A quantity of cement-bentonite grout (94 pounds cement, 5 pounds bentonite, 6.5 gallons water) equal to 10-annular feet of 6-inch ID casing will be placed in the borehole using tremie methods. A tightly-fitted PVC cap will be attached to the bottom of the 6-inch casing and the casing will be set to the bottom of the borehole (field welds casing as needed). The HSAs will then be extracted in 5-ft increments while topping off the annular space with cement-bentonite grout such that at least 5 feet of grout remains inside the lowest HSA during extraction. This process is repeated until all HSAs have been extracted. Cement-bentonite grout will be tremmied into the annual space around the casing. No further drilling will be performed at that location for a minimum of 24 hours after the 6-inch casing is set to allow proper curing.

Drilling inside the monitoring well (below the 6-inch casing depth) will typically be performed by water rotary with a 5 7/8-inch tricone bit (specifics will be identified in the site-specific FAP). The rods and bit will be advanced by rotation from a truck-mounted drill rig. If required by the project-specific work plan, split-spoon sampling will be conducted in accordance with Section 4.2 at intervals specified in the site-specific Work Plan or site-specific FAP.

Once the borehole has been advanced to the desired depth the driller will prepare the borehole for monitoring well installation by flushing out the drilling fluid with potable water. Monitoring wells will be constructed using methods and materials as described in Section 3.4.1.

A copy of the typical installation double cased monitoring well installation log is provided in Appendix A of this Generic FAP.

3.4.3 Monitoring Well Surface Completions

Monitoring wells will be completed with either a flushmount protective casing or a steel stickup protective casing depending on Site conditions.

For stickup completions, the PVC or steel well casing will extend approximately 2.5 ft above the ground surface. A steel protective casing will be placed over the well riser. A 2-ft by 2-ft by 4-inch concrete pad will be constructed around the casing. For flushmount completions, a flushmount lid will be set over the well riser and set in a concrete collar.

3.5 Well Development

Each new (and if necessary, existing) monitoring well will be developed to remove fine grained soils introduced during the drilling process and to improve hydraulic connection between the formation and the well screen. A suitable pump will be selected for development at each well and specified in the site-specific work plan. Pump selection will depend upon monitoring well casing diameter, depth to water, anticipated drawdown, volume of water required to be removed, and access well or electric power supply. Typical pumps include electric submersible, bladder, peristaltic. If necessary, other options include bailers and hand-operated, positive displacement pumps (e.g., Waterra).

Each well will be developed until the purge water is clear, or other criteria specified in the Site-specific Work Plan or site-specific FAP. During development, the field supervisor will record development information on the Well Development form. Periodic readings (every 0.5 to 1 well volume) will include depth to water, pumping rate, temperature, pH, conductivity and turbidity. The goal of development will be to remove at least several casing volumes of water and achieve a turbidity reading of 50 nephelometric units (NTU) or less. If these development goals have not been achieved after two hours of development, the field supervisor will contact the AECOM project manager who will contact the NYSDEC Project Manager for further instructions. During development of the wells that are installed using water or mud rotary methods, extra effort will be made to remove as much of the water (and drilling fluids) lost to the formation during drilling as possible.

3.6 Groundwater Sampling from Monitoring Wells

Groundwater sampling will be performed to evaluate the extent of groundwater contamination. The rationale, locations, wells, and analytical parameters will be specified in the site-specific Work Plan or FAP and QAPP addenda.

3.6.1 Low Flow Sampling Technique

Unless specified otherwise in the site-specific work plan and approved by NYSDEC, groundwater sampling will be done in accordance with *Groundwater Sampling Guidelines for Superfund and RCRA Project Managers* (USEPA OSWER 542-S-02-001). The default groundwater sampling method will be in accordance with EPA's low stress (often referred to as low flow) sampling technique (EPA, 1998.

A bladder pump (or similar submersible pump) will be used to purge the wells. The pump intake will be set at the midpoint of the screened interval. The pump will be operated at a flow rate of 300 to 500 milliliters per minute (mL/m). Dedicated Teflon or Teflon-lined tubing will be used for groundwater sample collection. Field parameters will be recorded on the Well Sampling Form (see Appendix A) every five minutes during purging and will include:

- flow rate (mL/min)
- depth to water (0.01 ft)
- temperature (degrees Celsius)
- pH (dim)
- specific conductance (millisiemens per centimeter [ms/cm])
- DO (milligrams per liter [mg/L])

- ORP (millivolts [mV])
- turbidity (NTU)

A flow-through cell will be used to obtain temperature, pH, specific conductance, DO, ORP, and turbidity. Purging will be considered complete when the indicator parameters have stabilized over three consecutive readings. Stabilization parameters are:

- purge rate: between 300 and 500 mL/m;
- depth to water: less than 0.3 ft drawdown during purging;
- pH: ± 0.1
- conductivity: ± 3%
- DO: ± 10 % (mg/L)
- ORP: ±10 mV and
- Turbidity: less than 50 NTU.

If stabilization is not achieved after two hours of purging, the field team leader will notify the AECOM project manager who will contact the NYSDEC project manager for further instruction (unless default contingencies are established in advance).

During sample collection, the flow-through cell will be disconnected and the sample tubing discharge will be directed into the laboratory supplied sample containers. The flow rate will be decreased to approximately 100 mL/m during sample collection for volatile organic compounds (VOCs) analysis. Groundwater samples will be packaged in accordance with Section 8 and submitted to the laboratory for analysis.

3.6.2 Well Volume Sampling Technique

Many long term monitoring sites utilize the volumetric approach for collecting groundwater samples. There are two techniques for determining when it is appropriate to collect samples. One method stipulates that a predetermined well volume be removed prior or sampling, typically three to five casing volumes. The second method relies on stabilization of field parameters similar to the low flow technique as detailed in Section 3.6.1.

For both techniques, the static water level will be recorded prior to purging and the volume of water in one casing volume will be calculated. If the static water level is above the screen, the pump will be set near the top of the water column and slowly lowered into the screened interval during the purging process to completely remove any stagnant casing water above the screen. If the screen is exposed, the pump should be set at a sufficient depth below the water table to allow for drawdown during purging. In either case, the pump should not be allowed to touch the bottom of the well or draw in sediment from the bottom of the well casing. The pumping rate should not produce excessive turbulence and typically will not exceed one gallon per minute. Water quality parameters will be collected approximately every casing volume. The depth to water will be monitored during purging to prevent the dynamic water level from dropping below the pump intake. If using water quality parameters to determine stabilization, the sample can be collected once the parameters have stabilized for three consecutive readings. The sample can be collected either by Teflon bailer or through the pump if suitable for the analysis required, for instance VOC samples cannot be collected from a centrifugal or peristaltic pump.

3.7 Monitoring Well Decommissioning and Borehole Abandonment

Monitoring well decommissioning will be performed in accordance with NYSDEC Policy CP-43 (NYSDEC, 2009). Several methods are available such as grouting in place, casing perforation/grouting in place or over-drilling.

The best method is dependent on the type of well and construction details. Consequently the retails for well decommissioning will be documented in the site-specific FAP.

The preferred method for borehole abandonment will be to containerize all cuttings for proper disposal as detailed in Section 6.2 and grout the borehole upon completion of sampling activities.

4.0 Soil Sampling Activities

Soil sampling activities which may be typically conducted include surface soil sampling and subsurface soil sampling. Procedures for these activities are described below.

4.1 Surface Soil Sampling

Surface soil samples (defined as soil samples from the first six inches or fewer of native soil) will be taken at locations identified in the site-specific Work Plan or site-specific FAP. Near-surface soil sampling by hand implements is also discussed in this section.

4.1.1 Surface Soil Sample Collection Procedure

- Using a decontaminated stainless steel trowel or by hand (protected by a chemically resistant glove), remove rocks, stone, grass, and debris to gain access to the surface soils.
- Using a decontaminated stainless device (teaspoon, trowel, "scoopula," or similar), transfer the exposed soils directly into the laboratory-provided sample containers. Sampling depth typically should not exceed six inches.
- Complete the label on the sample container and transfer the sample container(s) to an iced cooler.
- After collection of the sample, screen the hole with a photoionization detector for volatile organic vapors. Record the readings and any significant observations such as staining, oily sheen, or odors.
- If the location is to be surveyed, place a stake in the center of the hole after backfilling the hole with the excavated material. Otherwise, measure the location from fixed (permanent) objects using a tape measure.

4.1.2 Near-Surface Soil Sampling (by Hand Auger)

- Prepare the surface as described above for surface soil sampling.
- Obtain a decontaminated 3¼-inch hand auger with extension and handle (note that other devices may be used; see site-specific Work Plan or site-specific FAP for specifics).
- Connect the auger to the extension handle (after removing any protective cover such as foil or plastic) and advance the auger to the full bucket depth.
- Remove the auger form the hole, placing it on a clean sheet of aluminum foil.
- Scan the auger for organic vapors and record any significant observations.
- Collect the sample as described above.
- Repeat the process as necessary to the depths specified in the site-specific Work Plan or site-specific FAP.
- Depending on soil conditions, and if auger extension handles are available, it may be possible to obtain samples to depths of about 5 ft bgs by hand implements.
- After completing the sampling, backfill the hole with the removed material and compact the material to as close to pre-sampling conditions as possible. Stake the location or measure as described above.

4.2 Subsurface Soil Sampling

Borings will be advanced at the locations as specified in the site-specific Work Plan or site-specific FAP. Borings are typically advanced either by direct push (geoprobe) methods or by HSA drilling. Soils will normally be logged during subsurface sampling, regardless of the method selected. Typical procedures for direct push sampling, sampling from HSA borings, and soil logging are presented below.

4.2.1 Subsurface Soil Sampling from Direct Push Borings

Soil samples will be collected at specific locations identified in the Site-specific Work Plan, or based on field observations (e.g., if contamination is observed or if elevated PID readings are recorded). The soil samples will be analyzed for parameters as indicated in the Site-specific Work Plan.

The Geoprobe will be advanced to the specified depth, or to refusal. The soil samples will be collected using a 4-ft or 5-ft long dedicated acetate liner. The acetate liner will be opened upon retrieving the sampler. The soil retained in the sampler will be visually evaluated and will also be screened with a photo-ionization detector (PID).

The direct push drilling procedures will follow ASTM D6282-98 (Standard Guide for Direct Push Sampling for Environmental Site Characterization). Soil samples will be collected using a four or five-foot-long, pre-decontaminated sampling tool. Liners will be new and unused. The retrieved sampler will be opened as soon after retrieval as possible. The soil retained in the sampler will be visually evaluated, and will also be screened with a PID.

Soil samples will be collected from intervals and depths specified in the site-specific Work Plan or site-specific FAP. Samples for VOC analysis will be collected prior to sample homogenization. The soil will be placed directly in a field-decontaminated stainless steel bowl for homogenization. Homogenization will be accomplished using a decontaminated stainless-steel spoon or spatula. If possible, sufficient pre-cleaned equipment will be brought to the site. If this is not practical, stainless-steel bowls, spoons, and spatulas will be field-decontaminated prior to use and between uses, as described in Section 6.1 of the FAP. Homogenization will involve the thorough mixing of the selected six-inch interval in order to provide a well-mixed, representative sample to the laboratory. Once homogenized, the soil sample will be transferred directly to the appropriate sample containers, slightly tamped-down, filled to near the top of the container, and sealed with the appropriate cap. Sample containers and preservation techniques are listed in the QAPP.

The process will be repeated for each interval of borehole penetration where samples are required. Decontamination of direct push technology (DPT) sampling equipment used in soil sampling will follow the decontamination procedures in Section 6 of the FAP.

4.2.2 Subsurface Soil Sampling from HSA Borings

Subsurface soil samples may also be collected from borings advanced for the installation of monitoring wells. Typically, this will be accomplished using 4 ¼-inch ID hollow stem augers. Sampling from these borings will be consistent with ASTM D-1586-08 using a standard 2-ft long, 2-inch OD steel split spoon sampler with a 140-lb hammer. If necessary, and indicated in the site-specific Work Plan or site-specific FAP, a 3-inch OD split spoon may be utilized to obtain sufficient soil for laboratory analysis.

The general procedure for subsurface sampling from split spoon samplers is described below.

- Identify the soil boring location and record the location on the soil boring log.
- Put on a new pair of disposable gloves.
- Prepare a clean surface (e.g., using a plastic sheet) onto which sampling equipment, meters, and the like can be placed; clean the equipment prior to placing on the clean surface.
- Retrieve the split spoon sampler from the borehole (or accept the split spoon sampler from the drilling subcontractor).
- Remove the shoe and head attachments from the split spoon sampler and place the split spoon sampler on a clean surface.
- Remove one-half of the split spoon sampler tube to expose the sample.
- Immediately screen for organic vapors using a PID and record the results.
- Measure the recovery (in inches) of soil in the split spoon.
- If the sample is to be analyzed for VOCs, take an immediate grab sample and place into the designated container (EnCore or 4-oz glass jar) without homogenizing.
- The remainder of the soil from the split spoon sampler will be placed directly in a decontaminated stainless steel bowl for homogenization.
- Homogenize the sample using a decontaminated stainless-steel spoon or spatula. If possible, sufficient pre-cleaned equipment will be brought to the site. If this is not practical, stainless-steel bowls, spoons, and spatulas will be field-decontaminated prior to use and between uses, as described in Section 6 of the FAP. Homogenization will involve the thorough mixing in order to provide a well-mixed, representative sample to the laboratory.
- Once homogenized, transfer the soil sample will be transferred directly to the appropriate sample containers, slightly tamped-down, filled to near the top of the container, and sealed with the appropriate cap.
- After the last sample has been collected, record the date and time; place the sample bottles in the cooler, on ice.

4.2.3 Subsurface Soil Logging

Subsurface soil logging will be conducted for borings advance by direct push methods or by HSAs. Soil boring logs will be prepared in the field by a qualified, experienced geologist or engineer, as borings are drilled. Boring logs will be prepared on a standard drilling log form, an example of which is provided in Appendix A. The final logs will be typed into an Excel spreadsheet.

Soil borings will be logged, with each type of material encountered being described on the log form. All relevant information in the log heading and body will be completed. If surveyed horizontal control is not available at the time of drilling, location sketches referenced by distances to permanent surface features will be shown on or attached to the log.

Each material type encountered will be described on the log form. Descriptions of unconsolidated materials will include Unified Soil Classification System (USCS) in accordance with ASTM D-2487-00, consistency of cohesive materials or apparent density of non-cohesive materials, moisture content assessment, color, other descriptive features such as bedding characteristics, organic materials, macrostructure of fine-grained soils, and depositional type. A Summary Sheet will accompany the logger for easy reference to the USCS Soil Classification System; a copy of is provided in FAP Appendix A.

Depth information will be from direct measurements accurate to ±0.1 ft. Stratigraphic/lithologic changes will be identified by a solid horizontal line at the appropriate scale depth on the log that corresponds to changes at the measured borehole depth. Gradational changes identified from cuttings will be identified by a horizontal dashed line at the appropriate scale depth based on the best judgment of the logger.

Lines will be drawn with a straight edge. Boring logs will clearly show the depth interval from which all samples are obtained. Logs will also indicate the presence or absence of water in boreholes, the depth at which water is first encountered, the depth to water at the completion of drilling, the stabilized water depth, and the time allowed for the levels to stabilize.

Boring logs will show drilling detail, including borehole and sample diameters, the depth at which changes occur in drilling or sampling methods or equipment, and the total depth of penetration and sampling. The bottom of the borehole will be identified by “Bottom of Borehole” clearly on the log. Any drilling or sampling problems will be noted on the logs, including descriptions of resolutions. Logs will include other information relevant to the investigation, including odors, field screening and test results, and any evidence of contamination of samples, cuttings, or drilling fluids. Boring logs will be submitted in the draft and final reports.

5.0 Decontamination and Management of Investigation Derived Waste

5.1 Equipment Decontamination

To avoid cross contamination, sampling equipment (defined as any piece of equipment which may contact a sample) will be decontaminated according to the following procedures specified in the site-specific Work Plan or FAP; the procedures discussed here are general and may be superseded by project-specific requirements (as documented in the site-specific Work Plan or site-specific FAP). Field equipment rinsate blanks are generated and analyzed to monitor the effective of field decontamination procedures.

Cross contamination is minimized by the use of vendor-decontaminated, dedicated, disposable equipment to the extent practical.

5.1.1 Decontamination Procedures

For larger projects, and as indicated in the site-specific Work Plan or site-specific FAP, a decontamination pad may be constructed on the site. The pad will be sized to be large enough to handle the equipment used on site (e.g., drill rig). Additionally, the pad will be used for small equipment decontamination as well as personnel decontamination.

5.1.2 Small Equipment Decontamination

Small equipment decontamination for non-disposable equipment such as Geoprobe® HydroPunch® samplers, transducer probes and cables, will be accomplished using the following procedures:

- Alconox (or equivalent) and potable water wash
- Potable water rinse
- Distilled/deionized water rinse

Solvents will not be used in the field decontamination of such equipment. Decontamination will include scrubbing/washing with a laboratory grade detergent (e.g. Alconox) to remove visible contamination, followed by potable (tap) water and analyte-free water rinses. Tap water may be used from any treated municipal water system; the use of an untreated potable water supply is not an acceptable substitute.

Equipment should be allowed to dry prior to use. Steam cleaning or high pressure hot water cleaning may be used in the initial removal of gross, visible contamination.

Electric submersible pumps (such as a Grundfos Redi-Flow II) will be decontaminated using the above steps followed by running a large volume (several gallons) of potable water through the pump, followed by an analyte-free water rinse. Tubing will not be re-used (new tubing will be used for each well). Submersible pumps and supporting lines and cables will be placed in a plastic bucket filled with Liquinox and potable water and then run for several minutes (to decontaminate both exterior and interior parts). The process will be repeated with potable water. Submersible pumps will also be given a final analyte-free water rinse of both interior and exterior parts.

If bladder pumps are used, the pump will be disassembled and cleaned after each used. A new bladder will be used for each sample. Small parts, such as screens and gaskets will be replaced after each use. Dedicated air line tubing and Teflon sample tubing will be used at each monitoring well. The pump will be cleaned using the following steps:

- Alconox (or equivalent) and potable water wash
- Potable water rinse
- Distilled/deionized water rinse
- Solvent (reagent or pesticide grade) rinse if samples are collected for organic analysis
- Dilute (10%) nitric acid rinse if samples are collected for metals analysis
- Distilled/deionized rinse, air dry

5.1.3 Heavy Equipment Decontamination

Drilling equipment will be decontaminated before the first use, between boreholes and prior to demobilization using high-pressure steam. Decontamination will be conducted at a dedicated decontamination pad constructed for the project or at an alternate location as indicated in the site-specific Work Plan or site-specific FAP. Decontamination fluids will be containerized (drummed) for subsequent characterization or disposal, unless other arrangements are made on a project-specific basis and as indicated in the site-specific Work Plan.

5.1.4 Personnel Decontamination

Wash buckets and potable water will be set up at the decontamination pad or alternate location as indicated in the site-specific Work Plan, site-specific FAP, or HASP. This includes washing hands and a boot wash. Details of the personnel decontamination procedures will be provided in the HASP.

5.2 Management of Investigation Derived Waste

IDW management will be in accordance with section 3.3(3e) of DER-10 (NYSDEC, 2010). The sampling methods and equipment will be selected to limit both the need for decontamination and the volume of investigation-derived waste (IDW). Personal protective equipment and disposable sampling equipment will be placed in plastic garbage bags for disposal as a solid waste. Types of IDW typically generated include: soil cuttings from soil borings and monitoring well installation; development and purge water from the wells; and decontamination water from the drill rigs, Geoprobe rigs and equipment. Monitoring well purge water, and decontamination water will be containerized for characterization and subsequent disposal unless indicated otherwise in the Site-specific Work Plan.

Drill cuttings and other soil generated on-site during an investigation will be considered contaminated. Cuttings will be placed back in the borehole if free product or grossly contaminated soils are not present in accordance with the provisions specified in DER-10 Section 3.3(e)1. All other soils will be containerized in either new or reconditioned drums and stored within the designated IDW staging area. Drummed material will be characterized and disposed of in accordance with all applicable State and Federal regulations.

Off-site soil cuttings will generally not be considered contaminated unless screening indicates the presence of hazardous constituents. Cuttings will be returned to the borehole following the provisions of DER-10 or placed in drums and transported to the staging area for characterization and proper disposal.

Any free product or grossly contaminated soils will be drummed and transported to the staging area. Buried drums or other containers found will be over packed or placed in drums and transported to the staging area for proper disposal.

Well development water and purge water from sampling will be containerized and handled in accordance with the provisions of DER-10. Waste water containing non-aqueous phase liquids (NAPL), sheens, olfactory or visible evidence of contamination will be characterized for proper disposal. If testing indicates that the liquids are not hazardous, the water may be recharged to unpaved ground with the permission of NYSDEC.

If IDW requires off-site disposal, AECOM will collect characterization samples to classify the IDW and solicit bids for disposal at a licensed facility.

6.0 Community Air Monitoring Program

A Community Air Monitoring Plan (CAMP) is used 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 protocols cited below are based on the NYSDOH Generic Community Air Monitoring Plan (May, 2010; Appendix 1A to DER-10 [NYSDEC, 2010]) which is typically utilized by NYSDEC as guidance for work conducted under these contracts.

6.1 Monitoring

Real-time air monitoring for volatile organic compounds (VOCs) and/or particulate levels at the perimeter and surrounding community of the work area may be necessary. Monitoring activities will consist of a combination of continuous and periodic monitoring, which will be performed dependent upon the type of activity being conducted at the site, as discussed below.

The specific types of monitoring necessary and appropriate for any particular project will be determined by NYSDEC and AECOM and specified in the site-specific Work Plan and site-specific FAP.

6.1.1 Continuous Air Monitoring

Continuous monitoring for VOCs and particulates may be required for ground intrusive activities associated with the site, including, but not limited to, the installation of soil borings and groundwater monitoring wells.

VOC monitoring will be conducted at the downwind perimeter of the immediate work area on a continuous basis. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions. VOC monitoring will be performed using a MiniRAE 2000 or equivalent, which is appropriate to detect a wide range of contaminants typically encountered. The MiniRAE 2000 will be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The MiniRAE 2000 is capable of calculating 15-minute running average concentrations, which will be compared to the action levels specified below.

Particulate concentrations will be monitored continuously at the upwind and downwind perimeters of the work area at temporary particulate monitoring stations. The particulate monitoring will be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) such as a Thermo MIE pDR-4000 DataRam or equivalent. The Thermo MIE pDR-4000 DataRam is a real-time monitoring equipment capable of measuring particulate matter less than 10 microns (µm) in size [PM-10] and capable of integrating over a period of 15 minutes for comparison to the airborne particulate action level. The Thermo MIE pDR is equipped with an audible alarm to indicate exceedance of the action level. In addition to using the Thermo MIE pDR-4000 DataRam, fugitive dust migration will be visually assessed during work activities. If particulate concentrations at the upwind station are higher or equivalent to concentrations at or downwind of work areas, then continuous air monitoring may be discontinued, as approved by NYSDEC.

6.1.2 Periodic (As-Needed) Air Monitoring

Periodic or as-needed air monitoring for VOCs may be required during non-intrusive activities associated with the site-specific Work Plan. Non-intrusive activities may include the collection of soil, the collection of groundwater samples from existing monitoring wells, and the collection of indoor air and soil vapor samples. Periodic air monitoring during sample collection will consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well bailing/purging, and taking a reading prior to leaving a sample location.

6.2 Action Levels and Response

This subsection identifies the action levels and corresponding responses for concentrations of VOCs and particulates detected during the field activities associated with a site.

6.2.1 Volatile Organic Compounds

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

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 will be stopped, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities will resume provided that the total organic vapor level 200 ft downwind of the work zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less (but in no case less than 20 ft), is below 5 ppm over background for the 15-minute average.

If the organic vapor level is above 25 ppm at the perimeter of the work area, field activities will be shut down.

All 15-minute readings will be recorded and be available for NYSDEC and NYSDOH personnel to review. Instantaneous readings (if any) used for decision purposes will also be recorded.

6.2.2 Particulates

If the downwind PM-10 particulate level is 100 µg/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 will be employed. Work will continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 µg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.

If, after implementation of dust suppression techniques, the downwind PM-10 particulate levels are greater than 150 µg/m^3 above the upwind level, work will be stopped and a re-evaluation of activities initiated. Work will resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 µg/m3 of the upwind level and in preventing visible dust migration.

Similar to the VOC readings, particulate readings will be recorded and be available for state (NYSDEC and NYSDOH) and county health personnel to review.

7.0 Field Records and Documentation

The objective of this subsection is to provide consistent procedures and formats by which field records will be kept and activities documented, and a methodology by which field records will be managed. Field records and documentation to be used during field activities include Field Log Books and Standard Forms. Standard Forms include chain-of-custody (COC) forms, Drilling Logs, Well Installation Diagrams, Well Development Forms, Well Sampling Forms, Aquifer Testing Forms, Well Condition Forms, and investigation derived waste (IDW) Log Sheets. Example forms are provided in Appendix A.

7.1 Field Log Books

Field log books will be prepared and maintained throughout the course of the investigation. Only bound, weatherproof field log books will be used by personnel working on NYSDEC projects. The log books will be turned in for copying/filing/tracking when complete.

Each log book will be labeled on the front cover in indelible ink with the following designation: “Site Name/Project Type, NYSDEC Work Assignment D007626-60284002, AECOM Project Number 60284002.”

Log book entries will be recorded in indelible, waterproof ink. If errors are made in any field log book, field record (form), Chain-of-Custody Record, or any other field record document, corrections will be made by crossing a single line through the error, entering the correct information, and initialing and dating the correction.

Entries will be made in the following format. Documentation and reporting of events and activities will be made in chronological order on the right page of an open log book. The left page of the log book will be used for extemporaneous reporting, such as sketches, tables, providing details or comments on events reported sequentially, or interpretations, and notes identifying use of any other field documentation such as COCs and Standard Forms.

Standard Forms have been adopted in this FAP to facilitate the collection of consistent data (See Appendix A). This will preclude detailed documentation of, for example, lithologic descriptions in the Field Log Book. A reference, however, to use of each specific form must be made in the log book.

The date will be placed at the top of every page in the left-hand corner of the right page. The time of entry recordings will be in columnar form down the left-hand side of the right page. If an entry is made in a non-dedicated log book, then the date, project name, and project number will be entered left to right, respectively, along the top of the right page. Entries should be dated, and time of entry recorded. At the beginning of each day, the first two entries will be “Personnel/Contractors On Site” and “Weather.” At the end of each day's entry or particular event, if appropriate, the person entering the field notes should draw a diagonal line originating from the bottom left corner of the page to the conclusion of the entry and sign along the line indicating the conclusion of the entry or the day's activity.

Entries in field log books will be legible (printing is preferable) and will contain accurate and inclusive documentation of project activities (investigation, monitoring remediation, closure,

maintenance, etc.). Information pertaining to health and safety aspects, personnel on site, visitor's names, association, and time of arrival/departure, etc., should also be recorded. Language should be objective, factual, and free of personal feelings or other terminology that might prove inappropriate, since field records are the basis for later written reports. Once completed, these field log books become accountable documents and must be maintained as part of the project files.

Sample collection and handling activities, as well as visual observations, will be documented in the field log books. The sample collection equipment (where appropriate), field analytical equipment, and equipment used to make physical measurements will be identified in the field log books. Calculations, results, and calibration data for field sampling, field analytical, and field physical measurement equipment will also be recorded in the field log books, except where these are referenced as being recorded on approved field forms. Field analyses and measurements must be traceable to the specific piece of field equipment utilized and to the field investigator collecting the sample, making the measurement, or conducting analyses. Log books will be updated as field work progresses.

When an individual log book is full, the log book will be submitted to the AECOM project manager for final cataloging and filing. The log books will be stored in the Project File. Copies of specific sections will be made available to personnel upon request.

7.2 Standard Forms

All non-bound field records (e.g., drilling logs, well construction forms, sampling records, COCs, aquifer testing forms) will be completed the day the associated activity occurs. Field data collected using electronic data loggers or computer entry forms, will be downloaded as soon as practical onto CDs or uploaded to office servers. If possible, the person collecting the data will download electronic data on a daily basis. This person will be responsible for verifying that the data collected are adequately represented in electronic media and in the file. A hard copy of the data, and any graphical representation produced by logging software, will also be printed out and duplicated. Examples of forms typically used are provided in Appendix A of this Generic FAP.

7.3 Sample Identification

During this project, a unique sample identifier will designate each sample collected. The following system may be used to assign unique sample identification numbers; however, modifications should be made as needed to clearly and appropriate identify samples for each site or project. Each sample will be identified by an alphanumeric character identifier, as described below.

The following codes will be used for identifying other sample types:

CODE	Sample Type
MW	Monitoring well
SB	Soil boring
SW	Surface water
SD	Sediment
IA	Indoor air
OA (or AA)	Outdoor (or ambient) air
SV	Soil vapor

FB	Field (Rinsate) Blank
N + 50	Field Duplicate (e.g., field duplicate of MW-3S will be MW-53S)
TB	Trip Blank
MS/MSD	Matrix Spike/ Matrix Spike Duplicate

Field blanks and tip blanks will be labeled for the day of collection. For MS/MSD samples, the MS/MSD will be added to the sample ID and included on the COC as a note.

An example of the sample numbering system is provided below.

Sample Identifier	Description
MW-1S	Shallow well MW-1S
MW-101D	Deep monitoring well MW-101D
SB-02-0406	Soil sample from 4 to 6 ft interval from boring SB-02.
SS-01	Surface soil sample from location SS-01.
FBW110502	Field blank associated with water samples collected on 5/2/11
TB110503	Trip blank associated with samples shipped 5/3/11.

7.4 Sample Labeling

A non-removable label will be affixed to each sample container. Labels will be marked with permanent marker pens. The following information will be contained on each label:

Project name;

Sample identifier;

Company (AECOM);

Sample date and time;

Sampler's initials;

Sample preservation; and

Analysis required.

7.5 Sample Chain of Custody

At the time of the sampling, a field team member will record the sample information in the field log book, well sampling form or drilling log, and on a COC form. The sample information recorded in the log books will be at least as detailed as that recorded on labels, and should indicate the type of sample (e.g., groundwater, soil), sample preservation, and sampling location, in sufficient detail as to allow re-sampling at the same location. Errors on forms or logbook entries will be stricken with a single line and corrected, with the date and initials of the person making the correction.

After samples are collected, the field team member will immediately place the filled containers in coolers and iced to 4 degrees Celsius (^{o}C). Samples will be preserved as required and specified in the QAPP. The field team will maintain custody of the samples until they are shipped to the laboratory. The entries on the COC form will correspond to the field log book, standard forms, and sample labels.

Original white copies of COCs will be forwarded to the laboratory. Yellow copies and associated shipping air bills will be maintained by the Field Supervisor with all other documentation until provided to the Project Manager. COCs will be copied to the field file weekly or as otherwise specified in the site-specific Work Plan or site-specific FAP. Yellow copies will be filed by the Project Manager or designated representative on a weekly basis (at a minimum) in the Project File for permanent storage.

7.6 Sample Packaging and Shipping

Samples collected for laboratory analysis will be shipped by a commercial overnight delivery service to the laboratory on the day of collection (if possible; otherwise samples will be shipped on the day after collection), following proper identification, chain-of-custody, preservation, and packaging procedures. Samples which require maintenance at 4º C (essentially all aqueous and non-aqueous samples submitted for chemical analysis) which are collected and shipped on a Friday must be delivered to, and accepted by, the laboratory on Saturday; note that it may be necessary to arrange this in advance.

Sample packaging and shipping procedures are summarized as follows:

A properly completed chain-of-custody form will accompany each sample shipment. The sample identifiers will be listed on the chain-of-custody form. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the record. This record documents transfer of custody of samples from the sampler to another person, to the laboratory, or to/from a secure storage area.

Samples will be properly packaged to avoid breakage, stored on ice at 4° C for shipment and dispatched to the appropriate laboratory for analysis. (In the event that samples must be held overnight prior to shipment, the temperature of the cooler and presence of sufficient ice will be checked and new ice added prior to shipment.) A signed COC form will be enclosed and secured to the inside top of each sample box or cooler. The COC (white copy), a cooler receipt form (if applicable), and any additional documentation will be placed in a plastic bag to prevent them from getting wet, and one copy will be retained by the field team leader.

Shipping containers will be secured with strapping tape and custody seals for shipment to the laboratory. Signed custody seals will be covered with clear plastic tape. The cooler will be taped shut with strapping tape in at least two locations.

Samples will be transported to the laboratory by a commercial overnight carrier (e.g., FedEx) unless other arrangements are made on a project-specific basis (e.g., laboratory courier sample pickup; or hand delivery of samples to the laboratory by AECOM personnel).

8.0 References

New York State Department of Environmental Conservation (NYSDEC), 2008. NYSDEC Modifications to EPA Region 9 TO-15 QA/QC Criteria. February 2008.

NYSDEC, 2009. CP-43 Groundwater Monitoring Well Decommissioning Policy. November 3, 2009.

NYSDEC, 2010a. DER-10 Technical Guidance for Site Investigation and Remediation. May 3, 2010.

NYSDEC, 2010b. DER-31 Green Remediation. August 11, 2010.

NYSDEC, 2010c. CP-51 Soil Cleanup Guidance. October 21, 2010.

NYSDOH, 2000. Generic Community Air Monitoring Plan. June 2000.

New York State Department of Health (NYSDOH), 2006. Guidance for Evaluating Soil Vapor Intrusion in the State of New York. Final. October, 2006.

United States Environmental Protection Agency (USEPA), 1988. Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA, Interim Final. USEPA Office of Emergency and Remedial Response. EPA/540/G-89/004. October.

USEPA, 1996. Low-Flow (Minimal Drawdown) Ground-Water Sampling Procedures. USEPA Office of Solid Waste and Emergency Response (OSWER), Office of Research and Development. Robert Puls and Michael Barcelona. EPA/540/S-95/504. April, 1996.

USEPA, 1998. Region II Sampling SOP - Ground Water Sampling Procedure Low Stress (Low Flow) Purging and Sampling. March 16, 1998.

USEPA, 2002. Ground-Water Sampling Guidelines for Superfund and RCRA Project Managers. OSWER. Douglas Yeskis and Bernard Zavala. EPA 542-S-02-001. May, 2002.

Appendix A

Standard Forms

DAILY FIELD MEETING RECORD
General Information

Project: NEAM ISCO Pilot Study	Location: 2145 Dwyer Ave, Utica, NY 13501
Project Number: D007626.60284002	Client:
Date:	Weather:

Team Members / Subcontractor Personnel / Visitors Present:

Topics Discussed:

	YES	NO	
Are all team members/subcontractors present?			
Have the team members read and understood the applicable sections of the Work Plans?			
Have safety issues been discussed?			
Are there any outstanding issues that need to be addressed?			
Are there any unforeseen problems that may be encountered?			
Have underground utilities been marked out?			
Do the field teams have the necessary equipment and supplies to perform their tasks?			

Signature of attendees:	

AECOM

BORING LOG

Boring No.: (MW-)

PROJECT: NEAM ISCO Pilot Study	CONTRACTOR:	PAGE 1 OF 4
PROJECT No.: D007626.60284002	LOCATION: 2145 Dwyer Ave, Utica NY 13501	DATE:
SURFACE ELEVATION:	DATUM: DRILLER:	AECOM REP.:

WATER LEVELS			DRILLING AND SAMPLING				
DATE	TIME	DEPTH		CASING	SAMPLER	CORE	TUBE
			TYPE	Steel	split spoon		
			I.D.	6-inch	1 3/8 inch		
			WT./Fall	--	140 lbs.		

Depth (ft)	Sample Number & Time	Blows per/6"	Rec. (feet)	PID Readings (ppm)	SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					
13					
14					
15					
16					
17					
18					
19					
20					

AECOM

BORING LOG

Boring No.: (MW-)

PROJECT: NEAM ISCO Pilot Study

PROJECT No.: D007626.60284002

Depth (ft)	Sample Number & Time	Blows per/6"	Rec. (feet)	PID Readings (ppm)	SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES
20					
21					
22					
23					
24					
25					
26					
27					
28					
29					
30					
31					
32					
33					
34					
35					
36					
37					
38					
39					
40					

AECOM

BORING LOG

Boring No.: (MW-)

PROJECT: NEAM ISCO Pilot Study

PROJECT No.: D007626.60284002

Depth (ft)	Sample Number & Time	Blows per/6"	Rec. (feet)	PID Readings (ppm)	SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES
40					
41					
42					
43					
44					
45					
46					
47					
48					
49					
50					
51					
52					
53					
54					
55					
56					
57					
58					
59					
60					

AECOM

BORING LOG

Boring No.: (MW-)

PROJECT: NEAM ISCO Pilot Study

PROJECT No.: D007626.60284002

Depth (ft)	Sample Number & Time	Blows per/6"	Rec. (feet)	PID Readings (ppm)	SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES
60					
61					
62					
63					
64					
65					
66					
67					
68					
69					
70					
71					
72					
73					
74					
75					
76					
77					
78					
79					
80					

AECOM

BORING LOG

Boring No.: (MW-)

PROJECT: NEAM ISCO Pilot Study

PROJECT No.: D007626.60284002

Depth (ft)	Sample Number & Time	Blows per/6"	Rec. (feet)	PID Readings (ppm)	SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES
80					
81					
82					
83					
84					
85					
86					
87					
88					
89					
90					
91					
92					
93					
94					
95					
96					
97					
98					
99					
100					

AECOM

BORING LOG

Boring No.: (MW-)

PROJECT: NEAM ISCO Pilot Study

PROJECT No.: D007626.60284002

Depth (ft)	Sample Number & Time	Blows per/6"	Rec. (feet)	PID Readings (ppm)	SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES
100					
101					
102					
103					
104					
105					
106					
107					
108					
109					
110					
111					
112					
113					
114					
115					
116					
117					
118					
119					
120					

AECOM

BORING LOG

Boring No.: (MW-)

PROJECT: NEAM ISCO Pilot Study

PROJECT No.: D007626.60284002

Depth (ft)	Sample Number & Time	Blows per/6"	Rec. (feet)	PID Readings (ppm)	SAMPLE DESCRIPTION, REMARKS, AND STRATUM CHANGES
120					
121					
122					
123					
124					
125					
126					
127					
128					
129					
130					
131					
132					
133					
134					
135					
136					
137					
138					
139					
140					

SITE NAME: _____ SITE ID.: _____

INSPECTOR: _____

MONITORING WELL FIELD INSPECTION LOG

DATE/TIME: _____

WELL ID.: _____

	YES	NO
WELL VISIBLE? (If not, provide directions below)		

WELL COORDINATES? NYTM X _____ NYTM Y _____ See Report

PDOP Reading from Trimble pathfinder: _____ Satelites: _____

GPS Method (circle) Trimble And/Or Magellan

	YES	NO
WELL I.D. VISIBLE?		
WELL LOCATION MATCH SITE MAP? (if not, sketch actual location on back)		

WELL I.D. AS IT APPEARS ON PROTECTIVE CASING OR WELL: .....

	YES	NO
SURFACE SEAL PRESENT?		
SURFACE SEAL COMPETENT? (If cracked, heaved etc., describe below)		
PROTECTIVE CASING IN GOOD CONDITION? (If damaged, describe below)		

Cap does not close properly. Lid is not flush with casing.

HEADSPACE READING (ppm) AND INSTRUMENT USED ..... _____

TYPE OF PROTECTIVE CASING AND HEIGHT OF STICKUP IN FEET (If applicable) ..... _____

PROTECTIVE CASING MATERIAL TYPE: ..... _____

MEASURE PROTECTIVE CASING INSIDE DIAMETER (Inches): .....

	YES	NO
LOCK PRESENT?		
LOCK FUNCTIONAL?		
DID YOU REPLACE THE LOCK?		
IS THERE EVIDENCE THAT THE WELL IS DOUBLE CASED? (If yes,describe below)		
WELL MEASURING POINT VISIBLE?		

MEASURE WELL DEPTH FROM MEASURING POINT (Feet): ..... _____

MEASURE DEPTH TO WATER FROM MEASURING POINT (Feet): ..... _____

MEASURE WELL DIAMETER (Inches): ..... _____

WELL CASING MATERIAL: ..... _____

PHYSICAL CONDITION OF VISIBLE WELL CASING: ..... _____

ATTACH ID MARKER (if well ID is confirmed) and IDENTIFY MARKER TYPE ..... _____

PROXIMITY TO UNDERGROUND OR OVERHEAD UTILITIES ..... _____

DESCRIBE ACCESS TO WELL: (Include accessibility to truck mounted rig, natural obstructions, overhead power lines, proximity to permanent structures, etc.); ADD SKETCH OF LOCATION ON BACK, IF NECESSARY.

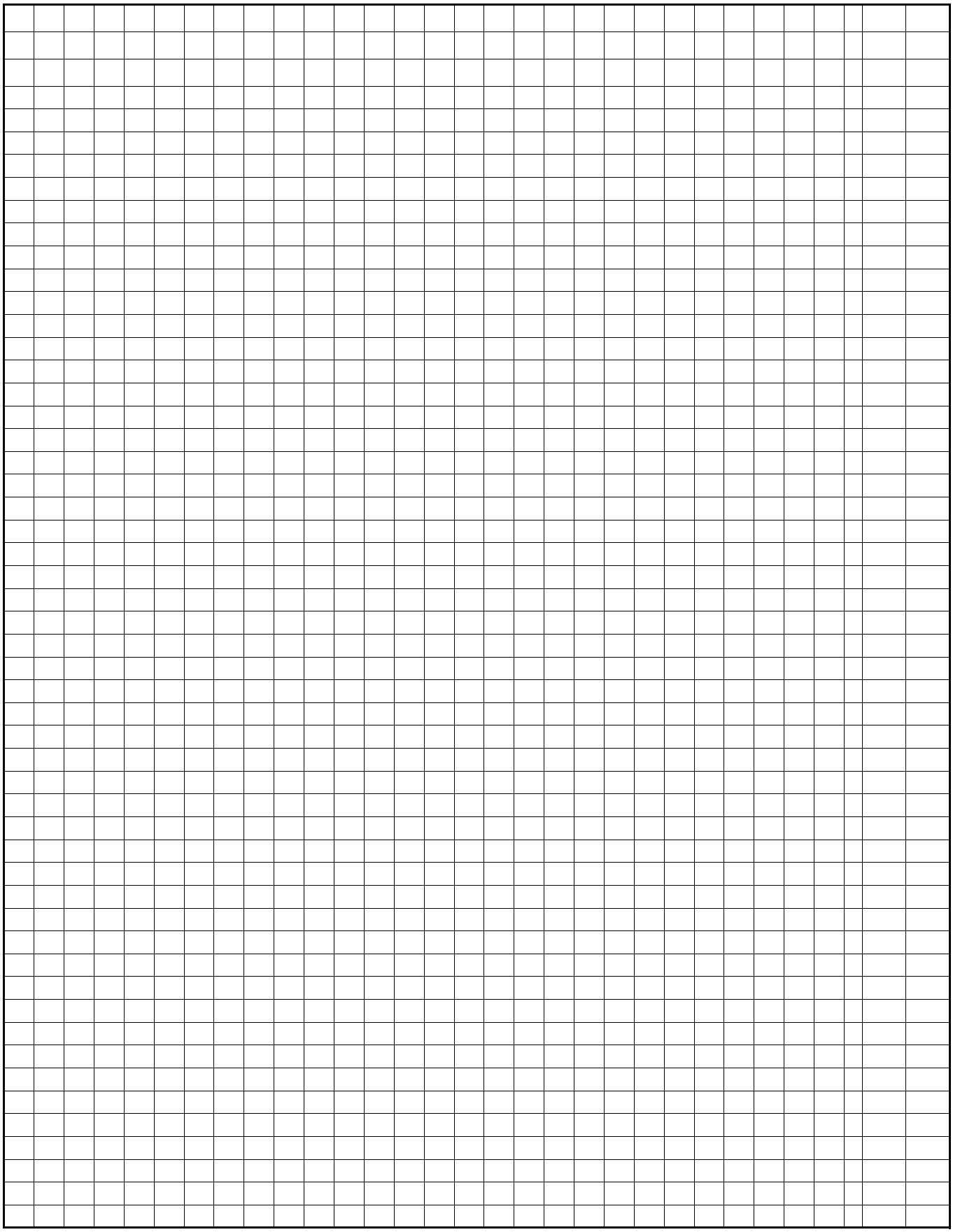
DESCRIBE WELL SETTING (For example, located in a field, in a playground, on pavement, in a garden, etc.) AND ASSESS THE TYPE OF RESTORATION REQUIRED.

IDENTIFY ANY NEARBY POTENTIAL SOURCES OF CONTAMINATION, IF PRESENT (e.g. Gas station, salt pile, etc.):

REMARKS:

MONITORING WELL INSPECTION LOG

SKETCH



AECOM

Well Sampling Form **WELL NO.**

WELL SAMPLING FORM	PROJECT: NEAM ISCO Pilot Study	PROJECT No.: D007626.60284002	SHEET: 1 OF SHEETS: 1
LOCATION: 2145 Dwyer Ave, Utica, NY 13501		DATE WELL STARTED:	DATE WELL COMPLETED:
CLIENT:		NAME OF INSPECTOR:	
DRILLING COMPANY:		SIGNATURE OF INSPECTOR:	

ONE WELL VOLUME : gallons WELL TD: ft PUMP INTAKE DEPTH: ft

Time	Depth to Water (ft)	Purge Rate (mL/min)	FIELD MEASUREMENTS: Temp. (°C)	Conduct. (µs/cm)	DO (mg/L)	pH	ORP	Turbidity (ntu)	REMARKS
									Static water level
									pump on

Pump Type: _____

Analytical Parameters: _____

Appendix B

Health and Safety Plan (HASP)

AECOM Environment

Prepared for:
Superfund Standby Program
NYSDEC
Albany, NY

Prepared by:
AECOM
Latham, NY
April 2014

Health & Safety Plan

Northeast Alloys & Metals ISCO Pilot Study
Northeast Alloys & Metals
Utica, NY 13501
WORK ASSIGNMENT D007626.60284002

Prepared for:

New York State Department of Environmental Conservation
625 Broadway
Albany, New York 12233

Prepared by:

AECOM Technical Services Northeast, Inc.
40 British American Boulevard
Latham, New York 12110

Project No: 60284002

Project Health and Safety Plan

This project Health and Safety Plan (HASP) was prepared for employees performing a specific, limited scope of work. It was prepared based on the best available information regarding the physical and chemical hazards known or suspected to be present on the project site. While it is not possible to discover, evaluate, and protect in advance against all possible hazards, which may be encountered during the completion of this project, adherence to the requirements of the HASP will significantly reduce the potential for occupational injury.

By signing below, I acknowledge that I have reviewed and hereby approve the HASP for the Northeast Alloy& Metals site. This HASP has been written for the exclusive use of AECOM. The plan is written for specified site conditions, dates, and personnel, and must be amended if these conditions change.

Prepared by:

Chris Norton — April 8th, 2014
Chris Norton
Engineer
(518) 951-2398
Date

Concurrence by:

Michael Grasso — April 7, 2014
Michael Grasso
Northeast District Safety, Health and Environmental Manager
(607) 277-5716 607-201-673
Date

Scott Underhill — 4-8-14
Scott Underhill, PE
Program Manager
(518) 951-2208
Date

Contents

List of Tables

List of Figures

Executive Summary

The purpose of this Health and Safety Plan (HASP) is to address health and safety concerns related to AECOM managed activities at the Northeast Alloys & Metals site, located at 2145 Dwyer Avenue in Utica, New York. The specific roles, responsibilities, authority, and requirements as they pertain to the safety of employees and the scope of services are discussed herein. The document is intended to identify known potential hazards and facilitate communication and control measures to prevent injury or harm. Additionally, provisions to control the potential for environmental impact from these activities are included where applicable.

SUMMARY TABLE					
AECOM SOW	AECOM will be performing soil sampling, monitoring well installation, ISCO injections pilot study, and quarterly groundwater sampling to support the RA effort on the site.				
Subcontractor A SOW	Subcontractor A will be injection a 10% Sodium Permanganate solution using direct push technology at 26 locations.				
Subcontractor B SOW	Subcontractor B will be cleaning the frac tank utilized to store the Sodium Permanganate and dispose of residual and cleaning solution.				
PRIMARY PHYSICAL HAZARDS					
x	Underground Utilities	x	Traffic Control	x	Electrical Hazards
x	Overhead Utilities	x	Slips, Trips/Walking Surface	x	Excavation & Trenching
x	Drill Rig Operations	x	Manual Lifting	x	Working adjacent to Railway
CHEMCIAL HAZARDS, MONITORING, ACTION LEVELS					
COC		MONITORING		ACTION LEVELS	
DCE, PCE, TCE, and VC		PID with 10.6eV		Upgrade to Level C at 1 ppm for COCs	

All staff will be bound by the provisions of this HASP and are required to participate in a preliminary project safety meeting to familiarize them with the anticipated hazards and respective onsite controls. The discussion will cover the entire HASP subject matter, putting emphasis on critical elements of the plan; such as the emergency response procedures, personal protective equipment, site control strategies, and monitoring requirements. In addition, daily tailgate safety meetings will be held to discuss: the anticipated scope of work, required controls, identify new hazards and controls, incident reporting, review the results of inspections, any lessons learned or concerns from the previous day.

1 Introduction

This Health and Safety Plan (HASP) (including Attachments A-E) provides a general description of the levels of personal protection and safe operating guidelines expected of each employee associated with the environmental services being conducted at the Northeast Alloy & Metals (NEAM) site, located at 2145 Dwyer Avenue in Utica, NY. This HASP also identifies chemical and physical hazards known to be associated with the AECOM-managed activities addressed in this document.

HASP Supplements will be generated as necessary to address any additional activities or changes in site conditions, which may occur during field operations. In addition to following this HASP and its supplements, all subcontractors will be required to develop and maintain their own HASP.

1.1 General

The provisions of this HASP are mandatory for all AECOM personnel engaged in fieldwork associated with the environmental services being conducted at the subject site. A copy of this HASP, any applicable HASP Supplements and the AECOM's North America Safety, Health, and Environmental (SH&E) Procedures and Manual shall be accessible on site and available for review at all times. Record keeping will be maintained in accordance with this HASP and the applicable Standard Operating Procedures (SOPs). In the event of a conflict between this HASP, the SOPs and federal, provincial, state, and local regulations, workers shall follow the most stringent/protective requirements. Concurrence with the provisions of this HASP is mandatory for all personnel at the site covered by this HASP and must be signed on the acknowledgement page.

1.2 Project Policy Statement

AECOM is committed to protecting the safety and health of our employees. We are also committed to protecting and preserving the natural environment in which we operate. The safety of persons and property is of vital importance to the success of this project and accident prevention measures shall be taken toward the avoidance of needless waste and loss. It shall be the policy of this project that all operations be conducted safely. Onsite supervisors are responsible for those they supervise by maintaining a safe and healthy working environment in their areas of responsibility, and by fairly and uniformly enforcing safety and health rules and requirements for all project personnel.

At a minimum, Subcontractors shall comply with the requirements of this HASP, provisions contained within the contract document and all applicable rules, requirements and health, safety and environmental regulations. All practical measures shall be taken to promote safety and maintain a safe place to work. Subcontractors are wholly responsible for the prevention of accidents on work under their direction and shall be responsible for thorough safety and loss control programs and the execution of their own Health and Safety plan for the protection of workers.

1.3 References

This HASP conforms to the regulatory requirements and guidelines established in the following documents:

- Title 29, Part 1910 of the Code of Federal Regulations (29 CFR 1910), *Occupational Safety and Health Standards* (with special attention to Section 120, *Hazardous Waste Operations and Emergency Response*).
- Title 29, Part 1926 of the Code of Federal Regulations (29 CFR 1926), *Safety and Health Regulations for Construction*.

- National Institute for Occupational Safety and Health (NIOSH)/OSHA/U.S. Coast Guard (USCG)/EPA, *Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities*, Publication No. 85-115, 1985.

2 Site Information and Scope of Work

AECOM will conduct environmental services at the NEAM site. Work will be performed in accordance with the applicable Statement of Work (SOW) and associated Project Work Plan developed for project site. Deviations from the listed SOW will require that a Safety Professional review and changes made to this HASP, to ensure adequate protection of personnel and other property.

The following is a summary of relevant data concerning the project site, and the work procedures to be performed. The Project Work Plan prepared by AECOM as a companion document to this HASP provides more detail concerning both site history and planned work operations.

2.1 Site Information

This section provides a general description and historical information associated with the site.

2.1.1 General Description

The NEAM site is situated 2145 Dwyer Avenue in the City of Utica, New York (Figure 9-1). The site served as the location to a former metal fabrication facility is located off of NY-5S E and approximately 3 miles east of the center of Utica.

2.1.2 Site Background/History

The site was a former metal fabrication/recycling facility that was operational from the 1950s into the early 1990s. The 3.9 acre site also included a commercial laundry facility during the 1970s. The primary contaminants of concern (COCs) are trichloroethene (TCE) and cis-1, 2-dichlorothene (cis-1,2-DCE). Previous investigations discussed in below, revealed reports identifying the potential sources of these contaminates that included a drum of TCE that had been pierced in the courtyard by a forklift and had discharged to a storm drain during the metal fabrication/recycling facility activities.

2.1.3 Previous Investigations

Previous actions have been taken to reduce the contamination at Area A and Area B. The following subsections summarize previous investigations and remedial actions that have been completed at the NEAM.

2.1.3.1 Remedial Investigation

In 1989, an underground fuel-oil storage tank was removed from the southwestern portion of the courtyard and the initial presence of VOCs contamination at the site was reported. Subsequent investigations resulted in the detection of VOCs in soil and groundwater. TCE and cis-1, 2-DCE were identified as COCs. The site was added to the NYSDEC Registry of Inactive Hazardous Waste Disposal Sites as a Class 2 site (site no. 6-33-045) following an environmental investigation in 1994. The remedial investigation/feasibility study (RI/FS) was completed in 1997 and a Record of Decision (ROD) was issued in March 1998.

2.1.3.2 Interim Remedial Actions

The selected remedy prompted by the 1997 RI/FS for the site included 1) installation of a groundwater collection and treatment system that discharges into the local publicly owned treatment works (POTW), 2) installation of a soil vapor extraction system at RW-1 and RW-2, 3) excavation of contaminated soil in the east gate area in the vicinity of MW-9 to meet soil cleanup objectives, 4) implementation of restrictions on groundwater use until groundwater standards are attained and 5) implementation of a site-wide operation, monitoring, and maintenance program to insure that the remedial program is effective and that the remedial action goals are obtained.

An operation, monitoring, and maintenance (OM&M) program was initiated after the remedial work was completed in March 2001. Previous groundwater sampling events were performed by Earth Tech and AECOM in May 2005, October 2005, August 2007, October 2008 (limited sampling), and October 2011 to monitor the effectiveness of the remedy on groundwater quality.

A subsurface investigation (SI) was performed in February and March 2008, to characterize the degree and extent of soil contamination around MW-6. During this investigation two possible sources of the contamination were identified, one in Area A and another in Area B. A supplemental subsurface investigation (SSI) was performed between August and October 2008 to delineate the vertical and horizontal extend of soil contamination. Figure 4 of the Work Plan (WP) shows the lateral extent of TCE and DCE above the NYSDEC Part 375 Commercial Use SCOs are limited to two locations: ETB-22 (10-10.5 foot interval) and ETB-44 (10-12 foot interval). The estimated volume of the impacted soils above commercial-use SCOs is approximately 300 cubic yards.

The wells installed in June 2013 within Area B (MW-15 and MW-16) and Area A (MW-17 and MW-18) contained elevated soil and ground water concentrations of VOCs, summarized in Table 2-1. MW-17 contains the highest known onsite concentration of VOCs at 253,300 µg/l. MW-6, located between the two source areas, continues to exhibit the highest concentration of total VOCs (3,524 µg/l) among the older monitoring wells. The concentration of VOCs reported in ground water samples collected in July 2013 are shown in Figure 5. Ground water samples collected from wells within the presumed capture zone of the groundwater recovery trench have much higher total VOC concentrations (up to three orders of magnitude higher) than the water collected from the trench, suggesting the trench is having only marginal recover of impacted groundwater.

Table 2-1 Previous Investigation Data

Contaminates Above Commercial Use SCOs	**Soil (ug/kg)		***Total VOCs in Groundwater (ug/l)
	TCE	DCE	VOCs
1st Highest Concentration	720,000	NED	253,300
2nd Highest Concentration	310,000	NED	12,910

NDE: No Exceedance Detected
*Values Referenced From WP: Figure 4** and Figure 5***

2.2 Scope of Work

The overall project objective is to conduct an ISCO injection pilot study for the remediation of chlorinated solvent-impacted soils and groundwater at NEAM.

Work will begin with the submission of the UIC to Region II USEPA and the finalization of the pilot study report. With the procurement of subcontractors, ISCO chemicals, and project-supporting materials/equipment, the ISCO injection system, as well as chemical storage, new monitoring wells/ injection points, and staging facilities can be built onsite subsequent of site preparation. Injections will commence targeting soils and groundwater with COCs above the soil cleanup objectives, occurring for approximately 2 weeks.

Groundwater and soil samples will be collected quarterly from impacted area monitoring wells, beginning three months after the conclusion of ISCO injections. During groundwater sampling, colorimetric testing will be conducted to determine concentrations of permanganate remaining in the groundwater. If the results of the soil sampling indicate that contaminate concentrations are still above the NYSDEC SCOs, then another round of injections may be proposed. If the results of the groundwater sampling indicate that contaminate concentrations are still above the SCOs, then additional monitoring will be performed to determine trends. Once the post-injection groundwater results show all contaminates below protection of groundwater SCOs, sampling will occur for additional monitoring, sampled quarterly for one year. The goal of site closure will be realized when all contaminates remain below SCOs for a year of consecutive quarters of sampling. Once the goal has been

achieved, demobilization of supporting materials, equipment, and infrastructure will be performed, including backfilling of soil bore holes with soil cuttings.

The steps detailed above will also be accompanied by additional activities that include decontamination, mobilization/demobilization, sampling, and site preparation. These additional activities included within the scope of work are discussed below.

2.2.1 Mobilization/Demobilization

Mobilization and demobilization represent limited pre and post-task activities. These activities include driving to and from the site; initial site preparations, such as chemical storage, handling, and decontamination area construction. This activity does not represent any intrusive activities. Electrical hook-up and disconnect for any equipment needing such must be performed by a licensed electrical subcontractor.

2.2.2 Site Preparation

Site preparation includes surveying of the injection points, utility mark-out and clearance, and the set-up of other work support related items such as delivery of the 20,000 gallon frac tank. All utility clearance shall be obtained by the authorizing authority for the subject site. If utility locations cannot be verified on-site by the public authority, then a private utility location contractor may need to be utilized to confirm/deny the presence of private underground utilities on the site. Typically lead time is 3 days and the permits generally valid for 10. Consult the specific clearance dates associated with the permit obtained for the site.

2.2.3 Groundwater Sampling

This activity will include the collection of groundwater samples from existing monitoring well network. Groundwater samples will be collected through low-flow sampling techniques using submersible pumps. The major activities involved with collecting groundwater samples from the site and surrounding properties include the following:

- Pre-sampling event notifications and approval
- Set-up for sampling activities
- Groundwater samples from monitoring wells will be collected low-flow sampling techniques using USEPA Method 8260.
- Sample prep and sample shipping
- Administrative activities

2.2.4 Soil Sampling

Soil samples will be collected from areas of impacted soils. During sampling activities, appropriate air monitoring will be conducted and the appropriate chemical resistant PPE will be worn to protect against exposure, as well as safety precautions taken when sampling involves use of a drill rig. The major activities involved with collecting samples from the site include the following:

- Pre-sampling event notifications and approval
- Set-up for sampling activities utilizing geoprobe rig
- Soil samples will be collected during the quarterly monitoring periods subsequent of the last ISCO injection using USEPA Method 8260B.
- Sample prep and sample shipping
- Administrative activities

2.2.5 Oversight of ISCO Injections

AECOM personnel will perform oversight of the ISCO injections at the NEAM facility for the remediation of TCE, DCE, and VOC impacted groundwater and soil. Activities include overseeing permanganate deliveries, setup of

the geoprobe rig at each injection location, delivery of the permanganate into the subsurface and site cleanup. AECOM personnel will also be responsible for performing all community air monitoring.

2.2.6 Investigative-Derived Waste (IDW) Management

IDW will be collected and categorized as non-hazardous or hazardous. Potentially hazardous IDW purge water, and decontamination fluids, and soil cuttings (if any) will be tested and disposed of within 90 calendar days of completing the field activities. Potentially hazardous IDW waste will be staged onsite, then delivered to an IDW storage facility for processing. Non-hazardous IDW (normal trash) will be disposed of in a timely fashion during fieldwork.

2.2.7 Equipment Decontamination

AECOM and subcontractor personnel will perform decontamination of equipment used to perform work within controlled work areas. Personnel leaving the designated EZ (exclusion zone) shall follow the decontamination that will be implementing on the site by others. Equipment that has contact impacted water or sediment shall be decontaminated and/or bagged prior to being brought into a clean area.

2.2.7.1 Decontamination Supplies

The basic supplies required to perform decontamination may vary based on site-specific conditions and the nature of the contaminant(s). The following equipment is commonly used for decontamination purposes:

- Soft-bristle scrub brushes or long-handled brushes to remove contaminants;
- Hoses, buckets of water or garden sprayers for rinsing;
- Large plastic/galvanized wash tubs or children's wading pools for washing and rinsing solutions;
- Large plastic garbage cans or similar containers lined with plastic bags for the storage of contaminated clothing and equipment;
- Metal or plastic cans or drums for the temporary storage of contaminated liquids; and
- Paper or cloth towels for drying protective clothing and equipment.

2.2.7.2 Personal Decontamination

Level D

<u>In the EZ (near boundary of Contaminate Reduction Zone (CRZ)):</u>

1. Equipment drop on plastic sheet
2. Remove the majority of gross contamination
3. Wash boot covers and outer gloves
4. Rinse boot covers and outer gloves
5. Remove tape
6. Remove boot covers and outer gloves

<u>In the CRZ:</u>

1. Wash protective suits and safety boots
2. Rinse protective suits and safety boots
3. Safety boot removal
4. Remove protective suit
5. Wash inner gloves
6. Rinse inner gloves

7. Remove inner gloves
8. Remove inner clothing (if necessary)

In the Support Zone (SZ):

1. Finish with personal decon/hygiene wash procedures
2. Redress (if necessary).

2.2.7.3 Small Equipment Decontamination

For small equipment, use the following steps for decontamination:

1. Remove majority of visible gross contamination in EZ.
2. Wash equipment in decontamination solution with a scrub brush and/or power wash heavy equipment.
3. Rinse equipment.
4. Visually inspect for remaining contamination.
5. Follow appropriate personal decontamination steps outlined above.

Pre-cleaned and dedicated sampling materials/equipment will be used to collect the soil and groundwater samples for laboratory analysis. After the samples are collected, any disposable, or one-time use equipment (tubing, bladders) will placed in a plastic bag for disposal per accordance with the paragraph above. Non-disposable sampling and drilling equipment that contacted the soil and/or groundwater will be decontaminated between each sampling location. Gross sediments and/or contamination will first be removed from the sampling and drilling equipment. The equipment will then be washed with DI water and Alconox detergent and then rinsed with DI water, methanol, etc.

All decontaminated equipment shall be visually inspected for contamination prior to leaving the CRZ. Signs of visible contamination may include an oily sheen, residue or contaminated sediments left on the equipment. All non-disposable equipment with visible signs of contamination shall be re-decontaminated until clean. Depending on the nature of the contaminant, equipment may have to be analyzed using a wipe method or other means.

Before any drilling is begun, and at the completion of drilling, the drilling subcontractor shall decontaminate the drill rig, casing, samplers, and all other drilling equipment that will be used on site. The drilling subcontractor shall provide a high-pressure steam cleaner for decontamination of all downhole drilling equipment. The drill rig shall be steam-cleaned between drilling at each site. Soil sampling equipment shall be decontaminated between each use, using a phosphate free detergent and potable water in accordance with ASTM D 5088. The drilling subcontractor shall construct a temporary decontamination pad to contain all decontamination water generated during decontamination of drill rigs and tools.

2.2.8 Site Restoration

AECOM does not anticipate any site restoration activities to be included in this pilot study. However equipment brought onsite will be removed, including ISCO injection equipment, drill rigs, and chemical handling/storage. The decontamination area will be deconstructed and soil cuttings will be placed back into soil boreholes. Hazardous waste that includes used PPE will be disposed of properly as detailed in the WP, Section 6.

2.2.9 Additional Work Operations

Operations at the site may require additional tasks not identified in this section or addressed in Attachment A, Task Hazard Analysis (THAs). Before performing any task not covered in this HASP a THA must be prepared, and approved by the Safety Professional.

3 Hazard Assessment (Safety)

3.1 Physical Hazards

The following physical hazards are anticipated to be present on the site. Additional hazards may be noted on the THA's developed for the individual tasks.

3.1.1 Slips, Trips, Falls, and Protruding Objects

A variety of conditions may exist that may result in injury from slips, trips, falls, and protruding objects. Slips and trips may occur as a result of wet, slippery, or uneven walking surfaces. To prevent injuries from slips and trips, always keep work areas clean; keep walkways free of objects and debris; and report/clean up liquid spills. Serious injuries may occur as a result of falls from elevated heights. Always wear fall protection while working at heights of 6 feet or greater above the next lower level. Protruding objects are any object that extends into the path of travel or working area that may cause injury when contacted by personnel. Always be aware of protruding objects and when feasible remove or label the protruding object with an appropriate warning.

3.1.2 Housekeeping

During site activities, work areas will be continuously policed for identification of excess trash and unnecessary debris. Excess debris and trash will be collected and stored in an appropriate container (e.g., plastic trash bags, garbage can, roll-off bin) prior to disposal. At no time will debris or trash be intermingled with waste PPE or contaminated materials. Additional information on the requirements of housekeeping can be found in S3NA 307 PR, *Housekeeping, Worksite*.

3.1.3 Manual Lifting

Most materials associated with investigation and remedial activities are moved by hand. The human body is subject to severe damage in the forms of back injury, muscle strains, and hernia if caution is not observed in the handling process. Whenever possible, use mechanical assistance to lift or move materials and at a minimum, use at least two people to lift, or roll/lift with your arms as close to the body as possible. For additional requirements, refer to S3NA 308 PR, *Manual Lifting* and S3NA 308 WI, *Manual Lifting Safe Work Practices.*

3.1.4 Utilities

Various forms of underground/overhead utility lines or pipes may be encountered during site activities. Prior to the start of intrusive operations, utility clearance is mandated, as well as obtaining authorization from all concerned public utility department offices. If insufficient data is available to accurately determine the location of the utility lines, the drilling subcontractor will hand clear to a depth of at least 5 feet below ground surface in the proposed areas of subsurface investigation. Should intrusive operations cause equipment to come into contact with utility lines, the SSO and an AECOM SH&E Professional will be notified immediately. Work will be suspended until the applicable utility agency is contacted and the appropriate actions for the particular situations can be taken. The phone number for the applicable state agency is provided in the Emergency Contacts list found in Section 8. For additional requirements, refer to S3NA 417 PR, *Utilities Underground*.

Verify that backhoe operator, truck drivers, etc. and signal person are aware of overhead power lines when working around overhead power lines. Overhead power and utility lines may be present on, or adjacent to, the site and represent a potential hazard during the mobe/demobe of equipment and supplies. Maintain a minimum of 10 feet between overhead power lines and the bucket and/or arm of the backhoe bed/cab of trucks, etc. Any deviation must be approved by the Regional Health & Safety Manager. Additional information on working adjacent to overhead power and utility lines can be found in S3NA 406 PR, *Electrical Lines, Overhead*.

3.1.5 Electrical hazards

Electrical and powered equipment may be used during a variety of site activities. Injuries associated with electrical and powered equipment include electric shock, cuts/lacerations, eye damage (from flying debris), and burns. To reduce the potential of injury from the hazards associated with electrical and powered equipment, always comply with the following:

- Use ground fault circuit interrupters (GFCIs) when using electrical powered tools/equipment. GFCIs prevent electrical shock by detecting the loss of electricity from a power cord and/or electrical device.
- Verify generators are properly grounded, including the use of a grounding rod, driven to a depth of 3-feet.
- Wear ANSI-approved (Z87.1) safety glasses. Face shields may be required to provide additional face protection from flying debris.
- Wear appropriate work gloves. Work gloves may reduce the severity of burns and cuts/lacerations.

All temporary electric installations (site trailer, subpanels) will comply with OSHA (29 CFR 1926, Subpart K, and 29 CFR 1910, Subpart S) guidelines. Only qualified and competent individuals (licensed electrician) will provide electrical service/servicing. Refer to S3NA 410 PR, *Hazardous Energy Control*, for additional requirements and information.

3.1.6 Lock-Out/Tag-Out Procedures

Use lockout/tagout procedures when performing maintenance or repairs on equipment.

It is the responsibility of AECOM employees to verify that all remediation equipment is locked out before AECOM employees perform any maintenance or repair work on the system. **The source must be locked out; it is not enough to push the power switch to off and disconnect the breaker. Anyone can re-engage power under these circumstances. Locking out the power source is the only way to guarantee that the power will not be inadvertently reactivated.**

A lock-out/tag-out kit will be located in the treatment shed for the duration of the project. The kit includes standard locks, keys and lock-out notices.

The site specific lock-out/tag-out information must be completed for both the groundwater containment system and the SSD system. These forms will then be placed within the remediation trailer so all field technicians performing operations and maintenance work on the system are familiar with how to lock-out the system when necessary. Refer to S3NA 410 PR, *Hazardous Energy Control*, for additional information and requirements.

3.1.7 Heavy Equipment and Vehicle Operations

Heavy equipment and site vehicles present serious hazards site personnel. Blind spots, failure to yield, and other situations may cause heavy equipment/vehicles to come into contact with personnel. To reduce the possibility of contact between equipment/traffic and personnel, always adhere to the following:

- Personnel must wear a high visibility, reflective safety vest at all times when working near heavy equipment and/or other vehicle traffic.
- Personnel must always yield to equipment/vehicle traffic and stay as far as possible from all equipment/vehicle traffic. Always maintain eye contact with operators.
- When feasible, place barriers between work areas and equipment/vehicle traffic.
- Always ensure reverse warning alarms are working and louder than surrounding noise. Personnel must report inoperative reverse warning alarms.
- Ensure Daily Equipment Safety Inspections are being performed and documentation filed at the site.

For additional requirements, refer to S3NA 309 PR, *Mobile or Heavy Equipment*.

3.1.8 Drilling Operations

Drilling operations, including hollow-stem, rotary and/or direct push drilling, present their own set of hazards. Several basic precautions that should be taken include, but are not limited to, confirming locations of underground and overhead utilities, wearing of appropriate PPE and the avoidance of loose clothing or jewelry, staying clear of moving parts, knowing the locations of emergency shut-off switches. Other operational safety precautions regarding moving the drilling equipment, raising and lowering the derrick (mast), and drilling can be found in S3NA 405 PR*, Drilling and Boring.*

3.1.9 Excavations and Trenches

It is not anticipated that AECOM and its subcontractors propose excavations and trenches.

3.1.10 Aerial Lifts

AECOM does not anticipate the use of aerial lifts in this project. If use of an aerial lift is required, the HASP will be revised to include aerial lift safety precautions and AECOM will refer to S3NA 408 PR, *Elevated Work Platforms and Aerial Lifts* and for additional requirements regarding aerial lifts.

3.1.11 Working At Heights

Fall Protection - Fall Protection Systems shall comply with OSHA Regulations (Standards – 29 CFR) Standard # 1926.502 Fall Protection Systems Criteria and Practices and OSHA Standard # 1926.502(d) – 1926 Subpart M App C Personal Fall Arrest Systems.

Specifically, anyone working in an area exposed to a fall greater than 6 feet must use appropriate fall protection. Such protection includes: guardrail systems, safety net systems or personal fall arrest systems. Other protection methods include hole-covers, positioning devices, equipment guards, fences and barricades. Fall protection shall be provided as required in OSHA Regulations 29CFR1910 and 29CFR1926, reference: standard 1926.501 Duty to Have Fall Protection.

Work above a height of 6 feet requires a fall protection system. This project requires 100% tie off using full-body harness (Class III or IV) with dual shock-absorbing lanyard (shorter than fall distance and a maximum 6 ft. long) equipped with double-locking hooks connected to a proper tie-off attachment point capable of handling potential fall loads of 5,000 pounds.

Fall protection systems classified as “job made” (not purchased approved fall prevention devices from a fall protection supplier) shall be designed by a Registered Professional Engineer. Fall protection or restraining methods shall be in place when employees are within 6 feet of the leading or exposed edge, where a fall hazard exceeding 6 feet exists, such as during decking activities, inspecting structures, climbing, trenching, etc.

Refer to S3NA 304 PR, *Fall Protection and Working at Heights* for additional requirements when working at heights.

3.1.12 Dust and Odor Control

Specific controls will be in place to prevent dust generation. If dust is observed reaching or approaching the site boundary, activities causing the dust will be immediately stopped. Dust control measures (water spray, soil covers, slower work pace, or change in work activities) will be deployed prior to resuming work. Corrective measures will be documented in the daily report.

Due to the nature of the contaminant at the site, odors are not anticipated to be of concern. In the event that an odor complaint is received, the SS and/or SSO will immediately assess site conditions and determine the probable cause or causes. Appropriate odor mitigation measures will be deployed. These measures may include covering soil cuttings, deploying odor suppressing foam, implementation of air monitoring or discontinuing activities that are generating the odor. Corrective measures will be documented in the daily report.

3.1.13 Spill Prevention

Work activities may involve the use of hazardous materials (i.e. fuels, solvents) or work involving drums or other containers. The following procedures will be used to prevent or contain spills:

- All hazardous material will be stored in appropriate containers
- Tops/lids will be placed back on containers after use.
- Containers of hazardous materials will be stored appropriately away from moving equipment.

At least one spill response kit, to include an appropriate empty container, materials to allow for booming or diking the area to minimize the size of the spill, and appropriate clean-up material (i.e. speedy dri) shall be available at each work site (more as needed).

- All hazardous commodities in use (i.e. fuels) shall be properly labeled.
- Containers shall only be lifted using equipment specifically manufactured for that purpose.
- For drums/containers, follow the procedures in S3NA 308 WI, *Manual Lifting Safe Work Practices*, to minimize spillage.

3.1.14 Noise Exposure Monitoring

When heavy equipment is in operation, it will be necessary to ensure that each exclusion zone fully encompasses all areas where hazardous noise levels are present (85dBA or greater). Once each work day, the SSO will use a sound level meter to survey the perimeter of each exclusion zone, while all onsite heavy equipment within the zone is being operated simultaneously. If the sound pressure level exceeds 85 dBA at any location along the site perimeter, the SSO will exit the exclusion zone and use the meter to determine the 85 dBA limit. The exclusion zone boundary will then be adjusted to fully encompass this region. Refer to S3NA 510 PR, *Hearing Conservation Program*, for additional information and requirements.

3.1.15 Traffic Control

During certain work tasks, the establishment of traffic control to adequately protect workers and the public may be required on-site. Site specific requirements will be determined by the site supervisor/SSO on a case-by-case basis. Only approved traffic control devices per accordance with the Manual of Uniform Traffic Control Devices (MUTCD) will be used on public road ways per accordance with the applicable State regulatory guidance.

General traffic control precautions include placing a work vehicle between your worksite and oncoming traffic whenever possible. Not only is it a large, visible warning sign, but also if an oncoming car should fail to yield or deviate, the parked vehicle rather than your body would absorb the first impact of a crash. Turn the vehicle wheels so that if it was struck, it would swing away from the worksite. When using cones or other devices to modify traffic flow, ensure use of the proper taper length and device spacing to provide adequate warning distance to on-coming motor vehicles. In addition, proper PPE is to be worn during traffic operations, to include hardhat and high-visibility vests. Refer to S3NA 306 PR, *Highway and Road Work*, for additional requirements.

3.2 Biological Hazards

It is anticipated that numerous biological hazards will be present on the project site. Poisonous plants may be found along the tree lines, and adjacent to monitoring wells, along with ticks and other biting insects. Stinging insects, such as bees and wasps may build nests inside of monitoring wells or be within proximity of the work zone. Below is a discussion of the most common biological hazards found on project sites, and those anticipated to be of concern here.

3.2.1. **Small Mammals**

Working in the field either directly or indirectly with small mammals have inherent risks of injury or exposure to zoonotic diseases (infectious diseases that can be transmitted from animals to humans) that all field staff need to protect themselves against.

The risks are usually higher when there is direct contact with a wild animal, either through a break in the skin (blood), saliva, or excrement; however, there are also risks through air-borne diseases (e.g., Hantavirus).

Obviously, wildlife biologists directly handling wildlife, dead or alive, or working with wildlife feces or in enclosed habitats (such as caves), have an increased risk of exposure to a wider range of zoonotic diseases and should take extra precautions.

3.2.2. Venomous Animals

Some animals have the ability to inject venom. These include: rattlesnakes, black widow spiders, and scorpions. These all have limited distributions, so in most areas you are unlikely to encounter them. Other spiders possess venom but they are not harmful to humans. Shrews have poisonous saliva but the chance of being envenomated by them is extremely unlikely unless they are handled.

If bitten by any of these animals special care should be taken to treat the wound as it may lead to complications due to the toxin.

A bite from a venomous snake, which may inject varying degrees of toxic venom, is rarely fatal but should always be considered a medical emergency.

3.2.3. Poisonous Plants

Sensitivity to toxins generated by plants, insects and animals varies according to dosage and the ability of the victim to process the toxin, therefore it is difficult to predict whether a reaction will occur, or how severe the reaction will be. Staff should be aware that there are a large number of organisms capable of causing serious irritations and allergic reactions. Some reactions will only erupt if a secondary exposure to sunlight occurs. Depending on the severity of the reaction, the result can result in severe scarring, blindness or even death.

Plants that field staff should recognize and take precautions to avoid include: Poison Sumac, Poison Ivy (terrestrial and climbing), Poison Oak, Giant Hogweed (or Giant Cow Parsnip), Wild Parsnip, Devil's Club and Stinging Nettle. Many others are extremely poisonous to eat (e.g., Poison Hemlock; Water Parsnip) – do not eat anything that has not been identified.

A large number of plants are not harmful to touch but may contain poisonous berries or foliage that could cause serious complications or death if they are ingested. It goes without saying not to eat any berries or plants that you are not absolutely sure of their identity. Examples of common poisonous or irritating plant species, common to the United States, are shown in Table 3-1.

Table 3-1 Hazardous Plant Identification Guide

Poison Ivy • Grows in West, Midwest, Texas, East • Several forms – vine, trailing shrub, or shrub • Three leaflets (can vary 3-9) • Leaves green in summer, red in fall • Yellow or green flowers • White berries	 

Poison Oak • Grows in the East (NJ to Texas), Pacific Coast • 6-foot tall shrubs or long vines • Oak-like leaves, clusters of three • Yellow berries		

3.2.4. Insects

Insects for which precautionary measures should be taken include: mosquitoes (potential carriers of disease aside from dermatitis), black flies, wasps, bees, ticks, and European Fire Ant.

Wasps and bees will cause a painful sting to anyone if they are harassed. They are of most concern for individuals with allergic reactions who can go into anaphylactic shock. Also instances where an individual is exposed to multiple stings can cause a serious health concern for anyone. These insects are most likely to sting when their hive or nest is threatened.

Ticks can be encountered when walking in tall grass or shrubs. They crawl up clothing searching for exposed skin where they will insert mouthparts to drink blood. Most serious concern is possibility of contracting Lyme disease which is spread by the Black-legged or Deer Tick. Occasionally a tick can cause Tick Paralysis if it is able to remain feeding for several days. Full recovery usually occurs shortly after the tick is removed.

The European Fire Ant is spreading in Southern Ontario and often very abundant where it is established. It is very aggressive and commonly climbs up clothing and stings unprovoked when it comes into contact with skin. Painful irritations will persist for an hour or more.

3.3 Radiological Hazards

It is not anticipated that AECOM proposed services will encounter radiological hazards.

3.4 Ultraviolet Hazards

Workers performing field work outdoors may be susceptible to sunburn if not properly protected with sunscreen or protective clothing and hats. Skin can burn in minutes when the UV Index is VERY HIGH. Protective measures are advisable.

3.5 Weather Hazards

The Site Safety Officer will be attentive to daily weather forecasts for the project area each morning. Predicted weather conditions of potential field impact are to be included in safety briefings and the Task Hazard Analysis (THA) for that day. Weather changes should initiate a review and updates (THA) as necessary. Weather-related hazards will directly correlate to the type of weather involved. Hot, dry weather may cause greater dust emissions, particularly during intrusive activities. Rain may increase slip/trip hazards, particularly for ground workers.

Severe weather can occur with little warning. Employees will be vigilant for the potentials for storms, lightning, high winds, and flash flood events. Additionally, lightning strikes during electrical storms could also be a potential hazard. The following procedures will be implemented once thunder is heard or lightning spotted:

1) If thunder is heard, all site personnel are to be alert of any visible lightning flashes. The SSO will observe the storm front and track the direction it is moving. The SSO will continue to observe the storm front until it passes or until the prevailing direction is determined to be away from the site.

2) If lightning is observed, the SS or SSO are to be notified. When the next lightning flash is observed, a "second" count shall be initiated from the time the lightning is observed until the thunder from the strike is heard.

3) The following action guidelines shall be implemented once the "second" count is ≤ 30 seconds:

   a) "second" count > 30, the SS or SSO will continually observe the storm front. If the front is moving away, work will continue. If the front is moving towards the site, the SS will initially place workers on alert for potential evacuation.

   b) "second" count ≤ 30, the SS will issue the evacuation command and all workers are to report to the break/lunch trailer. Work can be re-initiated once the front has passed by and thunder has not been heard for 30 minutes.

4) If lightning is observed and the storm front is moving away from or around the site and is > 20 miles away, work will be permitted to continue. The location of the storm can be confirmed via internet access to a local weather website that has a Doppler radar tracking system.

3.6 Other Hazards

In the event AECOM and/or its subcontractors encounter hazards not address in these HASP, additional THAs will be developed and reviewed for approval by the project SH&E Professional. Following approval, the HASP will be updated to include the new THA in Attachment A.

3.7 Hazard Analysis

Task Hazard Analyses (THAs) will be completed for all tasks identified in the Scope of Work (Attachment A):

- Mobilization/Demobilization
- Site Preparation
- Clearing & Grubbing
- Groundwater Sampling
- Surface Water Sampling
- Soil Sampling
- Temporary Boring and Well Installation Oversight
- Well Abandonment Oversight
- Operations and Maintenance of ISCO Pilot System
- Investigative-Derived Waste (IDW) Management
- Equipment Decontamination
- Site Restoration

Unanticipated Work Activities/Conditions

As a result of unanticipated work activities or changing conditions, additional THAs may be required. All additional THAs will be reviewed and approved by the SH&E Professional (Attachment A).

3.8 Task Specific SH&E Procedures

As discussed in Section 5.0, personnel may be exposed to a variety of chemical, physical, and radiological hazards resulting from task or equipment-specific activities. The controls for many of these hazards are discussed in SOPs found in the **Series 300 to 500** Series of the North America SH&E SOPs.

Table 3-2 Applicable SOPs

	SOP#	TITLE		SOP#	TITLE
S3NA 300 Series—Field(Common)			S3NA 500 Series—Industrial Hygiene		
☐	S3NA-301-PR	Confined Spaces	☐	S3NA-501-PR	Asbestos
☒	S3NA-302-PR	Electrical, General	☐	S3NA-502-PR	Benzene
☐	S3NA-303-PR	Excavation and Trenching	☐	S3NA-503-PR	Blood borne Pathogen Program
☐	S3NA-304-PR	Fall Protection	☐	S3NA-504-PR	Cadmium
☒	S3NA-305-PR	Hand and Power Tools	☒	S3NA-505-PR	Cold Stress Prevention
☐	S3NA-306-PR	Highway and Road Work	☒	S3NA-506-PR	Compressed Gases
☒	S3NA-307-PR	Housekeeping, Worksite	☒	S3NA-507-PR	Hazardous Materials Communication / WHMIS
☒	S3NA-308-PR	Manual Lifting, Field	☒	S3NA-508-PR	Hazardous Materials Handling and Shipping
☒	S3NA-309-PR	Mobile or Heavy Equipment	☒	S3NA-509-PR	Hazardous Waste Operations and Emergency Response Activities
☐	S3NA-310-PR	Rigging, Hoisting, Cranes and Lifting Devises	☒	S3NA-510-PR	Hearing Conservation Program
☐	S3NA-311-PR	Scaffolding	☒	S3NA-511-PR	Heat Stress Prevention
☐	S3NA-312-PR	Ladders and Stairways	☐	S3NA-512-PR	Laboratory Safety
☒	S3NA-313-PR	Wildlife, Plants and Insects	☐	S3NA-513-PR	Lead
☒	S3NA-314-PR	Working Alone & Remote Travel	☐	S3NA-514-PR	Munitions and Explosives of Concern / Unexploded Ordnance (MEC-UXO)
☐	S3NA-315-PR	Water, Working Around	☐	S3NA-515-PR	Nanotechnology
			☐	S3NA-516-PR	Radiation Safety Programs
S3NA 400 Series Field (Uncommon)			☐	S3NA-517-PR	Radiation, Non-Ionizing
☐	S3NA-401-PR	Aircraft Charters	☐	S3NA-518-PR	Radiation, Gauge Source program
☐	S3NA-402-PR	All Terrain Vehicles (ATVs)	☒	S3NA-519-PR	Respiratory Protection Program
☐	S3NA-403-PR	Avalanches	☒	S3NA-520-PR	Spill Response, Incidental
☒	S4NA(US)-404-PR	Commercial Motor Vehicles			
☒	S3NA-405-PR	Drilling and Boring			
☒	S3NA-406-PR	Electrical Lines, Overhead			
☐	S3NA-407-PR	Electro-fishing			
☐	S3NA-408-PR	Elevated Work Platforms and Aerial Lifts			
☐	S3NA-409-PR	Forklifts (operation of)			
☐	S3NA-410-PR	Hazardous Energy Control			
☐	S3NA-411-PR	Machine Guarding			
☐	S3NA-412-PR	Powder-Actuated Tools			

☒	S4NA(US)-413-PR1	Process Safety Management
☐	S4NA(US)-414-PR	Railway Sites
☐	S4NA(US)-415-PR	RCRA Regulated Facilities
☐	S3NA-416-PR	Tunnel and Underground Work
☒	S3NA-417-PR	Utilities, Underground
☐	S3NA-418-PR	Welding, Cutting and Other Hot Work
☐	S3NA-419-PR	Water, Marine Operations, Boating
☐	S3-NA420-PR	Water, Underwater Diving

4 SH&E Requirements (Safety)

4.1 HAZWOPER Qualifications

Personnel performing work at the job site must be qualified as HAZWOPER workers in accordance with 29 CFR 1910.120 (unless otherwise noted in specific THAs or by the SSO), and must meet the medical monitoring and training requirements specified in the AECOM's North America SH&E Standard Operating Procedures.

If site monitoring procedures indicate that a possible exposure has occurred above the OSHA permissible exposure limit (PEL), employees may be required to receive supplemental medical testing to document any symptoms that may be specific to the particular materials present.

4.2 Site-Specific Safety Training

All AECOM personnel performing activities at the site will be trained in accordance with *S3NA-003-PR SH&E Training.* All personnel are required to remain current in all of their required training and evaluate their need for additional training when there is a change in work. In addition to the general health and safety training programs, personnel will be required to complete any supplemental task specific training developed for the tasks to be performed. Administration and compliance with the requirements for additional task-specific training will be the responsibility of the project or lead manager. Any additional required training that is completed will be documented and tracked in the project files.

4.2.1 Competent Person Training Requirements

In order to complete the planned scope of work, an (OSHA conformance) competent person must be designated to perform the required daily onsite inspections of operations and/or equipment. The competent person may be an AECOM (if responsible for supervising that activity) or the subcontractor's employee. Designated competent person(s) for this project are shown in Table 4-2:

Table 4-1 Task-Specific Competent Persons

Employee Name	Organization	Area of Competency
	AECOM	Respiratory Protection (S3NA 519 PR)

Note: The training requirements for competent persons are specified in the indicated SOPs and/or *S3NA-202-PR Competent Person Designation*. By identifying an employee as a "competent person", that person has now been authorized to take prompt corrective measures to eliminate hazards.

4.3 Tailgate Meetings

Prior to the commencement of daily project activities, a tailgate meeting will be conducted by the SSO to review the specific requirements of this HASP, applicable THA. Attendance at the daily tailgate meeting is mandatory for all employees at the site covered by this HASP and must be documented on the attendance form. All safety training documentation is to be maintained in the project file by the SSO.

4.4 Hazard Communication

Hazardous materials that may be encountered as existing on-site environmental or physical/health contaminants during the work activities are addressed in this HASP and their properties, hazards and associated required controls will be communicated to all affected staff and subcontractors.

In addition, any employee or organization (contractor or subcontractor) intending to bring any hazardous material onto this AECOM-controlled work site must first provide a copy of the item's Material Safety Data Sheet (MSDS)/Safety Data Sheet (SDS) to the SSO for review and filing (the SSO will maintain copies of all MSDS/SDS on site). MSDS/SDS may not be available for locally-obtained products, in which case some alternate form of product hazard documentation will be acceptable in accordance with the requirements of *S3NA-507-PR Hazardous Materials Communication/WHMIS*.

All personnel shall be briefed on the hazards of any chemical product they use, and shall be aware of and have access to all MSDS/SDS.

All containers on site shall be properly labeled to indicate their contents. Labeling on any containers not intended for single-day, individual use shall contain additional information indicating potential health and safety hazards (flammability, reactivity, etc.).

Attachment B provides copies of MSDS/SDS for those items planned to be brought on site at the time this HASP is prepared. This information will be updated as required during site operations.

4.5 Confined Space Entry

Confined space entry is not anticipated for this site. If confined spaces are identified, the SSO/site supervisor will inform all employees of the location of confined spaces and prevent unauthorized entry. Confined space entry procedures and training requirements are listed in S3NA 301 PR, *Confined Spaces.*

4.6 Hazardous, Solid, Or Municipal Waste

If hazardous, solid, and/or municipal wastes are generated during any phase of the project, the waste shall be accumulated, labeled, and disposed of in accordance with applicable Federal, State, Provincial, Territorial and/or local regulations. Consult the Regional SH&E Manager for further guidance.

4.7 General Safety Rules

All site personnel shall conduct themselves in a safe manner and maintain a working environment that is free of additional hazards, in adherence to *S3NA-001-PR Safe Work Standards and Rules* and *S3NA-307-PR Housekeeping, Worksite*.

4.7.1 Housekeeping

During site activities, work areas will be continuously policed for identification of excess trash and unnecessary debris. Excess debris and trash will be collected and stored in an appropriate container (e.g., plastic trash bags, garbage can, roll-off bin) prior to disposal. At no time will debris or trash be intermingled with waste PPE or contaminated materials.

4.7.2 Smoking, Eating, or Drinking

Smoking, eating and drinking will not be permitted inside any controlled work area at any time. Field workers will first wash hands and face immediately after leaving controlled work areas (and always prior to eating or drinking). Consumption of alcoholic beverages is prohibited at any AECOM site. Smoking, eating or drinking must be in an approved area.

4.7.3 Personal Hygiene

The following personal hygiene requirements will be observed:

Water Supply: A water supply meeting the following requirements will be utilized:

> *Potable Water* - An adequate supply of potable water will be available for field personnel consumption. Potable water can be provided in the form of water bottles, canteens, water coolers, or drinking fountains. Where drinking fountains are not available, individual-use cups will be provided as well as adequate

disposal containers. Potable water containers will be properly identified in order to distinguish them from non-potable water sources.

Non-Potable Water - Non-potable water may be used for hand washing and cleaning activities. Non-potable water will not be used for drinking purposes. All containers of non-potable water will be marked with a label stating:

Non-Potable Water
Not Intended for Drinking Water Consumption

Toilet Facilities: A minimum of one toilet will be provided for every 20 personnel on site, with separate toilets maintained for each sex except where there are less than 5 total personnel on site. For mobile crews where work activities and locations permit transportation to nearby toilet facilities on-site facilities are not required.

Washing Facilities: Employees will be provided washing facilities (e.g., buckets with water and Alconox) at each work location. The use of water and hand soap (or similar substance) will be required by all employees following exit from the Exclusion Zone, prior to breaks, and at the end of daily work activities.

4.7.4 Buddy System

All field personnel will use the buddy system when working within any controlled work area. Personnel belonging to another organization on site can serve as "buddies" for AECOM personnel. Under no circumstances will any employee be present alone in a controlled work area. For areas not in controlled work areas, the procedures outlined in *S3NA-314-PR Working Alone and Remote Travel* will be followed at all times.

4.8 Stop Work Authority

All employees have the right and duty to stop work when, in their opinion conditions are unsafe, and to assist in correcting these conditions as outlined in *S3NA-002-PR, Stop Work Authority*. Whenever the SSO determines that workplace conditions present an uncontrolled risk of injury or illness to employees, immediate resolution with the appropriate supervisor shall be sought. Should the supervisor be unable or unwilling to correct the unsafe conditions, the SSO is authorized and required to stop work, which shall be immediately binding on all affected AECOM employees and subcontractors.

Upon issuing the stop work order, the SSO shall implement corrective actions so that operations may be safely resumed. Resumption of safe operations is the primary objective; however, operations shall not resume until the Safety Professional has concurred that workplace conditions meet acceptable safety standards.

4.9 Client Specific Safety Requirements

Currently, the client has specified no additional health and safety requirements. In the event Client-specific safety requirements are announced, client-specific health and safety guidelines will be included in Attachment E of this HASP. All site activities must be performed in accordance with client-specific requirements and procedures.

5 Exposure Monitoring Procedures (Health)

5.1 Contaminant Exposure Hazards

The following is a discussion of the hazards presented to worker personnel during this project from on-site chemical and radiological hazards known, suspected or anticipated to be present on site.

Exposure symptoms and applicable first aid information for each suspected site contaminant identified in the Scope of Work are located in the following subsections.

5.1.1 cis-1,2-Dichloroethene

1,2-Dichloroethene (1,2-DCE) can occur as an odorless organic liquid commonly used as a solvent for waxes, resins, and in other industrial manufacturing activities (USEPA). 1,2-DCE exists as two chemical structures: a “cis” form and a “trans” form. Cis-1,2-DCE is regulated by the NYSDEC under 6 NYCRR Part 375 Environmental Remediation Program.

cis-1,2-DCE has been reported to potentially cause central nervous system depression, as well as damage to the liver, circulatory and nervous system. 1,2-DCE is volatile and likely to evaporate into the atmosphere or leach into groundwater when in soil. Cis-1,2-DCE was detected on NEAM’s soils in concentrations requiring remediation actions. 200 ppm 8 hour TWA –IP: 9.65

5.1.2 Trichloroethene

Trichloroethene (TCE) can occur as a colorless, organic liquid with a sweet chloroform-like odor. TCE is commonly used as a vapor degreasing of fabricated metals, refrigerant, and in pharmaceuticals (USEPA). TCE is regulated by the NYSDEC under 6 NYCRR Part 375 Environmental Remediation Program.

TCE has been reported to cause liver damage, as well as have the potential to have carcinogenic effects (USEPA). TCE is volatile and has demonstrated ready transport through soil with low potential for adsorption to sediments (USEPA). TCE was detected on NEAM’s soils in concentrations requiring remediation actions. 10 ppm 8 hour TWA/25 ppm STEL – IP: 9.45

5.1.3 Tetrachloroethene

Tetrachloroethene (PCE) is a volatile organic compound that can exist as a nonflammable colorless liquid with a sweet odor under ambient conditions. PCE is commonly used for vapor degreasing in metal-cleaning operations, dry cleaning, and for other industrial uses (USEPA). PCE exposure can occur in ambient air, contaminated ground water, and in industrial occupations that involve manufacturing of the chemical. PCE is regulated by the NYSDEC under 6 NYCRR Part 375 Environmental Remediation Program.

PCE has been reported to cause adverse non-carcinogenic effects on the human nervous system, to the kidney, immune, and hematologic systems as well as have the potential to have carcinogenic effects (USEPA). PCE is volatile and has demonstrated ready transport through ground, air, water and adsorption in lipids of aquatic animals (USEPA). PCE may exist on NEAM’s soils in concentrations requiring remediation actions that may have not degraded into the TCE detected on-site. 25 ppm 8 hour TWA/100 ppm STEL – IP: 9.32

5.1.4 Vinyl Chloride

Vinyl Chloride (VC) is a colorless gas with a mild, sweet odor, slightly water soluble, and flammable. VC is commonly used to manufacture a variety of vinyl and plastic products and has been used as a refrigerant in the past (USEPA). VC exposure can occur in ambient air, ground water contaminated with TCE, and in drinking water in contact with polyvinyl pipes (USEPA). VC is regulated by the NYSDEC under 6 NYCRR Part 375 Environmental Remediation Program.

VC has been reported to cause adverse non-carcinogenic effects on the human kidneys, immune, and nervous system, as well as have carcinogenic and reproductive effects (USEPA). TCE was detected on NEAM's soils and presents the risk of contributing to degradation development of VC that requires remediation action. 1 ppm 8 hour TWA/STEL 5 ppm – IP: 9.99

5.1.5 Sodium Permanganate

Sodium permanganate is an inorganic compound with a low melting point and high solubility. Sodium permanganate is commonly used in printed circuitry manufacturing, water treatment, and odor control. Sodium permanganate exposure can occur through dermal contact, ingestion, or inhalation. Health effects include irritation to body tissue with which it comes into contact with, however no known cases of chronic poisoning due to permanganates have been reported and sodium permanganate has not been classified as a carcinogen by OSHA, NTP, IARC.

In the context of this project, sodium permanganate will be used as an oxidant to react with chlorinated solvents DCE, TCE, PCE, and VC. It is anticipated that sodium permanganate in contact with these contaminates will oxidize to form carbon dioxide, manganese dioxide, and dissolved salts.0.2 mg/cm3 Mn 8 hour TWA

5.2 REAL-TIME Exposure Measurement

Monitoring shall be performed within the work area on site in order to detect the presence and relative levels of toxic substances. The data collected throughout monitoring shall be used to determine the appropriate levels of PPE. Table 5-1 specifies the real-time monitoring equipment, which will be used for this project.

Table 5-1 Monitoring Parameters and Equipment

INSTRUMENT	MANUFACTURER/MODEL*	SUBSTANCES DETECTED
Photo Ionization Detector (PID)	RAE Systems mini-RAE Photovac Microtip HNu Model Hnu (min. 10.6 eV bulb)	Petroleum hydrocarbons Organic Solvents
Nephelometer	Thermo MIE pDR-4000 DataRam	Dust particulates Smoke Mist Fumes

*Or similar unit, as approved by the SH&E Professional

5.3 Health and Safety Action Levels

An action level is a point at which increased protection is required due to the concentration of contaminants in the work area or other environmental conditions. The concentration level (above background level) and the ability of the PPE to protect against that specific contaminant determine each action level. The action levels are based on concentrations in the breathing zone.

If ambient levels are measured which exceed the action levels in areas accessible to unprotected personnel, necessary control measures (barricades, warning signs, and mitigative actions to limit, etc.) must be implemented prior to commencing activities at the specific work area.

Personnel should also be able to upgrade or downgrade their level of protection with the concurrence of SSO or the Safety Professional.

Reasons to upgrade:

- Known or suspected presence of dermal hazards.
- Occurrence or likely occurrence of gas, vapor, or dust emission.
- Change in work task that will increase the exposure or potential exposure to hazardous materials.

Reasons to downgrade:

- New information indicating that the situation is less hazardous than was originally suspected.
- Change in site conditions that decrease the potential hazard.
- Change in work task that will reduce exposure to hazardous materials.

5.3.1 Monitoring Procedures

Table 5-2 Monitoring Procedures and Action Levels

PARAMETER	LOCATION AND INTERVAL	RESPONSE LEVEL (Meter units/ppm above background)	RESPONSE
Dust Particulates	Continuous monitoring upwind and downwind of the immediate work area for a sustained reading of 15 minutes in duration	< 100 µg/m^3	Dust suppression techniques will be employed
		< 150 µg/m^3	Stop work and Contact SSO
Volatile Organic Compounds (Total by PID)	Continuous in the worker's breathing zone or in the immediate work area for sustained reading of 2 minutes in duration.	< 1 ppm	Level D work and continue monitoring (not applicable for initial assessment of unknown drums or containers.
		≥ 1 ppm for > 1 minute	Stop work and Contact the SSO.

5.3.1.1 Monitoring Equipment Calibration

All instruments used will be calibrated at the beginning and end of each work shift, in accordance with the manufacturer's recommendations. If the owner's manual is not available, the personnel operating the equipment will contact the applicable office representative, rental agency or manufacturer for technical guidance for proper calibration. If equipment cannot be pre-calibrated to specifications, site operations requiring monitoring for worker exposure or off-site migration of contaminants will be postponed or temporarily ceased until this requirement is completed.

5.3.1.2 Personal Sampling

Should site activities warrant performing personal sampling (breathing zone) to better assess chemical exposures experienced by AECOM employees, the SSO, under the direction of a Certified Industrial Hygienist (CIH), Certified Safety Professional (CSP) will be responsible for specifying the monitoring required. Within five working days after the receipt of monitoring results, the CIH or CSP will notify each employee, in writing, of the results that represent that employee's exposure. Copies of air sampling results will be maintained in the SSO project files.

If the site activities warrant, the subcontractor will ensure its employees' exposures are quantified via the use of appropriate sampling techniques. The subcontractor shall notify the employees sampled in accordance with health and safety regulations, and provide the results to the SSO for use in determining the potential for other employees' exposure.

5.4 Heat and Cold Stress

Heat and cold stress may vary based upon work activities, PPE/clothing selection, geographical locations, and weather conditions. To reduce the potential of developing heat/cold stress, be aware of the signs and symptoms of heat/cold stress and watch fellow employees for signs of heat/cold stress.

Heat stress can be a significant field site hazard, particularly for non-acclimated personnel operating in a hot, humid setting. Site personnel will be instructed in the identification of a heat stress victim, the first-aid treatment procedures for the victim and the prevention of heat stress casualties. Work-rest cycles will be determined and the appropriate measures taken to prevent heat stress as outlined in SH&E 616, *Heat Stress Prevention Program*.

5.4.1 Responding to Heat-Related Illness

The guidance below will be used in identifying and treating heat-related illness.

Table 5-3 Identification and Treatment of Heat-Related Illness

Type of Heat-Related Illness	Description	First Aid
Mild Heat Strain	The mildest form of heat-related illness. Victims exhibit irritability, lethargy, and significant sweating. The victim may complain of headache or nausea. This is the initial stage of overheating, and prompt action at this point may prevent more severe heat-related illness from occurring.	• Provide the victim with a work break during which he/she may relax, remove any excess protective clothing, and drink cool fluids. • If an air-conditioned spot is available, this is an ideal break location. • Once the victim shows improvement, he/she may resume working; however, the work pace should be moderated to prevent recurrence of the symptoms.
Heat Exhaustion	Usually begins with muscular weakness and cramping, dizziness, staggering gait, and nausea. The victim will have pale, clammy moist skin and may perspire profusely. The pulse is weak and fast and the victim may faint unless they lie down. The bowels may move involuntarily.	• Immediately remove the victim from the work area to a shady or cool area with good air circulation (*avoid drafts or sudden chilling*). • Remove all protective outerwear. • Call a physician. • Treat the victim for shock. (*Make the victim lie down, raise his or her feet 6–12 inches, and keep him/her cool by loosening all clothing*). • If the victim is conscious, it may be helpful to give him/ her sips of water. • Transport victim to a medical facility ASAP.

Type of Heat-Related Illness	Description	First Aid
Heat Stroke	The most serious of heat illness, heat stroke represents the collapse of the body's cooling mechanisms. As a result, body temperature may rise to 104 degrees Fahrenheit or higher. As the victim progresses toward heat stroke, symptoms such as headache, dizziness, nausea can be noted, and the skin is observed to be dry, red, and hot. Sudden collapse and loss of consciousness follows quickly and death is imminent if exposure continues. Heat stroke can occur suddenly.	• Immediately evacuate the victim to a cool/shady area. • Remove all protective outerwear and as much personal clothing as decency permits. • Lay the victim on his/her back w/the feet slightly elevated. • Apply cold wet towels or ice bags to the head, armpits, and thighs. • Sponge off the bare skin with cool water. • The main objective is to cool without chilling the victim. • Give no stimulants or hot drinks. • Since heat stroke is a severe medical condition requiring professional medical attention, emergency medical help should be summoned immediately to provide onsite treatment of the victim and proper transport to a medical facility.

6 Environmental Program (Environment)

6.1 Environmental Compliance and Management

This project and the individual tasks will comply with all federal, state, provincial, and local environmental requirements. AECOM and subcontractors will be responsible for implementing actions such as erosion and sediment control, storm water infiltration control, and migration of contaminates that would result in groundwater or surface water contamination. The site Environmental Monitoring Plan outlines further details for environmental compliance and management.

6.1.1 Air Emissions

It is not anticipated that AECOM proposed services will generate significant dust and/or COC emissions however a Community Air Monitoring Program (CAMP) will be maintained on site to monitor air emissions during all site activities. Actions to be performed if air quality standards are exceeded will include wetting access roads and areas of equipment traffic and covering residuals from drilling activities with protective covers. The details of this CAMP are discussed in the Field Activities Plan.

6.1.2 Hazardous Waste Management

It is not anticipated that AECOM proposed services will generate significant amounts of hazardous waste that require storage, treatment, or disposal at the project site. In the event operations yield an unexpected significant amount of hazardous waste, actions will be taken that include:

- Notify NEAM
- Obtaining RCRA Part B permits or equivalent
- Securing of storage and handling equipment that will be utilized in a safe manner with changes made to the HASP Level of Protection.
- Procurement of hazardous waste pick-up for transportation to appropriate disposal facility within 90-day storage procedures or equivalent.

6.1.3 Storm Water Pollution Prevention

The area of disturbance plans to disturb less than an acre of soil, thus eliminating the need for a Stormwater Pollution Prevention Plan in accordance with NYSDEC regulations. It is not anticipated that AECOM proposed services will generate significant sources of storm water pollution however erosion and sediment control best management practices will be exercised if needed.

6.1.4 Wetlands Protection

Wetlands are not anticipated to be impacted by the project activities

6.1.5 Critical Habitat Protection

There are no known Critical Habitats in or adjacent to the proposed work zone.

6.1.6 Spill Mitigation

The primary concern is the release of permanganate to the down gradient effluent trench and to areas outside of the injection wells. This plan was developed with consideration of the manufactures recommended response to a release as documented in the MSDS/SDS attached to this HASP (Attachment B). However this response relies on a neutralizing agent composed of a 1:1:1 mixture of water, hydrogen peroxide (3% first aid antiseptic) and natural white vinegar (5%) rather than the sodium thiosulfate, bisulfate, sulfuric acid solution recommended in the MSDS/SDS.

The reason for this change is that a dilute permanganate solution is easily neutralized with the less hazardous peroxide and vinegar, which are readily available at most retail grocery stores. At least 10 gallons each of vinegar and peroxide will be available onsite during the remedial effort. One gallon of mixed solution will be available in a spray bottle to treat small spills.

Once a surface spill has been identified, injections will be shut down while the source of the spill will be controlled and removed from use. Surface spills will be treated with a neutralizing agent consisting of 1:1:1 mixture of water, hydrogen peroxide (3%) and white vinegar (5%). A 1-gallon pump spray container of neutralizing agent will be readily available to handle these spills. Once the spill is neutralized the area will be flushed with water. The subcontractor will be responsible for conducting all aspects of the spill mitigation procedure.

7 Personal Protective Equipment

7.1 Personal Protective Equipment

The purpose of personal protective equipment (PPE) is to provide a barrier, which will shield or isolate individuals from the chemical and/or physical hazards that may be encountered during work activities. *S3NA-208-PR Personal Protective Equipment Program* lists the general requirements for selection and usage of PPE. Table 7-1 lists the minimum PPE required during site operations and additional PPE that may be necessary. The specific PPE requirements for each work task are specified in the individual THAs.

By signing this HASP the employee agree shaving been trained in the use, limitations, care and maintenance of the protective equipment to be used by the employee at this project. If training has not been provided, request same of the PM/SSO for the proper training before signing.

Table 7-1 Personal Protective Equipment

TYPE	MATERIAL	ADDITIONAL INFORMATION
Minimum PPE		
Safety Vest	ANSI Type II high-visibility	Must have reflective tape/be visible from all sides
Boots	Leather	ANSI approved safety toe, steel shank
Ice Cleats		Whenever walking on snow/ice
Safety Glasses		ANSI Approved; ≥98% UV protection
Hard Hat		ANSI Approved; recommended wide-brim
Work Uniform		No shorts/cutoff jeans or sleeveless shirts
Tyveks		Whenever coming in contact with contaminated soils/liquid. Also required in areas where ticks may be present.
Cold Weather Gear	Hard hat liner, hand warmers, insulated gloves	
N-Dex Gloves		Whenever coming in contact with contaminated soils/liquid.
Additional PPE		
Hearing Protection	Ear plugs and/ or muffs	In hazardous noise areas
Leather Gloves		If working with sharp objects or powered equipment.
Face Shield		Safety glasses or goggles must be worn concurrently.
Sunscreen	SPF 30 or higher	

7.2 PPE Doffing and Donning (UTILIZATION) Information

The following information is to provide field personnel with helpful hints that, when applied, make donning and doffing of PPE a more safe and manageable task:

- Never cut disposable booties from your feet with basic utility knives. This has resulted in workers cutting through the booty and the underlying sturdy leather work boot, resulting in significant cuts to the legs/ankles. Recommend using a pair of scissors or a package/letter opener (cut above and parallel with the work boot) to start a cut in the edge of the booty, then proceed by manually tearing the material down to the sole of the booty for easy removal.
- When applying duct tape to PPE interfaces (wrist, lower leg, around respirator, etc.) and zippers, leave approximately one inch at the end of the tape to fold over onto itself. This will make it much easier to remove the tape by providing a small handle to grab while still wearing gloves. Without this fold, trying to pull up the tape end with multiple gloves on may be difficult and result in premature tearing of the PPE.
- Have a "buddy" check your ensemble to ensure proper donning before entering controlled work areas. Without mirrors, the most obvious discrepancies can go unnoticed and may result in a potential exposure situation.
- Never perform personal decontamination with a pressure washer.

7.3 Decontamination

7.3.1 General Requirements

All possible and necessary steps shall be taken to reduce or minimize contact with chemicals and contaminated/impacted materials while performing field activities (e.g., avoid sitting or leaning on, walking through, dragging equipment through or over, tracking, or splashing potential or known contaminated/impacted materials, etc).

All personal decontamination activities shall be performed with an attendant (buddy) to provide assistance to personnel that are performing decontamination activities. Depending on specific site hazards, attendants may be required to wear a level of protection that is equal to the required level in the Exclusion Zone (EZ).

All persons and equipment entering the EZ shall be considered contaminated, and thus, must be properly decontaminated prior to entering the SZ.

Decontamination procedures may vary based on site conditions and nature of the contaminant(s). If chemicals or decontamination solutions are used, care should be taken to minimize reactions between the solutions and contaminated materials. In addition, personnel must assess the potential exposures created by the decontamination chemical(s) or solutions. The applicable Material Safety Data Sheet (MSDS) must be reviewed, implemented, and filed by personnel contacting the chemicals/solutions.

All contaminated PPE and decontamination materials shall be contained, stored and disposed of in accordance with site-specific requirements determined by site management.

7.3.2 Decontamination Equipment

The equipment required to perform decontamination may vary based on site-specific conditions and the nature of the contaminant(s). The following equipment is commonly used for decontamination purposes:

- Soft-bristle scrub brushes or long-handled brushes to remove contaminants;
- Hoses, buckets of water or garden sprayers for rinsing;
- Large plastic/galvanized wash tubs or children's wading pools for washing and rinsing solutions;
- Large plastic garbage cans or similar containers lined with plastic bags for the storage of contaminated clothing and equipment;
- Metal or plastic cans or drums for the temporary storage of contaminated liquids; and
- Paper or cloth towels for drying protective clothing and equipment.

7.3.3 Personal/Equipment Decontamination

All equipment leaving the EZ shall be considered contaminated and must be properly decontaminated to minimize the potential for exposure and off-site migration of impacted materials. Such equipment may include, but is not limited to: sampling tools, heavy equipment, vehicles, PPE, support devices (e.g., hoses, cylinders, etc.), and various handheld tools.

All employees performing equipment decontamination shall wear the appropriate PPE to protect against exposure to contaminated materials. The level of PPE may be equivalent to the level of PPE required in the EZ. Other PPE may include splash protection, such as face-shields and splash suits, and knee protectors. Following equipment decontamination, employees may be required to follow the proper personal decontamination procedures above.

Personnel decontamination should consist of the following glove removal procedure:

- Grasp the cuff of the dominant hand and pull glove over the bulk of the hand, leaving the fingers inside the glove.
- Use the dominant hand to grasp the cuff of the non-dominant hand and pull the glove completely off (inside-out) and place inside of the dominant hand glove.
- Once removed, employee should only touch the inside material of the dominant hand glove.
- Thoroughly wash hands.

For larger equipment, a high-pressure washer may need to be used. Some contaminants require the use of a detergent or chemical solution and scrub brushes to ensure proper decontamination. Before heavy equipment and trucks are taken offsite, the SS and/or SSO will visually inspect them for signs of contamination. If contamination is present, the equipment must be decontaminated

For smaller equipment, use the following steps for decontamination:

1. Remove majority of visible gross contamination in EZ.
2. Wash equipment in decontamination solution with a scrub brush and/or power wash heavy equipment.
3. Rinse equipment.
4. Visually inspect for remaining contamination.
5. Follow appropriate personal decontamination steps outlined above.

All decontaminated equipment shall be visually inspected for contamination prior to leaving the Contaminant Reduction Zone (CRZ). Signs of visible contamination may include an oily sheen, residue or contaminated soils left on the equipment. All equipment with visible signs of contamination shall be discarded or re-decontaminated until clean. Depending on the nature of the contaminant, equipment may have to be analyzed using a wipe method or other means.

8 Project Health And Safety Organization

8.1 Project Manager [Scott Underhill]

The Project Manager (PM) has overall management authority and responsibility for all site operations, including safety. The PM will provide the site supervisor with work plans, staff, and budgetary resources, which are appropriate to meet the safety needs of the project operations.

8.2 Site Supervisor [to be determined]

The site supervisor has the overall responsibility and authority to direct work operations at the job site according to the provided work plans. The PM may act as the site supervisor while on site.

8.2.1 Responsibilities

The site supervisor is responsible to:

- Discuss deviations from the work plan with the SSO and PM.
- Discuss safety issues with the PM, SSO, and field personnel.
- Assist the SSO with the development and implementation of corrective actions for site safety deficiencies.
- Assist the SSO with the implementation of this HASP and ensuring compliance.
- Assist the SSO with inspections of the site for compliance with this HASP and applicable SOPs.

8.2.2 Authority

The site supervisor has authority to:

- Verify that all operations are in compliance with the requirements of this HASP, and halt any activity that poses a potential hazard to personnel, property, or the environment.
- Temporarily suspend individuals from field activities for infractions against the HASP pending consideration by the SSO, the Safety Professional, and the PM.

8.2.3 Qualifications

In addition to being Hazardous Waste Operations and Emergency Response (HAZWOPER)-qualified (see Section 4.1), the Site Supervisor is required to have completed the 8-hour HAZWOPER Supervisor Training Course in accordance with 29 CFR 1910.120 (e)(4).

8.3 Site Safety Officer [to be determined]

8.3.1 Responsibilities

The SSO is responsible to:

- Update the site-specific HASP to reflect changes in site conditions or the scope of work. HASP updates must be reviewed and approved by the Safety Professional.
- Be aware of changes in AECOM Safety Policy.
- Monitor the lost time incidence rate for this project and work toward improving it.
- Inspect the site for compliance with this HASP and the SOPs using the appropriate audit inspection checklist provided by an AECOM Safety Professional.
- Work with the site supervisor and PM to develop and implement corrective action plans to correct deficiencies discovered during site inspections. Deficiencies will be discussed with project management to determine appropriate corrective action(s).
- Contact the Safety Professional for technical advice regarding safety issues.

- Provide a means for employees to communicate safety issues to management in a discreet manner (i.e., suggestion box, etc.).
- Determine emergency evacuation routes, establishing and posting local emergency telephone numbers, and arranging emergency transportation.
- Check that all site personnel and visitors have received the proper training and medical clearance prior to entering the site.
- Establish any necessary controlled work areas (as designated in this HASP or other safety documentation).
- Present tailgate safety meetings and maintain attendance logs and records.
- Discuss potential health and safety hazards with the Site Supervisor, the Safety Professional, and the PM.
- Select an alternate SSO by name and inform him/her of their duties, in the event that the SSO must leave or is absent from the site. The alternate SSO must be approved by the PM.

8.3.2 Authority

The SSO has authority to:

- Verify that all operations are in compliance with the requirements of this HASP.
- Issue a “Stop Work Order” under the conditions set forth in this HASP.
- Temporarily suspend individuals from field activities for infractions against the HASP pending consideration by the Safety Professional and the PM.

8.3.3 Qualifications

In addition to being HAZWOPER-qualified, the SSO is required to have completed the 8-hour HAZWOPER Supervisor Training Course in accordance with 29 CFR 1910.120 (e)(4).

8.4 Employees

8.4.1 Employee Responsibilities

Responsibilities of employees associated with this project include, but are not limited to:

- Understanding and abiding by the policies and procedures specified in the HASP and other applicable safety policies, and clarifying those areas where understanding is incomplete.
- Providing feedback to health and safety management relating to omissions and modifications in the HASP or other safety policies.
- Notifying the SSO, in writing, of unsafe conditions and acts.

8.4.2 Employee Authority

The health and safety authority of each employee assigned to the site includes the following:

- The right to refuse to work and/or stop work authority when the employee feels that the work is unsafe (including subcontractors or team contractors), or where specified safety precautions are not adequate or fully understood.
- The right to refuse to work on any site or operation where the safety procedures specified in this HASP or other safety policies are not being followed.
- The right to contact the SSO or the Safety Professional at any time to discuss potential concerns.
- The right and duty to stop work when conditions are unsafe, and to assist in correcting these conditions

8.5 Safety Professional [Mike Grasso or Rich Renzi]

The Safety Professional is the member of the AECOM Safety, Health and Environmental Department assigned to provide guidance and technical support for the project. Duties include the following:

- Approving this HASP and any required changes.
- Approving the designated Site Safety Officer (SSO).
- Reviewing all personal exposure monitoring results.

- Investigating any reported unsafe acts or conditions.

8.6 Subcontractors

The requirements for subcontractor selection and subcontractor safety responsibilities are outlined in *S3NA-213-PR Subcontractors*. Each AECOM subcontractor is responsible for assigning specific work tasks to their employees. Each subcontractor's management will provide qualified employees and allocate sufficient time, materials, and equipment to safely complete assigned tasks. In particular, each subcontractor is responsible for equipping its personnel with any required personnel protective equipment (PPE) and all required training.

AECOM considers each subcontractor to be an expert in all aspects of the work operations for which they are tasked to provide, and each subcontractor is responsible for compliance with the regulatory requirements that pertain to those services. Each subcontractor is expected to perform its operations in accordance with its own unique safety policies and procedures, in order to ensure that hazards associated with the performance of the work activities are properly controlled. Copies of any required safety documentation for a subcontractor's work activities will be provided to AECOM for review prior to the start of onsite activities, if required.

Hazards not listed in this HASP but known to any subcontractor, or known to be associated with a subcontractor's services, must be identified and addressed to the AECOM PM or the Site Supervisor prior to beginning work operations. The Site Supervisor or authorized representative has the authority to halt any subcontractor operations, and to remove any subcontractor or subcontractor employee from the site for failure to comply with established health and safety procedures or for operating in an unsafe manner.

8.7 Visitors

Authorized visitors (e.g., client representatives, regulators, AECOM management staff, etc.) requiring entry to any work location on the site will be briefed by the PM on the hazards present at that location. Visitors will be escorted at all times at the work location and will be responsible for compliance with their employer's health and safety policies. In addition, this HASP specifies the minimum acceptable qualifications, training and personal protective equipment which are required for entry to any controlled work area; visitors must comply with these requirements at all times.

8.7.1 Visitor Access

Visitors to any HAZWOPER controlled-work area must comply with the health and safety requirements of this HASP, and demonstrate an acceptable need for entry into the work area. All visitors desiring to enter any controlled work area must observe the following procedures:

1. A written confirmation must be received by AECOM documenting that each of the visitors has received the proper training and medical monitoring required by this HASP. Verbal confirmation can be considered acceptable provided such confirmation is made by an officer or other authorized representative of the visitor's organization.
2. Each visitor will be briefed on the hazards associated with the site activities being performed and acknowledge receipt of this briefing by signing the appropriate tailgate safety briefing form.
3. All visitors must be escorted by an AECOM employee.

If the site visitor requires entry to any EZ, but does not comply with the above requirements, all work activities within the EZ must be suspended. Until these requirements have been met, entry will not be permitted.

Unauthorized visitors, and visitors not meeting the specified qualifications, will not be permitted within established controlled work areas.

9 Site Control

9.1 General

The purpose of site control is to minimize potential contamination of workers, protect the public from site hazards, and prevent vandalism. The degree of site control necessary depends on the site characteristics, site size, and the surrounding community.

Controlled work areas will be established at each work location, and if required, will be established directly prior to the work being conducted. Diagrams designating specific controlled work areas will be drawn on site maps, posted in the support vehicle or trailer and discussed during the daily safety meetings. If the site layout changes, the new areas and their potential hazards will be discussed immediately after the changes are made. General examples of zone layouts have been developed for drilling and are attached in the WP (Figure 6, Figure 7).

9.2 Controlled Work Areas

Each HAZWOPER controlled work area will consist of the following three zones:

- Exclusion Zone: Contaminated work area.
- Contamination Reduction Zone: Decontamination area.
- Support Zone: Uncontaminated or “clean area” where personnel should not be exposed to hazardous conditions.

Each zone will be periodically monitored in accordance with the air monitoring requirements established in this HASP. The Exclusion Zone and the Contamination Reduction Zone are considered work areas. The Support Zone is accessible to the public (e.g., vendors, inspectors).

9.2.1 Exclusion Zone

The Exclusion Zone is the area where primary activities occur, such as sampling, remediation operations, installation of wells, cleanup work, etc. This area must be clearly marked with hazard tape, barricades or cones, or enclosed by fences or ropes. Only personnel involved in work activities, and meeting the requirements specified in the applicable THA and this HASP will be allowed in an Exclusion Zone.

The extent of each area will be sufficient to ensure that personnel located at/beyond its boundaries will not be affected in any substantial way by hazards associated with sample collection activities.

- **Direct Push Drilling Activities**. A distance of 20 feet in all directions will be cleared from the rig. The cleared area will be sufficient to accommodate movement of necessary equipment and soil sampling supplies. Vehicles and other hard barriers should be used where applicable to protect employees and public.

All personnel should be alert to prevent unauthorized, accidental entrance into controlled-access areas (the EZ and CRZ). If such an entry should occur, the trespasser should be immediately escorted outside the area, or all HAZWOPER-related work must cease. All personnel, equipment, and supplies that enter controlled-access areas must be decontaminated or containerized as waste prior to leaving (through the CRZ only).

9.2.2 Contamination Reduction Zone

The Contamination Reduction Zone is the transition area between the contaminated area and the clean area. Decontamination is the main focus in this area. The decontamination of workers and equipment limits the physical transfer of hazardous substances into the clean area. This area must also be clearly marked with hazard tape and access limited to personnel involved in decontamination.

9.2.3 Support Zone

The Support Zone is an uncontaminated zone where administrative and other support functions, such as first aid, equipment supply, emergency information, etc., are located. The Support Zone shall have minimal potential for significant exposure to contaminants (i.e., background levels).

Employees will establish a Support Zone (if necessary) at the site before the commencement of site activities. The Support Zone would also serve as the entry point for controlling site access.

9.3 Site Access Documentation

If implemented by the PM, all personnel entering the site shall complete the “Site Entry/Exit Log” located at the site trailer or primary site support vehicle.

9.4 Site Security

Site security is necessary to:

- Prevent the exposure of unauthorized, unprotected people to site hazards.
- Avoid the increased hazards from vandals or persons seeking to abandon other wastes on the site.
- Prevent theft.
- Avoid interference with safe working procedures.

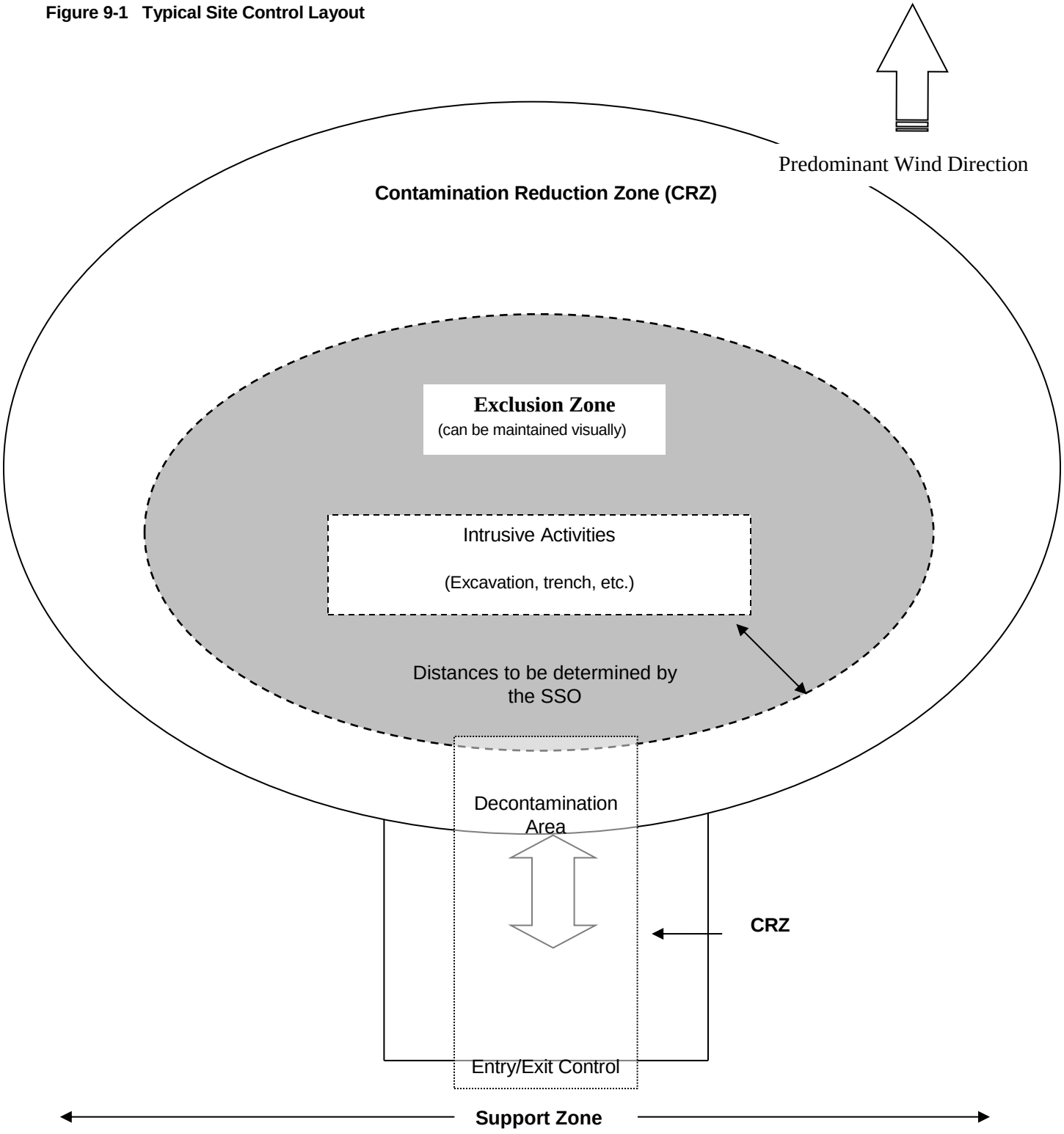
To maintain site security during working hours:

1. Maintain security in the Support Zone and at access control points.
2. Establish an identification system to identify authorized persons and limitations to their approved activities.
3. Assign responsibility for enforcing authority for entry and exit requirements.
4. When feasible, install fencing or other physical barrier around the site.
5. If the site is not fenced, post signs around the perimeter and whenever possible, use guards to patrol the perimeter. Guards must be fully apprised of the hazards involved and trained in emergency procedures.
6. Have the PM approve all visitors to the site. Make sure they have valid purpose for entering the site. Have trained site personnel accompany visitors at all times and provide them with the appropriate protective equipment.

To maintain site security during off-duty hours:

1. If possible, assign trained, in-house technicians for site surveillance. They will be familiar with the site, the nature of the work, the site’s hazards, and respiratory protection techniques.
2. If necessary, use security guards to patrol the site boundary. Such personnel may be less expensive than trained technicians, but will be more difficult to train in safety procedures and will be less confident in reacting to problems around hazardous substances.
3. Enlist public enforcement agencies, such as the local police department, if the site presents a significant risk to local health and safety.
4. Secure the equipment.

Figure 9-1 Typical Site Control Layout



10 Emergency Response Planning

10.1 Emergency Action Plan

Although the potential for an emergency to occur is remote, an emergency action plan has been prepared for this project should such critical situations arise. The only significant type of onsite emergency that may occur is physical injury or illness to a member of the AECOM team. The Emergency Action Plan (EAP) will be reviewed by all personnel prior to the start of field activities. A test of the EAP will be performed within the first three (3) days of the project field operations. This test will be evaluated and documented in the project records.

Three major categories of emergencies could occur during site operations:

1. Illnesses and physical injuries (including injury-causing chemical exposure)
2. Catastrophic events (fire, explosion, earthquake, or chemical)
3. Workplace Violence, Bomb Threat
4. Safety equipment problems

10.1.1 Emergency Coordinator

The duties of the Emergency Coordinator (EC) include:

- Implement the EAP based on the identified emergency condition
- Notify the appropriate project and SH&E Department personnel of the emergency (Table 9-3)
- Verify emergency evacuation routes and muster points are accessible
- Conduct routine EAP drills and evaluate compliance with the EAP

10.1.2 Site-Specific Emergency Procedures

Prior to the start of site operations, the EC will complete Table 9-1 with any site-specific information regarding evacuations, muster points, communication, and other site-specific emergency procedures.

Table 10-1 Emergency Planning

Emergency	Evacuation Route	Muster Location
Chemical Spill	• Upwind, approximately 30 feet from exclusion zone	• Gather in southern or western parking lot onsite
Fire/Explosion	• Head 300 feet from exclusion zone towards southern parking lot	• Gather in southern or western parking lot onsite
Tornado/Severe Weather	• Head 100-300 feet towards southern entrance of NEAM building (door faces Dwyer Avenue)	• Inside NEAM building via the southern entrance door facing Dwyer Avenue. Gather in building away from windows and unsecured items.
Lightning	• Travel 100-300 feet towards personnel vehicle in southern or western parking lot	• Vehicle parked in southern or western parking lot.
Additional Information		
Communication	Direct verbal communications, however; must be supplemented anytime voices cannot be clearly perceived above ambient noise levels (i.e., noise from heavy equipment;	

Procedures	drilling rigs, backhoes, etc.) and anytime a clear line-of-sight cannot be easily maintained amongst all AECOM personnel because of distance, terrain or other obstructions. Verbal communications will be adequate to warn employees of hazards associated with the immediate work area. AECOM personnel will bring a mobile phone to the site to ensure that communications with local emergency responders is maintained, when necessary.
CPR/First Aid Trained Personnel	
Site-Specific Spill Response Procedures	Once a spill has been identified: 1. Subcontractor shuts down injections 2. Subcontractor applies surface spills with a neutralizing agent consisting of 1:1:1 mixture of water, hydrogen peroxide (3%) and white vinegar (5%). A 1-gallon pump spray container of neutralizing agent will be readily available to handle these spills. Once the spill is neutralized the area will be flushed with water.

10.1.3 Spill Containment Procedure

Work activities may involve the use of hazardous materials (i.e. fuels, solvents) or work involving drums or other containers. State specific spill reporting procedures have been included in Attachment C. If anything beyond these procedures are required, a site specific spill reporting card/procedure must be developed for the site. Procedures outlined below will be used to prevent or contain spills:

- All hazardous material will be stored in appropriate containers
- Tops/lids will be placed back on containers after use.
- Containers of hazardous materials will be stored appropriately away from moving equipment.

At least one spill response kit, to include an appropriate empty container, materials to allow for booming or diking the area to minimize the size of the spill, and appropriate clean-up material (i.e. speedy dri) shall be available at each work site (more as needed).

- All hazardous commodities in use (i.e. fuels) shall be properly labeled.
- Containers shall only be lifted using equipment specifically manufactured for that purpose.
- Drums/containers will be secured and handled in a manner which minimizes spillage and reduces the risk of musculoskeletal injuries.

10.1.4 Safety Accident/Incident Reporting

All accidents and incidents that occur on-site during any field activity will be promptly reported to the SSO and the immediate supervisor.

If any AECOM employee is injured and requires medical treatment, the Site Supervisor will report the incident in accordance with AECOM's incident reporting procedures. A copy of the final Supervisor's Report of Incident will be provided to the SH&E Professional before the end of the following shift.

If any employee of a subcontractor is injured, documentation of the incident will be accomplished in accordance with the subcontractor's procedures; however, copies of all documentation (which at a minimum must include the OSHA Form 301 or equivalent) must be provided to the SSO within 24 hours after the accident has occurred.

All accidents/incidents will be investigated Copies of all subcontractor accident investigations will be provided to the SSO within five (5) days of the accident/incident.

10.1.5 Environmental Spill/Release Reporting

All environmental spills or releases of hazardous materials (e.g., fuels, solvents, etc.), whether in excess of the Reportable Quantity or not, will be reported according to the sequence identified in the *Site-Specific Spill Reporting Card (if applicable)*. In determining whether a spill or release must be reported to a regulatory agency, the Site Supervisor will assess the quantity of the spill or release and evaluate the reporting criteria against the state-specific reporting requirements, your applicable regulatory permit, and/or client-specific reporting procedures.

In order to support the Site Supervisor and expedite the decision to report to a state regulatory agency, a site-specific Spill Reporting Card will be developed (Attachment C). **If reporting to a US state or Federal regulatory agency is required, AECOM has 15 minutes from the time of the spill/release to officially report it.**

Chemical-specific Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Reportable Quantities for the known chemicals onsite are shown in Table 10-2.

Table 10-2 CERCLA Reportable Quantities

Hazardous Substance	Regulatory Synonyms	Final RQ Pounds (Kg)
Methanol	N/A	5,000 (2270)
Acetic Acid	N/A	5,000 (2270)
Sodium Hydroxide	N/A	1,000 (454)
cis-1,2-Dichloroethene	N/A	1,000 (454)
Trichloroethene	N/A	100 (45.4)
Tetrachloroethene	N/A	100 (45.4)
Vinyl Chloride	N/A	1 (0.454)

CERCLA RQs can be found at:

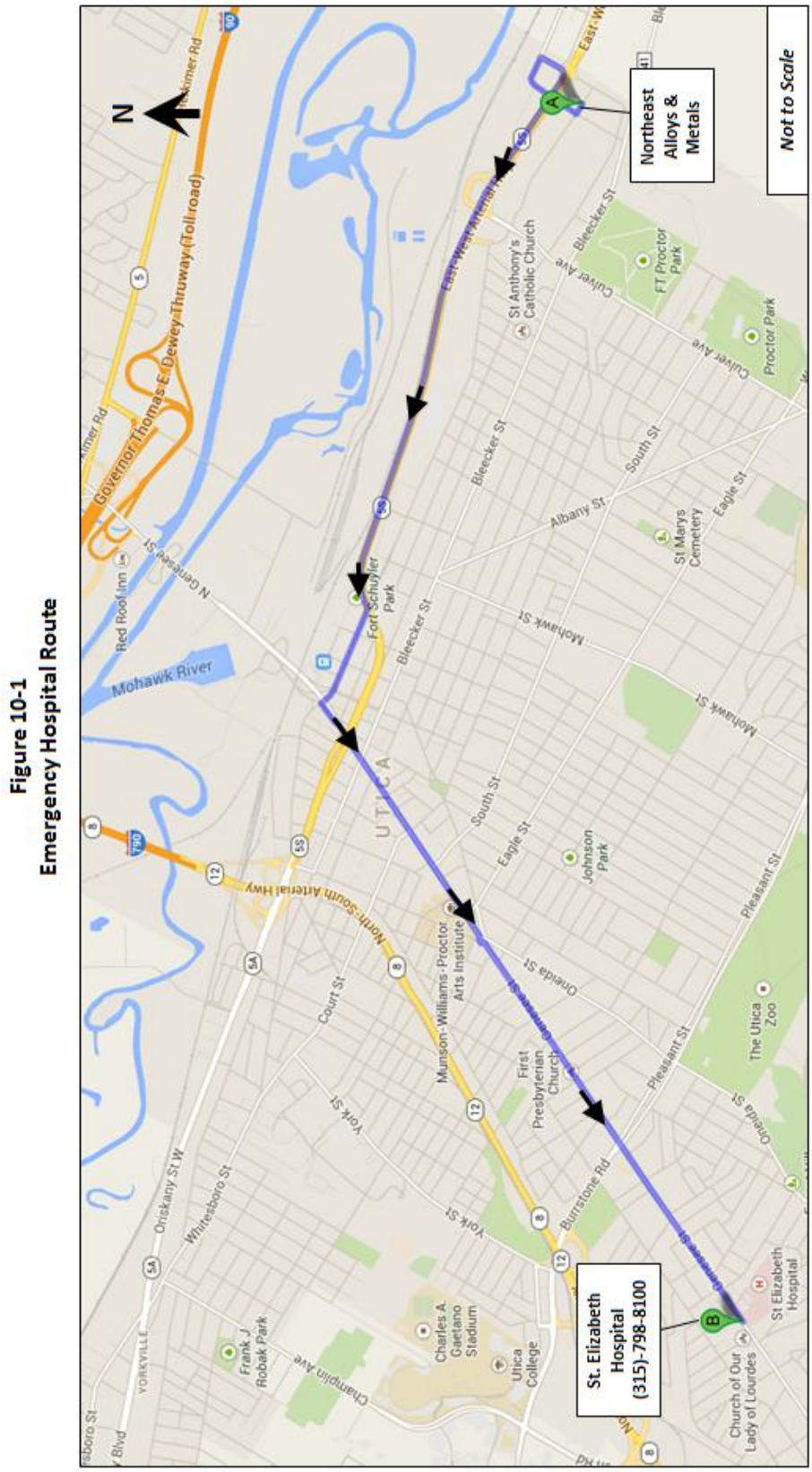
http://homer.ornl.gov/rq/302.pdf

Table 10-3 Emergency Contacts

Emergency Coordinators / Key Personnel			
Name	**Title/Workstation**	**Telephone Number**	**Mobile Phone**
Salvatore Priore	Client Contact	(518) 402-9665	
Scott Underhill	Account/Client Manager	(518) 951-2208	(518) 396-7638
Steve Choiniere	Project Manager	(518) 951-2262	(518) 951-2262
John Santacroce	Task Manager	(518) 951-2265	(518) 542-6333
	Oversight Engineer		
Rich Renzi	Regional SH&E Manager	781-224-6450	781-266-7472
Michael A. Grasso	District SH&E Manager	607-201-6737	607-201-6737
Incident Reporting	**Incident Reporting Line**	**(800) 348-5046**	
Organization / Agency			
Name			**Telephone Number**
Police Department (local)			911 or (315)-735-3301
Fire Department (local)			911 or (315)-731-2000
Ambulance Service ***(EMT will determine appropriate hospital for treatment)***			911
-Emergency Hospital ***(Use by site personnel is only for non-emergency cases)***			
St. Elizabeth Medical Center			(315)-798-8100
2209 Genesee Street			

Utica, NY 13501	
Emergency Hospital Route: See Figure 10-1	
WorkCare: 24-hr On-Call Occupational Nurse **(*Non-Emergency assistance only – Employees must notify SH&E prior to calling*)**	(800) 455-6155
Poison Control Center	(800) 222-1222
Pollution Emergency	(800) 292-4706
National Response Center	(800) 424-8802
Info-Trac: 24-hr Response Services– Account # 74984	(800) 355-5053
Title 3 Hotline	(800) 424-9346
Public Utilities	
Name	**Telephone Number**
Call Before You Dig	811 or PA One Call 800-242-1776 MD/DE/DC - Miss Utility 800-257-7777 VA Miss Utility 800-552-7001

Figure 10-1 Emergency Occupational Hospital Route/Detail Map



11 Personnel Acknowledgement

By signing below, the undersigned acknowledges that he/she has read and reviewed the AECOM Health and Safety Plan for the NEAM site. The undersigned also acknowledges that he/she has been instructed in the contents of this document and understands the information pertaining to the specified work, and will comply with the provisions contained therein.

PRINT NAME	SIGNATURE	ORGANIZATION	DATE

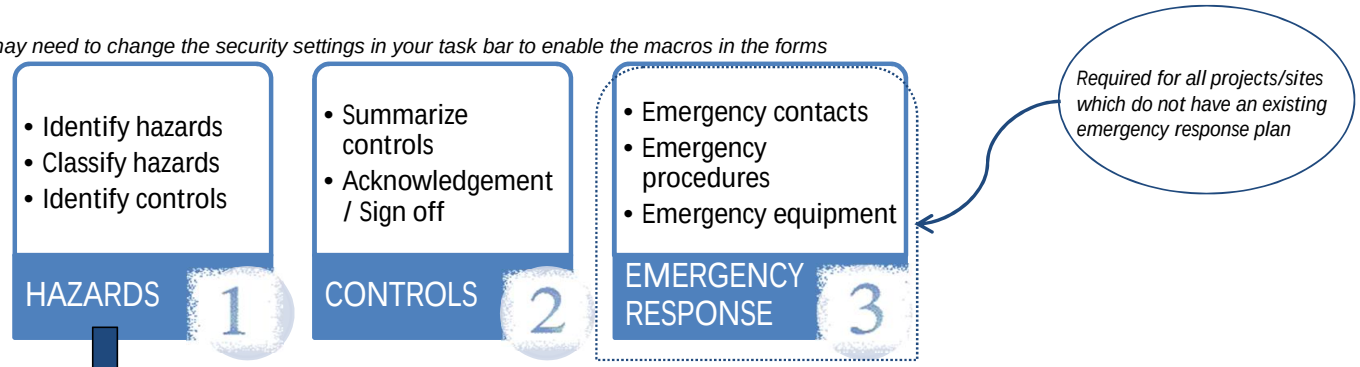
Attachment A

Task Hazard Analyses

S3NA-209-FM TASK HAZARD ANALYSIS

This THA (worksheets 1 & 2) must be completed for all field work.

***you may need to change the security settings in your task bar to enable the macros in the forms*



Hazard Identification

- Natural (biological) – bacteria, viruses, insects, plants, birds, and animals
- Chemical – exposure to chemical toxins, acute or chronic, by way of inhalation, injection, ingestion or absorption
- Physical – slipping/tripping, being struck by moving objects, repetitive movement, strains from lifting
- Environmental – extreme heat or cold, noise, vibrations, magnetic fields, pressure extremes and air quality
- Psychosocial – stress, violence

Hazard Classification

- Considers the potential severity of the outcome
- Considers the likelihood of the occurrence
- Used to prioritize and determine extent of required controls

Controls

- Elimination (first) – choose a different process; modify an existing process; substitute with less hazardous substance
- Engineering Controls (second) – physically alter the plant or equipment design in order to circumvent possible hazards; place guards on machinery
- Administrative Controls (third) – change the job procedure and/or process; limit the amount of time an individual is in a hazardous environment through job rotation
- Personal Protective Equipment (last option) – provide employees with direct physical protection while working in a hazardous environment

S3NA-209-FM TASK HAZARD ANALYSIS

AECOM	Project Name:	Project Number:	Client:
	Supervisor:	Project Manager:	Location:
	THA Developed By:		Date:
TASK HAZARD ANALYSIS	Task Name:	Regularity of Task: One-time ☐ Routine ☐	

	Job Event Sequence *(List the major steps of the individual task)*	Hazards *(List primary hazards)*	Hazard Classification *(before controls)* Severity	Likelihood	Risk Level	Hazard Classification	Controls *(List controls that AECOM will implement)*
1					0		
2					0		
3					0		
4					0		
5					0		
6					0		
7					0		
8					0		
9					0		
10					0		
11					0		
12					0		
13					0		
14					0		
15					0		
16					0		
17					0		

Hazard Classification Guidelines

Severity

1 Remote potential for injury, property damage/$ loss, or env damage

2 Potential for minor first aid injury, property damage/$ loss, or environmental damage

3 Potential for moderate personnel injuries, including medical treatment, property damage/$ loss, environmental damage, or negative public impact

4 Potential for a serious injury, major property damage/$ loss, serious impact to the environment, and public health

5 Catastrophic damage to people, property/equipment, environment, or public health

Likelihood of Occurrence

1 Very unlikely

2 Unlikely

3 Likely

4 Very likely

5 Certain

Hazard Classification Matrix

Likelihood \ Severity	1	2	3	4	5
1	1	2	3	4	5
2	2	4	6	8	10
3	3	6	9	12	15
4	4	8	12	16	20
5	5	10	15	20	25

Risk Level
Low
Medium
High

Risk Level = Likelihood x Severity

S3NA-209-FM TASK HAZARD ANALYSIS

AECOM	Project Name:	Project Number:	Client:
	Supervisor:	Project Manager:	Location:
	THA Developed By:		Date:
SUMMARY OF CONTROLS	Task Name:		Regularity of Task: One-time ☐ Routine ☐

Personal Protective Equipment (*check all that apply*)	Air Monitoring (reference HASP monitoring plan)			
☐ CSA/ANSI Safety-Toed Boots (Leather or Rubber)	☐ No air monitoring required		☐ Air monitoring required (*see procedures below*)	
☐ CSA/ANSI Safety Glasses or Goggles	Parameter	Location/Monitoring Interval	Response/Action Levels	Response Activity
☐ CSA/ANSI-approved Hard Hat				
☐ CSA/ANSI Type II/III Reflective Traffic Safety Vest				
☐				
☐				
☐				
☐				
☐				
☐				

Required Training (associated with this THA)	Key SOPs (associated with this THA)		Client & Other Requirements
1			
2			
3			
4			
5			
6			

Acknowledgement / Signatures

Project Manager / Supervisor (signature): Date:

Name	Signature	Company	Date	Name	Signature	Company	Date

S3NA-209-FM TASK HAZARD ANALYSIS

AECOM	Project Name:	Project Number:	Client:
	Supervisor:	Project Manager:	Location:
	THA Developed By:		Date:
EMERGENCY RESPONSE PLAN	Task Name:	Regularity of Task: One-time ☐ Routine ☐	

Check-in Procedures

Check-in Times	Check-in Person	Phone Number	Cell Phone Number
Alternate:			

Emergency Coordinators / Key Personnel

Name	Title	Phone Number	Cell Phone Number
	On-site First Aid Attendant		
	Project Manager		
	Site Supervisor		
	Regional SH&E Manager		
	Incident Reporting Line (BY THE END OF THE SHIFT)		
	Client Contact		

Emergency Agencies / Public Utilities

Name	Type	Details	Phone Number
	Police		
	Fire		
	Ambulance		
	Nearest Hospital / Clinic		
	Poison Control Center		
	Pollution / Environmental		

Emergency Equipment & Supplies

- ☐ First Aid Kit - Type:
- ☐ Blankets / Survival:
- ☐ Fire Extinguishers Type:
- ☐ Communication Device
- ☐ Vehicle Safety Equipment
- ☐ Eye Wash
- ☐ Spill Kit
- ☐ Other:

Other Emergency Plan Details

Attachment B

Material Safety Data Sheets

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MATHESON TRI-GAS, INC.
150 Allen Road Suite 302
Basking Ridge, New Jersey 07920
Information: 1-800-416-2505

Emergency Contact:
CHEMTREC 1-800-424-9300
Calls Originating Outside the US:
703-527-3887 (Collect Calls Accepted)

SUBSTANCE: CIS-1,2-DICHLOROETHYLENE

TRADE NAMES/SYNONYMS:
CIS-ACETYLENE DICHLORIDE; 1,2-DICHLOROETHYLENE; C2H2CL2; MAT05125; RTECS KV9420000

CHEMICAL FAMILY: halogenated, aliphatic

CREATION DATE: Jan 24 1989
REVISION DATE: Dec 11 2008

2. COMPOSITION, INFORMATION ON INGREDIENTS

COMPONENT: CIS-1,2-DICHLOROETHYLENE
CAS NUMBER: 156-59-2
PERCENTAGE: 100.0

3. HAZARDS IDENTIFICATION

NFPA RATINGS (SCALE 0-4): HEALTH=2 FIRE=3 REACTIVITY=2

EMERGENCY OVERVIEW:
COLOR: colorless
PHYSICAL FORM: liquid
ODOR: pleasant odor
MAJOR HEALTH HAZARDS: respiratory tract irritation, skin irritation, eye irritation, central nervous system depression
PHYSICAL HAZARDS: Flammable liquid and vapor. Vapor may cause flash fire. May react on contact with air, heat, light or water.

POTENTIAL HEALTH EFFECTS:
INHALATION:

SHORT TERM EXPOSURE: irritation, nausea, vomiting, drowsiness, symptoms of drunkenness
LONG TERM EXPOSURE: no information on significant adverse effects
SKIN CONTACT:
SHORT TERM EXPOSURE: irritation
LONG TERM EXPOSURE: same as effects reported in short term exposure
EYE CONTACT:
SHORT TERM EXPOSURE: irritation
LONG TERM EXPOSURE: same as effects reported in short term exposure
INGESTION:
SHORT TERM EXPOSURE: symptoms of drunkenness
LONG TERM EXPOSURE: no information on significant adverse effects

4. FIRST AID MEASURES

INHALATION: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. Get immediate medical attention.

SKIN CONTACT: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention, if needed. Thoroughly clean and dry contaminated clothing and shoes before reuse.

EYE CONTACT: Flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

INGESTION: If vomiting occurs, keep head lower than hips to help prevent aspiration. If person is unconscious, turn head to side. Get medical attention immediately.

NOTE TO PHYSICIAN: For ingestion, consider gastric lavage. Consider oxygen.

5. FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARDS: Severe fire hazard. Moderate explosion hazard. Vapor/air mixtures are explosive above flash point. The vapor is heavier than air. Vapors or gases may ignite at distant ignition sources and flash back.

EXTINGUISHING MEDIA: regular dry chemical, carbon dioxide, water, regular foam

Large fires: Use regular foam or flood with fine water spray.

FIRE FIGHTING: Move container from fire area if it can be done without risk. Cool containers with water spray until well after the fire is out. Stay away from the ends of tanks. For fires in cargo or storage area: Cool containers with water from unmanned hose holder or monitor nozzles until well after fire is out. If this is impossible then take the following precautions: Keep unnecessary people away, isolate hazard area and deny entry. Let the fire burn. Withdraw immediately in case of rising sound from venting safety device or any

discoloration of tanks due to fire. For tank, rail car or tank truck: Evacuation radius: 800 meters (1/2 mile). Do not attempt to extinguish fire unless flow of material can be stopped first. Flood with fine water spray. Do not scatter spilled material with high-pressure water streams. Cool containers with water spray until well after the fire is out. Apply water from a protected location or from a safe distance. Avoid inhalation of material or combustion by-products. Stay upwind and keep out of low areas. Water may be ineffective.

FLASH POINT: 39 F (4 C) (CC)
LOWER FLAMMABLE LIMIT: 9.7%
UPPER FLAMMABLE LIMIT: 12.8%
FLAMMABILITY CLASS (OSHA): IB

6. ACCIDENTAL RELEASE MEASURES

OCCUPATIONAL RELEASE:
Avoid heat, flames, sparks and other sources of ignition. Stop leak if possible without personal risk. Reduce vapors with water spray. Small spills: Absorb with sand or other non-combustible material. Collect spilled material in appropriate container for disposal. Large spills: Dike for later disposal. Remove sources of ignition. Keep unnecessary people away, isolate hazard area and deny entry.

7. HANDLING AND STORAGE

STORAGE: Store and handle in accordance with all current regulations and standards. Subject to storage regulations: U.S. OSHA 29 CFR 1910.106. Grounding and bonding required. Keep separated from incompatible substances.

8. EXPOSURE CONTROLS, PERSONAL PROTECTION

EXPOSURE LIMITS:
CIS-1,2-DICHLOROETHYLENE:
1,2-DICHLOROETHYLENE (ALL ISOMERS):
200 ppm (790 mg/m3) OSHA TWA
200 ppm ACGIH TWA
200 ppm (790 mg/m3) NIOSH recommended TWA 10 hour(s)

VENTILATION: Provide local exhaust ventilation system. Ventilation equipment should be explosion-resistant if explosive concentrations of material are present. Ensure compliance with applicable exposure limits.

EYE PROTECTION: Wear splash resistant safety goggles with a faceshield. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

CLOTHING: Wear appropriate chemical resistant clothing.

GLOVES: Wear appropriate chemical resistant gloves.

RESPIRATOR: The following respirators and maximum use concentrations are drawn from NIOSH and/or OSHA.
2000 ppm
Any supplied-air respirator operated in a continuous-flow mode.
Any powered, air-purifying respirator with organic vapor cartridge(s).
Any air-purifying respirator with a full facepiece and an organic vapor canister.
Any air-purifying full-facepiece respirator (gas mask) with a chin-style, front-mounted or back-mounted organic vapor canister.
Any self-contained breathing apparatus with a full facepiece.
Any supplied-air respirator with a full facepiece.
Emergency or planned entry into unknown concentrations or IDLH conditions -
Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.
Any supplied-air respirator with a full facepiece that is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode.
Escape -
Any air-purifying full-facepiece respirator (gas mask) with a chin-style, front-mounted or back-mounted organic vapor canister.
Any appropriate escape-type, self-contained breathing apparatus.
For Unknown Concentrations or Immediately Dangerous to Life or Health -
Any supplied-air respirator with a full facepiece that is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode.
Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: liquid
COLOR: colorless
ODOR: pleasant odor
MOLECULAR WEIGHT: 96.94
MOLECULAR FORMULA: C2-H2-CL2
BOILING POINT: 140 F (60 C)
FREEZING POINT: -114 F (-81 C)
VAPOR PRESSURE: 400 mmHg @ 41 C
VAPOR DENSITY (air=1): 3.34
SPECIFIC GRAVITY (water=1): 1.2837
WATER SOLUBILITY: insoluble
PH: Not available
VOLATILITY: Not available
ODOR THRESHOLD: Not available
EVAPORATION RATE: Not available

COEFFICIENT OF WATER/OIL DISTRIBUTION: Not available
SOLVENT SOLUBILITY:
Soluble: acetone, benzene, ether, alcohol

10. STABILITY AND REACTIVITY

REACTIVITY: May decompose on contact with air, light, moisture, heat or storage and use above room temperature. Releases toxic, corrosive, flammable or explosive gases.

CONDITIONS TO AVOID: Avoid heat, flames, sparks and other sources of ignition. Containers may rupture or explode if exposed to heat. Keep out of water supplies and sewers.

INCOMPATIBILITIES: bases, metals, combustible materials, oxidizing materials, acids

HAZARDOUS DECOMPOSITION:
Thermal decomposition products: phosgene, halogenated compounds, oxides of carbon

POLYMERIZATION: May polymerize. Avoid contact with incompatible materials.

11. TOXICOLOGICAL INFORMATION

CIS-1,2-DICHLOROETHYLENE:
TOXICITY DATA: 13700 ppm inhalation-rat LC50
LOCAL EFFECTS:
Irritant: inhalation, skin, eye
ACUTE TOXICITY LEVEL:
Slightly Toxic: inhalation
TARGET ORGANS: central nervous system
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: respiratory disorders
MUTAGENIC DATA: Available.

12. ECOLOGICAL INFORMATION

Not available

13. DISPOSAL CONSIDERATIONS

Subject to disposal regulations: U.S. EPA 40 CFR 262. Hazardous Waste Number(s): D001. Dispose in accordance with all applicable regulations.

14. TRANSPORT INFORMATION

U.S. DOT 49 CFR 172.101:
PROPER SHIPPING NAME: 1,2-Dichloroethylene
ID NUMBER: UN1150
HAZARD CLASS OR DIVISION: 3
PACKING GROUP: II
LABELING REQUIREMENTS: 3

CANADIAN TRANSPORTATION OF DANGEROUS GOODS:
SHIPPING NAME: 1,2-Dichloroethylene
UN NUMBER: UN1150
CLASS: 3
PACKING GROUP/CATEGORY: II

15. REGULATORY INFORMATION

U.S. REGULATIONS:
CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4): Not regulated.

SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355 Subpart B): Not regulated.

SARA TITLE III SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355 Subpart C): Not regulated.

SARA TITLE III SARA SECTIONS 311/312 HAZARDOUS CATEGORIES (40 CFR 370 Subparts B and C):
ACUTE: Yes
CHRONIC: No
FIRE: Yes
REACTIVE: Yes
SUDDEN RELEASE: No

SARA TITLE III SECTION 313 (40 CFR 372.65):
1,2-DICHLOROETHYLENE (ALL ISOMERS)

OSHA PROCESS SAFETY (29 CFR 1910.119): Not regulated.

STATE REGULATIONS:
California Proposition 65: Not regulated.

CANADIAN REGULATIONS:
WHMIS CLASSIFICATION: BD2

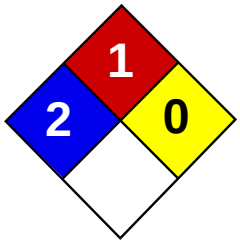
NATIONAL INVENTORY STATUS:
U.S. INVENTORY (TSCA): Listed on inventory.

TSCA 12(b) EXPORT NOTIFICATION: Not listed.

CANADA INVENTORY (DSL/NDSL): Not determined.

16. OTHER INFORMATION

MATHESON TRI-GAS, INC. MAKES NO EXPRESS OR IMPLIED WARRANTIES, GUARANTEES OR REPRESENTATIONS REGARDING THE PRODUCT OR THE INFORMATION HEREIN, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR USE. MATHESON TRI-GAS, INC. SHALL NOT BE LIABLE FOR ANY PERSONAL INJURY, PROPERTY OR OTHER DAMAGES OF ANY NATURE, WHETHER COMPENSATORY, CONSEQUENTIAL, EXEMPLARY, OR OTHERWISE, RESULTING FROM ANY PUBLICATION, USE OR RELIANCE UPON THE INFORMATION HEREIN.



Material Safety Data Sheet
Trichloroethylene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Trichloroethylene

Catalog Codes: SLT3310, SLT2590

CAS#: 79-01-6

RTECS: KX4560000

TSCA: TSCA 8(b) inventory: Trichloroethylene

CI#: Not available.

Synonym:

Chemical Formula: C2HCl3

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Trichloroethylene	79-01-6	100

Toxicological Data on Ingredients: Trichloroethylene: ORAL (LD50): Acute: 5650 mg/kg [Rat]. 2402 mg/kg [Mouse]. DERMAL (LD50): Acute: 20001 mg/kg [Rabbit].

Section 3: Hazards Identification

Potential Acute Health Effects: Hazardous in case of skin contact (irritant, permeator), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified + (PROVEN) by OSHA. Classified A5 (Not suspected for human.) by ACGIH. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to kidneys, the nervous system, liver, heart, upper respiratory tract. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: 420°C (788°F)

Flash Points: Not available.

Flammable Limits: LOWER: 8% UPPER: 10.5%

Products of Combustion: These products are carbon oxides (CO, CO2), halogenated compounds.

Fire Hazards in Presence of Various Substances: Not available.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Absorb with an inert material and put the spilled material in an appropriate waste disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/

spray. Wear suitable protective clothing In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes

Storage:
Keep container dry. Keep in a cool place. Ground all equipment containing material. Carcinogenic, teratogenic or mutagenic materials should be stored in a separate locked safety storage cabinet or room.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 50 STEL: 200 (ppm) from ACGIH (TLV) TWA: 269 STEL: 1070 (mg/m3) from ACGIH Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Not available.

Taste: Not available.

Molecular Weight: 131.39 g/mole

Color: Clear Colorless.

pH (1% soln/water): Not available.

Boiling Point: 86.7°C (188.1°F)

Melting Point: -87.1°C (-124.8°F)

Critical Temperature: Not available.

Specific Gravity: 1.4649 (Water = 1)

Vapor Pressure: 58 mm of Hg (@ 20°C)

Vapor Density: 4.53 (Air = 1)

Volatility: Not available.

Odor Threshold: 20 ppm

Water/Oil Dist. Coeff.: The product is equally soluble in oil and water; log(oil/water) = 0

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, methanol, diethyl ether, acetone.

Solubility:
Easily soluble in methanol, diethyl ether, acetone. Very slightly soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity:
Extremely corrosive in presence of aluminum. Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
Acute oral toxicity (LD50): 2402 mg/kg [Mouse]. Acute dermal toxicity (LD50): 20001 mg/kg [Rabbit].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified + (PROVEN) by OSHA. Classified A5 (Not suspected for human.) by ACGIH. The substance is toxic to kidneys, the nervous system, liver, heart, upper respiratory tract.

Other Toxic Effects on Humans: Hazardous in case of skin contact (irritant, permeator), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Passes through the placental barrier in human. Detected in maternal milk in human.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : Trichloroethylene : UN1710 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Trichloroethylene California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Trichloroethylene Pennsylvania RTK: Trichloroethylene Florida: Trichloroethylene Minnesota: Trichloroethylene Massachusetts RTK: Trichloroethylene New Jersey: Trichloroethylene TSCA 8(b) inventory: Trichloroethylene CERCLA: Hazardous substances.: Trichloroethylene

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):
CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC). CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):
R36/38- Irritating to eyes and skin. R45- May cause cancer.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:54 PM

Last Updated: 11/01/2010 12:00 PM

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MATHESON TRI-GAS, INC.
150 Allen Road Suite 302
Basking Ridge, New Jersey 07920
Information: 1-800-416-2505

Emergency Contact:
CHEMTREC 1-800-424-9300
Calls Originating Outside the US:
703-527-3887 (Collect Calls Accepted)

SUBSTANCE: TETRACHLOROETHYLENE

TRADE NAMES/SYNONYMS:
MTG MSDS 238; PERCHLOROETHYLENE; 1,1,2,2-TETRACHLOROETHYLENE; ETHYLENE TETRACHLORIDE; PERC; TETRACHLORETHYLENE; PERCHLORETHYLENE; TETRACHLOROETHENE; PCE; RCRA U210; UN 1897; C2Cl4; MAT22900; RTECS KX3850000

CHEMICAL FAMILY: halogenated, aliphatic

CREATION DATE: Jan 24 1989
REVISION DATE: Dec 11 2008

2. COMPOSITION, INFORMATION ON INGREDIENTS

COMPONENT: TETRACHLOROETHYLENE
CAS NUMBER: 127-18-4
PERCENTAGE: 100.0

3. HAZARDS IDENTIFICATION

NFPA RATINGS (SCALE 0-4): HEALTH=3 FIRE=0 REACTIVITY=0

EMERGENCY OVERVIEW:
COLOR: colorless
PHYSICAL FORM: volatile liquid
ODOR: faint odor, sweet odor
MAJOR HEALTH HAZARDS: respiratory tract irritation, skin irritation, eye irritation, central nervous system depression, cancer hazard (in humans)

POTENTIAL HEALTH EFFECTS:
INHALATION:
SHORT TERM EXPOSURE: irritation, nausea, vomiting, chest pain, difficulty breathing, irregular

heartbeat, headache, drowsiness, dizziness, disorientation, mood swings, loss of coordination, blurred vision, lung congestion, kidney damage, liver damage
LONG TERM EXPOSURE: irritation, nausea, stomach pain, loss of appetite, headache, drowsiness, dizziness, disorientation, sleep disturbances, pain in extremities, loss of coordination, blurred vision, hormonal disorders, internal bleeding, heart damage, liver damage, birth defects, brain damage, tumors, cancer
SKIN CONTACT:
SHORT TERM EXPOSURE: irritation (possibly severe)
LONG TERM EXPOSURE: irritation
EYE CONTACT:
SHORT TERM EXPOSURE: irritation
LONG TERM EXPOSURE: irritation
INGESTION:
SHORT TERM EXPOSURE: same as effects reported in short term inhalation
LONG TERM EXPOSURE: same as effects reported in long term inhalation

4. FIRST AID MEASURES

INHALATION: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. Get immediate medical attention.

SKIN CONTACT: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention, if needed. Thoroughly clean and dry contaminated clothing and shoes before reuse.

EYE CONTACT: Flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

INGESTION: If vomiting occurs, keep head lower than hips to help prevent aspiration. If person is unconscious, turn head to side. Get medical attention immediately.

NOTE TO PHYSICIAN: For inhalation, consider oxygen. For ingestion, consider gastric lavage. Consider oxygen.

5. FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARDS: Negligible fire hazard.

EXTINGUISHING MEDIA: carbon dioxide, regular dry chemical

Large fires: Use regular foam or flood with fine water spray.

FIRE FIGHTING: Cool containers with water spray until well after the fire is out. Stay away from the ends

of tanks. For tank, rail car or tank truck, evacuation radius: 800 meters (1/2 mile).

FLASH POINT: No data available.

6. ACCIDENTAL RELEASE MEASURES

SOIL RELEASE:
Dig holding area such as lagoon, pond or pit for containment. Dike for later disposal. Absorb with sand or other non-combustible material.

WATER RELEASE:
Absorb with activated carbon. Remove trapped material with suction hoses. Subject to California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65). Keep out of water supplies and sewers.

OCCUPATIONAL RELEASE:
Avoid heat, flames, sparks and other sources of ignition. Stop leak if possible without personal risk. Small liquid spills: Absorb with sand or other non-combustible material. Large spills: Dike for later disposal. Remove sources of ignition. Keep unnecessary people away, isolate hazard area and deny entry. Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equal to RQ (U.S. SARA Section 304). If release occurs in the U.S. and is reportable under CERCLA Section 103, notify the National Response Center at (800)424-8802 (USA) or (202)426-2675 (USA).

7. HANDLING AND STORAGE

STORAGE: Store and handle in accordance with all current regulations and standards. Store in a cool, dry place. Store in a well-ventilated area. Avoid heat, flames, sparks and other sources of ignition. Keep separated from incompatible substances.

8. EXPOSURE CONTROLS, PERSONAL PROTECTION

EXPOSURE LIMITS:
TETRACHLOROETHYLENE:
TETRACHLOROETHYLENE (PERCHLOROETHYLENE):
100 ppm OSHA TWA
200 ppm OSHA ceiling
300 ppm OSHA peak (5 minutes in any 3 hours)
25 ppm (170 mg/m3) OSHA TWA (vacated by 58 FR 35338, June 30, 1993)
25 ppm ACGIH TWA
100 ppm ACGIH STEL
NIOSH TWA (lowest feasible concentration)

VENTILATION: Provide local exhaust or process enclosure ventilation system. Ensure compliance with applicable exposure limits.

EYE PROTECTION: Wear splash resistant safety goggles. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

CLOTHING: Wear appropriate chemical resistant clothing.

GLOVES: Wear appropriate chemical resistant gloves.

RESPIRATOR: The following respirators and maximum use concentrations are drawn from NIOSH and/or OSHA.
At any detectable concentration -
Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.
Any supplied-air respirator with a full facepiece that is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode.
Escape -
Any air-purifying full-facepiece respirator (gas mask) with a chin-style, front-mounted or back-mounted organic vapor canister.
Any appropriate escape-type, self-contained breathing apparatus.
For Unknown Concentrations or Immediately Dangerous to Life or Health -
Any supplied-air respirator with a full facepiece that is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode.
Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: liquid
APPEARANCE: clear
COLOR: colorless
PHYSICAL FORM: volatile liquid
ODOR: faint odor, sweet odor
MOLECULAR WEIGHT: 165.83
MOLECULAR FORMULA: Cl2-C-C-Cl2
BOILING POINT: 250 F (121 C)
FREEZING POINT: -2 F (-19 C)
VAPOR PRESSURE: 14 mmHg @ 20 C
VAPOR DENSITY (air=1): 5.83
SPECIFIC GRAVITY (water=1): 1.6227
WATER SOLUBILITY: 0.015%
PH: Not available
VOLATILITY: Not available
ODOR THRESHOLD: 50 ppm
EVAPORATION RATE: 2.8 (butyl acetate=1)

COEFFICIENT OF WATER/OIL DISTRIBUTION: Not available
SOLVENT SOLUBILITY:
Soluble: alcohol, ether, benzene, chloroform, oils

10. STABILITY AND REACTIVITY

REACTIVITY: Stable at normal temperatures and pressure.

CONDITIONS TO AVOID: Avoid heat, flames, sparks and other sources of ignition. Containers may rupture or explode if exposed to heat.

INCOMPATIBILITIES: acids, metals, bases, oxidizing materials, combustible materials

HAZARDOUS DECOMPOSITION:
Thermal decomposition products: phosgene, halogenated compounds, oxides of carbon

POLYMERIZATION: Will not polymerize.

11. TOXICOLOGICAL INFORMATION

TETRACHLOROETHYLENE:
IRRITATION DATA: 810 mg/24 hour(s) skin-rabbit severe; 500 mg/24 hour(s) skin-rabbit mild; 162 mg eyes-rabbit mild; 500 mg/24 hour(s) eyes-rabbit mild
TOXICITY DATA: 4100 ppm/6 hour(s) inhalation-rat LC50; >10000 mg/kg skin-rabbit LD50 (Dow); 2629 mg/kg oral-rat LD50
CARCINOGEN STATUS: NTP: Anticipated Human Carcinogen; IARC: Human Limited Evidence, Animal Sufficient Evidence, Group 2A; ACGIH: A3 -Confirmed Animal Carcinogen; EC: Category 2
LOCAL EFFECTS:
Irritant: inhalation, skin, eye
ACUTE TOXICITY LEVEL:
Moderately Toxic: ingestion
Slightly Toxic: inhalation
TARGET ORGANS: central nervous system
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: eye disorders, heart or cardiovascular disorders, kidney disorders, liver disorders, nervous system disorders, skin disorders and allergies
TUMORIGENIC DATA: Available.
MUTAGENIC DATA: Available.
REPRODUCTIVE EFFECTS DATA: Available.
ADDITIONAL DATA: May be excreted in breast milk. Alcohol may enhance the toxic effects. Stimulants such as epinephrine may induce ventricular fibrillation.

12. ECOLOGICAL INFORMATION

ECOTOXICITY DATA:
FISH TOXICITY: 8430 ug/L 96 hour(s) LC50 (Mortality) Flagfish (Jordanella floridae)

INVERTEBRATE TOXICITY: 7500 ug/L 48 hour(s) EC50 (Immobilization) Water flea (Daphnia magna)

ALGAL TOXICITY: 509000 ug/L 96 hour(s) EC50 (Photosynthesis) Diatom (Skeletonema costatum)

FATE AND TRANSPORT:
BIOCONCENTRATION: 49 ug/L 1-21 hour(s) BCF (Residue) Bluegill (Lepomis macrochirus) 3.43 ug/L

13. DISPOSAL CONSIDERATIONS

Subject to disposal regulations: U.S. EPA 40 CFR 262. Hazardous Waste Number(s): U210. Hazardous Waste Number(s): D039. Dispose of in accordance with U.S. EPA 40 CFR 262 for concentrations at or above the Regulatory level. Regulatory level- 0.7 mg/L. Dispose in accordance with all applicable regulations.

14. TRANSPORT INFORMATION

U.S. DOT 49 CFR 172.101:
PROPER SHIPPING NAME: Tetrachloroethylene
ID NUMBER: UN1897
HAZARD CLASS OR DIVISION: 6.1
PACKING GROUP: III
LABELING REQUIREMENTS: 6.1
MARINE POLLUTANT: TETRACHLOROETHYLENE

CANADIAN TRANSPORTATION OF DANGEROUS GOODS:
SHIPPING NAME: Tetrachloroethylene
UN NUMBER: UN1897
CLASS: 6.1
PACKING GROUP/CATEGORY: III

15. REGULATORY INFORMATION

U.S. REGULATIONS:
CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4):
TETRACHLOROETHYLENE (PERCHLOROETHYLENE): 100 LBS RQ

SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355 Subpart B): Not regulated.

SARA TITLE III SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355 Subpart

C): Not regulated.

SARA TITLE III SARA SECTIONS 311/312 HAZARDOUS CATEGORIES (40 CFR 370 Subparts B and C):
ACUTE: Yes
CHRONIC: Yes
FIRE: No
REACTIVE: No
SUDDEN RELEASE: No

SARA TITLE III SECTION 313 (40 CFR 372.65):
TETRACHLOROETHYLENE (PERCHLOROETHYLENE)

OSHA PROCESS SAFETY (29 CFR 1910.119): Not regulated.

STATE REGULATIONS:
California Proposition 65:
Known to the state of California to cause the following:
TETRACHLOROETHYLENE (PERCHLOROETHYLENE)
Cancer (Apr 01, 1988)

CANADIAN REGULATIONS:
WHMIS CLASSIFICATION: D2

NATIONAL INVENTORY STATUS:
U.S. INVENTORY (TSCA): Listed on inventory.

TSCA 12(b) EXPORT NOTIFICATION: Not listed.

CANADA INVENTORY (DSL/NDSL): Not determined.

16. OTHER INFORMATION

MATHESON TRI-GAS, INC. MAKES NO EXPRESS OR IMPLIED WARRANTIES, GUARANTEES OR REPRESENTATIONS REGARDING THE PRODUCT OR THE INFORMATION HEREIN, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR USE. MATHESON TRI-GAS, INC. SHALL NOT BE LIABLE FOR ANY PERSONAL INJURY, PROPERTY OR OTHER DAMAGES OF ANY NATURE, WHETHER COMPENSATORY, CONSEQUENTIAL, EXEMPLARY, OR OTHERWISE, RESULTING FROM ANY PUBLICATION, USE OR RELIANCE UPON THE INFORMATION HEREIN.

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MATHESON TRI-GAS, INC.
150 Allen Road Suite 302
Basking Ridge, New Jersey 07920
Information: 1-800-416-2505

Emergency Contact:
CHEMTREC 1-800-424-9300
Calls Originating Outside the US:
703-527-3887 (Collect Calls Accepted)

SUBSTANCE: VINYL CHLORIDE

TRADE NAMES/SYNONYMS:
MTG MSDS 97; 1-CHLOROETHYLENE; 1-CHLOROETHENE; CHLOROETHYLENE; CHLOROETHENE; CHLORETHENE; CHLORETHYLENE; ETHYLENE MONOCHLORIDE; MONOCHLOROETHYLENE; MONOCHLORO ETHENE; MONOCHLOROETHENE; VINYL CHLORIDE MONOMER; VINYL CHLORIDE, INHIBITED; VINYL C MONOMER; RCRA U043; UN 1086; C2H3Cl; MAT24940; RTECS KU9625000

CHEMICAL FAMILY: halogenated, aliphatic

CREATION DATE: Jan 24 1989
REVISION DATE: Dec 11 2008

2. COMPOSITION, INFORMATION ON INGREDIENTS

COMPONENT: VINYL CHLORIDE
CAS NUMBER: 75-01-4
PERCENTAGE: >99.9

COMPONENT: PHENOL
CAS NUMBER: 108-95-2
PERCENTAGE: <0.1

COMPONENT: INHIBITORS
CAS NUMBER: Not assigned.
PERCENTAGE: <0.1

3. HAZARDS IDENTIFICATION

NFPA RATINGS (SCALE 0-4): HEALTH=2 FIRE=4 REACTIVITY=1

EMERGENCY OVERVIEW:
COLOR: colorless
PHYSICAL FORM: gas
ODOR: faint odor, sweet odor
MAJOR HEALTH HAZARDS: harmful if swallowed, skin irritation, eye irritation, central nervous system depression, cancer hazard (in humans)
PHYSICAL HAZARDS: Flammable gas. May cause flash fire. May polymerize. Containers may rupture or explode.

POTENTIAL HEALTH EFFECTS:
INHALATION:
SHORT TERM EXPOSURE: irritation, nausea, difficulty breathing, irregular heartbeat, headache, drowsiness, dizziness, disorientation, joint pain, loss of coordination, hearing loss, lung congestion
LONG TERM EXPOSURE: impotence, bluish skin color, blood disorders, liver damage, cancer
SKIN CONTACT:
SHORT TERM EXPOSURE: irritation, blisters
LONG TERM EXPOSURE: irritation, blisters
EYE CONTACT:
SHORT TERM EXPOSURE: irritation, eye damage
LONG TERM EXPOSURE: irritation, eye damage
INGESTION:
SHORT TERM EXPOSURE: frostbite
LONG TERM EXPOSURE: cancer

4. FIRST AID MEASURES

INHALATION: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. Get immediate medical attention.

SKIN CONTACT: If frostbite or freezing occur, immediately flush with plenty of lukewarm water (105-115 F; 41-46 C). DO NOT USE HOT WATER. If warm water is not available, gently wrap affected parts in blankets. Get immediate medical attention.

EYE CONTACT: Wash eyes immediately with large amounts of water, occasionally lifting upper and lower lids, until no evidence of chemical remains. Get medical attention immediately.

INGESTION: If a large amount is swallowed, get medical attention.

NOTE TO PHYSICIAN: For inhalation, consider oxygen.

5. FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARDS: Severe fire hazard. Severe explosion hazard. The vapor is heavier than air. Vapors or gases may ignite at distant ignition sources and flash back. Vapor/air mixtures are explosive. Electrostatic discharges may be generated by flow or agitation resulting in ignition or explosion.

EXTINGUISHING MEDIA: carbon dioxide, regular dry chemical

Large fires: Use regular foam or flood with fine water spray.

FIRE FIGHTING: Move container from fire area if it can be done without risk. For fires in cargo or storage area: Cool containers with water from unmanned hose holder or monitor nozzles until well after fire is out. If this is impossible then take the following precautions: Keep unnecessary people away, isolate hazard area and deny entry. Let the fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tanks due to fire. For tank, rail car or tank truck: Stop leak if possible without personal risk. Let burn unless leak can be stopped immediately. For smaller tanks or cylinders, extinguish and isolate from other flammables. Evacuation radius: 800 meters (1/2 mile). Do not attempt to extinguish fire unless flow of material can be stopped first. Flood with fine water spray. Cool containers with water spray until well after the fire is out. Apply water from a protected location or from a safe distance. Avoid inhalation of material or combustion by-products. Stay upwind and keep out of low areas. Evacuate if fire gets out of control or containers are directly exposed to fire. Evacuation radius: 500 meters (1/3 mile). Consider downwind evacuation if material is leaking.

FLASH POINT: -108 F (-78 C) (CC)
LOWER FLAMMABLE LIMIT: 3.6%
UPPER FLAMMABLE LIMIT: 33%
AUTOIGNITION: 882 F (472 C)

6. ACCIDENTAL RELEASE MEASURES

WATER RELEASE:
Subject to California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65). Keep out of water supplies and sewers.

OCCUPATIONAL RELEASE:
Avoid heat, flames, sparks and other sources of ignition. Stop leak if possible without personal risk. Reduce vapors with water spray. Keep unnecessary people away, isolate hazard area and deny entry. Remove sources of ignition. Ventilate closed spaces before entering. Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equal to RQ (U.S. SARA Section 304). If release occurs in the U.S. and is reportable under CERCLA Section 103, notify the National Response Center at (800)424-8802 (USA) or (202)426-2675 (USA).

7. HANDLING AND STORAGE

STORAGE: Store and handle in accordance with all current regulations and standards. Protect from physical damage. Store outside or in a detached building. Inside storage: Store in a cool, dry place. Store in a

well-ventilated area. Avoid heat, flames, sparks and other sources of ignition. Grounding and bonding required. Subject to storage regulations: U.S. OSHA 29 CFR 1910.101. See original container for storage recommendations. Keep separated from incompatible substances.

8. EXPOSURE CONTROLS, PERSONAL PROTECTION

EXPOSURE LIMITS:
VINYL CHLORIDE:
1.0 ppm OSHA TWA
5 ppm OSHA STEL 15 minute(s)
0.5 ppm OSHA action level 8 hour(s)
1 ppm ACGIH TWA
NIOSH TWA (lowest feasible concentration)

VENTILATION: Ventilation equipment should be explosion-resistant if explosive concentrations of material are present. Provide local exhaust or process enclosure ventilation system. Ensure compliance with applicable exposure limits.

EYE PROTECTION: Wear splash resistant safety goggles with a faceshield. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

CLOTHING: Wear appropriate chemical resistant clothing.

GLOVES: For the gas: Wear appropriate chemical resistant gloves. For the liquid: Wear insulated gloves.
OSHA REGULATED SUBSTANCES: U.S. OSHA 29 CFR 1910.1017.

RESPIRATOR: The following respirators and maximum use concentrations are drawn from NIOSH and/or OSHA.
OSHA Standard:
Respirator selection should comply with 29 CFR 1910.134, 29 CFR 1910.1017, and the final rule published in the Federal Register on August 24, 2006.
NIOSH Recommendations:
At any detectable concentration -
Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.
Any supplied-air respirator with a full facepiece that is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode.
Escape -
Any air-purifying full-facepiece respirator (gas mask) with a chin-style, front-mounted or back-mounted canister providing protection against the compound of concern.
Any appropriate escape-type, self-contained breathing apparatus.

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: gas
COLOR: colorless
ODOR: faint odor, sweet odor
MOLECULAR WEIGHT: 62.50
MOLECULAR FORMULA: C-H2-C-H-Cl
BOILING POINT: 9 F (-13 C)
FREEZING POINT: -245 F (-154 C)
VAPOR PRESSURE: 2515.6 mmHg @ 21.1 C
VAPOR DENSITY (air=1): 2.2
SPECIFIC GRAVITY (water=1): 0.9106
WATER SOLUBILITY: 0.25%
PH: Not applicable
VOLATILITY: Not applicable
ODOR THRESHOLD: 260 ppm
EVAPORATION RATE: Not applicable
VISCOSITY: 0.01072 cP @ 20 C
COEFFICIENT OF WATER/OIL DISTRIBUTION: Not applicable
SOLVENT SOLUBILITY:
Soluble: alcohol, ether, carbon tetrachloride, benzene

10. STABILITY AND REACTIVITY

REACTIVITY: May polymerize. Avoid contact with light or storage and use above room temperature.

CONDITIONS TO AVOID: Avoid heat, flames, sparks and other sources of ignition. Containers may rupture or explode if exposed to heat.

INCOMPATIBILITIES: metal carbide, metals, oxidizing materials, peroxides

HAZARDOUS DECOMPOSITION:
Thermal decomposition products: halogenated compounds, oxides of carbon, phosgene

POLYMERIZATION: May polymerize. Avoid contact with heat, light, air, water or incompatible materials. Closed containers may rupture violently.

11. TOXICOLOGICAL INFORMATION

VINYL CHLORIDE:
TOXICITY DATA: 18 pph/15 minute(s) inhalation-rat LC50; 500 mg/kg oral-rat LD50
CARCINOGEN STATUS: OSHA: Carcinogen; NTP: Known Human Carcinogen; IARC: Human Sufficient Evidence, Animal Sufficient Evidence, Group 1; ACGIH: A1 -Confirmed Human Carcinogen;

EC: Category 1
LOCAL EFFECTS:
Irritant: skin, eye
ACUTE TOXICITY LEVEL:
Toxic: ingestion
Relatively Non-toxic: inhalation
TARGET ORGANS: central nervous system
TUMORIGENIC DATA: Available.
MUTAGENIC DATA: Available.
REPRODUCTIVE EFFECTS DATA: Available.
ADDITIONAL DATA: Stimulants such as epinephrine may induce ventricular fibrillation. May cause birth defects.

12. ECOLOGICAL INFORMATION

ECOTOXICITY DATA:
FISH TOXICITY: 388000 ug/L 10 month(s) LETH (Mortality) Northern pike (Esox lucius)

INVERTEBRATE TOXICITY: 41.74 ug/L 72 day(s) (Residue) Mosquito (Culex pipiens quinquefasciata)

ALGAL TOXICITY: 41.74 ug/L 72 day(s) (Residue) Green algae (Oedogonium cardiacum)

13. DISPOSAL CONSIDERATIONS

Dispose in accordance with all applicable regulations. Hazardous Waste Number(s): D043. Dispose of in accordance with U.S. EPA 40 CFR 262 for concentrations at or above the Regulatory level. Regulatory level- 0.2 mg/L. U043.

14. TRANSPORT INFORMATION

U.S. DOT 49 CFR 172.101:
PROPER SHIPPING NAME: Vinyl chloride, stabilized
ID NUMBER: UN1086
HAZARD CLASS OR DIVISION: 2.1
LABELING REQUIREMENTS: 2.1
QUANTITY LIMITATIONS:
PASSENGER AIRCRAFT OR RAILCAR: Forbidden
CARGO AIRCRAFT ONLY: 150 kg

CANADIAN TRANSPORTATION OF DANGEROUS GOODS:
SHIPPING NAME: Vinyl chloride, stabilized
UN NUMBER: UN1086
CLASS: 2.1

15. REGULATORY INFORMATION

U.S. REGULATIONS:
CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4):
Vinyl chloride: 1 LBS RQ
PHENOL: 1000 LBS RQ

SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355 Subpart B): Not regulated.

SARA TITLE III SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355 Subpart C): Not regulated.

SARA TITLE III SARA SECTIONS 311/312 HAZARDOUS CATEGORIES (40 CFR 370 Subparts B and C):
ACUTE: Yes
CHRONIC: Yes
FIRE: Yes
REACTIVE: Yes
SUDDEN RELEASE: Yes

SARA TITLE III SECTION 313 (40 CFR 372.65):
Vinyl chloride

OSHA PROCESS SAFETY (29 CFR 1910.119): Not regulated.

STATE REGULATIONS:
California Proposition 65:
Known to the state of California to cause the following:
Vinyl chloride
Cancer (Feb 27, 1987)

CANADIAN REGULATIONS:
WHMIS CLASSIFICATION: ABD2

NATIONAL INVENTORY STATUS:
U.S. INVENTORY (TSCA): Listed on inventory.

TSCA 12(b) EXPORT NOTIFICATION: Not listed.

CANADA INVENTORY (DSL/NDSL): Not determined.

16. OTHER INFORMATION

MSDS: Sodium Permanganate (40%)

DATE ISSUED: 12/04

SECTION 1 - CHEMICAL PRODUCT IDENTIFICATION

PRODUCT NAME: *Sodium Permanganate Solution
DESCRIPTION: *40% minimum as NaMnO4

SECTION 2 - COMPOSITION / INFORMATION ON INGREDIENTS

CHEMICAL NAME	%	TLV	CAS No.
* Sodium Permanganate * * *	40-42	.2mg Mn per cubic meter of air	*10101-50-5

SECTION 3 - HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: *

EFFECTS OF OVEREXPOSURE - ACUTE

EYES: *Sodium Permanganate is damaging to eye tissue on contact. It may cause burns that result in damage to the eye.

SKIN: *Momentary contact of solution at room temp may be irritating to the skin,leaving brown stains.

INGESTION: *If swallowed,may cause burns to mucous membranes of the mouth,throat,esophagus, and stomach

INHALATION: *May cause irritation to the respiratory tract

EFFECTS OF OVEREXPOSURE - CHRONIC *

PRIMARY ROUTE OF ENTRY: *

SECTION 4 - FIRST AID MEASURES

EYES: *Flush immediately with large amounts of water for at least 15 minutes. Seek medical attention immediately.

SKIN: *Wash contaminated area with water. Seek medical attention if irritation persists.

INGESTION: *If person is conscious, give large amounts of water or milk. Seek medical attention.

INHALATION: *Remove person from contaminated area to fresh air. Seek medical attention.

*PHYSICIANS NOTE: *Decomposition products are alkaline.

SECTION 5 - FIRE-FIGHTING MEASURES

FLASHPOINT: *None
FLAMMABILITY: *Nonflammable
AUTOFLAMMABILITY: *None EXPLOSIVE LIMITS: LOWER: n/a UPPER:n/a
EXPLOSION HAZARD: *Explosive in contact with sulfuric acid or peroxides,or readily oxidizable substances
EXTINGUISHING MEDIA: Use large amounts of water. Dike to contain.

SPECIAL EXPOSURE HAZARDS IN FIRE: Keep containers cool by spraying with water if exposed to fire.
SPECIAL PROTECTIVE EQUIPMENT FOR A FIRE: Self-contained breathing apparatus should be worn.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

ENVIRONMENTAL PRECAUTIONS: *Contain spill by collecting the liquid in a pit or holding behind a dam. Dilute to approx 6% solution with water and then reduce with sodium thiosulfate,a bisulfite or ferrous salt solution.
METHODS FOR CLEANUP: *Flush with abundant water into the sewer, if permitted by federal,state, and local authorities. If not,collect and treat as above.

SECTION 7 - HANDLING AND STORAGE

HANDLING: *Wash hands thoroughly with soap and water after handling.
STORAGE: *Store in a cool, well-ventilated area. Segregate from acids,peroxides, Formaldehyde,and all combustible,organic or easily oxidized materials.

SECTION 8 - EXPOSURE CONTROL / PERSONAL PROTECTION

ENGINEERING CONTROLS: General ventilation is recommended. Eyewash and safety shower stations must be located in the immediate area.
EXPOSURE GUIDELINES: not established

PERSONAL PROTECTION EQUIPMENT:

RESPIRATORY: NIOSH-approved self-contained breathing apparatus for exposure to levels above limits.
HAND: Rubber gloves and boots.
EYE: Chemical goggles which are splash and dust proof or face shield.
SKIN: If clothing is contaminated. wash skin and launder clothing.

NOTE: BEFORE EATING, DRINKING OR SMOKING, WASH FACE AND HANDS THOROUGHLY WITH SOAP AND WATER.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE, COLOR AND ODOR: *Purple Solution
PH as is: *5-7
BOILING POINT: *105 degrees C
FLASH POINT: *
VAPOR PRESSURE: *760 mm Hg @ 105 degrees C
SPECIFIC GRAVITY: *1.36-1.39
SOLUBILITY IN WATER: *Miscible in all proportions
VISCOSITY: *

SECTION 10 - STABILITY AND REACTIVITY

HAZARDOUS POLYMERIZATION: *material is not known to polymerize
CHEMICAL STABILITY: *Stable under normal conditions
CONDITIONS TO AVOID: *contact with incompatible materials or heat(275* F)
MATERIALS TO AVOID: *Acids,peroxides,formaldehyde,antifreeze,hydraulic fluids,and all combustible organic or readily oxidizable materials
HAZARDOUS DECOMPOSITION PRODUCTS: *may form corrosive fumes in a fire

SECTION 11 - TOXICOLOGICAL INFORMATION

ACUTE TOXICITY: irritating to body tissue with which it comes into contact
IRRITANCY: *
SENSITIZATION: *
SUB-ACUTE, SUB-CHRONIC AND PROLONGED TOXICITY:No known cases of chronic poisoning due to permanganates have been reported.
EMPIRICAL DATA ON EFFECTS ON HUMANS: has not been classified as a carcinogen by OSHA,NTP,IARC

SECTION 12 - ECOLOGICAL INFORMATION

PERSISTENCE IN THE ENVIRONMENT:Permanganate has a low estimated lifetime in the environment
BIOLOGICAL OXYGEN DEMAND:In non-reducing and non-acidic environments MnO2 is insoluble
CHEMICAL OXYGEN DEMAND:
AQUATIC TOXICITY: No data
Daphnia magna
Fathead minnow
OTHER INFORMATION: * Discharge of this product must be in accordance with all federal, state, local or other applicable laws and regulations.

SECTION 13 - DISPOSAL CONSIDERATIONS

DISPOSAL METHOD: *Is considered a D001 hazardous (ignitable) waste.For disposal, see section 6

SECTION 14 - TRANSPORTATION INFORMATION

DOT SHIPPING NAME: Permanganates,inorganic,aqueous solution,n.o.s.
UN Number: UN3214
DOT HAZARD CLASS: Oxidizer 5.1
PACKING GROUP: II

SECTION 15 - REGULATORY INFORMATION

TOXIC SUBSTANCES CONTROL ACT (TSCA): All components of this product are listed in the Toxic Substances Control Act inventory.
COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION AND LIABILITY ACT (CERCLA): Not Listed
SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA Title III) - Section 311 Hazard Categories:302/303 not listed 311/312 hazard Catagories: Fire,acute and chronic

toxicity Section 313 contains 20% manganese compounds as part of the chemical structure and is subject to the reporting requirements section313 of title III

Acute Health:	Yes
Chronic Health:	No
Fire:	No
Sudden Release of Pressure:	No
Reactive:	No

SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA Title III) - Section 311:
Components of this product subject to reporting: none

SECTION 16 - OTHER INFORMATION

HMIS RATINGS
HEALTH: 1 FLAMMABILITY: 0 REACTIVITY: 0 SPECIAL HAZARD: Oxidizer

The information and recommendations contained in this Material Safety Data Sheet have been compiled from sources believed to be reliable and to represent the best opinion on the subject as of the date on this sheet. However, no warranty, guarantee or representation, expressed or implied, is made by F2 Industries LLC., as to the correctness or sufficiency of this information or to the results to be obtained from the use thereof.

Attachment C
State Spill Reporting Procedures

TECHNICAL

FIELD GUIDANCE

SPILL REPORTING AND INITIAL NOTIFICATION REQUIREMENTS

NOTES

Spill Reporting and Initial Notification Requirements

GUIDANCE SUMMARY AT-A-GLANCE

- Reporting spills is a crucial first step in the response process.
- You should understand the spill reporting requirements to be able to inform the spillers of their responsibilities.
- Several different state, local, and federal laws and regulations require spillers to report petroleum and hazardous materials spills.
- The state and federal reporting requirements are summarized in Exhibit 1.1-1.
- Petroleum spills must be reported to DEC unless they meet all of the following criteria:
  - The spill is known to be less than 5 gallons; and
  - The spill is contained and under the control of the spiller; and
  - The spill has not and will not reach the State's water or any land; and
  - The spill is cleaned up within 2 hours of discovery.

  All reportable petroleum spills and most hazardous materials spills must be reported to DEC hotline (1-800-457-7362) within New York State; and (1-518 457-7362) from outside New York State. For spills not deemed reportable, it is strongly recommended that the facts concerning the incident be documented by the spiller and a record maintained for one year.
- Inform the spiller to report the spill to other federal or local authorities, if required.
- Report yourself those spills for which you are unable to locate the responsible spiller.
- Make note of other agencies' emergency response telephone numbers in case you require their on-scene assistance, or if the response is their responsibility and not BSPR's.

NOTES

1.1.1 Notification Requirements for Oil Spills and Hazardous Material Spills

Spillers are required under state law and under certain local and federal laws to report spills. These various requirements, summarized in Exhibit 1.1-1, often overlap; that is, a particular spill might be required to be reported under several laws or regulations and to several authorities. Under state law, all petroleum and most hazardous material spills must be reported to DEC Hotline (1-800-457-7362), within New York State, and to 1-518-457-7362 from outside New York State. Prompt reporting by spillers allows for a quick response, which may reduce the likelihood of any adverse impact to human health and the environment. Yo will often have to inform spillers of there responsibilities.

Although the spiller is responsible for reporting spills, other persons with knowledge of a spill, leak, or discharge is required to report the incident (see Appendices A and B). You will often have to inform spillers of their responsibilities. You may also have to report spills yourself in situations where the spiller is not known or cannot be located. However, it is the legal responsibility of the spiller to report spills to both state and other authorities.

BSPR personnel also are responsible for notifying other response agencies when the expertise or assistance of other agencies is needed. For example, the local fire department should be notified of spills that pose a potential explosion and/or fire hazard. If such a hazard is detected and the fire department has not been notified, call for their assistance immediately. Fire departments are trained and equipped to respond to these situations; you should not proceed with your response until the fire/safety hazard is eliminated. For more information on interagency coordination in emergency situations see Part 1, Section 3, Emergency Response.

Another important responsibility is notifying health department officials when a drinking water supply is found to be contaminated as a result of a spill. It will be the health department's responsibility to advise you on the health risk associated with any contamination.

Exhibits 1.1-1 and 1.1-2 list the state and federal requirements to report petroleum and hazardous substance spills, respectively. The charts describe the type of material covered, the applicable act or regulation, the agency that must be notified, what must be reported, and the person responsible for reporting. New York state also has a emergency notification network for spill situations (e.g., major chemical releases) that escalate beyond the capabilities of local and regional response agencies/authorities to provide adequate response. The New York State Emergency Management Office (SEMO) coordinates emergency response activities among local, state, and federal government organizations in these cases.

Exhibit 1.1-1

State and Federal Reporting Requirements for Petroleum Spills, Leaks, and Discharges

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Petroleum from any source	Navigation Law Article 12; 17 NYCRR 32.3 and 32.4	DEC Hotline 1-800-457-7362	The notification of a discharge must be immediate, but in no case later than two hours after discharge. 1. Name of person making report and his relationship to any person which might be responsible for causing the discharge. 2. Time and date of discharge. 3. Probable source of discharge. 4. The location of the discharge, both geographic and with respect to bodies of water. 5. Type of petroleum discharges. 6. Possible health or fire hazards resulting from the discharge. 7. Amount of petroleum discharged. 8. All actions that are being taken to clean up and remove the discharge. 9. The personnel presently on the scene. 10. Other government agencies that have been or will be notified.	Any person causing discharge of petroleum. Owner or person in actual or constructive control must notify DEC unless that person has adequate assurance that such notice has already been given.
All aboveground petroleum and underground storage facilities with a combined storage capacity of over 1100 gallons.	ECL §17-1007; 6 NYCRR §613.8	DEC Hotline 1-800-457-7362	1. Report spill incident within two hours of discovery. 2. Also when results of any inventory, record, test, or inspection shows a facility is leaking, that fact must be reported within two hours of discovery.	Any person with knowledge of a spill, leak, or discharge.
Petroleum contaminated with PCB.	Chemical Bulk Storage Act 6 NYCRR Parts 595, 596, 597	DEC Hotline 1-800-457-7362	Releases of a reportable quantity of PCB oil.	Owner or person in actual or constructive possession or control of the substance, or a person in contractual relationship, who inspects, tests, or repairs for owner.

Exhibit 1.1-1

State and Federal Reporting Requirements for Petroleum Spills, Leaks, and Discharges (continued)

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Any liquid (petroleum included) that if released would be likely to pollute lands or waters of the state.	ECL §17-1743	DEC Hotline 1-800-457-7362	Immediate notification that a spill, release, or discharge of any amount has occurred. Owner or person in actual or constructive possession or control of more than 1,100 gallons of the liquid.	
Petroleum Discharge in violation of §311(b)(3) of the Clean Water Act	40 CFR §110.10 (Clean Water Act)	1. National Response Center (NRC) 1-800-424-8802. 2. If not possible to notify NRC, notify Coast Guard or predesignated on-scene coordinator. 3. If not possible to notify either 1 or 2, reports may be made immediately to nearest Coast Guard units, provided NRC notified as soon as possible.	Immediate notification as soon as there is knowledge of an oil discharge that violates water quality standards or causes sheen on navigable waters. Procedures for notice are set forth in 33 CFR Part 153, Subpart B, and in the National Oil and Hazardous Substances Pollution Contingency Plan, 40 CFR Part 300, Subpart E.	Person in charge of vessel or on-shore or off-shore facility.
Petroleum, petroleum by-products or other dangerous liquid commodities that may create a hazardous or toxic condition spilled into navigable waters.	33 CFR 126.29 (Ports and Waters Safety Act)	Captain of the Port or District Commander	As soon as discharge occurs, owner or master of vessel must immediately report that a discharge has occurred.	Owner or master of vessel or owner or operator of the facility at which the discharge occurred.

Exhibit 1.1-1

State and Federal Reporting Requirements for Petroleum Spills, Leaks, and Discharges (continued)

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Petroleum or hazardous substance from a vessel, on-shore or off-shore facility in violation of §311(b)(3) of the Clean Water Act.	33 CFR 153.203 (Clean Water Act)	1. NRC U.S. Coast Guard, 2100 Second Street, SW, Washington, DC 20593; 1-800-424-8802. 2. Where direct reporting not practicable, reports may be made to the Coast Guard (District Offices), the 3rd and 9th district of the EPA regional office at 26 Federal Plaza, NY, NY 10278; 1-201-548-8730. 3. Where none of the above is possible, may contact nearest Coast Guard unit, provided NRC notified as soon as possible.	Any discharger shall immediately notify the NRC of such discharge.	Person in charge of vessel or facility.

Exhibit 1.1-2

State and Federal Reporting Requirements for Hazardous Substance Spills, Leaks, and Discharges

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Any hazardous substance pursuant to Article 37. Does not include petroleum.	Chemical Bulk Storage Act 6 NYCRR Parts 595, 596, 597; ECL 40-0113(d)	DEC Hotline 1-800-457-7362	Releases of a reportable quantity of a hazardous substance.	Owner or person in actual or constructive possession or control of the substance, or a person in contractual relationship, who inspects, tests, or repairs for owner.
Hazardous materials or substances as defined in 49 CFR §171.8 that are transported. (See federal reporting requirements.)	Transportation Law 14(f); 17 NYCRR 507.4(b)	Local fire department or police department or local municipality	Immediate notification must be given of incident in which any of the following occurs as a direct result of a spill of hazardous materials: 1. Person is killed. 2. Person receives injuries requiring hospitalization. 3. Estimated damage to carrier or other property exceeds $50,000. 4. Fire, breakage, spillage, or suspected contamination due to radioactive materials. 5. Fire, breakage, spillage, or suspected contamination involving etiologic agents. 6. Situation is such that, in the judgment of the carrier, a continuing danger to life or property exists at the scene of the incident.	All persons and carriers engaged in the transportation of hazardous materials.

Exhibit 1.1-2
State and Federal Reporting Requirements for Hazardous Substance Spills, Leaks, and Discharges
(continued)

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Hazardous materials (wastes included) that are transported, whose carrier is involved in an accident.	Department of Transportation Regulations 49 CFR 171.15; 17 NYCRR Part 924; 17 NYCRR Part 507	1. U.S. Department of Transportation 1-800-424-8802 2. DEC Hotline 1-800-457-7362 3. Rail Carrier <u>On-Duty</u> 518-457-1046 <u>Off-Duty</u> 518-457-6164 4. Notify local police or fire department.	Notice should be given by telephone at the earliest practicable moment and should include: 1. Name of reporter. 2. Name and address of carrier represented by reporter. 3. Phone number where reporter can be contacted. 4. Date, time, and location of incident. 5. The extent of injuries, if any. 6. Classification, name and quantity of hazardous materials involved, if available. 7. Type of incident and nature of hazardous material involved and whether a continuing danger to life exists at scene. 8. Each carrier making this report must also make the report required by §171.16.	Each carrier that transports hazardous materials involves in an accident that causes any of the following as a direct result: 1. A person is killed 2. A person receives injuries requiring hospitalization 3. Estimated damage to carrier or other property exceeds $50,000 4. Fire, breakage, spillage, suspected or otherwise involving radioactive material. 5. Fire, breakage, spillage, suspected contamination involving etiologic agents. 6. Situation is such that carrier thinks it should be reported in accordance with paragraph b.

Exhibit 1.1-2
State and Federal Reporting Requirements for Hazardous Substance Spills, Leaks, and Discharges
(continued)

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Reportable quantity of a hazardous substance into navigable waters or adjoining shorelines. Substances are listed in 40 CFR 302.4.	Department of Transportation Regulations 49 CFR §171.16 as authorized by the Hazardous Materials Transportation Act	U.S. Coast Guard National Response Center (NRC), 1-800-424-8802 or 1-202-267-2675	As soon as person in charge becomes aware of a spill incident, he must notify NRC and provide the following information: 1. The information required by 49 CFR §171.15 (see above). 2. Name of shipper of hazardous substance. 3. Quantity of hazardous substance discharged, if known. 4. If person in charge is incapacitated, carrier shall make the notification. 5. Estimate of quantity of hazardous substance removed from the scene and the manner of disposition of any unremoved hazardous substance shall be entered in Part (H) of the report required by 49 CFR 171.16 (see above).	Person in charge of aircraft, vessel, transport vehicle, or facility. Must inform NRC directly, or indirectly through carrier.
Reportable quantity of a hazardous substance from vessel, on-shore or off-shore facility. Substances and requirements specified in 40 CFR §117.3.	40 CFR §117.21 as authorized under the FWPCA	NRC 1-800-424-8802. If not practicable report may be made to the Coast Guard (3rd or 9th Districts) District Offices or to EPA, designated On-Scene Coordinator, Region II, 26 Federal Plaza, NY, NY 10278; 1-201-548-8730	Immediate notification is required.	Person in charge of vessel, or on-shore or off-shore facility

Exhibit 1.1-2
State and Federal Reporting Requirements for Hazardous Substance Spills, Leaks, and Discharges
(continued)

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Facilities where a hazardous chemical is produced, used, or stored, and there is a reportable quantity of any extremely hazardous substance as set out in Appendix A to 40 CFR 355 or a CERCLA hazardous substance as specified in 40 CFR 302.4. (This section does not apply to a release that does not go beyond the facility, that emanates from a facility that is federally permitted, is continuous as defined under §103(f) of CERCLA or to any release exempt from CERCLA §103(a) reporting under §101(22) of CERCLA.)	40 CFR 355.40 (SARA) Releases of CERCLA Hazardous Substances are subject to release reporting requirements of CERCLA §103, codified at 40 CFR Part 302, in addition to being subject to the requirements of this Part.	Community emergency coordinator for the local emergency planning committee of any area likely to be affected and the State Emergency Response Commission of any state likely to be affected by the release. If there is no local emergency planning commission notification shall be made to relevant local emergency response personnel.	Immediately notify agencies at left and provide the following information when available: 1. Chemical name or identity of any substance involved in the release. 2. Indication of whether the substance is an extremely hazardous substance. 3. An estimate of the quantity released. 4. Time and duration of release. 5. Medium or media into which the release occurred. 6. Known health risks associated with emergency and where appropriate advice regarding medical attention for those exposed. 7. Proper precautions/actions that should be taken, including evacuation. 8. Names and telephone numbers of person to be contacted for further information. As soon as practicable after release, followup notification by providing the following information: 1. Actions taken to respond to and contain the release. 2. Health risks. 3. Advice on medical attention for exposed individuals.	Owner or operator of facility

Exhibit 1.1-2
State and Federal Reporting Requirements for Hazardous Substance Spills, Leaks, and Discharges
(continued)

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Hazardous liquids transported in pipelines, a release of which results in any circumstances as set out in 195.50(a) through (f). Also any incident that results in circumstances listed in 195.52(g).	49 CFR 195.50, 195.52 and 195.54 (Hazardous Liquid Pipeline Safety Act).	NRC, 1-800-424-8802	Notice must be given at the earliest practicable moment and the following information provided: 1. Name and address of the operator. 2. Name and telephone number of the reporter. 3. Location of the failure. 4. The time of the failure. 5. The fatalities and personal injuries, if any. 6. All other significant facts known by the operator that are relevant to the cause of the failure or extent of the damages.	Operator of system.
Hazardous wastes in transport	40 CFR §263.30(a) (RCRA)	1. Local authorities 2. If required by 49 CFR 171.15, notify the NRC at 1-800-424-8802 or 1-202-426-2675 3. Report in writing to Director of Hazardous Materials Regulations, Materials Transportation Bureau, Department of Transportation, Washington, DC 20590	Notification must be immediate. For discharge of hazardous waste by air, rail, highway, or water, the transporter must: 1. Give notice as in 49 CFR 161.15 (if applicable). 2. Report in writing as in 49 CFR 171.16. Wastes transporter (bulk shipment) must give same notice as required by 33 CFR 153.20.	Transporter by air, rail, highway, or water.

Exhibit 1.1-2
State and Federal Reporting Requirements for Hazardous Substance Spills, Leaks, and Discharges
(continued)

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Vinyl Chloride from any manual vent valve, or polyvinyl chloride plants	Clean Air Act 40 CFR 61.64	Administrator of EPA	Within 10 days of any discharge from any manual vent valve, report must be made, in writing, and the following information provided: 1. Source, nature and cause of the discharge 2. Date and time of the discharge 3. Approximate total vinyl chloride loss during discharge 4. Method used for determining loss 5. Action taken to prevent the discharge 6. Measures adopted to prevent future discharges.	Owner or operator of plant.
Radioactive Materials	6 NYCRR §380.7	Commissioner of DEC	1. Notify immediately by telephone when concentration, averaged over a 24-hour period, exceeds or threatens to exceed 5000 times the limits set forth in Schedule 2 of 380.9 (in uncontrolled areas). 2. Notify within 24 hours by telephone when concentration, averaged over 24- hour period, exceeds or threatens to exceed 500 times the limits set forth in Schedule 2 above (in uncontrolled areas). 3. Report within 30 days the concentration and quantity of radioactive material involved, the cause of the discharge, and corrective steps taken or planned to ensure no recurrence of the discharge.	Operator of the radiation installation.

Exhibit 1.1-2
State and Federal Reporting Requirements for Hazardous Substance Spills, Leaks, and Discharges
(continued)

Materials Covered	Act or Regulation	Agency to Notify	What Must Be Reported and When	Who Must Report
Low Level radioactive wastes in transport. Any suspected or actual uncontrolled releases.	6 NYCRR 381.16 ECL §27-0305 Waste Transporter Permits	DEC and Department of Health	Immediate notification.	Transporter

TECHNICAL

FIELD GUIDANCE

SPILL REPORTING AND INITIAL NOTIFICATION
ENFORCEMENT OF SPILLER RESPONSIBILITY

NOTES

Spill Reporting and Initial Notification -
Enforcement of Spiller Responsibility

GUIDANCE SUMMARY-AT-A-GLANCE

Use the "Notification Procedures Checklist" (Exhibit 1.1-3) to document conversations with the responsible party or potentially responsible party (PRP/RP) concerning his or her clean-up responsibilities.

The steps to follow when you inform the PRP/RP of his or her legal responsibility are:

-- Give your name and identify yourself as a DEC employee;

-- Inform them that they have been identified as the party responsible for the spill;

-- Inform PRP/Rps of their liability for all clean-up and removal costs. (If necessary, cite Section 181 of the Navigation Law);

-- Ask PRP/Rps "point blank" if they will accept responsibility for the cleanup; and

-- If the PRP/RP does not accept responsibility, or does not admit to being the PRP/RP, inform him or her that DEC will conduct the cleanup and send the bill to whoever is the PRP/RP. Also inform them that a DEC-conducted cleanup could be more costly than a PRP/RP-conducted cleanup, and that the PRP/RP could face interest charges and penalties for refusing to clean up the spill.

If the PRP/RP accepts responsibility for the cleanup:

(1) Send the PRP/RP a "Spiller Responsibility Letter" (Exhibit 1.1-5) and an "Acceptance of Financial Responsibility Form" (Exhibit 1.1-6) and

(2) Send the PRP/RP an "Option Letter," which should outline the options available to the PRP/RP to clean up the spill. See Exhibit 1.1-4 for a summary of how and when to use these forms and what they may include.

NOTES

1.1.2 Spill Reporting and Initial Notification - Enforcement of Spiller Responsibility

This section provides guidance on those steps you take to inform responsible parties or potentially responsible parties (PRP/Rps) or spillers of their responsibility under state law for cleaning up spills. This guidance applies to all contacts (by phone, by mail, or in person) you have with Rps throughout the response process concerning their fulfillment of this legal responsibility. The possible consequences of an RP's refusal or inability to conduct the spill response are also discussed.

1. State Law and Policy

Under Article 12 of the Navigation Law and Article 71 of the Environmental Conservation law (ECL), those parties responsible for a petroleum release are liable for all costs associated with cleaning up the spill as well as third party damages (see Introduction-A for more information). Section 181 of the Navigation Law states:

> *Any person who has discharged petroleum shall be strictly liable, without regard to fault, for all cleanup and removal costs and all direct damages, no matter by whom sustained as defined in this section.*

There are two ways by which PRP/RPs can pay for the costs associated with cleanups. First, the PRP/RP can reimburse the state for site investigation, clean-up, and remediation costs incurred by the State Oil Spill Fund or federal Leaking Underground Storage Tank (LUST) Trust Fund. Second, the PRP/RP can assume full responsibility for the cleanup from the beginning and bear all costs throughout the clean-up process. It is DEC's policy to make every effort to have PRP/RPs pay for cleanups from the outset.[1]

To achieve PRP/RP-directed and PRP/RP-financed cleanups, your responsibilities are to: (1) identify the PRP/RP(s), (2) inform them of their legal responsibilities for the spill, and (3) ensure that they carry out these responsibilities. All investigations of spills and PRP/RPs should be pursued vigorously and without prejudice. Use to your advantage the argument that having the PRP/RP assume responsibility for clean-up costs benefits both DEC and the spiller. It saves DEC the expense of cost-recovery procedures. It also allows the PRP/RP to be more involved in clean-up decisions (e.g., choosing their clean-up contractors) and, more significantly, it usually results in lower clean-up costs. Because the PRP/RP is responsible for all indirect costs incurred if DEC conducts the cleanup, the spiller will pay for the DEC contractor's clean-up work, as well as the supervision costs incurred by DEC, any third-party claims associated with the spill, and any punitive fines levied.

---

[1] Spillers are not only responsible for assuming the costs of a cleanup, but also can be subject to a $25,000 per day fine for not paying the clean-up costs (among other violations). The Navigation Law provides for these penalties in Section 192, which states:

> Any person who knowingly gives or causes to be given any false information as a part of, or in response to, any claim made pursuant to this article for cleanup and removal costs, direct or indirect damages resulting from a discharge, or who otherwise violates any of the provisions of this article or any rule promulgated thereunder or who fails to comply with any duty created by this article shall be liable to a penalty of not more than twenty-five thousand dollars for each offense in court of competent jurisdiction. If the violation is of a continuing nature each day during which it continues shall constitute an additional, separate, and distinct offense. (emphasis added)

NOTES

2. Notification Process

Part 1, Section 4, of this manual discusses the process of identifying the PRP/RP as part of the spill investigation for a particular site. Once you identify the PRP/RP, follow the guidance provided below for informing the PRP/RP of his or her responsibilities for spill cleanup. If you are uncertain about who the PRP/RP is, apply the procedures outlined below with all suspected RPs until the responsible party or parties are identified.

a. Informing RPs of Their Responsibility at the Spill Scene

It is important to inform PRP/RPs of their legal responsibility to clean up a spill as soon as possible. When you arrive at a spill site, you should immediately inform the representative of any PRP/RP of their liability under the Navigation Law and the Environmental Conservation Law. In doing so, follow the steps covered in the "Notification Procedures Checklist" (Exhibit 1.1-3).

Document completion of the notification steps, and identify your contact(s).

Although you should be firm and direct in informing the PRP/RP of their responsibility, you should make every attempt to avoid an adversarial relationship with the RP. The full cooperation of the PRP/RP will result in a more efficient and effective cleanup.

b. Informing Spillers of Their Responsibility in Writing

You should send three different letters to the PRP/RP to inform them of their responsibility (see Exhibit 1.1-4, "Notification Forms Summary"). If a site response was initiated and you are able to confirm the spill visually, the "Spiller Responsibility Letter" (Exhibit 1.1-5) along with an "Acceptance of Financial Responsibility Form" (Exhibit 1.1-6) should be sent as soon as possible. In addition, an "Option Letter" that informs the PRP/RP of their possible options for addressing a spill should be sent. These letters should be kept as part of the Corrective Action Plan (CAP) (see Part 1, Section 5, "Corrective Action Plans.")

Exhibit 1.1-3
Notification Procedures Checklist

Completed	Step	Date	Contact(s)
_____	1. Give your name and identify yourself as a DEC employee.		
_____	2. Inform the PRP/RP that he/she has been identified as the party responsible for the spill.		
_____	3. Inform PRP/RPs of their responsibility to pay for all clean-up costs. (As necessary, cite Section 181 of the Navigation Law or Article 71 of the ECL.)		
_____	4. Ask PRP/RPs "point blank" if they will accept responsibility for the cleanup. Response: _____ _____ _____ _____ _____		
_____	5. If the PRP/RP does not accept responsibility, or does not admit to being the spiller, inform him/her that DEC will conduct the cleanup and send the bill to whoever is the spiller.		
_____	6. If the PRP/RP does not accept responsibility also inform him or her that a DEC-conducted cleanup could be more costly than a spiller-conducted cleanup, and that the spiller could face interest charges and a fine for refusing to pay for the billed clean-up costs.		

Exhibit 1-A-4

Notification Forms Summary
(Send Forms by Certified Mail)

Notification Form	When and How to Use	Information to be Included
Spiller Responsibility Letter	Send by certified mail to PRP/RP for confirmed spill.	# Spill location; # Spiller's responsibility under the Navigation Law; # Penalties that can be levied if the spiller does not cooperate; and # Deadline for spiller to begin containment and removal of the spill.
Acceptance of Spiller Responsibility Form	Send by certified mail to PRP/RP for confirmed spill.	# Request for spiller's signature acknowledging his or her acceptance of responsibility for the spill cleanup.
Option Letter	Send by certified mail to PRP/RP for confirmed or suspected release (e.g., failed tightness test).	# Spill number; # Date spill was discovered or reported; # Exact location of the spill; # Authority of Article 12 of the Navigation Act; and # Penalties for noncompliance.

Exhibit 1.1-5

Spiller Responsibility Letter

[Date]

[Addressee]
[Address]

Dear [ ]:

This is to inform you that as a result of investigation by our Department, we consider you responsible for Petroleum Spill Number _____, dated _____, at _____. Under Article 12 of the Navigation Law, Section 192, any person who discharges petroleum without a permit and fails to promptly clean up such prohibited discharge may be subject to a penalty of up to $25,000 a day.

Containment and removal of this spill must be initiated within _____ hours.

Your failure to initiate timely spill cleanup and removal, in addition to the penalty stated above, will result in your being billed for all actual costs incurred by New York State as set forth in Section 181 of the Navigation Law. These costs include cleanup and removal, all direct and indirect damages, including damages incurred by third parties.

Sincerely,

Regional Spill Engineer
Region

Exhibit 1.1-6
Acceptance of Spiller Responsibility Letter

[Date]

SPILL #_____

ACCEPTANCE OF FINANCIAL RESPONSIBILITY

_____, hereby assumes responsibility for containment and
(Name of Company and Person)

cleanup of _____ discharged from_____
(Substance) (Source)

on _____, and recognizes that the determination of the adequacy and propriety of
(Date)

the containment and cleanup operation continues to rest with the New York State

Department of Environmental Conservation On-Scene Coordinator.

_____
(Authorized Signature and Title)

_____
(Name and Title Printed)

_____
(Address of Company)

_____
(Date and Time)

_____
(Witness)

NOTES

The "Spiller Responsibility Letter" informs spillers of their responsibility under the Navigation Law and explains the penalties that can be levied if the spiller does not cooperate. It should be sent to the spiller or suspected spiller as soon as a petroleum spill has been confirmed. The letter notifies the spiller that he or she is required to initiate containment and removal of the spill within a period of time you specify.

There are at least three factors you should consider when specifying a deadline in this letter:

- The size and nature of the spill;

- The proximity of the spill to, or its possible effects on, water supplies (surface or ground water), nearby homes and other structures, and/or sensitive environmental areas; and The possible environmental, safety, and/or human health effects of delaying containment and removal.

The "Acceptance of Spiller Responsibility Form" requires the spiller's signature acknowledging his or her responsibility for containment and cleanup of the spill. This form and the "Spiller Responsibility Letter" should be sent by certified mail.

The "Option Letter" outlines the possible options available to the PRP/RP for cleanup of the spill. The contents of this letter can vary somewhat depending on how the release was discovered (e.g., through a complaint or a failed tightness test), the extent and type of spill, and the policies and procedures of your regional office. There is, however, some information that should appear in every "Option Letter." All "Option Letters" should contain the following: spill number, date the spill was discovered, and exact location of the spill. In addition, the letter should cite the response authority provided DEC by Article 12 of the Navigation Act and describe the penalties for noncompliance.

Each "Option Letter" should outline clearly the options open to the PRP/RP to address the spill and the information you wish submitted, and may also specify certain deadlines for taking action. However, it is up to you to determine the particular options, information requirements, and dates you include in the letter. Depending on the circumstances, you may list in your letter one or several options from which the PRP/RP can choose. For example, when an UST fails an initial tank test the following options could be included:

- Conduct separate integrity tests on the piping and the tanks in order to verify the release source within the tank system.

- Remove the "non-tight" tank and either remove and dispose of all contaminated soils, or install monitoring wells.

NOTES

- Install monitoring wells and abandon the "non-tight" tank in-place.

- Remove the tank within 30 days, according to the requirements for tank removal (outline these requirements in the letter).

The "Option Letter" should always be sent by certified mail. In addition, you should have the PRP/RP inform you as soon as possible about the option(s) he or she has chosen.

Several examples of possible "Option Letters" are included as Exhibits 1.1-7 through 1.1-12. These are provided as examples only; you should use "Option Letters" developed by your own office, or develop your own.

Exhibit 1.1-7 is a sample option letter to an PRP/RP for removal of contaminated soil from an UST release. Note that this option letter includes: (a) specific requirements for removal of the contaminated soil; (b) dates for when the removal must be completed, and (c) requirements for the PRP/RP to forward to DEC copies of the landfill disposal receipt and ample test results. The additional sample option letters apply to the following situations: when an UST has failed an initial tightness test (Exhibit 1.1-8), when an UST fails an isolation tank test (Exhibit 1.1-9), when an UST fails a Petro-tite Systems Test (Exhibit 1.1-10), and ground-water contamination cleanup (Exhibit 1.1-11).

3. Dealing with Uncooperative Spillers

There are generally two ways in which an PRP/RP may fail to fulfill his or her legal responsibilities for spill cleanup: (1) a PRP/RP may refuse from the beginning to accept responsibility, or (2) an PRP/RP may fail to conduct a cleanup in the manner, or in as timely a fashion, as agreed upon with the DEC. If a PRP/RP refuses to cooperate from the outset, try again to change the RP's mind. Send additional notices of spiller responsibility (Exhibit 1.1-12) and/or initiate phone conversations with PRP/RPs to inform them again of the consequences of not cooperating (i.e., higher clean-up costs and possible penalties). If a party claims not to be the PRP/RP, you should inform them of your reasons for believing they are the PRP/RP under the Navigation Law.

If a PRP/RP agrees to conduct and pay for the cleanup and then does not proceed in the manner agreed upon or as quickly as agreed upon, you should inform the PRP/RP immediately that you are dissatisfied with the progress of the cleanup and that DEC is considering taking it over. There are no hard-and-fast rules for deciding when you should take over a cleanup. If possible, you should always work toward having the PRP/RP continue the cleanup in the agreed-upon manner. Attempt to determine why the cleanup is not proceeding as planned and consider means of helping the PRP/RP-directed cleanup get back on track.

Exhibit 1.1-7

Sample Option Letter:
Soil Cleanup Spill

[Date]

[Addressee]
[Address]

Dear [ ]:

This letter is to confirm your - (site meeting) (telephone conversation) with _____ of this Department on _____,
(Name) (day) (date) (year)
in regards to the above-mentioned spill site. This site involves _____
(explanation)
The following items were discussed and agreed upon:

1. All contaminated material must be removed and stored on site until it can be properly disposed of at a properly permitted landfill.

2. All contaminated material must be sampled for _____ _____. The results must be
(analyses)
negative for the material to be considered non-hazardous oily debris. You must contact your selected sanitary landfill to verify the sample analyses that they require for disposal.

3. A hauler with a Part 364 permit must be used to haul the contaminated soil to your selected landfill.

4. Please notify this Department after the work is completed but prior to any backfilling of the spill area so that an inspection of the excavation may be made.

5. Please forward to us a copy of the landfill disposal receipt and the sample results.

A schedule for this work is required by _____.
(day) (date) (year)
Cleanup must be performed by no later than _____.
(day) (date) (year)

If you have any questions, please feel free to contact _____
(Name)
at 847-4590. Your cooperation will be appreciated.

Very truly yours,

Senior Sanitary Engineer

Exhibit 1.1-8

Sample Option Letter:
Initial Tank Failure

[Date]

[Addressee]
[Address]

Dear [ ]:

This Department received notification on _____ that (a)
(day) (date) (year)
_____ tank(s) failed its (their) tank test performed by
(gallons) (product stored)
_____. On _____, Mr._____ of this Department
(contractor) (date) (name)
discussed with _____ that one of the following options must be done concerning this tank.
(person)

OPTION 1:

1. The tank is to be immediately isolated from the piping and is to be retested. If the tank tests tight, it may remain in service.
2. The lines are to be repaired, if necessary, and retested by a state-approved method. Exposed piping may be air tested.
3. A copy of any test results are to be sent to this office.

OPTION 2: If the tank fails the retest, or if you decide not to retest, the following must now be done:

1. All product must be immediately removed from the tank.
2. The tank itself must be removed within thirty days. A Petroleum Bulk Storage form must be submitted to this Department prior to tank removal.
3. The interior surface of the tank must be cleaned, and all sludge and residue generated by this process must be properly disposed. The tank must be cut open to allow for this work and to ensure proper ventilation of the tank interior.
4. All safety precautions regarding the opening, cleaning and entering of the tank must be followed. The interior atmosphere of the tank may be explosive and proper procedures must be followed.
5. Once the tank has been cleaned out, it may be disposed as scrap.

Mr._____ must be notified when you have a firm date for retesting or removal. Please note, we must be present when this tank is removed to determine if any groundwater or soil contamination exists. If groundwater or soil contamination is found, further remedial work will be required.

If you have any questions, please contact_____ at 847-4590. Your cooperation will be appreciated.

Sincerely,

[ ]

Exhibit 1.1-9

Sample Option Letter:
Retest Failure, Tank Removal

[Date]

[Addressee]
[Address]

Dear [ ]:

On_____, a _____gallon _____, underground store storage tank at the
(day) (date) (year) (#) (material)
above-mentioned address failed a system tank test. On_____, this tank failed an isolation tank test.
(day) (date) (year)

Since the tank failed the retest, the following must now be done:

1. All product must be immediately removed from the tank.

2. The tank itself must be removed within thirty days. A Petroleum Bulk Storage form (enclosed) must be submitted to this Department prior to tank removal.

3. The interior surface of the tank must be cleaned, and all sludge and residue generated by this process must be properly disposed. The tank must be cut open to allow for this work and to ensure proper ventilation of the tank interior.

4. All safety precautions regarding the opening, cleaning and entering of the tank must be followed. The interior atmosphere of the tank may be explosive and proper procedures must be followed.

5. Once the tank has been cleaned out, it may be disposed as scrap.

_____of this Department must be notified when you have a firm
(Name)
date for removal. We must be present when this tank is removed to determine if any groundwater or soil contamination exists. If groundwater or soil contamination is found, further remedial work will be required.

For your use, enclosed is a list of contractors that are known by this Department to do this type of work. This list is by no means complete. Any contractor may be used by you for this work.

If you have any questions, please feel free to call _____at 847-4590.
(Name)
Your cooperation will be appreciated.

Sincerely,

[ ]

Exhibit 1.1-10

Sample Option Letter:
Failed Tank Test

[Date]

CERTIFIED - RETURN RECEIPT REQUESTED

[Addressee]
[Address]

RE: Spill No.

Gentlemen:

This office has been informed by (Name) that (tank) failed a Petrotite systems test. In accordance with Article 12 of the New York State Navigation Law, I must determine if there has been any harm to the lands or the groundwater of the State. In order for me to make this determination, you have three options:

1. Prove that it was not a leaking tank by removing all the piping from the tank and separately Petrotite test the tank. If the tank passes the Petrotite test, it is a piping leak. The tank may then be abandoned or the piping can be repaired, attached to the tank, and the system Petrotite tested.

2. Excavate and remove the tank in the presence of a representative from this office so that an inspection of the tank and the soil can be made. If the tank is sound, and there is no evidence of product loss, nothing further need be done. If there is a problem, proceed as in 3 below.

3. Abandon the tank in-place and install several four (4) inch diameter PVC site wells extending five (5) feet into the groundwater with a screen length of ten (10) feet, with slot size of .020 inches. The exact location and number of wells will be determined by a representative from this office. These wells will be checked for a period of twelve months by New York State, and if there is no evidence of product for that period, the spill will be removed from our listing. If free or dissolved product appears, cleanup must begin immediately.

If cleanup does not begin by (Date) by the responsible party, the State will begin the cleanup and bill the responsible party.

Sincerely,

[ ]

Exhibit 1.1-11

Sample Option Letter:
Ground-water Cleanup

[Date]

[Addressee]
[Address]

Dear [ ]:

This letter is to confirm your (site meeting) (telephone conversation) with (Name) of this Department on (day) (date) (year) . Groundwater at this spill site is contaminated with (free floating oil) (dissolved oil components). The following items were discussed and agreed upon:

1. (#) additional four-inch monitoring wells will be installed at the agreed upon locations. A sketch of a typical monitoring well is enclosed for your use.

2. One recovery well will be installed to recover oil product. Groundwater must be pumped to depress the groundwater table. The groundwater must be pumped to an oil-water separator tank. Accumulated oil may be recovered from the well by bailing or by a second pump. A second type of recovery well pumps both oil and water to a separator tank. Oil from the tank is then recovered. You should check with your contractor to determine the best method for the recovery well. Groundwater must be pumped to depress the groundwater table.

3. The discharge water must be sampled for (Contaminates) . Dependent upon the sampling results, it may be discharged with a SPDES permit to (Name) . The water must at all times be sheenless. An air stripper or a carbon filter may be necessary for the discharge water.

4. All collected oil must be properly disposed. Copies of receipts indicating the disposal site must be forwarded to this office.

It was also agreed that these actions be completed by (Date) . Should you have any questions, please do not hesitate to contact (Name) at 847-4590. Your cooperation will be appreciated.

Sincerely,

[ ]

Exhibit 1.1-12

Sample Option Letter:
Soil Disposal, Soil Still On Site

[Date]

[Addressee]
[Address]

Dear [ ]:

A recent inspection by (Name) of this office indicated that the contaminated soil at your facility still remains on site. We are requesting this oil be removed by (day) (date) (year) to an acceptable landfill. Please send a copy of the disposal receipt to this office.

If you cannot remove the soil by that date, please contact this office immediately. If you do not contact this office and the soil still remains on site past (Date) , DEC will have the soil removed from your site. You will then be billed for the costs of removal and disposal as well any relevant penalties.

If you have any questions, please feel free to contact (Name) at 847-4590. Your cooperation will be appreciated.

Very truly yours,

Senior Sanitary Engineer

NOTES

If all efforts to encourage a PRP/RP to continue the cleanup fail, send a certified letter (Exhibit 1.1-13) notifying them that their actions have been unsatisfactory and that DEC will assume responsibility for the cleanup. This letter again informs the PRP/RP of his or her liability for all costs incurred by DEC during its cleanup.

Exhibit 1.1-13

Unsatisfactory Cleanup Notice Letter

[Date]

CERTIFIED MAIL SPILL #

[Addressee]
[Address]

Dear Sir:

My letter of (Date) notified you of New York State's interest in a pollution incident for which you are presently considered responsible.

You are hereby given notice that your actions to remove the pollutant and mitigate its effects have been evaluated as unsatisfactory. Effective (Date), the New York State Department of Environmental Conservation will conduct all cleanup activities under the authority of Article 12 of the Navigation Law. Removal will be effected in accordance with the regulations of the Department of Environmental Conservation. You will be billed for all actual costs incurred by New York State as set forth in Section 181 of the Navigation Law, as well as interest and penalties.

Should you require further information concerning this matter, contact: (Name)
.

Sincerely,

[ ]

Received and Acknowledged

_____ _____ _____

Time Date

TECHNICAL

FIELD GUIDANCE

SPILL REPORTING AND INITIAL NOTIFICATIONS - ACCESS AND RIGHT-OF-ENTRY

NOTES

Spill Reporting and Initial Notifications - Access and Right-of-Entry

GUIDANCE SUMMARY AT-A-GLANCE

- Section 178 of the Navigation Law gives you the authority to enter private property to investigate or clean up a suspected spill.

- In general, you should inform the property owner of your right to enter onto private property and obtain consent from the owner. This consent can be either written or verbal.

- Detailed information and procedures for access and right-of-entry is considered confidential for spill responders. This information is contained in Appendix L, and is marked confidential.

NOTES

1.1.3 Access and Right-of-Entry

This section addresses the right of NYSDEC personnel to enter private property on which a spill has occurred or is suspected, for the purpose of investigating, containing, and/or cleaning up the spill. Detailed information and procedures of access and right-of-entry are considered confidential. Therefore, this information can be found in Appendix L, including your legal rights to enter property and the procedures to follow to ensure that no charges of trespassing are brought against the Department.

1. State Law and Policy

You have the authority, under the Navigation Law, to enter property to investigate or clean up a real or suspected spill. Specifically, Section 178 of the Navigation Law states:

> *The department is hereby authorized to enter and inspect any property or premises for the purpose of inspecting facilities and investigating either actual or suspected sources of discharges or violation of this article or any rule or regulations promulgated pursuant to this article. The department is further authorized to enter on property or premises in order to assist in the cleanup or removal of the discharge. Any information relating to secret processes or methods of manufacture shall be kept confidential.*

In any emergency or non-emergency, you must possess information supporting a reasonable belief to suspect that a spill has occurred or is occurring, or that the spill is impacting the premises for which access is sought. A reasonable belief may be based on a report of a spill or visual observation. For example, if a gasoline station operator reports an unexpected loss of product from his underground storage tanks that are located near private household wells, you might want to investigate those wells and check the water.

Although you have the authority to enter the premises, *it is always advisable to obtain the consent of the property owner or his or her agent before entering the property.* This consent can be either written or verbal. Obtaining this consent may help avoid civil or criminal charges for trespass being logged. In cases where the owner/agent is not available or not ascertainable, entry should be made.

Attachment D
Applicable SH&E SOPs

No Applicable SH&E SOPs currently exist. In the event an SOP is needed, the HASP will be revised to include the specific SOP.

Attachment E

Client-Specific SH&E Guidelines and Subcontractors SH&E info

No Client specific and subcontractor SH&E information currently exists. In the event such information is obtained, the HASP will be revised to include SH&E information.

Appendix C

Quality Assurance Project Plan (QAPP)

AECOM Environment

Prepared for:
Superfund Standby Program
NYSDEC
Albany, NY

Prepared by:
AECOM
Latham, NY
April 2014

QUALITY ASSURANCE PROJECT PLAN (QAPP)

Northeast Alloys & Metals ISCO Pilot Study
Northeast Alloys & Metals
Utica, NY 13501
WORK ASSIGNMENT
D007626.60284002

Prepared for:

New York State Department of Environmental Conservation
625 Broadway
Albany, New York 12233

Prepared by:

AECOM Technical Services Northeast, Inc.
40 British American Boulevard
Latham, New York 12110

QUALITY ASSURANCE PROJECT PLAN (QAPP)

Northeast Alloys & Metals ISCO Pilot Study
Northeast Alloys & Metals
Utica, NY 13501
WORK ASSIGNMENT D007626.60284002

Prepared by:

Chris Norton — April 8th, 2014
Chris Norton
Engineer
(518) 951-2398
Date

Concurrence by:

Scott Underhill — 4-8-14
Scott Underhill, PE
Program Manager
(518) 951-2208
Date

Contents

List of Tables

List of Attachments

1.0 INTRODUCTION

1.1 PURPOSE AND OBJECTIVE

The purpose of this Generic Quality Assurance Project Plan (QAPP) is to document planned investigative activities and establish the criteria for performing these activities at a predetermined quality for the work conducted completed by AECOM Technical Services Northeast, Inc. (AECOM) under NYSDEC Standby Engineering Contract D007626.

Project work will be conducted in general accordance with the NYSDEC DER-10, Technical Guidance for Site Investigation and Remediation (NYSDEC, 2010a), technical requirements in Contract D007626 between NYSDEC and AECOM (NYSDEC and AECOM, 2010), and United States Environmental Protection Agency (USEPA) Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (USEPA, 1988).

The generic QAPP is intended to be a companion document to the site-specific Work Plan prepared for each work assignment. A QAPP Addendum will be prepared as an Appendix included in the site-specific Work Plan for each Work Assignment to address site-specific conditions and project-specific requirements.

1.2 PROJECT MANAGEMENT AND ORGANIZATION

1.2.1 Personnel

The general responsibilities of key project personnel are listed below.

Program Manager – Scott Underhill, PE will have responsibility for overall program management and coordination of subcontractors to complete the work.

Project Manager – to be determined (TBD) will have responsibility for overall project management and coordination with NYSDEC, and will coordinate the initiation and implementation of the Task 2 activities.

Task Leaders/Field Team Leaders – These individuals and roles, determined on a work assignment-specific basis, will share the responsibility of implementing and coordinating the field and office project activities.

QA Officer – Mr. Allen Burton (AECOM) will serve as the Program Quality Assurance Officer (QAO) for work assignments issued under this contract. The QAO will be responsible for oversight of the data validation and laboratory subcontractors, as well as data usability reports. The QAO will work with the AECOM database manager to assure that electronic deliverables provided by the laboratory are accurate and are formatted consistent with AECOM and NYSDEC requirements. The Program QAO may designate another qualified individual to serve as project QA officer to oversee the data-to-day quality assurance aspects of specific work assignments.

H & S Officer – Mr. Mike Grasso (AECOM) will be responsible for oversight of the preparation of the project health and safety plan, approving it, and tracking of its implementation.

Database Manager – Angela Toma-Eisele (AECOM) will serve as database manager. The database manager is responsible for verifying that laboratory deliverables meet AECOM and NYSDEC

electronic deliverable specifications, and for preparing the final EQuIS deliverable for submission to NYSDEC.

Resumes for most of the AECOM personnel have previously been submitted to the Contract Development Section. An updated personnel list is being submitted under separate cover.

1.2.2 Specific Tasks and Services

AECOM will obtain standby subcontractor specialists for services relating to laboratory/analytical services and data validation services. Field surveying and mapping will be provided by either through a pre-approved professional services contract (contracts not yet awarded) or by a site-specific solicitation. Geophysical/utility locating and drilling and monitoring well installation are acquired on a work-assignment-specific basis. Specific subcontractors for individual work assignments will be identified in the work plan.

Laboratory Analysis – An analytical laboratory will be assigned for each project, selected from laboratories subcontracted by AECOM based on a solicitation to be conducted in mid-2011. The assigned laboratory will be certified for aqueous and non-aqueous matrices. Laboratories will also be certified for air sample analysis; or must propose a certified subcontractor to perform air sample analysis.

Data Validation – A third-party data validator will be assigned for data quality review and data usability summary report (DUSR) preparation as needed for each project, selected from firms subcontracted by AECOM based on a solicitation to be conducted in mid-2011.

Utility Clearance/Geophysical Survey – TBD

Drilling and Monitoring Well Installation – TBD

Hydropunch Sampling - TBD

Surveying - TBD.

1.3 SITE DESCRIPTION AND LOCATION

Background data on the site, including the site description and location, site history, previous investigations, and current conditions, will be summarized in the in the site-specific Work Plan or Field Activities Plan (FAP).

2.0 SITE INVESTIGATION

Site investigation procedures will be developed on a work assignment-specific basis.

2.1 Field Sampling Procedures

Field activities will be detailed in the Work Plan or FAP and are not repeated in the QAPP.

2.2 Equipment Decontamination

To avoid cross contamination, sampling equipment (defined as any piece of equipment which may contact a sample) will be decontaminated according to the following procedures specified in the Work Plan or FAP; the procedures discussed here are general and may be superseded by project-specific requirements (as documented in the work plan or FAP). Field equipment rinsate blanks (see Section 3.6.1) are generated and analyzed to monitor the effective of field decontamination procedures.

Cross contamination is minimized by the use of vendor-decontaminated, dedicated, disposable equipment to the extent practical.

2.2.1 Decontamination Procedures

For larger projects, and as indicated in the Work Plan or FAP, a decontamination pad may be constructed on the site. The pad will be sized to be large enough to handle the equipment used on site (e.g., drill rig). The pad will also be used for small equipment decontamination as well as personnel decontamination.

2.2.2 Small Equipment Decontamination

Small equipment decontamination for non-disposable equipment such as Geoprobe Hydropunch samplers, transducer probes and cables, etc., will be accomplished using the following procedures:

- Alconox (or equivalent) and potable water wash;
- Potable water rinse;
- Distilled/deionized water rinse;

Solvents will not be used in the field decontamination of such equipment. Decontamination will include scrubbing/washing with a laboratory grade detergent (e.g. Alconox) to remove visible contamination, followed by potable (tap) water and analyte-free water rinses. Tap water may be used from any treated municipal water system; the use of an untreated potable water supply is not an acceptable substitute.

Equipment should be allowed to dry prior to use. Steam cleaning or high pressure hot water cleaning may be used in the initial removal of gross, visible contamination.

Electric submersible pumps (such as a Grundfos Redi-Flow II) will be decontaminated using the above steps followed by running a large volume (several gallons) of potable water through the pump, followed by an analyte-free water rinse. Tubing will not be re-used (new tubing will be used for each well). Submersible pumps and supporting lines and cables will be placed in a large clean plastic garbage can filled with potable water and then run for several minutes (to decontaminate both exterior and interior parts); submersible pumps will also be given a final analyte-free water rinse of both interior and exterior parts.

If bladder pumps are used, the pump will be disassembled and cleaned after each used. A new bladder will be used for each sample. Small parts, such as screens and gaskets will be replaced after each use. Dedicated air line tubing and Teflon sample tubing will be used at each monitoring well. The pump will be cleaned using the following steps:

- Alconox (or equivalent) and potable water wash;
- Potable water rinse;
- Distilled/deionized water rinse;
- Solvent (reagent or pesticide grade) rinse if samples are collected for organic analysis;
- Dilute (10%) nitric acid rinse if samples are collected for metals analysis;
- Distilled/deionized rinse, air dry.

2.2.3 Heavy Equipment Decontamination

Drilling equipment will be decontaminated before the first use during this project, between boreholes and prior to demobilization using high-pressure steam. Decontamination will be conducted at a dedicated decontamination pad constructed for the project or at an alternate location as indicated in the Work Plan or FAP. Decontamination fluids will be containerized (drummed) for subsequent characterization or disposal, unless other arrangements are made on a project-specific basis and as indicated in the Work Plan.

2.2.4 Personnel Decontamination

Wash buckets and potable water will be set up at the decontamination pad or alternate location as indicated in the work plan, FAP, or Health and Safety Plan (HASP). This includes washing hands and a boot wash. Details of the personnel decontamination procedures will be provided in the HASP.

3.0 SAMPLE HANDLING

3.1 SAMPLE IDENTIFICATION AND LABELING

Samples will be assigned a unique identification using the sample location or other sample-specific identifier. Sample identification may be limited to a specific number of alphanumeric characters to be consistent with the limitations of the laboratory tracking/reporting software. The general sample identification format follows (other designations may be used to accommodate the requirements of specific projects). It should be noted that the field sample IDs shown below are not those required for the EQuIS deliverable; AECOM will coordinate with the analytical laboratory so that the sample types and codes are entered properly for each field and QC sample, and that the codes are consistent with the most recent NYSDEC Valid Values.

MW = Monitoring Well

SB = Soil boring

SW = Surface Water

SD = Sediment

IA = Indoor Air

OA (or AA) = Outdoor (or ambient) air

SV = Soil Vapor

FB = Field (Equipment Rinsate) Blank

TB = Trip Blank

XX = Numerical sample identifier (up to five characters). This will ordinarily be the number of the monitoring well or soil boring location from which the sample was obtained.

As part of the unique identifier, the sample date will be included following any location that may have more than one sample collected. The format will be MMDDYY. For example MW-01S that is sampled on May 24, 2011 will be MW-01S_052411.

QC field duplicate samples will be submitted blind to the laboratory; a fictitious sample ID will be created using the same system as the original by adding 50 to the original well ID (e.g., MW-51S_052411 would be a field duplicate of MW-01S_052411). The sample identifications (of the original sample and its field duplicate) will be marked in the field book and on the copy of the chain-of-custody kept by the sampler and copied to the project manager. As the field duplicates are blind to the laboratory, the NYSDEC Valid Value for a field duplicate (FD) along with the identification of the parent sample will be done by AECOM after the EQuIS deliverable is received from the laboratory.

Affixed to each sampling container will be a non-removable label on which the following information will be recorded with permanent water-proof ink:

- Site name, location, and job number;
- Sample name;
- Date and time;
- Sampler's name;

- Preservative;
- Type of sample (e.g., water, soil, sludge, sediment, air); and,
- Requested analyses.

3.2 SAMPLE BOTTLES, PRESERVATION, AND HOLDING TIME

Table 1 identifies the sample preparation and analytical method, matrix, holding time, containers, and preservatives for the typical analyses to be performed under this contract. Sample bottle requirements, preservation, and holding times are discussed further below.

3.2.1 Sample Containers

The selection of sample containers used to collect samples is based on the criteria of sample matrix, analytical method, potential contaminants of concern, reactivity of container material with the sample, QA/QC requirements and any regulatory protocol requirements.

Sample bottles will be provided by the analytical laboratory and will conform to the requirements of the USEPA Specifications and Guidance for Contaminant-Free Sample Containers. Aqueous samples for volatile organic compound (VOC) analysis will be collected in 40-mL vials with teflon septa. Summa canisters for air samples will either be batch-certified or individually certified by the laboratory, as required by the specific needs of the project.

3.2.2 Sample Preservation

Samples will be preserved as indicated below and summarized on Table 1.

Aqueous Samples:

Volatile organics - cooled to 4º C; HCl added to pH ≤ 2.

Metals - cooled to 4º C; HNO_3 added to pH ≤ 2.

Cyanide – NaOH to pH ≥ 12.

Other organic fractions (semivolatiles, pesticides, PCBs) – no chemical preservation.

Chemical preservatives will be added to the sample bottles (prior to sample collection) by the analytical laboratory. The pH of samples will be spot-checked in the field and additional preservative will be added as needed. Sample preservation is checked upon sample receipt by the laboratory; this information is reported to the AECOM Quality Assurance Officer (QAO). If it appears that the level of chemical preservation added is not adequate, laboratory preservative preparation and addition will be modified or additional preservative will be added in the field by the sampling team.

Non-Aqueous (e.g., soil and sediment) Samples:

No chemical preservatives are added to non-aqueous samples

Air Samples (Summa Canisters):

No chemical preservatives are used for air samples.

3.2.3 Holding Times

Contractual holding times (see Table 1) are calculated from the validated time of sample receipt (VTSR) by the laboratory; samples will be shipped from the field to arrive at the lab no later than 48 hours from the time of sample collection. Holding time requirements will be those specified in the NYSDEC ASP 2005 with 2008 update for TO-15 analysis.

Although trip blanks are prepared in the analytical laboratory and shipped to the site prior to the collection of environmental samples, for the purposes of determining holding time conformance, trip blanks will be considered to have been generated on the same day as the environmental samples with which they are shipped and delivered. Procurement of bottles and blanks will be scheduled to prevent trip blanks from being stored for excessive periods prior to their return to the laboratory; the goal is that trip blanks should be held for no longer than one week prior to use.

3.3 CHAIN OF CUSTODY AND SHIPPING

A chain-of-custody form will trace the path of sample containers from the project site to the laboratory. Chain-of-custody forms are typically provided by the analytical laboratory.

Sample bottle tracking sheets or the chain-of-custody will be used to track the containers from the laboratory to the containers' destination. The project manager will notify the laboratory of upcoming field sampling events and the subsequent transfer of samples. This notification will include information concerning the number and type of samples, and the anticipated date of arrival. Insulated sample shipping containers (typically coolers) will be provided by the laboratory for shipping samples. Sample bottles within each shipping container will be individually labeled with an adhesive identification label provided by the laboratory. Project personnel receiving the sample containers from the laboratory will check each cooler for the condition and integrity of the bottles prior to field work.

Once the sample containers are filled, they will be immediately placed in the cooler with ice (in Ziploc plastic bags to prevent leaking) or synthetic ice packs to maintain the samples at 4º C. The field sampler will indicate the sample designation/location number in the space provided on the chain-of-custody form for each sample. The chain of custody forms will be signed and placed in a sealed plastic Ziploc bag in the cooler. The completed shipping container will be closed for transport with nylon strapping, or a similar shipping tape, and two paper seals will be affixed to the lid. The seals must be broken to open the cooler and will indicate tampering if the seals are broken before receipt at the laboratory. A label may be affixed identifying the cooler as containing "Environmental Samples" and the cooler will be shipped by an overnight delivery service to the laboratory. When the laboratory receives the coolers, the custody seals will be checked and lab personnel will sign the chain-of-custody form.

3.4 LABORATORY SAMPLE RECEIPT

Upon receipt at the laboratory, a laboratory representative inspects the samples for integrity and checks the shipment against the chain-of-custody/analytical task order form. Discrepancies are addressed at this point and documented on the chain-of-custody form and the cooler checklist (an example will be provided in each of the project-specific Field Sampling and Analysis Plans). Discrepancies are reported to the Laboratory Project Manager who contacts the AECOM Project Manager or QAO for resolution.

When the shipment and the chain-of-custody are in agreement, the custodian enters the samples into the Laboratory Information Management System and assigns each sample a unique laboratory number. This number is affixed to each sample bottle. The custodian then enters the sample and analysis information into the laboratory computer system.

3.4.1 Laboratory Sample Custody

The laboratory must satisfy the sample chain-of-custody requirements by implementing the following procedures for laboratory/sample security:

- Samples are stored in a secure area
- Access to the laboratory is through a monitored area

- Visitors sign a visitor's log and are escorted while in the laboratory
- Only the designated sample custodians have keys to sample storage area(s)
- Transfers of samples in and out of storage are documented.

3.4.2 Sample Storage, Security, and Disposal

While in the laboratory, the samples and aliquots that require storage at 4° C ± 2°C are maintained in a locked refrigerator unless they are being used for analysis. The laboratory is responsible for sample storage and security so that:

- Samples and extracts are stored for 60 days after the final analytical data report has been submitted to AECOM. The samples, extracts, and digestates are then disposed by the laboratory in accordance with laboratory SOPs and applicable regulations.
- Samples are not stored with standards or sample extracts.

4.0 DATA QUALITY REQUIREMENTS

4.1 ANALYTICAL METHODS

Soil and water sample analyses for these contracts will typically utilize USEPA SW-846 methods as listed below; however, specific methods will be determined on a work assignment-specific basis. Analytical and extraction/sample preparation methods typically used are shown on Table 1 and summarized below.

Volatile Organics - SW-846 Method 8260B

Semivolatile Organics – SW-846 Method 8270C

Pesticides – SW-846 Method 8081

PCBs – SW 846 Method 8082

Mercury – SW-846 Methods 7470 (water) and 7471 (soil)

Other target analyte list metals – SW-846 Method 6010B.

Air samples (sub slab vapor samples, indoor air samples, ambient air samples) will typically be collected in Summa canisters and analyzed by USEPA method TO-15.

Analytical methods used for project under these contracts are presented in the NYSDEC Analytical Services Protocol (ASP), 2005 (February 2008 supplement for TO-15). It is the laboratory's responsibility to be familiar with this document and procedures and deliverables within it pertaining to New York State work. Full Category B deliverables will be required unless specified otherwise in specific work assignments or work plans.

AECOM will assign an analytical laboratory to each project under subcontracts approved by NYSDEC. The proposed laboratory will be certified by the NYSDOH Environmental Laboratory Approved Program (see Section 1.2). The laboratory will be confirmed to be in good standing for the applicable parameter groups prior to being assigned to the WA by AECOM.

4.2 QUALITY ASSURANCE OBJECTIVES

Data quality objectives (DQOs) for measurement data in terms of sensitivity and the PARCC parameters (precision, accuracy, representativeness, comparability, and completeness) are established so that the data collected are sufficient and of adequate quality for their intended uses. Data collected and analyzed in conformance with the DQO process described in this QAPP will be used in assessing the uncertainty associated with decisions related to this site.

4.2.1 Sensitivity

The sensitivity or detection limit desired for each analysis or compound is based on the DQOs established for the project. The method detection is determined in accordance with the procedure in ASP Exhibit A, section 4.9.2.12, which is consistent with the procedure in 40 CFR Part 136 Appendix B.

The RL for nondetected analytes will be the lowest calibration standard associated with the analysis. Reporting limits will be equal to or lower than those presented in Exhibit C of ASP 2005 for the

applicable method. Analytes detected analytes at concentrations below the RL but above the MDL will be flagged "J" (estimated) by the laboratory. Typical RLs are summarized on Table 2.

The reporting limits and MDLs of the assigned laboratory will be reviewed by AECOM's QAO for each project to verify that the laboratory sensitivity is sufficient to meet the project objectives. These will typically include meeting the applicable standards, criteria, and guidance (SCGs) including soil cleanup objectives (6 NYCRR 375-6.8), supplemental soil cleanup objectives (NYSDEC, 2010b), groundwater and surface water criteria (compiled in TOGS 1.1.1), and indoor air screening levels (NYSDOH, 2006, 2007).

4.2.2 Precision

The laboratory objective for precision is to equal or exceed the precision demonstrated for the applied analytical methods on similar samples. Precision is evaluated by the analyses of laboratory and field duplicates. Matrix spike duplicate analyses will be performed once for every 20 samples for VOCs.

Relative Percent Difference (RPD) criteria determined from laboratory performance data are used to evaluate precision between duplicates. A matrix spike duplicate will be performed once for every twenty samples for volatile organics.

Precision measures the reproducibility of measurements under a given set of conditions. Specifically, it is a quantitative measure of the variability of a group of measurements compared to their average value. Precision is usually stated in terms of standard deviation but other estimates such as the coefficient of variation, relative standard deviation, range (maximum value minus minimum value), and relative range are common, and may be used pending review of the data.

The overall precision of measurement data is a mixture of sampling and analytical factors. Analytical precision is easier to control and quantify than sampling precision; there are more historical data related to individual method performance and the "universe" is not limited to the samples received in the laboratory. In contrast, sampling precision is unique to each site or project.

Overall system (sampling plus analytical) precision will be determined by analysis of field duplicate samples. Analytical results from laboratory duplicate samples will provide data on measurement (analytical) precision.

Precision will be determined from field duplicates, as well as laboratory matrix duplicate samples for metals analyses, and matrix spikes and matrix spike duplicates for organic analyses; it will be expressed as the relative percent difference (RPD):

$$RPD = 100 \times 2(|X_1 - X_2|) / (X_1 + X_2)$$

where:

> X_1 and X_2 are reported concentrations for each duplicate sample and subtracted differences represent absolute values.

Criteria for evaluation of laboratory duplicates are specified in the applicable methods. The objective for field duplicate precision is ≤ 50% RPD for all matrices for analytes detected at concentrations at least 2 times the reporting limit. Where one or both analytes are detected at less than 2 times the RL, the criterion is the absolute difference "D" ($X_1 - X_2$), and D should be less than the RL for the analyte.

4.2.3 Accuracy

The laboratory objective for accuracy is to equal or exceed the accuracy demonstrated for the applied analytical method on similar samples. Percent method recovery criteria and those determined from laboratory performance data, are used to evaluate accuracy in matrix (sample) spike and blank spike quality control samples. A matrix spike and blank spike or laboratory control will be performed once for

every analytical batch or as specified in the method or ASP. Other method-specific laboratory QC samples (such as continuing calibration standards) may also be used in the assessment of analytical accuracy. Sample (matrix) spike recovery is calculated as:

$$\% \text{ Recovery} = 100 \times (SSR-SR)/SA$$

Where:

SSR = Spiked sample Result

SR = Sample Result, and

SA = Spike Added

Accuracy measures the bias in a measurement system. It is difficult to measure accuracy for the entire data collection activity. Accuracy will be assessed through use of known QC samples. Accuracy values can be presented in a variety of ways. For projects under this NYSDEC contract, accuracy will be normally presented as percent recovery.

Routine organic analytical protocol requires a surrogate spike in each sample. Surrogate recovery will be defined as:

$$\% \text{ Recovery} = (R/S) \times 100$$

Where:

S = surrogate spike concentration

R = reported surrogate compound concentration

Recovery criteria for laboratory spikes and other laboratory QC samples through which accuracy may be evaluated are established in the applicable analytical method.

4.2.4 Representativeness

The representativeness of data is only as good as the representativeness of the samples collected. Sampling and handling procedures, and laboratory practices are designed to provide a standard set of performance-driven criteria to provide data of the same quality as other analyses of similar matrices using the same methods under similar conditions. Representativeness will be determined by a comparison of the quality controls for these samples against data from similar samples analyzed at the same time.

4.2.5 Comparability

Comparability of analytical data among laboratories becomes more accurate and reliable when all labs follow the same procedure and share information for program enhancement. Some of these procedures include:

- Instrument standards traceable to National Institute of Standards and Technology (NIST), the US Environmental Protection Agency (USEPA), or the New York State Departments of Health or Environmental Conservation;
- Using standard methodologies;
- Reporting results for similar matrices in consistent units;
- Applying appropriate levels of quality control within the context of the laboratory quality assurance program; and,
- Participation in inter-laboratory studies to document laboratory performance.

By using traceable standards and standard methods, the analytical results can be compared to other labs operating similarly. The QA Program documents internal performance. Periodic laboratory proficiency studies are instituted as a means of monitoring intra-laboratory performance.

Comparability within any specific project is also assessed by comparison of the project data to data generated previously; and, if available, comparison of the data for multiple sampling events conducted for the project. Comparability (consistency) of sampling techniques is also assessed, to some extent, by analysis of field duplicates; although it should be noted that large differences between field duplicates may result from a wide variety of causes, not just inconsistent sampling.

4.2.6 Completeness

The goal of completeness is to generate the maximum amount possible of valid data for all planned samples. Completeness of 100 percent indicates that all planned samples were collected; and the resultant data were fully valid and acceptable. As completeness is a function of both field activities and laboratory activities, separate completeness goals are established for each.

The default goal for sampling completeness is 95 percent, as is calculated as

$$\text{Sampling Completeness (\%)} = (Sc/Sp) \times 100$$

Where:

Sc = Samples collected (submitted) for analysis (documented from field records or COC)

Sp = Samples planned (as documented in the FAP or QAPP)

The default goal for analytical completeness is also set at 95 percent. Analytical completeness may be less than 100 percent either due to systemic failures that result in the rejection or loss of data for an entire sample; or compound-specific rejection (e.g., 2-hexanone) within an otherwise valid analysis.

For typical work assignments, the default overall completeness goal is 90 percent useable data. The impact of rejected or unusable data will be made on a case-by-case basis. If the goals of the project can be achieved without the missing datum or data, or if data from a different sampling event can be used to fill the data gap, no further action would be necessary. However, loss of critical data may require resampling or reanalysis.

4.3 FIELD QUALITY ASSURANCE

Blank water generated for use during this project must be “demonstrated analyte-free.” The criteria for analyte-free water are based on the USEPA-assigned values for the Contract Required Quantitation Limits (CRQLs) for CLP analyses, or the RL for SW-846 or other methods.

However, specifically for the common laboratory contaminants (acetone and 2-butanone), the allowable limits are five times the CRQL (or RL). For methylene chloride, the limit is 2.5 times the CRQL. For common SVOC contaminants (phthalate esters such as bis(2-ethylhexyl) phthalate), the limit is 5 times the CRQL.

The analytical testing required for the water to be demonstrated as analyte-free must be performed prior to the start of sample collection; thus, blank water will be supplied by the laboratory.

Table 2 of this QAPP shows typical QA/QC samples and reporting limits. QA/QC samples are discussed below.

4.3.1 Field Equipment (Rinsate) Blanks

Equipment blanks consist of demonstrated, analyte-free water that show if sampling equipment has the potential for contaminant carryover to give a false impression of contamination in an

environmental sample. When blank water is used to rinse a piece of sampling equipment (before it is used to sample), the rinsate is collected and analyzed to see if sampling could be biased by contamination from the equipment.

Rinsate blanks are not required when samples are collected directly into laboratory-provided sample containers (e.g., if specified as such in the FAP for matrices such as surface water or leachate seeps).

Field Equipment (Rinsate) blanks for bailers: For initial sampling, as well as at subsequent rounds of sampling when bailers are reused, at least one of the bailers used per decontamination batch, will be used to generate equipment (rinsate) blanks during groundwater sampling. Disposable bailers will be obtained from a single vendor for this project. One rinsate blank will be collected for each groundwater sampling event to verify that the vendor decontamination was adequate and that contamination has not occurred during shipment and storage.

Typically, one rinsate blank will be collected for every 20 field samples collected or one per week, whichever is more frequent, for each type of sampling equipment. The rinsate blanks will be collected from the soil and groundwater sampling equipment. However, the specific frequency will be indicated in the work assignment and work plans on a project-specific basis.

Equipment blanks are not collected or submitted in association with air (Summa canister) samples.

4.3.2 Field Duplicate Samples

Field duplicate samples are used to assess the variability of a matrix at a specific sampling point and to assess the reproducibility of the sampling method.

Aqueous field duplicate samples are second samples collected from the same location, at the same time, in the same manner as the first, and placed into a separate container (technically, these are co-located samples). Each duplicate sample will be analyzed for the same parameters as the original sample collected that day.

Soil duplicate samples are collected from a single location and device (e.g., split spoon sampler). Soil duplicates for VOC analysis are collected first, without homogenization. If other parameters are being analyzed, the remaining soil is homogenized (e.g., by mixing in a clean stainless steel bowl) and prior to generating the sample and duplicate.

Air field duplicates are typically collected by utilizing a “T” fitting on the sample line and splitting the air between two Summa canisters of the same size and set to the same flow rate.

The default field duplicate precision (RPD) objective is ≤50% percent RPD for all matrices where the sample concentration is at least two times the reporting limit. Where the analyte is detected in both samples but the concentration is less than 2 times the reporting limit, precision is assessed by the absolute difference, which should be less than the reporting limit. The RPD is not calculable when the analyte is not detected in one or both analyses. A more detailed discussion of the calculation is provided in Section 4.2.2 (Precision), above. Field duplicates will be collected at a frequency of one per 20 environmental samples for aqueous and non-aqueous sample for TCL/TAL analyses. The default field duplicate frequency for air samples is 10 percent (one per 10 environmental samples).

4.3.3 Split Samples

Split samples are used for performance audits or inter-laboratory comparability of data. Split samples may also be generated if a site owner or PRP requests them. A split sample will be defined as at least two separate sub-samples taken from a single original sample which has been thoroughly mixed or homogenized prior to the formation of the split samples. The exception to this is samples for volatile organics analysis which will not be homogenized. Collection of split samples is conducted only when specifically requested by NYSDEC.

4.3.4 Trip Blanks

The purpose of a VOC trip blank (using demonstrated analyte-free water) is to place a mechanism of control on sample bottle preparation and blank water quality, and sample handling. The trip blank travels from the lab to the site with the empty sample bottles and back from the site with the collected samples. There will be a minimum of one trip blank per shipment containing aqueous samples for VOC analysis.

Trip blanks will be collected only when aqueous volatile organics are being sampled and shipped; except that a trip blank is not required when the only aqueous samples in a shipment are QC samples (rinsate blanks).

4.3.5 Temperature Blanks

The laboratory will use either an infrared instrument to measure the temperature of liquid samples, or a temperature blank will be used to measure the temperature of liquid samples. If used, temperature blanks will be supplied by the analytical laboratory. If multiple coolers are necessary to store and transport aqueous samples, then each cooler will contain an individual temperature blank (if used).

4.4 FIELD TESTING QC

Field testing of groundwater will be performed during purging of wells prior to sampling for laboratory samples. Field QC checks of control limits for pH, specific conductance (conductivity) and turbidity are detailed below. The calibration frequencies discussed below are the minimum. Field personnel can and should check calibration more frequently in adverse conditions, if anomalous readings are obtained, or subjective observations of instrument performance suggest the possibility of erroneous readings. Calibration logs for the instruments discussed below will be provided in the work plan or FAP.

4.4.1 pH Meter

The pH meter is calibrated daily, using two standards bracketing the range of interest (generally 4.0 and 7.0). If the pH QC control sample (a pH buffer, which may be the same or different than those used to initially calibrate the instrument) exceeds 0.1 pH units from the true value, the source of the error will be determined and the instrument recalibrated. If a continuing calibration check with pH 7.0 buffer is off by more than 0.1 pH units, the instrument will be recalibrated. Expired buffer solutions will not be used.

Note that gel-type probes take longer to equilibrate (up to 15 minutes at near-freezing temperatures); this must be taken into account in calibrating the instrument and reading samples and standards.

4.4.2 Specific Conductivity

A vendor-provided conductivity standard will be used to check the calibration of the conductivity meter daily. Specific conductance QC samples will be on the order of 0.01 or 0.1 molar potassium chloride (KCl) solutions in accordance with manufacturer's recommendations.

4.4.3 Turbidity

The turbidity meter should be calibrated using a standard as close as possible to 50 NTU (the critical value for determining effectiveness of well development and evacuation). The turbidimeter will be checked daily. The turbidity QC sample will be a commercially prepared polymer standard (Advanced Polymer System, Inc., or similar).

4.4.4 Temperature

Temperature probes associated with instruments (such as the YSI SCT-33 conductivity and temperature meter) are not subject to field calibration, but the calibration should be checked to monitor instrument performance. It is recommended that the instrument temperature reading be checked against a NIST-traceable thermometer concurrently with checking the conductivity calibration. The instrument manual will be referenced for corrective actions if accurate readings cannot be obtained.

4.5 LABORATORY QUALITY ASSURANCE

4.5.1 Method Blanks

A method blank is laboratory water on which every step of the method is performed and analyzed along with the samples. Method blanks are used to assess the background variability of the method and to assess the introduction of contamination to the samples by the method, technique, or instruments as the sample is prepared and analyzed in the laboratory. Method blanks will be analyzed at a frequency of one for every twenty samples analyzed or as otherwise specified in the analytical protocol.

4.5.2 Laboratory Duplicates

Laboratory duplicates are sub-samples taken from a single aliquot of sample after the sample has been thoroughly mixed or homogenized (with the exception of volatile organics), to assess the precision or reproducibility of the analytical method on a sample of a particular matrix. Laboratory duplicates will be performed on spiked samples as a matrix spike and a matrix spike duplicate (MS/MSD) for volatile organics.

4.5.3 Spiked Samples

Two types of spiked samples will be prepared and analyzed as quality controls: matrix spikes and matrix spike duplicates (MS/MSD), which are analyzed to evaluate instrument and method performance and performance on samples of similar matrix. MS/MSD samples will be analyzed at a frequency of one (pair) for every 20 samples. In addition, matrix spike blanks (MSBs) will also be prepared and analyzed by the laboratory as required by NYSDEC ASP.

4.5.4 Laboratory Control Sample

A fortified clean matrix (laboratory control sample, or LCS) is analyzed with each analysis. In some cases a “Laboratory-Fortified Blank” (LFB) may serve as the LCS. These samples generally consist of a standard aqueous or solid matrix fortified with the analytes of interest for single-analyte methods and selected analytes for multi-analyte methods according to the appropriate analytical method. The LCS may be analyzed in duplicate for some methods (LCSD). The analyte recovery from each analysis (LCS and LCSD) is used to monitor analytical accuracy; analytical precision can be assessed from evaluation of the LCS/LCSD in the same manner as the MS/MSD.

5.0 FIELD DATA DOCUMENTATION

Field reporting documentation, including field logbooks and field data reporting forms, is discussed in FAP Section 3, especially sections 3.1 and 3.2, and not repeated here.

6.0 EQUIPMENT CALIBRATION AND MAINTENANCE

Quality assurance for instrumentation and equipment used for a project is controlled by a formal calibration program, which verifies that equipment is of the proper type, range, accuracy, and precision to provide data compatible with specified requirements. Instruments and equipment that measure a quantity, or whose performance is expected at a stated level, are subject to calibration. Calibration is performed using reference standards or externally by calibration agencies or equipment manufacturers.

6.1 STANDARD WATER AND AIR QUALITY FIELD EQUIPMENT

Field equipment used during the collection of environmental samples typically includes a turbidimeter (turbidity per EPA Method 180.1), pH meter (pH per EPA Method 150.1), conductivity meter (specific conductance per EPA Method 120.1), thermometer, and photoionization detector. See also Section 4.4 of this QAPP for additional discussion.

The organic vapor analyzer (MultiRAE, or equivalent organic vapor analyzer) used for soil screening and health and safety air monitoring will be calibrated following the manufacturer's instructions, at the beginning of the day, whenever the instrument is shut off for more than two hours, and at the field technician's discretion.

6.2 LABORATORY EQUIPMENT CALIBRATION

Laboratory equipment will be calibrated according to the method-specific requirements of the 2005 NYSDEC ASP**,** Exhibit E, Parts II and III, and maintained following professional judgment and the manufacturer's specifications, and additional requirements as specified in the ELAP certification manual.

6.2.1 Calibration Procedure

Written procedures are used for all instruments and equipment subject to calibration. For chemical analyses typically performed for these contracts, the calibration procedures are specified in the methods as compiled in the ASP. If established procedures are not available, a procedure is developed considering the type of equipment, stability characteristics of the equipment, required accuracy, and the effect of operational error on the quantities measured.

6.2.2 Calibration Frequency

Calibration frequency is based on the type of equipment, inherent stability, manufacturer's recommendations, values provided in recognized standards, intended data use, specified analytical methods, effect of error upon the measurement process, and prior experience.

6.2.3 Calibration Reference Standards

Two types of reference standards will be used by the standby laboratories for calibration:

Physical standards, such as weights for calibrating balances and certified thermometers for calibrating working thermometers, refrigerators and ovens, are generally used for periodic calibration.

Chemical standards, such as Standard Reference Materials (SRMs) provided by the National Institute of Standards and Technology (NIST) or USEPA, may also include vendor-certified materials traceable to NIST or USEPA SRMs. These are primarily used for operational calibration.

6.2.4 Calibration Failure

Equipment that cannot be calibrated or becomes inoperable is removed from service. Such equipment must be repaired and satisfactorily recalibrated before re-use. For laboratory equipment that fails calibration, analysis cannot proceed until appropriate corrective action is taken and the analyst achieves an acceptable calibration.

Laboratory managers are responsible for development and implementation of a contingency plan for major equipment failure. The plan includes guidelines on waiting for repairs, use of other instrumentation, subcontracting analyses, and evaluating scheduled priorities.

6.2.5 Calibration Records

Records are prepared and maintained for each piece of equipment subject to calibration. Records demonstrating accuracy of preparation, stability, and proof of continuity of reference standards are also maintained. Copies of the raw calibration data are kept with the analytical sample data.

6.3 OPERATIONAL CALIBRATION

Operational calibration is generally performed as part of the analytical procedure and refers to those operations in which instrument response (in its broadest interpretation) is related to analyte concentration. Included are the preparation of a standard response (calibration) curve and often the analysis of blanks.

Preparation of a standard calibration curve is accomplished by the analysis of calibration standards, which are prepared by adding the analyte(s) of interest to the solvent that is introduced into the instrument. The concentrations of the calibration standards are chosen to cover the working range of the instrument or method. For most methods, five calibration standards are used, with the concentration of the lowest calibration standard being the reporting or quantitation limit for that analysis. Sample measurements are made and reported within this working range; apparent concentrations which exceed the high end of the calibrated range (“E”-flagged data for organic analyses) are diluted (or a smaller sample is used) and re-analyzed. The calibration curve is prepared by plotting or performing a linear regression of the instrument responses against the analyte concentration.

7.0 DATA REDUCTION, VALIDATION, AND REPORTING

The guidance followed to perform quality data validation, and the methods and procedures outlined herein and elsewhere in the Work Plan, pertain to initiating and performing data validation, as well as reviewing data validation performed by others (if applicable). An outline of the data validation process is presented here, followed by a description of data validation review summaries.

7.1 LABORATORY DATA REPORTING AND REDUCTION

Data reduction is the process by which raw analytical data generated from laboratory instrument systems is converted into usable concentrations. The raw data, which may take the form of area counts, instrument responses, or observations, are processed by the laboratory and converted into concentrations expressed in the parts per million (mg/kg or mg/L) or parts per billion (µg/kg or µg/L) range. Raw data from these systems include compound identifications, concentrations, retention times, and data system print-outs. Raw data are usually reported in graphic form, bar graph form, or tabular form. The laboratory will follow standard operating procedures consistent with the data handling requirements of the applicable methods.

The laboratory will meet the applicable documentation, data reduction, and reporting protocols as specified in the 2005 revision of the NYSDEC ASP. ASP Deliverables are either Category B (full deliverables; similar to USEPA CLP requirements) or Category A (a reduced deliverable level). For this contract, Category B deliverables are the default and will be provided for all deliverables generated under the contract unless explicitly indicated otherwise on a site-specific basis. Laboratory data reports will conform to NYSDEC Category B deliverable requirements, as specified in Exhibit B, Part II.E, Sections 2 and 3, respectively.

Copies of the laboratory's generic Quality Assurance Management Plan (QAMP, as defined in ASP 2005 Exhibit E, Part I) will be maintained at AECOM's principal contact office (Latham, NY for D007626). The laboratory's QAMP will indicate the standard methods and practices for obtaining and assessing data, and how data are reduced from the analytical instruments to a finished report, indicating levels of review along the way.

To meet NYSDEC electronic data deliverable (EDD) requirements, standby laboratories subcontracted by AECOM for this work will be required to submit electronic deliverables in an EQuIS 4-file format consistent with AECOM standards (see Attachment 1). AECOM's database manager will be responsible verifying that the file submitted meets these specifications including verifying that current NYSDEC Valid Values were used for sample coding; providing an Excel (or Access) file to the data validator; uploading the validated data into the database; overseeing the uploading of any other data (field data, boring log information, etc.), and submitting a final EQuIS deliverable to NYSDEC that meets NYSDEC EDD requirements.

In addition to the hard copy of the data report, the laboratory will be asked to provide the sample data in spreadsheet form (submitted electronically or on computer diskette). The data spreadsheet will be generated to the extent possible directly from the laboratory's electronic files or information management system to minimize possible transcription errors resulting from the manual transcription of data.

7.2 DATA VALIDATION

Data generated for work assignments under these contracts will be typically be validated by a third-party subcontractor (not affiliated with the laboratory or with AECOM). Data validation will be performed by following guidelines established in the USEPA Region 2 SOPs applicable to the analytical method(s) being reviewed. These SOPs are checklists which are designed to formally and rigorously assess the quality and completeness of SW-846 and air sample TO-15 analysis data packages. The use of these USEPA SOPs will be adapted to conform to the specific requirements of the NYSDEC ASP (e.g., NYSDEC/ASP holding times; matrix spike blank requirements). Where necessary and appropriate, supplemental validation criteria may be derived from the EPA Functional Guidelines (USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, EPA-540-R-10-011, January 2010, and the National Functional Guidelines for Organic Data Review, EPA-540-R-08-01, June 2008).

Validation reports and DUSRs will consist of text results of the review and marked up copies of Form I (results with qualifiers applied by the validator). Validation will consist of target and non-target compounds with corresponding method blank data, spike and surrogate recoveries, sample data, and a final note of validation decision or qualification, along with any pertinent footnote references. Qualifiers applied to the data will be documented in the report text. Where QC failures caused the laboratory to perform a re-analysis, the data validator will make a recommendation as to which of the two analyses should be used. Data review will also include an assessment of sensitivity (i.e., are reporting limits appropriate to determine if contaminants are present at or above action levels or other applicable threshold values).

There may be some analyses for which there is no established USEPA or NYSDEC data validation protocol. In such cases, validation will be based on the Region 2 SOPs and EPA Functional Guidelines as much as possible, as well as the laboratory's adherence to the technical requirements of the method, and the professional judgment of the validator. The degree of rigor in such validation will correspond to the nature of the data and the significance of the data and its intended use.

7.3 DATA USABILITY

Subsequent to review of the items evaluated in the subcontractor data validator reports (DUSRs) and accompanying tables, AECOM's QA staff then prepares a brief data usability summary. The data usability summary, which will be provided as part of the project report, encompasses both quantitative and qualitative aspects, although the qualitative element is the most significant.

The quantitative aspect is a summary of the data quality as expressed by qualifiers applied to the data; the percent rejected, qualified (i.e., estimated), missing, and fully acceptable data are reported. As appropriate, this quantitative summary is broken down by matrix, laboratory, or analytical fraction or method.

The qualitative element of the data usability summary is the QA officer's translation and summary of the validation reports into a discussion useful to data users. The qualitative aspect will discuss the significance of the qualifications applied to the data, especially in terms of those most relevant to the intended use of the data. The usability report will also indicate whether there is a suspected bias (high or low) in qualified data, and will also provide a subjective overall assessment of the data quality. If similar analyses are performed by more than one method, a discussion of the extent of agreement among the various methods will be included, as well as discussion of any discrepancies among the data sets.

The QAO will also indicate if there is a technical basis for selecting one data type over another for multiple measurements which are not in agreement.

Data which has not been validated and field data used for the project will be discussed in the data usability summary, including any limitations on the use of such data.

7.4 FIELD DATA VERIFICATION

Field personnel will record all field data in bound field logbooks and on standard forms. After checking the validity of the data in the field notes, the Project Manager or his/her designee will reduce the data to tabular form, when possible, by entering the data into data files. Where appropriate, the data files will be set up for direct input into the project database. Subjective data will be filed as hard copies for later review by the Project Manager and incorporation into technical reports, as appropriate.

Verification of field data will be performed at two different levels. The first level of data verification will be performed at the time of collection by following standard procedures and QC checks. The second level of review consists of the Project Manager, Task Manager, or other competent personnel, reviewing the data to confirm that the correct codes and units have been included. After data reduction into tables and arrays is complete, the Site Manager will review data sets for anomalous values. The Project Manager, who will review field reports for reasonableness and completeness, will validate subjective field and technical data.

8.0 PERFORMANCE AND SYSTEM AUDITS

Audits are systematic checks to determine the quality of operation of some activity or function in the field or laboratory. Field audits are conducted to verify adherence to proper field and sampling procedures. Audits are of two types, as described below.

- Performance audits are independent safety and health, procedure, and/or sample checks made by a supervisor or auditor to arrive at a quantitative measure of the quality of the data produced by one section or the entire measurement process.
- System audits are onsite qualitative inspections and reviews of the QA system used by some part of or the entire measurement system. The audits are performed against the QAPP. A checklist is typically generated from the requirements and becomes the basis for the audit. The results of any deficiencies noted during the audit are summarized in an audit report.

Laboratory performance and system audits are performed by the laboratory's QA staff to assess the effectiveness of the quality system. These internal audits are performed on a routine basis. Audits are also performed by certifying agencies. Audit reports and corrective actions are available to NYSDEC for review.

8.1 RESPONSIBILITY, AUTHORITY, AND TIMING

QA audits to be conducted for the project may include system, performance, and data audits. The Project QA Officer will keep a tentative schedule on record that details the number and types of audits.

8.2 FIELD AUDITS

The need for field audits will be determined on a project-specific basis as required by the WA or in the approved work plans for the project. Not all the aspects listed below will be necessary or appropriate for projects for which field audits are specified.

Field performance audits, if specified, will be conducted during the project as field data are generated, reduced, and analyzed. Numerical manipulations, including manual calculations, will be documented. Records of numerical analyses will be legible, of reproduction quality, and sufficiently complete to permit logical reconstruction by a qualified individual other than the originator.

Indicators of the level of field performance include the analytical results of the blank and replicate samples. Each blank analysis will be considered an indirect audit of the effectiveness of measures taken in the field to maintain sample integrity (e.g., field decontamination procedures).

The results of the field replicate analyses are an indirect audit of the ability of each field team to collect representative sample portions of each matrix type.

System audits of site activities will be accomplished by an inspection of all field site activities. During this audit, the auditor(s) will compare current field practices with standard procedures. The following elements will be evaluated during a field system audit:

- Field activities conducted in substantial compliance with the Work Plan and FAP
- Procedures and analyses conducted according to procedures outlined in the QAPP and Addendum
- Sample documentation
- Working order of instruments and equipment
- Level of QA conducted by field personnel

- Contingency plans in case of equipment failure or other event preventing the planned activity from proceeding
- Decontamination procedures
- Level of efficiency with which each team conducts planned activities at one site and proceeds to the next
- Sample packaging and shipment.

After completion of the audit, any deficiencies will be discussed with the field staff and corrections identified. If any of these deficiencies could affect the integrity of the samples being collected, the auditor(s) will inform the field staff and corrections will be implemented immediately. The audit will be performed by the Project QA/QC Coordinator or the Site Manager.

8.3 LABORATORY PERFORMANCE AND SYSTEM AUDITS

As part of the laboratory subcontractor procurement process under the AECOM/NYSDEC Standby Engineering Contract, the laboratory assigned to this project will been verified to be certified by the NYSDOH Environmental Laboratory Approval Program for the matrices and analytical protocols to be used. Therefore, no project-specific audit of the laboratory(s) will be performed unless warranted by a problem(s) that cannot be resolved by any other means, or at the discretion of AECOM and NYSDEC.

8.4 AUDIT PROCEDURES

Prior to an audit, the designated lead auditor prepares an audit checklist. During an audit and upon its completion, the auditor(s) will discuss the findings with the individuals audited and discuss and agree on corrective actions to be initiated. The auditor will then prepare and submit an audit report to the manager of the audited group and the project manager.

The manager of the audited group will then prepare and submit, to the Project QA Officer and the Project Manager, a plan for implementing the corrective action to be taken on non-conformances indicated in the audit report, the date by which such corrective action will be completed, and actions taken to prevent reoccurrence. If the corrective action has been completed, supporting documentation should be attached to the reply. The auditor will ascertain (by re-audit or other means) if appropriate and timely corrective action has been implemented.

Records of audits will be maintained in the project files.

8.5 AUDIT DOCUMENTATION

A checklist will be completed during each audit so that the previously defined scope of the individual audits is accomplished and that the audits follow established procedures. The checklist will detail the activities to be executed as part of the auditing plan. Audit checklists will be prepared in advance and will be available for review. Following each system, performance, and data audit, the auditor or QAO will prepare a report to document the findings of the specific audit.

9.0 CORRECTIVE ACTIONS

If instrument performance or data fall outside acceptable limits, then corrective actions will be taken. These actions may include recalibration or standardization of instruments, acquiring new standards, replacing equipment, repairing equipment, and reanalyzing samples or redoing sections of work.

Subcontractors providing analytical services should perform their own internal laboratory audits and calibration procedures with data review conducted at a frequency so that errors and problems are detected early, thus avoiding the prospect of redoing large segments of work.

Situations related to this project requiring corrective action will be documented and made part of the project file. For each measurement system identified requiring corrective action, the responsible individual for initiating the corrective action and also the individual responsible for approving the corrective action, if necessary, will be identified.

As part of its quality management system (QMS) program, AECOM provides relevant excerpts and conclusions from data validation reports to the analytical laboratories. The laboratories are therefore made aware of non-critical items and areas where improvement may be made in subsequent NYSDEC ASP work.

The objectives of the corrective action procedures presented below are to ensure that recognized errors in performance of sample and data acquisition lead to effective remedial measures and that those steps are documented to provide assurance that any data quality deficiencies are recognized in later interpretation and are not recurrent.

9.1 RATIONALE

Many times corrective measures are undertaken in a timely and effective fashion but go undocumented. In other cases, corrective actions are of a complex nature and may require scheduled interactions between departmental groups. In either case, documentation in a formal or informal sense can reinforce the effectiveness and duration of the corrective measures taken.

9.2 CORRECTIVE ACTION METHODS

9.2.1 Immediate Corrective Actions

Immediate corrective actions are of a minor or routine nature such as correcting malfunctioning equipment, correction of data transcription errors, and other such activities routinely made in the field, laboratory, or office by technicians, analysts, and other project staff.

9.2.2 Long-Term Corrective Actions

Long-term corrective action will be used to identify and eliminate causes of non-conformances which are of a complex nature and that are formally reported between management groups.

9.2.3 Corrective Action Steps

For long-term corrective actions, steps comprising closed-loop corrective action system are as follows:

- Define the problem
- Assign responsibility for investigating the problem
- Investigate and determine the cause of the problem
- Determine a corrective action to eliminate the problem
- Assign and accept responsibility for implementing the corrective action

Verify that the corrective action has eliminated the problem.

Non-conformance events associated with analytical work are documented by the laboratories' Non-Conformance Records, which are reviewed and approved by the laboratory's Quality Assurance Manager.

9.2.4 Audit-Based Non-Conformances

Following audits, corrective action is initiated by documenting the audit finding and recommended corrective action on an Audit Finding Report.

9.3 CORRECTIVE ACTION REPORT REVIEW AND FILING

Immediate and long-term corrective actions require review to assure that, during the time of non-conformance, erroneous data were not generated or that, if possible, correct data were acquired instead. Such confirmation and review is the responsibility of the supervisor of the staff implementing the corrective action. Confirmation will be acknowledged by notation and dated signature on the affected data record or appropriate form or by memorandum to AECOM project management.

10.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

Fundamental to the success of this QA/QC is the active participation of the Project Manager and the Project QA Officer. The Program QA Officer will be advised of project activities and will participate in development, review, and operation of the project. Project management will be informed of QA activities through the receipt, review, and/or approval of:

- Project-specific QA project plans
- Corporate and project-specific QA/QC plans and procedures
- Corrective action notices
- Non-conformance records.

Periodic assessment of field and laboratory QA/QC activities and data accuracy, precision, and completeness will be conducted and reported by the laboratory. Items to be included in the QA reports are the summary of results for the performance or the system audit and, where applicable:

- Assessment of adherence to work scope and schedule for the audited task
- Assessment of the precision, accuracy, and completeness of sample batches and
- subsequent status of data processing and analyses
- Significant QC problems and the status of any ongoing corrective actions
- Changes to the site-specific Work Plan
- Status of implementation of the site-specific Work Plan.

Monthly project status reporting to the NYSDEC will include aspects of quality control that were pertinent during the month’s activities. Problems revealed during review of the month’s activities will be documented and addressed. These reports will include a description of completed and on-going activities, and an indication how each task is progressing relative to the project schedule.

The project manager, through task managers, will be responsible for verifying that records and files related to the work assignment are stored appropriately and are retrievable.

The laboratory will submit any memoranda or correspondence related to quality control of this project's samples as part of its deliverables package.

11.0 REFERENCES

New York State Department of Environmental Conservation (NYSDEC), 2005. *Analytical Services Protocol (ASP) Manual*. July.

NYSDEC, 2008. *NYSDEC Modifications to EPA Region 9 TO-15 QA/QC Criteria provided in the July 2005 ASP*. February 2008.

NYSDEC, 2010a. *Technical Guidance for Site Investigation and Remediation. Draft. DER-10*. Division of Environmental Remediation. December.

NYSDEC, 2010b. CP-51 / *Soil Cleanup Guidance*. October.

NYSDEC and AECOM Technical Services, Northeast, Inc. (AECOM), 2010. Standby Contract No. D007626 between the State of New York Department of Environmental Conservation and AECOM Technical Services Northeast, Inc. For Engineering Services. October.

New York State Department of Health (NYSDOH) Wadsworth Laboratory Environmental Laboratory Approval Program Certification Manual. Accessed online at http://www.wadsworth.org/labcert/elapcert/index.html. Revisions through April, 2011; accessed May, 2011.

NYSDOH ELAP Web site. http://www.wadsworth.org/labcert/elap/

NYSDOH Center for Environmental Health Bureau of Environmental Exposure Investigation, 2006. *Guidance for Evaluating Soil Vapor Intrusion in the State of New York*. Final. October.

NYSDOH, 2007. Letter from Gary Litwin (Director) to Dale Desnoyers (NYSDEC DER) re: Sail Vapor/Indoor Air Matrices. (Adds additional chlorinated VOCs to the original matrices in the 2006 SVI guidance). June 25.

USEPA Region 2, Standard Operating Procedures for Data Review. Available at http://www.epa.gov/region02/qa/documents.htm#sop. Accessed May 2011.

USEPA Region 2, 1998. *Ground Water Sampling Procedure – Low Stress (Low Flow) Purging and Sampling*. Final. March 16.

USEPA, 2010. *Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*, EPA 540/R-10-011. January.

USEPA, 2008. *Contract Laboratory Program National Functional Guidelines for Organic Data Review*, EPA/540/R-08-01. June.

USEPA, 1999. *Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air – Second Edition*. USEPA Center for Environmental Research Information. EPA/625/R-96/010b. January.

USEPA, 1986. *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, Third edition. EPA SW-846. With revisions and updates through March, 2009. Accessed on line (at "SW-846 On-Line") May 2011 at http://www.epa.gov/epaoswer/hazwaste/test/main.htm

USEPA, 1988. *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA*. USEPA Office of Emergency and Remedial Response. OSWER Directive No. 355.3-01. October.

TABLES

Table 1
Generic Quality Assurance Project Plan
NYSDEC Standby Engineering Contract (D007626)

Sample Bottle, Volume, Preservation, and Holding Time Summary

MATRIX/ANALYSIS	Sample Prep Method [1]	Analytical Method [(2)]	Sample Bottles (3)				Minimum	Preservation	Holding Time (4, 5)		Comment
			Mat'l	Size	Qty	Source	Vol Rqd	(4)	Extraction	Analysis	
Aqueous Samples											
Volatile Organics	SW 846 5030B	SW 846 8260B	G	40 mL	2 or 3	Lab	40 mL	HCl to pH ≤ 2	NA	14 days	7 days if not preserved.
Semivolatile Organics	SW 846 3510C/3520C/3535	SW 846 8270C	G	1 L	2	Lab	1 L	None	7 days	40 days	
Pesticides	SW 846 3510C/3520C/3535	SW 846 8081A	G	1 L	1	Lab	1 L	None	7 days	40 days	
PCBs	SW 846 3510C/3520C/3535	SW 846 8082	G	1 L	1	Lab	1 L	None	7 days	40 days	
Metals (except mercury)	SW 846 3005A/3010A/3020A	SW 846 6010B	P	250 mL	1	Lab	200 mL	HNO_3 to pH≤ 2	NA	180 days	180 days for TAL metals except Hg.
Mercury	SW 846 7470A	SW 846 7470A	"	"	"	"	"	"	NA	28 days	28 days for Hg.
Non-Aqueous Samples											
Volatile Organics	SW 846 5035	SW 846 8260B	Encore	5 or 25 g	3 or 1	Vendor [7]	5 g	None	NA	48 hours [8]	
Semivolatile Organics	SW 846 3540C/3541/3545C	SW 846 8270C	G	8 oz [(6)]	1	Lab	30 g	None	14 days	40 days	
Pesticides	SW 846 3540C/3541/3545C	SW 846 8081A	G	"	"	Lab	30 g	None	14 days	40 days	
PCBs	SW 846 3540C/3541/3545C	SW 846 8082	G	"	"	Lab	30 g	None	14 days	40 days	
Metals (except mercury)	SW 846 3050B/3051/3052	SW 846 6010B	G	"	"	Lab	10 g	None	NA	180 days	180 days for TAL metals except Hg.
Mercury	SW 846 7471A	SW 846 7471A	"	"	"	"	2 g	"	NA	28 days	28 days for Hg.
Air/Vapor Samples											
Volatile Organics	NA	EPA TO-15	SS	6 L [(9)]	1	Lab	400 mL	None	NA	14 days	Summa canister; certified clean by laboratory.
Volatile Organics - Low	NA	EPA TO-15 SIM [(10)]	SS	6 L [(9)]	1	Lab	400 mL	None	NA	14 days	Summa canister; certified clean by laboratory.

(1) Laboratory may propose alternate extraction/preparation methods, subject to AECOM approval.
(2) More recent versions of SW-846 methods may be used subject to AECOM approval.
(3) Bottles typical. EnCore samplers for VOCs in soil will be provided by laboratory or AECOM on a case-by-case basis.
(4) All samples for chemical analysis should be held at 4 degrees C in addition to any chemical preservation required.
(5) Holding time calculated from day of collection, unless noted as being from time of extraction. Laboratory holding times (ASP 2005, Exhibit I) are two days shorter to allow for field handling and shipping.
(6) A single 8-oz sample is sufficient for SVOCs, pesticides, PCBs, and metals.
(7) Encore samplers are typically purchased from an outside supplier by AECOM but may also be requested (for a fee) from the analytical laboratory.
(8) Encore samplers must be prepared/preserved in the laboratory within 48 hours of collection. Soil samples in glass bottles and preserved Encores have a 14 day (total) holding time.
(9) Smaller canisters (e.g., 1.4 L "mini-cans") may be appropriate for some purposes on a case-by-case basis.
(10) A reporting limit of 0.25 $\mu g/m^3$ is required for NYSDOH Matrix 2 compounds (TCE, vinyl chloride, and carbon tetrachloride) in indoor air and outdoor (ambient) air samples.
G = Glass
P = Plastic
SS = Stainless Steel
SW-846: Test Methods for Evaluating Solid Waste, Physical/Chemical Methods. USEPA SW-846. Complete through Update IV, March 2009.
EPA = Compendium of Methods for the Determination of Toxic Organics in Air, Second Edition (EPA/625/R-96/010b; 1999)

Table 2
Generic Quality Assurance Project Plan
NYSDEC Standby Engineering Contract (D007626)

Reporting Limits and QA/QC Sample Quantity Summary

MATRIX/ANALYSIS	Analytical Method	Laboratory	Reporting Limit -Typical (units as specified)	Field Sample Quantity [1]	Matrix Spike (MS) or LCS	MS Duplicate or Matrix Duplicate	Field Duplicate	Equipment Blank [3]	Trip Blank	Total Billable Analyses
Aqueous Samples										
Volatile organics	SW 846 8260B	TBD	0.5 - 1.0 µg/L (typical)	20	1	1	1	1	1	25
Semivolatile organics	SW 846 8270C	TBD	10 - 20 µg/L (typical)	20	1	1	1	1	0	24
Pesticides	SW 846 8081A	TBD	0.05 - 0.5 µg/L (typical)	20	1	1	1	1	0	24
PCBs	SW 846 8082	TBD	33 µg/L	20	1	1	1	1	0	24
Metals (TAL except Hg)	SW 846 6010B	TBD	Analyte-specific	20	1	1	1	1	0	24
Mercury	SW 846 7470A	TBD	0.2 µg/L	20	1	1	1	1	0	24
Soil Samples										
Volatile organics	SW 846 8260B	TBD	5 µg/kg (typical) [2]	20	1	1	1	1	0	24
Semivolatile organics	SW 846 8270C	TBD	330 µg/kg (typical) [2]	20	1	1	1	1	0	24
Pesticides	SW 846 8081A	TBD	1.7-3.3 µg/kg (typical) [2]	20	1	1	1	1	0	24
PCBs	SW 846 8082	TBD	57 - 70 µg/kg [2]	20	1	1	1	1	0	24
Metals (TAL except Hg)	SW 846 6010B	TBD	Analyte-specific	20	1	1	1	1	0	24
Mercury	SW 846 7471A	TBD	0.2 µg/kg [2]	20	1	1	1	1	0	24
Air Samples										
Volatile organics	TO-15	TBD	1 µg/m^3	20	NA [4]	NA [4]	2	NA	NA	22
Volatile organics - low level	TO-15-SIM	TBD	0.25 µg/m^3 [(5)]	20	NA [4]	NA [4]	2	NA	NA	22

TAL = Target Analyte List (23 Metals)
TBD = To be determined. Laboratory services to be rotated among laboratories selected for standby subcontracts.

Notes

1 Field sample quantity shown (20) is for illustration only. QC quantities shown are typical requirements for each group of 20 or fewer field samples.
2 Reporting limits for soils, when adjusted for dry weight, will be higher. Detections above the MDL but less than reporting limits will be reported and flagged estimated (J).
3 Field equipment rinsate blank quantity will vary depending on sample collection rate and types of sampling equipment used; quantity may be greater or less than that shown. See Work Plan or FAP.
4 Spikes, LCS, and duplicates are not explicitly required by method TO-15 but are usually included as part the laboratory's analytical QA program.
5 A reporting limit of 0.25 µg/m^3 is required for NYSDOH Matrix 2 compounds (TCE, vinyl chloride, and carbon tetrachloride) in indoor air and outdoor (ambient) air samples.

ATTACHMENT 1

ATTACHMENT 1

AECOM Electronic Data Deliverable Specification

Documentation of the structure and contents of the EDD is now provided directly by the EQuIS Data Processor (EDP). Click the **EDD Description** button in the **Tools** section of the **Home** ribbon section of EDP. The AECOM format file and EDP software (for data providers that do not have it already) are available from http://www.earthsoft.com/products/edp/edp-format-for-aecom/. The format will have to be "registered" when first launched in EDP.

Each EDD will comprise 4 files, to describe samples, tests, results, and batches. The format file has two different sections for samples, Field and Lab, only one of which can be included in the EDD. Which sample section to use will be communicated by the AECOM data manager at project setup.

Submittal

The EDD file can be in one of the following formats:

- ZIP archive of tab-delimited text files (.txt)
- spreadsheet (.xls or .xlsx)
- database (.mdb)

Regardless of the method of EDD Submittal, EDD Packages must be named using a specific naming convention.
EDD File Name:
<Unique ID>.<Facility Code>.AECOM.{zip | xls | xlsx | mdb}

ZIP archive text file EDD section names:
<Unique ID>.<EDD Section Name>.txt

XLS worksheet MDB table EDD section names:
<EDD Section Name>

Where:
<Unique ID> = A unique identifier which will be the Sample Delivery Group name unless other arrangements have been made.
<Facility Code> = The facility code for the facility to which this EDD will be loaded, will be communicated by the AECOM data manager at project setup.
<EDD Section Name> = The name of the section within the EDD (i.e. AECOMLabSMP or AECOMFSample, AECOMLabTST, AECOMLabRES, AECOMLabBCH) as it appears in EDP.
Between each of the name elements is a "." (period). It is very important that it is a period and not a "-" (dash), "_" (underscore), or any other character.

Resubmittal

EDD packages may be resubmitted. However, in order to resubmit corrected EDDs, the files must each be renamed, regardless of the reason(s) for resubmittal.
Example: A lab originally submits an EDD Package (.zip) file named "20100129.MySite.AECOM.zip" which contains EDDs named "20100129.AECOMFSample.txt," etc. If the lab later makes a change to one of the EDDs, it would have to submit a new EDD Package named "20100129R.MySite.AECOM.zip" with EDDs named "20100129R.AECOMFSample.txt," etc.

Reference Values

A Reference Values file should be delivered from the AECOM data manager to the data provider at project setup. No EDDs will be accepted that do not strictly adhere to the project-specific reference values. If new values need to be used, they must be identified and explained to the AECOM data manager who will provide approval or alternate codes to use before any EDD should be submitted.

For the NYSDEC projects, the reference values can be accessed at
http://www.earthsoft.com/products/edp/edp-format-for-nysdec/