Formerly ACCO Brands, Inc. Site

32-00 Skillman Avenue
Long Island City, New York

REMEDIAL ACTION WORK PLAN

Operable Units 1 and 2

NYSDEC VCP Site Code V00331

Prepared For:
Beam Suntory, Inc.
149 Happy Hollow Road
Clermont, KY 40110

Submitted to:
New York City Department of Environmental Conservation
Division of Environmental Remediation
Region 2 – Long Island City
47-40 21st Street,
Long Island City, NY 11101

March 2015

Prepared by:
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CERTIFICATIONS

I, Arnold F. Fleming, certify that I am currently a NYS registered professional engineer or Qualified Environmental Professional as defined in 6 NYCRR Part 375 and that this Remedial Action Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10) and that all activities were performed in full accordance with the DER-approved work plan and any DER-approved modifications.

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

Arnold F. Fleming, P.E.
NYS Professional Engineer # 050411

3/26/15
Date

ARNOLD F. FLEMING
050411
Signature

It is a violation of Article 145 of New York State Education Law for any person to alter this document in any way without the express written verification of adoption by any New York State licensed engineer in accordance with Section 7209(2), Article 145, New York State Education Law.

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LIST OF ACRONYMS

VCA	Voluntary Cleanup Agreement
VCP	Voluntary Cleanup Program
ECL	Environmental Conservation Law
CAMP	Community Air Monitoring Program
Class GA Standards	NYSDEC TOGS 1.1.1 Class GA Ambient Water Quality Standards and Guidance Values
CEQR	City Environmental Quality Review
CFR	Code of Federal Regulations
CPP	Citizen Participation Plan
DER-10	NYSDEC Division of Environmental Remediation (DER), DER-10 / Technical Guidance for Site Investigation and Remediation
DUSR	Data Usability Summary Report
EC	Engineering Control
ESA	Environmental Site Assessment
FER	Final Engineering Report
FLS	Fleming-Lee Shue, Inc.
HASP	Health and Safety Plan
HSA	Hollow Stem Auger
HSO	Health and Safety Officer
IC	Institutional Control
MW	Monitoring Well
NJDEP	New Jersey Department of Environmental Protection
NYCDEP	New York City Department of Environmental Protection
NYCDOB	New York City Department of Buildings
NYCDOT	New York City Department of Transportation
NYCRR	New York Codes, Rules and Regulations
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYSDOH-ELAP	New York State Department of Health Environmental Laboratory Approval Program
OSHA	Occupational Safety and Health Association
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PCE	Tetrachloroethylene
PID	Photoionization Detector
PPE	Personal Protective Equipment
QA/QC	Quality Assurance / Quality Control
QAPP	Quality Assurance Project Plan
RAWP	Remedial Action Work Plan

RE	Remedial Engineer
RI	Remedial Investigation
SB	Soil Boring
SCG	Applicable Standards, Criteria and Guidance Values
SMP	Site Management Plan
SoMP	Soil/Material Management Plan
SVOC	Semi-Volatile Organic Compound
TAL	Target Analyte List
TCE	Trichloroethylene
TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching Procedure
TCLP Limits	USEPA Maximum Concentrations of Contaminants for the Toxicity Characteristic
USEPA	United States Environmental Protection Agency
USGS	United States Geological Survey
UST	Underground Storage Tank
VOC	Volatile Organic Compound

EXECUTIVE SUMMARY

Site Description

The property is located at 32-00 Skillman Avenue, Long Island City, New York and is identified as Block 245 and Lot 9 on the New York City Tax Map (Site). The Site is approximately 1.8-acres and is bounded by Skillman Avenue to the north, Queens Boulevard to the south, 32nd Place to the east and Van Dam Street to the west. Figure 1 shows the Site Location.

The Site is developed with a 3-story commercial and light industrial building occupied by multiple tenants, including a newspaper printing facility on the ground floor and a tennis and racquet ball club on the upper floors. The soil, groundwater, and soil vapor beneath the building's basement area (onsite) is covered under Operable Unit-1 (OU-1) while the offsite soil, groundwater, and soil vapor are covered under the OU-2 of the Voluntary Cleanup Program (VCP) entered into by ACCO Brands Inc. with the NYSDEC in October 2000. Figure 2 shows the Site Layout.

Site History

The Site building was constructed in 1950 and was occupied by ACCO Brands Inc. (ACCO) starting in 1952. During ACCO's occupancy, the Site building housed a manufacturing operation for staplers and stapler components, which involved the use of various paints, thinners, solvents and cleaners. ACCO sold the property in July 1998 to Swingstell, LLC (Swingstell), and the facility ceased operations in September 1999. An inspection of the Site conducted during the facility's closure revealed a small unlined sump in the basement adjacent to a former degreasing operations area and chlorinated solvent contamination in the subsurface soils and groundwater attributable to the former manufacturing operation.

In July 2000, ACCO entered the Site into the NYSDEC VCP to investigate the nature and extent of this contamination and to conduct any necessary remediation. ACCO agreed to lease the basement of the Site building from Swingstell for the purposes of conducting these activities. Fortune Brands, Inc. acquired the Site through a purchase of certain ACCO assets in approximately

2007 and subsequently changed its name to Beam, Inc. in 2011. In 2014, Beam, Inc. was acquired by Suntory Holdings and is now known as Beam Suntory, Inc.

Previous Environmental Investigations

In October 2000, ACCO entered into the NYSDEC VCP to investigate and remediate the subsurface contamination identified beneath the Site. An on-site (OU-1) investigation conducted in 2000 and an off-Site investigation (OU-2) in 2001 identified trichloroethylene (TCE) in the soils and groundwater beneath the Site.

Since 2004, several remedial measures have been applied to the Site and are summarized below:

- A Soil Vapor Extraction (SVE) system was installed in OU-1 in 2004 which has been in operation since.
- Air sparging at OU-1 took place from September 2004 to May 2005.
- Ozone injection at OU-1 took place during three different occasions (from May 2005 to July 2006, March 2008 to July 2008, and October 2008 to November 2008). The ozone injection system was removed in 2010.
- Chemical oxidation via the injection of Potassium Permanganate took place at OU-1 from 2004 to 2009 in seven injection events. Potassium Permanganate was injected at OU-2 from 2008 to 2010 on four different occasions.

Summary of the Supplemental Remedial Investigation

The Supplemental Remedial Investigation (SRI) was performed to confirm the findings of the Conceptual Site Model (CSM). Specifically, it was designed to better define the distribution and concentration of the residual TCE and confirm the connection to the lithology such that an appropriate final remedy could be designed and implemented. A reliable baseline assessment of the geochemical alteration of the subsurface resulting from the previous treatments was also conducted, and additional information regarding subsurface stratigraphy was obtained. The SRI activities were completed in accordance with the June 2013 SRI Work Plan that was approved by NYSDEC on July 1, 2013.

The SRI included the collection of groundwater samples for VOC analysis, the deployment of a membrane interface probe/hydraulic profiling tool (MIP/HPT) for in-situ analysis of subsurface soil quality and lithology and the collection of soil samples for VOC analysis.

The SRI results yield the following conclusions:

- Based on the MIP/HPT and the groundwater monitoring findings, static groundwater level is approximately 14 to 15 feet below the basement slab finished surface.
- The hydraulic conductivities ranged from 4.6 x 10-4 cm/s to 7.4 x 10-4 cm/s in the shallow wells and from 1.6 x10-3 cm/s to 2.0 x 10-3 cm/s in the intermediate wells.
- The subsurface lithology consists of three major lithological features. A sand stratum that ranges in thickness from 12 to 22 feet that is underlain by a silt stratum that ranges in thickness from 18 to 22 feet with interbedded 1 to 6 feet thick silty sand and sand lenses. A basal clay layer was encountered at approximately 30 to 40 feet below the basement slab finished surface. The clay layer is continuous throughout the area of investigation.
- The groundwater analytical results detected the presence of dissolved phase VOCs, primarily TCE at concentrations as high as 84,300 µg/L (indicative of a potential DNAPL). The greatest concentrations of dissolved phase TCE are located in the area of monitoring wells MW-3, MW-6, and MW-7, beneath the southwest corner of the building and extending to the southwest.
- The MIP/HPT investigation findings detected that the greatest TCE impacts are present in the vicinity of monitoring wells MW-1, MW-3, and MW-6 and that vertically, the highest impacts were found to be within the finer grained silt formation.
- Based on the soil analytical results, chlorinated VOC impacts were detected between 25 and 46 feet below the basement slab finished surface, within the tighter silt formations. It is believed that the TCE is adsorbed in the tighter silt formations.
- The ratio of tetrachloroethylene (PCE) to TCE in the deep groundwater is very different than the ratio in the shallow and intermediate groundwater. It is suggestive of an offsite, up gradient source other than the Site.

Summary of the Remedy

The selected remedy for the Site is treatment of the source area via Electrical Resistive Heating (ERH) for OU-1 and enhanced in-situ bioremediation for OU-2. The selected remedies will remove source contamination contributing to impacted groundwater quality in the shallow and intermediate groundwater in OU-1 via ERH, and the offsite shallow and intermediate groundwater contamination in OU-2. This approach will achieve protection of public health and the environment for the intended use of the property and allows for the occupation of the building by future tenants. The selected remedy will achieve all of the remedial action objectives established for the Site and addresses applicable standards, criteria and guidance values (SCGs). The selected remedial action alternative is effective in both the short-term and long-term and reduces, if not eliminates mobility, toxicity and volume of contaminants within the Site boundaries and in the affected offsite areas.

Land use at the Site will continue to be limited to commercial and industrial uses, as otherwise permitted by city zoning regulations. The preferred remedial action alternative is cost effective and implementable within an acceptable time frame. The selected remedy uses standards methods that are well established in the industry. Engineering and institutional controls will be included as part of the remedy.

The following summarized the key components of the selected Site remedy:

1. Site mobilization involving site security setup, equipment mobilization, utility mark outs and marking excavation areas;
2. Performance of a Community Air Monitoring Program (CAMP) for particulates and VOCs during intrusive work;
3. Screening for indications of contamination (by visual means, odor, and monitoring with PID) of all excavated soil during any intrusive Site work;
4. Performance of ERH treatment within the source area of OU-1 and enhanced in-situ bioremediation treatment for OU-2;

5. All liquids to be removed from the Site, including dewatering fluids, will be handled, transported and disposed in accordance with applicable local, State, and Federal regulations. Liquids discharged into the New York City sewer system will be addressed through approval by NYCDEP.
6. Appropriate offsite disposal of all material removed from the Site in accordance with all Federal, State and local rules and regulations for handling, transport, and disposal;
7. Construction and maintenance of an engineered composite cover to prevent human exposure to soils in OU-1, where intrusive work is anticipated;
8. Construction and maintenance of a SSDS under the slab of the entire building footprint to prevent human exposure to potential residual soil vapor contamination;
9. Recording of a Deed Restriction, including Institutional Controls, to prevent future exposure to any residual contamination remaining at the Site;
10. Restriction on the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by the NYCDOH.
11. Publication of a Site Management Plan (SMP) for long term management of residual contamination as required by the Deed Restriction, including plans for: (1) Institutional and Engineering Controls, (2) monitoring, (3) operation and maintenance and (4) reporting;
12. All responsibilities associated with the Remedial Action, including permitting requirements and pretreatment requirements, will be addressed in accordance with all applicable Federal, State and local rules and regulations.

Remedial activities will be performed at the Site in accordance with this NYSDEC-approved RAWP. All deviations from the RAWP will be promptly reported to NYSDEC for approval and fully explained in the Final Engineering Report (FER).

1.0 INTRODUCTION

Arnold F. Fleming, P.E. & Fleming-Lee Shue Inc. (collectively FLS) submits this Remedial Action Work Plan (RAWP) to the New York State Department of Environmental Conservation (NYSDEC) on behalf of Beam Suntory, Inc. (Volunteer) for the Formerly ACCO Brands, Inc. property located at 32-00 Skillman Avenue, Long Island City, Queens County, New York (Site). Beam Suntory, Inc. (f/k/a Fortune Brands, Inc.), through its predecessor corporation, ACCO Brands Inc., entered into a Voluntary Cleanup Agreement (VCA) with the NYSDEC (index # D2-0020-00-08) dated July 21, 2000. This RAWP has been prepared in accordance with the requirements and format presented in NYSDEC's Division of Environmental Remediation DER-10 Technical Guidance for Site Investigation and Remediation (DER-10).

1.1 SITE LOCATION AND DESCRIPTION

The Site is located at 32-00 Skillman Avenue, Long Island City, New York and is identified as Block 245 and Lot 9 on the New York City Tax Map. The Site is approximately 1.8-acres and is bounded by Skillman Avenue to the north, Queens Boulevard to the south, 32nd Place to the east and Van Dam Street to the west. Figure 1 shows the Site Location.

The Site is developed with a 3-story commercial and light industrial building occupied by multiple tenants, including a newspaper printing facility on the ground floor and a tennis and racquet ball club on the upper floors. The soil, groundwater, and soil vapor beneath the building (onsite) area is covered under Operable Unit-1 (OU-1) while the offsite soil, groundwater, and soil vapor are covered under the OU-2 of the Voluntary Cleanup Program (VCP) entered into by ACCO Brands Inc. with the NYSDEC in October 2000. Figure 2 shows the Site Layout.

1.2 DESCRIPTION OF SURROUNDING PROPERTY

The surrounding properties are primarily used for industrial and commercial purposes, with one adjacent property for mixed use. The adjacent properties consist of four commercial buildings (one is commercial and residential), an auto repair shop to the west, a warehouse, a parking lot, and a YMCA to the east, Sunnyside Rail Yard Long Island Rail Road tracks to the north, and elevated subway tracks followed by an 8-story commercial and residential building across Queens Boulevard, to the south.

1.3 SITE HISTORY

The Site building was constructed in 1950 and was occupied by ACCO Brands Inc. (ACCO) starting in 1952. During ACCO's occupancy, the Site building housed a manufacturing operation for staplers and stapler components, which involved the use of various paints, thinners, solvents and cleaners. ACCO sold the property in July 1998 to Swingstell, LLC (Swingstell), and the facility ceased operations in September 1999. An inspection of the Site conducted during the facility's closure revealed a small unlined sump in the basement adjacent to a former degreasing operations area and chlorinated solvent contamination in the subsurface soils and groundwater attributable to the former manufacturing operation.

In July 2000, ACCO entered the Site into the NYSDEC VCP to investigate the nature and extent of this contamination and to conduct any necessary remediation. ACCO agreed to lease the basement of the Site building from Swingstell for the purposes of conducting these activities. Fortune Brands, Inc. acquired the Site through a purchase of certain ACCO assets in approximately 2007 and subsequently changed its name to Beam, Inc. in 2011. In 2014, Beam, Inc. was acquired by Suntory Holdings and is now known as Beam Suntory, Inc.

1.3.1 Previous Environmental Investigations

In October 2000, ACCO Brands Inc. entered into the NYSDEC VCP to investigate and remediate the subsurface contamination identified beneath the Site. An on-site (OU-1) investigation conducted in 2000 and an offsite investigation (OU-2) in 2001 identified trichloroethylene (TCE) in the soils and groundwater beneath the Site.

Since 2004, several remedial measures have been applied to the Site and are summarized below:

- A Soil Vapor Extraction (SVE) system was installed in OU-1 in 2004 which has been in operation since.
- Air sparging at OU-1 took place from September 2004 to May 2005.

- Ozone injection at OU-1 took place during three different occasions (from May 2005 to July 2006, March 2008 to July 2008, and October 2008 to November 2008). The ozone injection system was removed in 2010.
- Chemical oxidation via the injection of Potassium Permanganate took place at OU-1 from 2004 to 2009 in seven injection events. Potassium Permanganate was injected at OU-2 from 2008 to 2010 on four different occasions.

Several investigations were also conducted to define the nature and extent of contamination at the Site. These investigations were reviewed by FLS and are summarized below:

1999 First Environment Remedial Investigation and 2000 SVE Pilot Test Summary

Groundwater samples collected in 1999 indicated elevated concentrations of TCE in the groundwater beneath the building. Contamination was further confirmed with additional soil and groundwater samples collected in 2000. Three SVE well points were installed in the basement and a SVE pilot test was conducted.

April 2002 First Environment Remedial Alternatives Selection Report – Remedial Action Work Plan

A site investigation was conducted at the facility during NYSDEC Part 373 Closure. The investigation, which included the installation of groundwater monitoring wells and collection of soil and groundwater samples, identified chlorinated organic contamination, mainly TCE, in both the soil and groundwater beneath the building. Following this determination, ACCO entered into the NYSDEC VCP. Under this program, additional investigations were conducted and included aquifer testing, pilot testing of chemical injection processes for treating groundwater contamination and a pilot testing of the SVE system. The results were reported in a Remedial Investigation Report (RIR) submitted to the NYSDEC in 2001. The RIR recommended a SVE system for treatment of the soil vapor and in-situ chemical oxidation for treatment of soil and groundwater. As a secondary treatment, bioremediation (hydrogen release compounds) was recommended for the groundwater.

July 2002 GES Supplemental Site Investigation Work Plan

The tasks proposed and detailed in this work plan included the installation of soil borings for electrical logging purposes; conducting bench-scale treatability tests to determine soil oxidant demands; installation of four wells to monitor the zone directly above the clay; and collection of groundwater samples.

August 2003 GES Remedial Action Work Plan Addendum for OU-1

A total of 17 soil borings were installed in the basement using a membrane interface probe and electrical conductivity direct push tool which analyzes the volatiles in the soils in addition to classifying soil types and textures. The results confirmed the presence of multiple layers of varying permeability. The upper layer is predominantly fine sand and silt, which is underlain by a silt layer and subsequently a second fine sand and silt layer. A deeper clay lens is present beneath this fine sand/silt layer and provides an impermeable barrier above the deepest sand and gravel layer. The proposed remedial actions for OU-1 include soil vapor extraction, ambient air and ozone sparging, and permanganate oxidation.

September 2007 GES Remedial Investigation Results Report/Remedial Action Work Plan for OU-2

The OU-2 Remedial Investigation Work Plan (RIWP) included installation and sampling of offsite soil vapor probes and groundwater monitoring wells. The primary contaminant of concern was identified as TCE which was present in the OU-2 wells. The core of the groundwater plume was identified as MW-8I. Elevated concentrations of TCE were identified in the offsite soil vapor samples. KMnO4 injections were implemented as the remedial measure in OU-2.

September 2010 GES Draft Construction Completion Report

The remediation and SVE wells were installed in early 2004 and the SVE system was put into operation in mid-2004. The contamination in the vadose zone was targeted using a combination of SVE and gas injection (ambient air sparging and ozone oxidation). Intermediate and deep groundwater was targeted using chemical oxidation with KMnO4. By 2007 a total of nine SVE wells, thirty gas injection wells and sixty-nine KMnO4 injection wells were installed in OU-1.

Reportedly, the majority of the TCE mass was removed from the vadose zone by the SVE system between 2004 and 2006. The ozone system was shut down in 2008 and removed from the Site in 2010. The KMnO4 injections began in December 2004 and continued until 2009. These injections were followed by monitoring for residual dissolved-phase KMnO4 until it was fully consumed. The report also included a proposal to convert the existing SVE system into a sub-slab depressurization system (SSDS).

1.4 GEOLOGICAL CONDITIONS

1.4.1 Topography

Based on information published by the United States Geological Survey 7.5 Minute Series Topographic Map of Brooklyn New York Quadrangle, the Site is located at approximately 10 to 15 feet above mean sea level. The topographic gradient of the Site and the surrounding area gradually slopes south-southwest towards Dutch Kills, a tributary to Newtown Creek.

1.4.2 Regional Geology

The regional geology of Queens County is comprised of sequences of Wisconsin age Upper Pleistocene glacial moraine (northern part) and glacial outwash (southern part) deposits (sand, gravel, cobbles, silt and clay); glacial-drift materials (lacustrine deposits, till, sand, gravel, and in some areas, fossil plant material disseminated in fine grained deposits); Upper Pleistocene deposits comprised of pre-Sangamon age Jameco gravel unit unconformably overlain by Gardiner's clay of Sangamon age; and Cretaceous age deposits of continental origin consisting of the Raritan Formation, the Magothy Formation – Matawan Group Undifferentiated (Soren 1978). Pre-Cambrian metamorphic bedrock underlying Queens is comprised of folded and faulted Ravenswood Granodiorite, and in some areas, Proterozoic Fordham Gneiss (Roberts – Dolgin 1989).

1.4.3 Local Geology

The Site subsurface consists of interbedded sand and silt units that overlie a clay unit. The sand/silt unit ranges from approximately 33 to 43 feet below the basement slab finished surface. The underlying clay unit was not penetrated during the FLS investigation, but based upon boring logs from prior investigations; it is believed that the clay unit is approximately 5 to 10 feet thick. Both the sand/silt and clay units dip to the south-southwest. A geologic cross-section of the Site is presented in Figure 3.

1.4.4 Hydrogeology

The groundwater table was encountered within the sand stratum at a depth of approximately 14 to 15 feet below the basement slab finished surface. Groundwater flow is to the south-southwest. A groundwater contour map is presented in Figure 4.

2.0 DESCRIPTION OF SUPPLEMENTAL REMEDIAL INVESTIGATION FINDINGS

2.1 SUMMARY OF SUPPLEMENTAL REMEDIAL INVESTIGATION

A Supplemental Remedial Investigation (SRI) was conducted between April 11 and November 6, 2013. The activities were conducted in four phases which included; groundwater monitoring, that included aquifer testing and collection of groundwater samples; a geophysical survey; a Membrane Interface Probe/Hydraulic Profiling Tool (MIP/HPT) investigation; and the advancement of eight soil borings and collection of soil samples. All activities conducted during the SRI were performed in accordance with the NYSDEC-approved SRI Work Plan, Quality Assurance Project Plan (QAPP), and the Health and Safety Plan (HASP). The SRI Report is included in Appendix A.

2.1.1 Groundwater Monitoring

Slug tests were conducted in two shallow wells (MW-1 and MW-6) and two intermediate wells (MW-1I and MW-6I) to determine the discrete vertical hydraulic conductivity of OU-1 hydrogeologic units. An analysis of the slug test results indicates calculated hydraulic conductivities ranging from 4.6 x 10-4 centimeter per second (cm/s) to 7.4 x 10-4 cm/s in the shallow wells and 1.6 x10-3 cm/s to 2.0 x 10-3 cm/s in the intermediate wells.

The groundwater analytical results were compared to NYSDEC Technical Operational Guidance Series 1.1.1 Ambient Water Quality Standards and Guidance Values (Groundwater Standards). A current monitoring well network is presented in Figures 5A and 5B. A proposed post-treatment monitoring well network is presented in Figure 5C and discussed further in Section 5.3. Table 1 summarizes the results of the groundwater analytical results from the SRI.

Total VOC concentrations in groundwater ranged from 6.7 microgram per liter (µg/L) in the sample from monitoring well MW-1(I) to 84,716.74 µg/L in the sample from monitoring well MW-3. Chlorinated VOCs were detected above Groundwater Standards in most of the samples. TCE was detected above the Groundwater Standards in all of the samples, with the greatest concentration observed at MW-3 (84,300 µg/L), MW-6(I) (24,800 µg/L) and MW-7(37,600 µg/L). Tetrachloroethylene (PCE) was detected above Groundwater Standards in the samples from monitoring wells MW-3 (158 µg/L), MW-6(I) (39.2 µg/L) and MW-7 field duplicate - MW-77 (46.5 µg/L). The degradation compound, cis-1,2 DCE was detected above Groundwater Standards in the samples from monitoring wells MW-6(I) (507 µg/L) and MW-7 (513 µg/L). Other organochlorides [carbon tetrachloride (7 µg/L), chloroform (15.4 µg/L), 1,2-dichloroethane (9.1 µg/L), 1,1,1-trichloroethane (36.3 µg/L)] and petroleum hydrocarbons (benzene [1.1 µg/L], toluene [8.7 µg/L]) were at concentrations exceeding the Groundwater Standards in the sample from monitoring well MW-3.

2.1.2 Membrane Interface Probe / Hydraulic Profiling

The MIP/HPT investigation was conducted to provide additional characterization of the subsurface soils and define the impacts to OU-1. The MIP/HPT investigation borings were advanced to depths ranging from 34.25 to 45.9 feet below the basement slab finished surface, just above the clay unit.

Based on the HPT measurements, the static groundwater level was between 14 and 15 feet below the basement slab finished surface. The electrical conductivity measurements indicated that the subsurface consists of interbedded sand and silt units that overlie a clay unit. An increase in EC responses was recorded starting at 12 feet below basement slab which is indicative of change in subsurface formation from coarser grained particles to finer grained particles.

The MIP investigation borings, MIP-01 through MIP-12, were placed in the vicinity of wells MW-1, MW-3 and MW-6. The results of the MIP investigation indicated that the highest measurable concentration of impacts lie in this vicinity. The highest electron capture detector measurements were recorded at locations MIP-01 through MIP-11. The highest PID measurements were recorded at locations MIP-03, MIP-04, MIP -08, MIP-10 and MIP-11. The highest flame ionization detector (FID) measurements were recorded at MIP-01, MIP-03, MIP-04, MIP-08, MIP-10 and MIP-11.

The MIP/HPT investigation borings were also advanced to vertically define the impacts in the vicinity of wells MW-1, MW-3 and MW-6. In this vicinity, the highest ECD, PID and FID measurements were between 22 and 38 feet below the basement slab finished surface. When analyzed with the corresponding HPT and EC measurements, the highest measurable impacts were found to be within the finer grained silt formation. A distinct drop off of ECD, PID and FID readings were observed with depth as the underlying clay unit was approached.

2.1.3 Soil Screening and Analytical Results

To provide more information on stratigraphy, contaminant distribution and mass estimates, eight soil borings were installed around the vicinity of wells MW-1, MW-3 and MW-6. Continuous soil samples were collected from all borings. The soils were field screened for VOCs using a PID. Soil samples were collected from the soil/groundwater interface, the highest observed MIP/HPT reading, the highest observed PID reading and from any major lithological change (i.e. sand/silt and silt/clay interface).

There were three major lithological features observed. A coarse-grained sand stratum that range in thickness from 12 to 22 feet that is underlain by a silt stratum that range in thickness from 18 to 22 feet interbedded by 1 to 6 feet thick silty sand and sand lenses. A clay layer was encountered at approximately 33 to 43 feet below the basement slab finished surface and is inferred to be a continuous impermeable barrier underlying the silt stratum. The clay unit was not penetrated during this investigation.

The soil analytical results were compared to the NYSDEC Part 375 Restricted Use Soil Cleanup Objectives for the Protection of Groundwater Resources (RUSCOs-PGW). Figure 6 shows a spider diagram of chlorinated compound concentrations in soil. Table 2 summarizes the results of the soil analytical results.

Chlorinated VOCs were detected above RUSCO-PGW in soil samples collected from intervals approximately 25 feet to 46 feet below the basement slab finished surface. TCE was detected above the RUSCOs-PGW in SB-9 (25-29.5’), SB-10 (32-33 feet and 45-46 feet), SB-11 (35 feet), SB-12 (25-26 feet and 36-37 feet), SB-13 (32-33 feet) and SB-14 (29-30, 33-34, 36-37 and 41-42 feet), with the greatest concentration observed at SB-12 (25-26 feet). The degradation compound cis-1,2 DCE was detected above RUSCOs-PGW in SB-9 (25-26 feet), SB-12 (25-26 feet) and SB-12 (36-37 feet). Petroleum hydrocarbons were detected in SB-12 (25-26 feet).

2.1.4 Supplemental Remedial Investigation Findings

The SRI results yield the following conclusions:

- Based on the MIP/HPT and the groundwater monitoring findings, static groundwater level is approximately 14 to 15 feet below basement slab finished surface.
- The hydraulic conductivities ranged from 4.6 x 10-4 cm/s to 7.4 x 10-4 cm/s in the shallow wells and from 1.6 x10-3 cm/s to 2.0 x 10-3 cm/s in the intermediate wells.
- The subsurface lithology consists of three major lithological features. A sand stratum that ranges in thickness from 12 to 22 feet that is underlain by a silt stratum that ranges in thickness from 18 to 22 feet with interbedded 1 to 6 feet thick silty sand and sand lenses. A basal clay layer was encountered at approximately 30 to 40 feet below basement slab finished surface. The clay layer is continuous throughout the area of investigation.
- The groundwater analytical results indicate the presence of dissolved phase VOCs, primarily TCE at concentrations as high as 84,300 µg/L (indicative of a potential DNAPL). The greatest concentrations of dissolved phase TCE are located in the area of monitoring wells MW-3, MW-6 and MW-7, beneath the southwest corner of the building and extending to the southwest.
- The MIP/HPT investigation findings indicate that the greatest TCE impacts are present in the vicinity of monitoring wells MW-1, MW-3 and MW-6 and that vertically, the highest impacts were found to be within the finer grained silt formation.
- Based on the soil analytical results, chlorinated VOC impacts were detected between 25 and 46 feet below basement slab finished surface, within the tighter silt formation. It is believed that the TCE is adsorbed in the tighter silt formation.
- The ratio of PCE to TCE in the deep groundwater differs from the ratio in the shallow and intermediate groundwater. It is suggestive of an offsite, up gradient source other than the Site.

2.2 SUMMARY OF ENVIRONMENTAL CONDITIONS

2.2.1 Conceptual Site Model

The Conceptual Site Model (CSM) provides a compilation and synthesis of information collected over the 10 plus years of investigation and remediation completed at the Site. Geologic cross-sections, monitoring well locations, groundwater contour maps, TCE trend graphs and groundwater isocontour maps were included.

Historically, the contamination in the vadose zone was targeted using a combination of SVE and gas injection (ambient air sparging and ozone oxidation). Intermediate and deep groundwater was targeted using chemical oxidation with KMnO4. By 2007 a total of nine SVE wells, thirty gas injection wells and sixty-nine KMnO4 injection wells were installed in OU-1. Reportedly, the majority of the TCE mass was removed from the vadose zone by the SVE system between 2004 and 2006. The ozone system was shut down in 2008 and removed from the site in 2010. A total of 248,239 gallons of KMnO4 were injected in OU-1 from December 2004 to November 2009, and 331,495 gallons in OU-2 from December 2008 to November 2010. These injections were followed by monitoring for residual dissolved-phase KMnO4 until it was fully consumed.

The injections of KMnO4 were effective temporarily, as the mass of the TCE contamination is absorbed into the finer-grained silt formations. The KMnO4 injections were effective in treating groundwater contamination located within the coarse-grained soils, but did not treat contamination that was absorbed into the fine-grained soils. As a result, the TCE contamination within the silt formations desorbed into the coarse-grained soils, causing rebound in groundwater contamination after treatment and therefore rendering it ineffective.

The soil sample analytical results from the SRIR, as well as the MIP/HPT investigation findings indicate that the greatest TCE impacts are present within the finer grained silt formation. Silt particles are more cohesive and inter-particle forces are stronger than sand (Palmer 1996). It is believed that the TCE is adsorbed in the tighter silt formation. These impacts are all above the basal clay layer that is present at a depth of approximately 30-40 feet below basement slab finished surface.

- The historic data identified a clear source of TCE in the shallow and intermediate groundwater in OU-1. While low levels of PCE were observed in the groundwater from some of the shallow and intermediate wells, the PCE concentrations were always several orders of magnitude less than the TCE concentrations. The difference in the PCE to TCE ratios in the shallow/intermediate wells when compared to the ratios in the deep wells is suggestive of an offsite, up gradient source other than the Site. While there is likely dense nonaqueous phase liquid (DNAPL) TCE in the shallow/intermediate source area groundwater, it does not appear to have penetrated the basal clay layer.

2.2.2 Treatability Study

Following the SRI, groundwater samples were collected to for a treatability study in July and August 2014. The purpose of the post investigation sampling event was to assess current groundwater conditions and be able to design an appropriate enhanced in-situ bioremediation design for OU-2.

As part of the treatability study, a total of 13 shallow, 10 intermediate and 1 deep groundwater samples were collected. Figure 7 shows an isocontour map of TCE concentrations in groundwater from the treatability study. The results of the treatability study are presented in Table 3. As shown in the results, TCE levels in groundwater in OU-1 have rebounded to pre-KNnO4 treatment concentrations.

2.3 QUALITATIVE HUMAN HEALTH EXPOSURE ASSESSMENT

This Qualitative Exposure Assessment was performed in accordance with Appendix 3B of DER-10. As presented in Appendix B, the assessment concludes that there is no current exposure pathway and that during remediation the HASP will minimize the exposure of Site workers to the contamination on the Site. Following remediation, the site will be capped, which will protect Site occupants and the public from exposure.

2.4 REMEDIAL ACTION OBJECTIVES

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

2.4.1 Groundwater

RAOs for Public Health Protection

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

RAOs for Environmental Protection

- Restore ground water aquifer, to the extent practicable, to pre-disposal/pre-release conditions, to the extent practicable.
- Remove the source of ground water or surface water contamination.

2.4.2 Soil

RAOs for Public Health Protection

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

RAOs for Environmental Protection

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

2.4.3 Soil Vapor

RAOs for Public Health Protection

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

3.0 DESCRIPTION OF REMEDIAL ACTION PLAN

The goal of the remedy selection process under the RAWP is to select a remedy that is protective of human health and the environment taking into consideration the current, intended and reasonably anticipated future use of the property. The remedy selection process begins by establishing RAOs for media in which chemical constituents were found in exceedance of their applicable standards, criteria and guidance values (SCGs). Three remedial alternatives have been considered and the evaluation process is detailed in the following sections.

3.1 EVALUATION OF REMEDIAL ALTERNATIVES

The remedial objectives for the Site have been established through the remedy selection process pursuant to the 6 NYCRR Part 375-1.10. The four remedial alternatives presented herein are evaluated in the following sections:

- Alternative 1 – Source Containment via Enhanced In-Situ Bioremediation
- Alternative 2 – Remediation of OU-1 via Electrical Resistance Heating
- Alternative 3 – Remediation of the Source Area in OU-1 via Electrical Resistance Heating
- Alternative 4 – Remediation of Source Area in OU-1 via Electrical Resistance Heating and OU-2 via Enhanced In-Situ Bioremediation

Remedial Alternatives 1 through 4 are presented here as part of the evaluation of possible remedies for this Site given its current use and the findings from previous remedial investigations, in particular, the SRI. The Remedial Alternatives have been evaluated with respect to the remedial selection evaluation criteria in Table 4 in accordance with the remedy selection factors listed in 6 NYCRR Part 375-1.8(f).

3.1.1 Remedial Alternative 1

The first remedial alternative that was considered was source containment for OU-1 via enhanced in-situ bioremediation. This alternative considered taking no remedial action for OU-2 and continuing with site management. This remedial alternative aims to contain/remediate shallow and intermediate groundwater.

If the source is contained via enhanced in-situ bioremediation, then the mass of TCE beneath the building would most likely remain for an indeterminate period. The bulk of the TCE residual mass is strongly affixed to the finer grain silt formation (likely in the form of DNAPL). The contaminant mass will continue to slowly diffuse into groundwater, leaving a dissolved plume of elevated TCE that will remain for an indeterminate period. Source containment will degrade the dissolved VOCs slowly over time and limit the extent of their migration, but VOCs will remain elevated in the groundwater for the foreseeable future.

The existing SVE system will be retrofitted into an active SSDS and remain in operation through the life of the building and serve as an engineering control (EC). The building slab will also serve as an EC and both will be monitored under a SMP. The offsite SSDSs at the adjacent multi-family residential (MFR) building and the YMCA will also be maintained under the SMP. A deed restriction will be recorded with the Queens County Office of the City Register before the VCA Release and Covenant Not to Sue can be issued by NYSDEC.

Because of the indeterminate length of time that it would take to reach any acceptable TCE concentrations in the shallow and intermediate groundwater this remedial alternative was not recommended.

3.1.2 Remedial Alternative 2

The second remedial alternative that was considered was the treatment of OU-1 via ERH and to continued site management for OU-2. This remedial alternative targets the entire footprint of OU-1 (approximately 31,300 square feet), which contains the bulk of the TCE mass. Treating OU-1 by ERH will remediate existing shallow and intermediate groundwater contamination in OU-1 and targets a TCE concentration of 100 ppb or less.

This remedy proposes intrinsic remediation via monitored natural attenuation of VOCs for OU-2 once treatment has concluded in OU-1. The NYSDEC defines natural attenuation as "relying on natural (physical, chemical, or biological) processes to reduce mass, toxicity, mobility, volume or concentration of compounds in soils or groundwater". The processes potentially occurring during natural attenuation include a combination of dispersion, dilution, sorption and volatilization. If the source area in OU-1 is removed, natural attenuation of the TCE down gradient is likely to occur.

During ERH operation, the existing SVE system will be retrofitted into an active SSDS that will only ventilate the slab on grade portion of the Site. The ERH system will have a vapor recovery system that will be protective of vapor intrusion in OU-1 during remediation. While the ERH system is in operation, it will serve as an EC. Once ERH operation concludes, the SSDS will be extended from the slab on grade portion of the Site to fully protect OU-1 from vapor intrusion. The retrofitted SSDS will be the final EC along with the building slab and both will be monitored under a SMP. The offsite SSDSs at the adjacent MFR building and the YMCA will also be maintained under the SMP. A deed restriction will be recorded with the Queens County Office of the City Register before the VCA Release and Covenant Not to Sue can be issued by NYSDEC.

Although a cleanup of the TCE in the entire basement footprint poses the best remedial scenario for OU-1, and would likely accelerate the cleanup of OU-2, the high capital cost of this remedial alternative makes it unfeasible, and as such, this remedial alternative was not recommended.

3.1.3 Remedial Alternative 3

The third remedial alternative that was considered involves the treatment of the source area in OU-1 via ERH to achieve a TCE concentration of 100 ppb in shallow and intermediate groundwater and continuing site management for OU-2. This remedy targets the TCE source area (approximately 9,700 square feet) and limits the treatment to strategically remediate the area containing the highest concentrations of TCE, as identified during the SRI.

This alternative proposes intrinsic remediation via monitored natural attenuation of the TCE for OU-2 in conjunction with site management. After the TCE source area is removed, natural attenuation of the remaining TCE would likely occur at an accelerated rate at OU-1 and down gradient of the source area because of the conducive environment created by the heated water. The dissolved TCE would degrade over time until regulatory compliance is achieved in OU-2.

During ERH operation, the existing SVE system will be retrofitted into an active SSDS that will only ventilate the slab on grade portion of the Site and areas in OU-1 outside of the treatment area. The ERH system will have a vapor recovery system that will be protective of vapor intrusion in OU-1 during remediation. While the ERH system is in operation, it will serve as an EC. Once ERH operation concludes, the SSDS will be extended from the slab on grade portion of the Site to fully protect OU-1 from vapor intrusion. The retrofitted SSDS will be the final EC along with the building slab and both will be monitored under a SMP. The offsite SSDSs at the adjacent MFR building and the YMCA will also be maintained under the SMP. A deed restriction will be recorded with the Queens County Office of the City Register before the VCA Release and Covenant Not to Sue can be issued by NYSDEC.

This remedial alternative is more cost-effective than Alternative 2 and achieves a TCE concentration of 100 ppb or less within the treatment area, which is significantly reduced. The passive remediation approach through monitored natural attenuation proposed for the rest of the OU-1 and OU-2 would be monitored through site management until the TCE concentrations in shallow and intermediate groundwater are approved by NYSDEC. This alternative was not chosen because of uncertainty in the time required to reach the desired levels for TCE in OU-2 via monitored natural attenuation.

3.1.4 Remedial Alternative 4

The final remedial alternative proposed for this project involves the treatment of the source contamination area in OU-1 via ERH to achieve a TCE concentration of 100 ppb or less within the treatment area and post-treatment enhanced in-situ bioremediation. This remedy targets the source contamination area (approximately 9,700 square feet) and limits the treatment to strategically remediate the area containing the highest concentrations of chlorinated VOCs, as identified during the SRI. Figure 9 shows the proposed ERH treatment area and electrode locations.

In addition to the ERH treatment, the application of enhanced in-situ bioremediation is proposed for the residual dissolved phase TCE in OU-2. With the source area remediated, natural attenuation would likely degrade the residual TCE slowly over time. The enhanced in-situ bioremediation proposed under this alternative would accelerate the rate at which the remaining TCE degrades.

During ERH operation, the existing SVE system will be retrofitted into an active SSDS that will only ventilate the slab on grade portion of the Site and areas in OU-1 outside of the treatment area. The ERH system will have a vapor recovery system that will be protective of vapor intrusion in OU-1 during remediation. While the ERH system is in operation, it will serve as an EC. Once ERH operation concludes, the SSDS will be extended from the slab on grade portion of the Site to fully protect OU-1 from vapor intrusion. The retrofitted SSDS will be the final EC along with the building slab and both will be monitored under a SMP. The offsite SSDSs at the adjacent MFR building and the YMCA will also be maintained under the SMP. A deed restriction will be recorded with the Queens County Office of the City Register before the VCA Release and Covenant Not to Sue can be issued by NYSDEC.

The cost-effectiveness of this remedial alternative, combined with the efficiency of treatment, makes this alternative the preferred option.

3.2 SELECTION OF PREFERRED REMEDY

This section describes the selected remedy, Remedial Alternative #4, and summarizes it according to the remedial selection criteria listed in 6 NYCRR Part 375-1.8(f). The following land use factor evaluation examines whether the preferred alternative, Remedial Alternative #4 is acceptable based on the criteria in the sections below as required by Article 27, Title 14 of the Environmental Conservation Law 27-1415.

3.2.1 Zoning

The Site is located within an M1-4 zoning district. M1-4 zoned areas are considered for light manufacturing/commercial use. The planned land use following the remediation of the Site of the building will not change and will be in compliance with existing zoning designation.

3.2.2 Applicable Comprehensive Community Master Plans or Land Use Plans

The planned land use will not change following remediation of the Site and therefore adheres with local zoning ordinances for this Site and surrounding area.

3.2.3 Surrounding Property Uses

The properties immediately adjacent to the Site are predominantly commercial. The Site remedy adheres to the surrounding property use.

3.2.4 Citizen Participation

The RAWP Fact Sheets will be distributed to the contact list in the approved Citizen Participation Plan (CPP) included in Appendix C.

3.2.5 Environmental Justice

There are no known Environmental Justice concerns associated with this site.

3.2.6 Land Use Designations

The Site is located in a predominantly industrial/commercial zoned area and will adhere with local zoning ordinances for this Site and surrounding area.

3.2.7 Population Growth Patterns

The Site use will not change following remediation. The proposed remedial action is not expected to have an impact on the population in the surrounding community.

3.2.8 Accessibility to Existing Infrastructure

The Site is accessible to the existing infrastructure. Water and sewer service will be available during remediation as the building is currently and will remain in use and connected during remediation to all utilities. Significant adverse impacts related to water usage and supply are not expected as a result of the proposed development, nor are significant adverse wastewater or storm water impacts anticipated as the remediation will be conducted within the confines of the Site building. Existing gas, water, electric and telecommunication connections are located in proximity to the Site.

3.2.9 Proximity to Cultural Resources

There are no known cultural resources within close proximity of the Site.

3.2.10 Proximity to Natural Resources

No regulated wetlands are mapped onsite or immediately adjacent to the Site. No significant coastal zones, lakes or NYSDEC designated Significant Habitats are located within the vicinity of the Site. The proposed remediation is not anticipated to result in any significant adverse impacts to natural resources.

3.2.11 Off-Site Groundwater Impacts

The groundwater analytical results from the SRIR indicate the greatest concentrations of dissolved phase TCE are in the shallow and intermediate groundwater in OU-1. These impacts are all above the basal clay layer that is present at a depth of approximately 30-40 feet below the basement slab finished surface.

Monitoring wells in OU-1 and OU-2 are screened to monitor three zones of the aquifer, shallow, intermediate and deep. The shallow and intermediate groundwater monitoring wells monitor groundwater above the basal clay layer while the deep groundwater monitoring wells monitor groundwater below the clay layer. Groundwater impacts were observed in shallow intermediate groundwater in OU-1 and OU-2.

- The ratio of PCE to TCE in the deep groundwater differs from the ratio in the shallow and intermediate groundwater. The ratio referenced herein is suggestive of an offsite, up gradient source other than the Site.

The selected remedy proposes to remediate TCE impacts in shallow and intermediate groundwater in OU-1 and OU-2 to levels of 100 ppb or less.

3.2.12 Proximity to Floodplains

According to the New York City flood maps, the Site is not located within any of the 100-year floodplain boundaries.

According to the New York City Office of Emergency Management (OEM) hurricane evacuation maps, the Site is not located within a hurricane evacuation zone.

3.2.13 Geography and Geology of the Site

The Site is located within a highly urban area. As noted in the Section 1.4.3 the Site subsurface consists of interbedded sand and silt units that overlie a clay unit. The sand/silt unit ranges from approximately 33 to 43 feet below basement slab finished surface. The underlying clay unit is believed that the clay unit is approximately 5 to 10 feet thick. Both the sand/silt and clay units dip to the south-southwest.

3.2.14 Current Institutional Controls

The Site currently has no institutional controls. Following implementation of the selected remedy, the Site will require a deed restriction for residual soil, groundwater and soil vapor impacts remaining under the proposed engineering control.

3.3 SUMMARY OF SELECTED REMEDIAL ACTIONS

The Volunteer has selected Remedial Alternative 4, as it will remove source contamination contributing to impacted groundwater quality in the shallow and intermediate groundwater in OU-1 via ERH and in OU-2 via enhanced in-situ bioremediation. This approach will achieve protection of public health and the environment for the intended use of the property and allows for the occupation of the building by future tenants. The selected remedy will achieve all of the remedial action objectives established for the project and addresses applicable SCGs. The selected remedial action alternative is effective in both the short-term and long-term and reduces, if not eliminates mobility, toxicity and volume of contaminants within the Site boundaries and in affected offsite areas.

Land use at the Site will continue to be limited to commercial and industrial uses, as otherwise permitted by city zoning regulations. The preferred remedial action alternative is cost effective and implementable within an acceptable time frame. The selected remedy uses standards methods that are well established in the industry. Engineering and institutional controls will be included as part of the remedy.

The following summarized the key components of the selected Site remedy:

1. Site mobilization involving site security setup, equipment mobilization, utility mark outs and marking excavation areas;
2. Performance of a Community Air Monitoring Program (CAMP) for particulates and VOCs during intrusive work;
3. Screening for indications of contamination (by visual means, odor, and monitoring with PID) of all excavated soil during any intrusive Site work;
4. Performance of ERH treatment within the source area of OU-1 and enhanced in-situ bioremediation for OU-2;
5. All liquids to be removed from the Site, including dewatering fluids, will be handled, transported and disposed in accordance with applicable local, State, and Federal regulations. Liquids discharged into the New York City sewer system will be addressed through approval by NYCDEP.
6. Appropriate offsite disposal of all material removed from the Site in accordance with all Federal, State and local rules and regulations for handling, transport, and disposal;
7. Construction and maintenance of an engineered composite cover to prevent human exposure to soils in OU-1, where intrusive work is anticipated;
8. Construction and maintenance of a SSDS under the slab of OU-1 to prevent human exposure to potential residual soil vapor contamination;
9. Recording of a Deed Restriction, including Institutional Controls, to prevent future exposure to any residual contamination remaining at the Site;
10. Restriction on the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by the NYCDOH.
11. Publication of a SMP for long term management of residual contamination as required by the Deed Restriction, including plans for: (1) Institutional and Engineering Controls, (2) monitoring, (3) operation and maintenance and (4) reporting;
12. All responsibilities associated with the Remedial Action, including permitting requirements and pretreatment requirements, will be addressed in accordance with all applicable Federal, State and local rules and regulations.

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

4.0 REMEDIAL ACTION PROGRAM

4.1 GOVERNING DOCUMENTS

4.1.1 Site Specific Health & Safety Plan

A Site Specific HASP has been created for the Site and is included in Appendix D. All remedial work performed under this plan will be in full compliance with governmental requirements, including Site and worker safety requirements mandated by the Occupational Safety and Health Administration.

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

The HASP and requirements defined in this RAWP pertain to all remedial and invasive work performed at the Site until the issuance of a Release by NYSDEC. The Site Safety Coordinator resume will be identified to NYSDEC prior to the start of remediation.

4.1.2 Quality Assurance Project Plan

A Quality Assurance Project Plan has been created for the Site to address quality control and quality assurance procedures for all Site sampling including groundwater monitoring and is included in Appendix E.

4.1.3 Soil/Materials Management Plan

The details of the Soil/Materials Management Plan (SoMP) are discussed in Section 5.3 of this RAWP. Section 5.3 includes detailed plans for managing all soils/materials that are disturbed at the Site, including excavation, handling, storage, transport and disposal. It also includes the controls that will be applied to these efforts to assure effective, nuisance-free performance in compliance with all applicable Federal, State and local laws and regulations.

4.1.4 Storm-Water Pollution Prevention Plan

The excavation work will be conducted within the confines of the basement portion of the building which and intrusive work will be less than 1 acre in size. The New York State Pollutant Discharge Elimination System (SPDES) general permit requirements for construction sites less than 1 acre in size does not require a Storm-Water Pollution Prevention Plan (SWPPP).

4.1.5 Community Air Monitoring Plan

The purpose of the CAMP is to protect downwind receptors (e.g., residences, businesses, schools, nearby workers, and the public) from potential airborne contaminants released as a direct result of the Remedial Action being performed at the Site. Since soil disturbance is only anticipated in OU-1, only a working zone CAMP station will be set up during intrusive activities to protect the worker population. The CAMP plan is included in the HASP.

4.1.6 Contractors Site Operations Plan

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

4.1.7 Citizen Participation Plan

The Citizen Participation Plan (CPP) provides members of the affected and interested public with information about how NYSDEC will inform and involve them during the investigation and remediation of the Site identified above. The approved CPP for this project is attached in Appendix C.

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

No changes will be made to the approved Fact Sheets authorized for release by NYSDEC without written consent of the NYSDEC. No other information, such as brochures and flyers, will be included with the Fact Sheet mailing.

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

Queens Borough Public Library
Court Square Branch
2501 Jackson Avenue
Long Island City, New York 11101
(718) 937-2790
Mon 12-7; Tue 1-6; Wed 10-6; Thurs 12-6; Fri 12-6; Sat 10-5:30; Sun closed

NYSDEC Region 2 Office
47-40 21st Street
Long Island City, NY 11101
Call in advance – (718) 482-6405
Mon. to Fri. 9 a.m. to 4 p.m.

4.2 GENERAL REMEDIAL CONSTRUCTION INFORMATION

4.2.1 Project Organization

An organization chart is included in Figure 8. Resumes of key personnel involved in the Remedial Action are included in Appendix F.

4.2.2 Remedial Engineer

The Remedial Engineer for this project will be Arnold F. Fleming, P.E. The Remedial Engineer is a registered professional engineer (P.E.) licensed by the State of New York. The

Remedial Engineer will have primary direct responsibility for implementation of the remedial program for the Formerly ACCO Brands, Inc. Site (VCP Site Code V00331). The Remedial Engineer will certify in the Final Engineering Report that the remedial activities were observed by qualified environmental professionals under his supervision and that the remediation requirements set forth in the RAWP and any other relevant provisions of ECL 27-1419 have been achieved in full conformance with that Plan. Other Remedial Engineer certification requirements are listed later in this RAWP.

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

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

4.2.3 Remedial Action Schedule

A general Remedial Action schedule commencing from NYSDEC approval of the RAWP through receipt of the Release and Covenant Not to Sue is included in Table 5.

4.2.4 Work Hours

The hours for operation of remedial construction will conform to the New York City Department of Buildings construction code requirements or according to specific variances issued by that agency. DEC will be notified by the Volunteer of any variances issued by the Department of Buildings. NYSDEC reserves the right to deny alternate remedial construction hours. General remedial construction work hours for the Site will be between 7:00am to 3:00pm from Monday to Friday. Once construction of the remedial system is complete, the system will be in continuous operation for 6 to 8 months and will be monitored continuously.

4.2.5 Site Security

The entrance to treatment area will be restricted during non-working hours. During working hours access to the Site will be limited to Site contractors and other permitted personnel. These controls will be maintained for the duration of the remedial activities proposed herein.

4.2.6 Traffic Control

The need for traffic control on the local roadways entering the Site is not anticipated at this time. Should conditions change and indicate the need for such control, said control measures will be provided in a manner that conforms to local municipal traffic control requirements.

4.2.7 Contingency Plan

If underground tanks or other previously unidentified contaminant sources such as buried drums, stained soils, subsurface pits, etc. are found during on-site remedial excavation, sampling will be performed, as warranted on product, sediment and surrounding soils, etc. Chemical analytical work will be for full scan parameters (TAL metals; TCL volatiles and semi-volatile organic compounds, TCL pesticides and PCBs). Sample parameter reduction must be approved by NYSDEC. These analyses will not be limited to STARS parameters where tanks are identified without prior approval by NYSDEC. Analyses will not be otherwise limited without NYSDEC approval.

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

4.2.8 Worker Training and Monitoring

As detailed in the accompanying HASP, all workers associated with the remedial activities will have been certified by a licensed physician as being physically able to perform their assigned field work, and to use the Personal Protective Equipment (PPE) which will be required for this project, in accordance with the provisions of OSHA Regulation 29 CFR 1910.120(f); and passed a Qualitative Respirator Fit Test.

All remediation personnel working within the remediation area shall be thoroughly trained as specified in OSHA Regulations 29 CFR 1910.120(e), and 1910.1028. This training will include: (1) Attendance at an initial 40-hour basic health and safety training course off the Site; (2) At least three days of actual field experience under the direct supervision of a trained, experienced supervisor; (3) On-site, site-specific training; and (4) an 8-hour annual update in the basic health and safety training course.

In addition to the above, on-site managers and supervisors who are directly responsible for, or who supervise employees engaged in hazardous waste operations must also receive: (1) 8-hours of site supervisor training; and (2) additional training at the time of job assignment on such topics as, but not limited to, the company's safety and health program and the associated employee training program; personal protective equipment program; spill containment program; air quality monitoring; emergency response; monitoring equipment usage and calibration; and, health hazard monitoring procedures and techniques.

At the time of job assignment, special training will be provided to on-site personnel who may be exposed to unique or special hazards not covered by the initial 40-hour basic health and safety course. If unique or special hazards are unexpectedly encountered, specialized training will be provided before work proceeds.

4.2.9 Agency Approvals

Volunteer has addressed all SEQRA requirements for this Site. All permits or government approvals required for remedial construction have been, or will be, obtained prior to the start of remedial construction.

The planned end use for the Site is in conformance with the current zoning for the property as determined by New York City Department of Planning.

A complete list of all local, regional and national governmental permits, certificates or other approvals or authorizations required to perform the remedial and development work is attached in Table 6. This list includes a citation of the law, statute or code to be complied with, the originating agency, and a contact name and phone number in that agency. This list will be updated in the FER.

4.2.10 Pre-Construction Meeting with NYSDEC

A meeting among the NYSDEC Project Manager, Remedial Engineer, and the contractors will be conducted at the Site prior to the start of the remedial activities proposed herein.

4.2.11 Emergency Contact Information

An emergency contact sheet with names and phone numbers is included in Table 7. That document will define the specific project contacts for use by NYSDEC and NYSDOH in the case of a day or night emergency.

4.3 REPORTING

As discussed in the following sections, both daily and monthly reports will be submitted. All monthly Reports will be included in the FER.

4.3.1 Daily Reports

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

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

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

Daily Reports will include a description of daily activities keyed to an alpha-numeric map for the Site that identifies work areas. These reports will include a summary of air sampling results, odor and dust problems and corrective actions, and all complaints received from the public. A Site map that shows a predefined alpha-numeric grid for use in identifying locations described in reports submitted to NYSDEC will be provided with daily reports. The NYSDEC assigned project number will appear on all reports.

4.3.2 Monthly Reports

Monthly reports will be submitted to NYSDEC and NYSDOH Project Managers within one week following the end of the month of the reporting period and will include:

- Activities relative to the Site during the previous reporting period and those anticipated for the next reporting period, including a quantitative presentation of work performed (i.e. tons of material exported and imported, etc.);
- Description of approved activity modifications, including changes of work scope and/or schedule;
- Sampling results received following internal data review and validation, as applicable; and,
- An update of the remedial schedule including the percentage of project completion, unresolved delays encountered or anticipated that may affect the future schedule, and efforts made to mitigate such delays.

At a minimum, the monthly report will conform to DER-10 section 5.7(b).

4.3.3 Other Reporting

Photographs will be taken of all remedial activities and submitted to NYSDEC in digital format. Photos will illustrate all remedial program elements and will be of acceptable quality. Representative photos of the Site prior to any Remedial Actions will be provided. Representative photos will be provided of each contaminant source, source area and Site structures before, during and after remediation. Photos will be included in the daily reports as needed, and a comprehensive collection of photos will be included in the FER.

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

4.3.4 Complaint Management Plan

In the event complaints are filed by the public regarding nuisance or other site conditions, the complaints will be addressed by the Site Remediation contractor.

The NYSDEC Project Manager will be notified immediately via e-mail of any such complaints. All complaints will be addressed in a timely manner (i.e. within 24-hours of receipt of the complaint) without a stoppage of site work. However, if the complaints address issues that are deemed by the regulatory oversight agencies (i.e. NYSDEC, NYSDOH and/or local regulatory officials) to be potentially harmful to human health and/or the environment, Site work will be immediately suspended until a resolution acceptable to the regulatory agency can be implemented.

4.3.5 Deviations from the Remedial Action Work Plan

In the event that any deviations from the RAWP are required, the NYSDEC Project Manager will be notified in writing of the anticipated deviation. In no event will a deviation occur without first obtaining prior written approval from the NYSDEC. Additionally, in no event shall a deviation affect the overall site remedy. All deviations will be identified in the FER.

5.0 REMEDIAL ACTION: ELECTRICAL RESISTANCE HEATING AND ENHANCED IN-SITU BIOREMEDIATION

Based on the comparative evaluation of proposed remedial alternatives, Alternative 4 (Remediation of Source Area OU-1 via Electrical Resistance Heating and Enhanced In-Situ Bioremediation of OU-2) is recommended for the Site. The proposed remedial action for the Site consists of performing ERH treatment of the source contamination area in OU-1 to achieve a TCE concentration of 100 ppb in groundwater, or less in the treatment area. Remediation of OU-2 would occur through enhanced in-situ bioremediation.

5.1 SCOPE OF ELECTRICAL RESISTANCE HEATING

The proposed ERH remedial alternative addresses the source contamination in OU-1. The proposed scope of the remediation is to remediate the most heavily impacted area as identified during the SRI. This area will be remediated to achieve TCE levels of 100 ppb in shallow and intermediate groundwater. To accomplish this remediation in a safe manner, the following methods will be used:

1. Equipment will be staged along the sidewalk of Van Dam Street. Prior to the start of field work, fencing will be erected to prevent access to the equipment staged on the sidewalk by the general public. This will be supplemented with signs stating no site access.
2. A kickoff meeting will be scheduled with NYSDEC to review the proposed remediation.
3. All remedial activity will be reviewed by the Remedial Engineer and updates will be provided throughout the duration of the field work.
4. Utility mark-outs will be completed prior to any subsurface work.
5. A pre-treatment survey will be conducted by a geotechnical consultant to document the existing conditions of the existing building, adjacent buildings, and New York City Transit (NYCT) structure before ERH treatment.
6. Emergency contact numbers are provided in the attached HASP.
7. All remedial activities will be fully documented in the final report.

5.1.1 Design

ERH passes an alternating electrical current through the soil and groundwater that requires treatment. The electrical current warms the soil and then boils a portion of the soil moisture into steam. This in-situ steam generation occurs in all soil types, regardless of permeability. Electrical energy evaporates the target contaminant and provides steam as a carrier gas to sweep the chlorinated VOCs to the vapor recovery (VR) wells. After the steam is condensed and the extracted air is cooled to ambient conditions, the chlorinated VOC vapors are treated using vapor phase granular activated carbon for adsorption.

Although volatilization will be the primary removal mechanism for chlorinated VOCs, a significant fraction of the chlorinated VOCs will be removed by other in-situ secondary processes, such as bioremediation. The heat generated by ERH will accelerate the chemical reaction that will cause the breakdown of Site contaminants and naturally occurring materials such as total organic carbon (TOC). The effects of heat and TOC on bioremediation are discussed in greater detail in Section 5.2.

The design of the ERH treatment will be completed by TRS Group, Inc. (TRS) with guidance from FLS. The TRS design specifics and parameters utilized to develop the remedy are presented in Appendix G. The anticipated treatment area is 9,700 square feet, with a treatment volume of approximately 11,000 cubic yards. Based on initial design preparations, it is anticipated that the ERH treatment will require 60 electrodes and 60 co-located vapor recovery wells. The electrodes will be installed in the saturated zone to a depth intersecting the confining clay layer. Seven temperature monitoring points will be installed as part of this set-up. The recovered vapors will be treated through activated carbon prior to discharge to the ambient air. The proposed ERH system layout is included in Figure 9.

TRS has determined the total amount of energy required to operate the ERH system. FLS is working with Con Edison to determine if the building's current electrical adequate supply is adequate for ERH operation.

All activities associated with the remedial action, including permitting requirements, will be conducted in accordance with the applicable Federal, State and local rules and regulations.

5.1.2 Materials Mobilization

Material mobilization to the Site will occur once all permits are in place. Materials being mobilized to the Site consist of two primary control units (PCUs) (700 kilowatt (kW) and 500 kW), condenser and cooling tower, 25-horsepower vapor recovery blower, vapor and liquid granular activated carbon vessels, and two step-down transformers. All materials are anticipated to be contained within the building except for the PCUs and the condenser, which will be staged on the sidewalk and adjacent street along Van Dam Street.

5.1.3 Subsurface Installation

Prior to subsurface installation, a pre-implementation stray current survey will be conducted by Con Edison to ensure that ERH treatment can be implemented safely. In addition to this, Con Edison is currently reviewing the ERH energy demands to ensure that adequate power for the treatment currently exists within the building.

Subsurface installation for this remedial action consists of drilling 60 locations to a depth intersecting the confining clay layer for electrode placement in addition to 60 co-located vapor recovery wells. Subsurface installation will take place once all material has been mobilized to the Site. The total duration of this task is anticipated to require approximately three months. Subsurface installation tasks consist of the following:

- Pre-installation building structural survey
- Utility locator survey
- Abandonment of existing PVC wells in accordance with Commissioner Policy on Groundwater Monitoring Well Decommissioning (CP-43)
- Drilling for electrodes and vapor recovery wells (60 locations)
- Drill cutting disposal

The subsurface installation will include the installation of a vapor recovery system for collection of vapors generated within the treatment area during ERH treatment. The current SVE system will be retrofitted during ERH treatment, and all current SVE wells within the treatment area will be abandoned. The vapor recovery system will act as the SVE in the treatment area while

ERH is ongoing. The SVE wells that are outside the treatment area will remain in operation through the duration of ERH treatment.

5.1.4 Surface Installation and Start-up

Surface installation and start-up will be conducted by TRS with oversight from FLS. Surface installation is expected to require approximately 12 weeks to complete and can be performed in conjunction with subsurface installation. Surface equipment to be mobilized for surface installation consists of the following:

- Crane to offload/position equipment
- Perimeter fence and security system
- Vapor recovery piping
- Steam condenser
- Vapor recovery blower
- Granular activated carbon
- Oil-water separator
- Equipment sound wall
- Electrical permit and utility connection to the PCUs
- Telephone connection to the PCUs
- Garden hose connection to the condenser

5.1.5 Remediation System Operation

Operation of the ERH system is expected to continue for approximately 6 to 8 months. Monitoring of system operation will be the primary responsibility of TRS, with oversight from FLS. Operation tasks will include the following:

- ERH control and temperature monitoring
- Vapor sampling and analysis
- Condensate/discharge sampling and analysis
- Groundwater sampling and analysis
- Water/condensate disposal

- Separate phase product disposal
- Optical monitoring of the NYCT structure and adjacent structures during ERH treatment

5.1.6 Demobilization and Post Treatment Sampling

The demobilization of the ERH system equipment will be the responsibility of TRS. The demobilization and post treatment sampling process will consist of the following:

- Confirmatory groundwater sample analysis
- Well abandonment
- Demobilization of surface equipment

During ERH, the current SVE will be retrofitted into an active SSDS that will be protective of vapor intrusion for the slab on grade portion of the Site and the area outside of the treatment area in OU-1. After ERH treatment is concluded, the vapor recovery wells used during treatment will be retrofitted into the SSDS to provide adequate coverage throughout the building. Figure 10 shows the SSDS layout while the ERH system is in operation.

5.2 SCOPE OF ENHANCED IN-SITU BIOREMEDIATION

Enhanced in-situ bioremediation is the process by which biostimulation and bioaugmentation are used to promote the biodegradation of contaminants in the subsurface. Biostimulation is the addition of a food source to the subsurface to stimulate beneficial microbial growth. Bioaugmentation is the addition of microbes to the subsurface to enhance remediation. For the bioremediation of TCE, the bacteria that needed to stimulate or add are a strain of reductive dechlorinating bacteria (*Dehalococcoides)* that thrive in anaerobic environments. Their food source is a carbon substrate (which also promotes an anaerobic environment).

Bioremediation will be conducted to achieve accelerated reduction of TCE concentrations in groundwater for OU-2. To accomplish this remediation in a safe manner, the following methods will be used:

1. All remedial activity will be reviewed by the Remedial Engineer and updates will be provided throughout the duration of the field work.
2. Emergency contact numbers are provided in the attached HASP.

3. All remedial activities will be fully documented in the FER.

5.2.1 Treatability Analysis

Pre-treatment groundwater analysis was performed to obtain baseline estimates on the amount of *Dehalococcoides* naturally present in the subsurface of OU-2. On January 27, 2014, FLS collected samples from three monitoring wells, MW-7, MW-18I, and MW-19I which were analyzed by SiREM Labs for percent *Dehalococcoides*. As shown in Appendix H, MW-18I was the only well with detectable results, 0.6-2% percent *Dehalococcoides* in microbial population.

These results confirm that there is an inadequate population of beneficial microorganisms in the subsurface. However, the reason for the relative absence of *Dehalococcoides* is not known. It is unclear if there are none this geologic environment, the environment is not conducive to their proliferation, or, if large quantities of oxidant that has historically been injected into the subsurface sterilized the environment. A Pilot Test and subsequent monitoring will be necessary to determine the reason for the relative absence of *Dehalococcoides*. A Pilot Test Work Plan was submitted to NYSDEC for approval on July 29, 2014.

5.2.2 Design

The design of the bioremediation treatment will be completed by Arnold Fleming, P.E. The anticipated treatment area is approximately 65,400 square feet with a treatment volume of approximately 60,300 cubic yards.

Tersus Environmental, LLC (Tersus) will be supplying the injectable material. Electron Donor Solution – Extended Release (EDS-ER), a water soluble vegetable oil, and Nutrimens™, a metabolic bioremediation nutrient, will be injected concurrently into the treatment zone. Then KB-1® Culture, containing the *Dehalococcoides* microbes will be injected into the subsurface. Additionally, a small amount L-Cysteine base will be supplied for making anaerobic water. Anaerobic water will precede and trail the KB-1® Culture for protection. To the extent possible, the existing OU-2 injection wells will be reused to minimize disturbance and cost.

The implementation of ERH will result in the heating of groundwater for 6 – 8 months. This will have a three-pronged benefit for bioremediation effectiveness. First, *Dehalococcoides* will be more procreative and dehalogenate quicker in the warmer environment. Second, the rate of conversion between the up gradient total organic carbon (TOC) into dissolved organic carbon (DOC) will be increased. This conversion makes the organic carbon bioavailable to dehalogenating microbes, increasing their food source. Third, as the groundwater temperature increases, the density will drop which will result in increased flow. This will help to disseminate the injectable material throughout the aquifer.

The exact amounts of substrate, volumes and ratios as well as the necessity for bioaugmentation will be determined during the Pilot Test. All activities associated with the remedial action, including permitting requirements, will be conducted in accordance with the applicable Federal, State and local rules and regulations.

5.2.3 Materials Mobilization

FLS has preliminarily determined approximate volumes and rations of material to be applied for the bioremediation. These volumes and ratios are likely to change based on the results of the Pilot Test. The materials being mobilized to the Site consist of 33,600 lbs. of EDS-ER, 8320 lbs. of Nutrimens™, 400 liters of KB-1®, and 6 gal of L-Cysteine. The materials will be staged adjacent to the injection well at the time of injection.

5.2.3 Injection Procedure

At each injection well, these materials will be injected into the interval in the following order:

1. Nutrimens™
2. EDS-ER mixed with a 1:4.5 ratio of water
3. Anaerobic water
4. KB-1®
5. Water to push materials into the subsurface formation

5.2.4 Remediation Schedule

A round of groundwater samples will be collected and analyzed for TCE prior to implementing bioremediation to estimate the remaining amount of contamination in the saturated zone. The following month, FLS will oversee the injection of the materials, listed above, at each of the injection wells. One month after injection, another round of groundwater samples will be collected to determine the degree of material migration.

5.2.5 Progress Monitoring

Upon completion of the injections, groundwater samples will be collected on a quarterly basis to confirm effectiveness of the treatment. Groundwater monitoring activities will cease once it is confirmed that the contaminant concentrations are not rebounding to pre-treatment levels and are acceptable to NYSDEC.

5.3 WELL ABANDONMENT PLAN

As presented in the SRIR, the chemical composition and TCE impacts in groundwater above the clay layer is different than below the clay layer. There are a number of monitoring an injection wells and piezometers installed through the basal clay layer that could act as a conduit for vertical migration of TCE. As such, the Volunteer is requesting approval from the NYSDEC, to abandon all monitoring and injection wells and piezometers that penetrate the clay basal layer with the exception of MW-22I and MW-15I, which are located in areas with minimal historic TCE impacts. Monitoring wells MW-18D and MW-8D will be abandoned but replaced by double-cased stainless steel monitoring wells.

In addition to the deep wells, the operation of the ERH system will require that all wells in the treatment area be abandoned before implementation. A total of 8 double-cased stainless steel monitoring wells (4 shallow and 4 co-located intermediate monitoring wells) will replace the monitoring wells abandoned within the treatment area in order to monitor groundwater above the clay layer. A total of 4 deep groundwater monitoring wells within the ERH treatment area will monitor deep groundwater before, during, and after ERH implementation. As directed by NYSDEC, the purpose of the deep groundwater monitoring wells in this area is to confirm no negative impacts to the deep aquifer from implementation of the ERH remediation. In the event analytical results in the deep groundwater remain consistent before, during, and for a period of four quarters after ERH treatment is completed, the volunteer may petition NYSDEC to abandon the deep wells and cease monitoring of the deep aquifer.

A summary of all wells/piezometers that are requested to be abandoned is presented in Table 8. Figure 5C shows the post-remediation monitoring well network. All wells will be properly abandoned in accordance with NYSDEC CP-43: Groundwater Monitoring Well Decommissioning Policy by a licensed well driller.

5.4 SOIL MANAGEMENT PLAN

5.4.1 Materials Excavation and Load Out

The estimated quantity of soil to be removed from the Site is estimated at 70 cubic yards. The soil that will be removed from the Site is largely from the borings that will be drilled for installing electrodes for ERH.

Soil from all of the soil borings will be containerized in 55-gallon drums. All transport of materials will be performed by licensed haulers in accordance with appropriate local, State, and Federal regulations, including 6 NYCRR Part 364. Haulers will be appropriately licensed and trucks properly placarded.

5.4.2 Fluids Management

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

5.4.3 Storm Water Pollution Prevention

A SWPPP will not be required for this project as the Site work will be conducted within a building and the disturbance to the Site is less than one acre in size.

5.4.4 Contingency Plan

If underground tanks or other previously unidentified contaminant sources are found during on-Site remedial excavation or development related construction, sampling will be performed on product, sediment and surrounding soils, etc. Chemical analytical work will be for full scan parameters (TAL metals; TCL volatiles and semi-volatiles, TCL pesticides and PCBs). These analyses will not be limited to STARS parameters where tanks are identified without prior approval by NYSDEC. Analyses will not be otherwise limited without NYSDEC approval.

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

5.4.5 Community Air Monitoring Plan

The remedial activities will be conducted under a Site specific HASP. The HASP is provided as Appendix D. During invasive activities such as soil boring or monitoring well installation, air monitoring will be continuously conducted with a PID in the work zone to measure ambient VOC concentrations for all indoor activities. Background readings will be taken at the beginning of each workday. The indoor VOC concentrations will be measured at a minimum of every 15 minutes during intrusive work. If the VOC concentrations exceed 5 ppm for a period of greater than 15 minutes, work activities will be temporarily halted until concentrations decrease below 5 ppm.

A project logbook will be kept and background readings as well as any readings that exceed action levels, thereby triggering a response, will be recorded within it. This record will be available for review by the NYSDEC/NYSDOH. The required action levels and responses are addressed in the HASP. Additionally, Site workers will ensure investigation-derived wastes (IDW) are quickly containerized and covered in order to minimize nuisance odors during field work.

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

6.0 RESIDUAL CONTAMINATION TO REMAIN ON-SITE

Deep groundwater treatment is not proposed under the selected remedial alternative. Since residual contaminated groundwater will exist beneath the Site after the remedy is complete, Engineering and Institutional Controls (ECs and ICs) are required to protect human health and the environment. These ECs and ICs are described hereafter. Long-term management of EC/ICs and of residual contamination will be executed under a Site-specific Site Management Plan (SMP) that will be developed and included in the FER.

ECs will be implemented to protect public health and the environment by appropriately managing residual contamination. The Controlled Property (the Site) will have two primary EC systems consisting of a composite cover system and SSDS. The engineered composite cover system will cover the entire Site. The current SVE will be retrofitted into an active SSDS during ERH treatment and will mitigate vapors from the slab on grade portion of the Site and areas outside of the ERH treatment area. Once ERH operation concludes, the SSDS will be expanded to provide mitigation of vapors from beneath the ERH treatment area. Figure 10A shows the current SVE SSDS System Layout. Figure 10B shows the retrofitted SSDS while the ERH system is in operation. Figure 10C shows the final retrofitter SSDS once the ERH system operation has concluded.

7.0 ENGINEERING CONTROLS

7.1 ELECTRICAL RESISTANCE HEATING SYSTEM

It is expected that the FER for the selected remedy will be submitted and approved prior to the completion of ERH operation. Therefore ERH will be operated under a SMP and will serve as an EC. ERH operation includes vapor recovery and therefore will serve as a SVE within the treatment area. Once ERH operations cease, the current SVE will be retrofitted into a SSDS that will ventilate the entire footprint of the Site, and the ERH system will no longer be considered an EC.

7.2 COMPOSITE COVER SYSTEM

Exposure to vapors associated with residual contaminated groundwater will be prevented by an engineered, composite cover system that will remain on the Site. This composite cover system will be comprised of a concrete building slab.

7.3 SUB-SLAB DEPRESSURIZATION SYSTEM

The SVE for the building will remain in operation throughout the duration of the remedy and during the initial portion of the Site management phase. The SVE system will be converted to an SSDS following the completion of remediation. The proposed final design for this SSDS is presented in Figure 10C.

7.4 GROUNDWATER TREATMENT

Shallow and intermediate groundwater will be treated to 100 ppb TCE within the treatment area in OU-1 via ERH. Shallow and intermediate groundwater in OU-2 will be treated via in-situ bioremediation.

Volume and density application rates for the biological nutrient will be based on the manufacturer’s recommendations. A letter from the manufacturer stating recommended dosage rates will be provided to NYSDEC and will be included in the Final Engineering Report. Design plans and a work schedule will be submitted to NYSDEC for injection and reinjection of the biological nutrient. All as-built drawings, diagrams, calculation and manufacturer documentation for treatment systems will be presented in the FER.

Upon completion of the injections, groundwater samples will be collected from shallow and intermediate groundwater on a quarterly basis to confirm effectiveness of the treatment. Groundwater monitoring activities will continue until NYSDEC approves discontinuing groundwater monitoring in writing.

8.0 CRITERIA FOR COMPLETION OF REMEDIATION/TERMINATION OF REMEDIAL SYSTEMS

8.1 COMPOSITE COVER SYSTEM

The composite cover system is a permanent control and the quality and integrity of this system will be inspected at defined, regular intervals in perpetuity. The composite cover system will cover the entire Site. Any portion of the concrete slab to remain will be renovated to ensure that it eliminates any contact with underlying fill.

8.2 SUB-SLAB DEPRESSURIZATION SYSTEM

The SSDS installed at the Site will be an active system. Post remediation sampling can take place to determine whether this SSDS can be converted into passive operation. This sampling event will include simultaneous sampling of sub-slab soil vapor and indoor air samples to determine if there is any potential for soil vapor intrusion after remediation. If post remediation sampling determines an active system is required, then the SSDS will be a permanent engineering control. The quality and integrity of these systems will be inspected at defined, regular intervals in perpetuity. The SSDS cannot be converted to passive operation or discontinued without prior written approval from NYSDEC.

8.3 GROUNDWATER MONITORING

Shallow and intermediate groundwater monitoring will be conducted on a quarterly basis to assess treatment effectiveness. Groundwater monitoring of shallow and intermediate monitoring wells will be conducted to assess natural attenuation, as determined by NYSDOH and NYSDEC, until residual groundwater concentrations have become asymptotic over an extended period. Monitoring of shallow and intermediate groundwater will continue until permission to discontinue is granted in writing by NYSDEC and NYSDOH.

9.0 INSTITUTIONAL CONTROLS

After the remedy is complete, the Site will have residual contamination remaining in place. Engineering Controls (ECs) for the residual contamination have been incorporated into the remedy to render the overall Site remedy protective of public health and the environment. Two elements have been designed to ensure continual and proper management of residual contamination in perpetuity: a Declaration of Covenants and Restriction (Deed Restrictions) and a Site Management Plan.

All as-built drawings, diagrams, calculation and manufacturer documentation for treatment systems will be presented in the FER. A Site-specific Deed Restriction will be recorded with Queens County to provide an enforceable means of ensuring the continual and proper management of residual contamination and protection of public health and the environment in perpetuity or until released in writing by NYSDEC. It requires that the property owner and the owner’s successors and assigns adhere to all ECs/ICs placed on this Site by this NYSDEC-approved remedy. ICs provide restrictions on Site usage and mandate operation, maintenance, monitoring and reporting measures for all ECs and ICs. The SMP describes appropriate methods and procedures to ensure compliance with all ECs and ICs that are required by the Environmental Easement. Once the SMP has been approved by the NYSDEC, compliance with the SMP is required by the owner and the owner’s successors and assigns.

9.1 DEED RESTRICTION

The Deed Restriction renders the Site a Controlled Property. The Deed Restriction must be recorded with the Queens County Office of the City Register before the VCA Release and Covenant Not to Sue can be issued by NYSDEC. A series of Institutional Controls are required under this remedy to implement, maintain and monitor these Engineering Control systems, prevent future exposure to residual contamination by controlling disturbances of the subsurface soil and restricting the use of the Site to restricted residential, commercial and industrial use(s) only. These Institutional Controls are requirements or restrictions placed on the Site that are listed in, and required by, the Deed Restriction. Institutional Controls can, generally, be subdivided between controls that support Engineering Controls, and those that place general restrictions on Site usage or other requirements. Institutional Controls in both of these groups are closely integrated with the

Site Management Plan, which provides all of the methods and procedures to be followed to comply with this remedy.

The Institutional Controls that support Engineering Controls are:

- Compliance with the Deed Restriction by the Owner and the Owner's successors and adherence of all elements of the SMP is required;
- All Engineering Controls must be operated and maintained as specified in the SMP;
- All Engineering Controls on the Controlled Property must be inspected and certified at a frequency and in a manner defined in the SMP;
- Groundwater, soil vapor, and other environmental or public health monitoring must be performed as defined in the SMP;
- Data and information pertinent to Site Management for the Controlled Property must be reported at the frequency and in a manner defined in the SMP;
- On-Site environmental monitoring devices, including but not limited to, groundwater monitor wells and soil vapor probes, must be protected and replaced as necessary to ensure proper functioning in the manner specified in the SMP;
- Engineering Controls may not be discontinued without an amendment or extinguishment of the Deed Restriction.

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

- Vegetable gardens and farming on the Controlled Property are prohibited;
- Use of groundwater underlying the Controlled Property is prohibited without treatment rendering it safe for intended purpose;
- All future activities on the Controlled Property that will disturb residual contaminated material are prohibited unless they are conducted in accordance with the soil management provisions in the Site Management Plan;

- The Controlled Property may be used restricted residential, commercial and industrial use only, provided the long-term Engineering and Institutional Controls included in the Site Management Plan are employed;
- The Controlled Property may not be used for a higher level of use, such as residential use without an amendment or extinguishment of the Deed Restriction;
- Property owner agrees to submit to NYSDEC a written statement that certifies, under penalty of perjury, that: (1) controls employed at the Controlled Property are unchanged from the previous certification or that any changes to the controls were approved by the NYSDEC; and, (2) nothing has occurred that impairs the ability of the controls to protect public health and environment or that constitute a violation or failure to comply with the SMP. NYSDEC retains the right to access such Controlled Property at any time in order to evaluate the continued maintenance of any and all controls. This certification shall be submitted annually, or an alternate period of time that NYSDEC may allow. This annual statement must be certified by an expert that the NYSDEC finds acceptable.

9.2 SITE MANAGEMENT PLAN

Site Management is the last phase of remediation and begins with the approval of the FER and issuance of the Release and Covenant Not to Sue for the Remedial Action. The Site Management Plan is submitted as part of the FER but will be written in a manner that allows its removal and use as a complete and independent document. Site Management continues in perpetuity or until released in writing by NYSDEC. The property owner is responsible to ensure that all Site Management responsibilities defined in the Deed Restriction and the SMP are performed.

The SMP is intended to provide a detailed description of the procedures required to manage residual contamination left in place at the Site following completion of the Remedial Action in accordance with the BCA with the NYSDEC. This includes: (1) development, implementation, and management of all Engineering and Institutional Controls; (2) development and implementation of monitoring systems and a Monitoring Plan; (3) development of a plan to operate and maintain any treatment, collection, containment, or recovery systems (including, where appropriate, preparation of an Operation and Maintenance Manual); (4) submittal of Site

Management Reports, performance of inspections and certification of results, and demonstration of proper communication of Site information to NYSDEC; and (5) defining criteria for termination of treatment system operation.

To address these needs, this SMP will include four plans: (1) an Engineering and Institutional Control Plan for implementation and management of EC/ICs; (2) a Monitoring Plan for implementation of Site Monitoring; (3) an Operation and Maintenance Plan for implementation of remedial collection, containment, treatment, and recovery systems; and (4) a Site Management Reporting Plan for submittal of data, information, recommendations, and certifications to NYSDEC. The SMP will be prepared in accordance with the requirements in NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation and the guidelines provided by NYSDEC.

Site management activities, reporting, and EC/IC certification will be scheduled on a certification period basis. The certification period will be annually.

The Site Management Plan in the Final Engineering Report will include a monitoring plan for groundwater at the down gradient Site perimeter to evaluate Site-wide performance of the remedy. Appropriately placed groundwater monitor wells will also be installed immediately down gradient of all remediation areas for the purpose of evaluation of the effectiveness of the remedy that is implemented.

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

10.0 FINAL ENGINEERING REPORT

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

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

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

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

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

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

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

Before approval of a FER and issuance of a Certificate of Completion, all project reports must be submitted in digital form on electronic media (PDF).

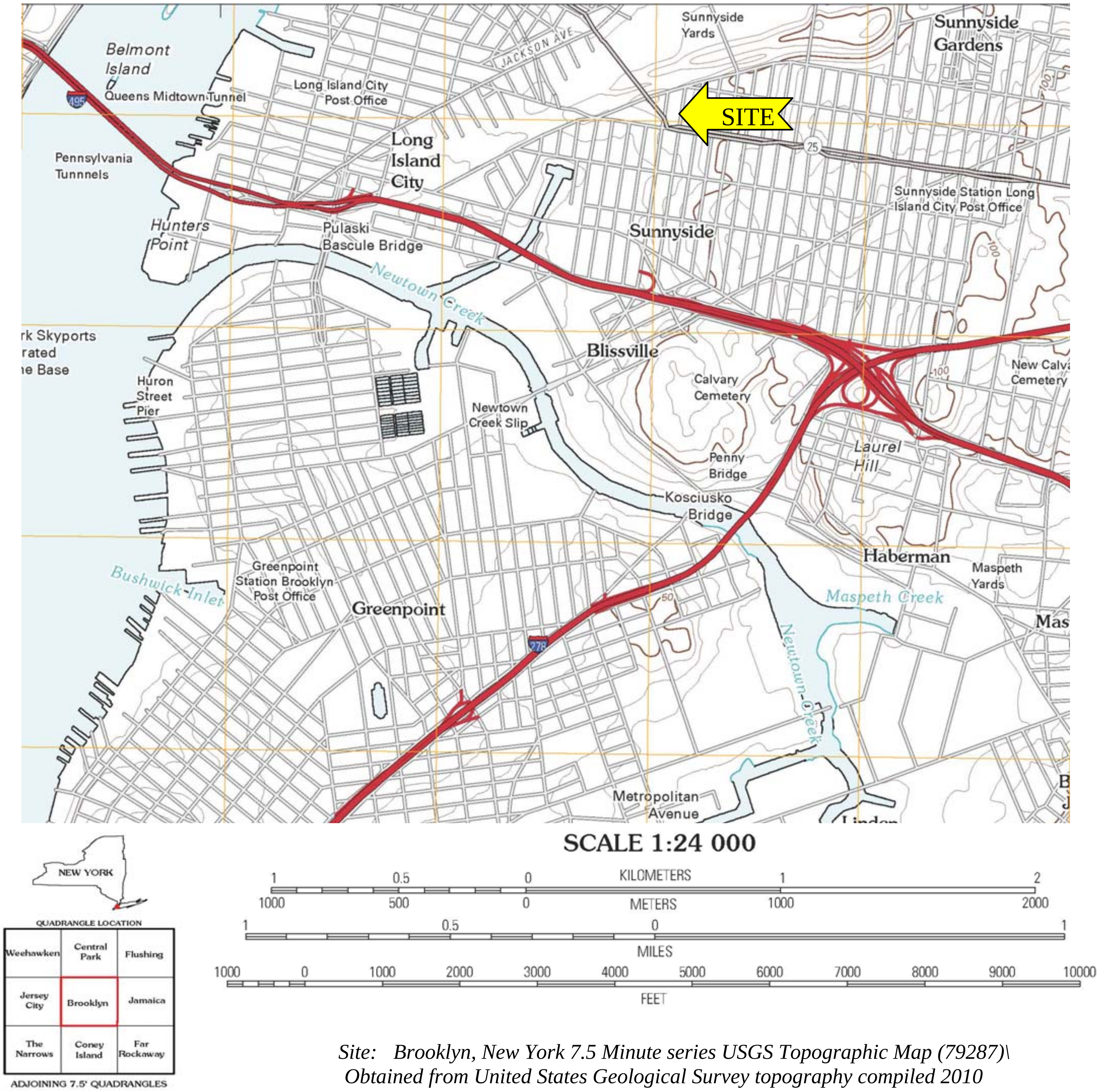
11.0 RELEASE AND COVENANT NOT TO SUE

After acceptance of the FER, the Volunteer will seek a Release for the Site in order to certify that the remediation has been completed. Fact sheets will be sent to all interested parties once the FER has been submitted to NYSDEC, and again once the Release has been issued.

12.0 COSTS AND SCHEDULE

A Remedial Action schedule is included in Table 5 and associated costs are summarized in Table 9. The schedule will be revised prior to the start of remediation and construction. Major deviations will be reported to the NYSDEC during the execution of the RAWP.

Figures



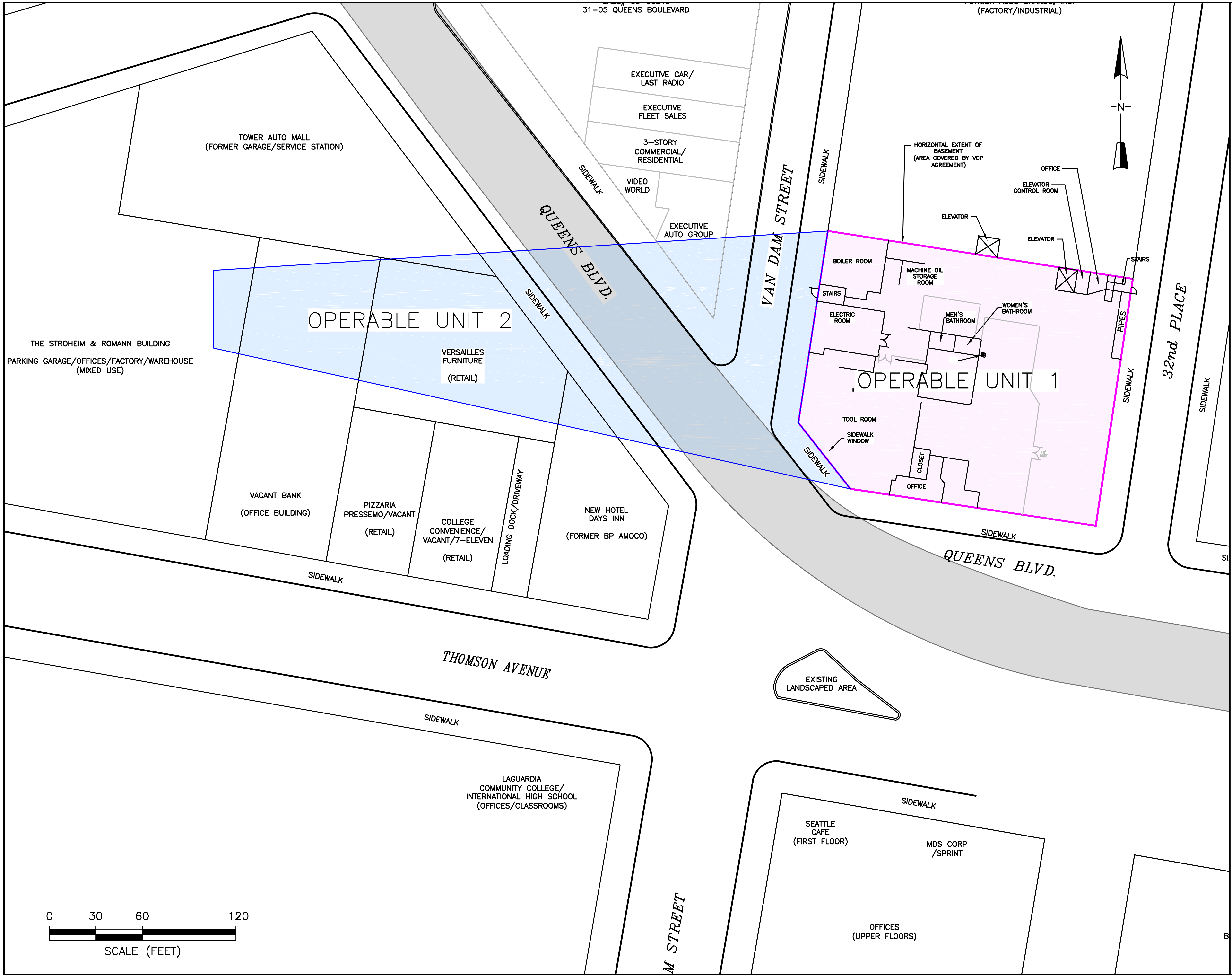
Site: Brooklyn, New York 7.5 Minute series USGS Topographic Map (79287)
Obtained from United States Geological Survey topography compiled 2010

FIGURE 1: SITE LOCATION

SITE: FORMER ACCO BRANDS
32-00 SKILLMAN AVENUE
LONG ISLAND CITY, NEW YORK

Fleming
Lee Shue

Environmental Management & Consulting, 158 West 29th Street, 9th Fl., New York, NY 10001



FILE: P:\Project Files\10195 – ACCO – Jim Beam\Figures and Maps\RAWP\FIG 2 – Site Layout.dwg DATE: 3/26/2015

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Long Island City, NY

FIGURE 2

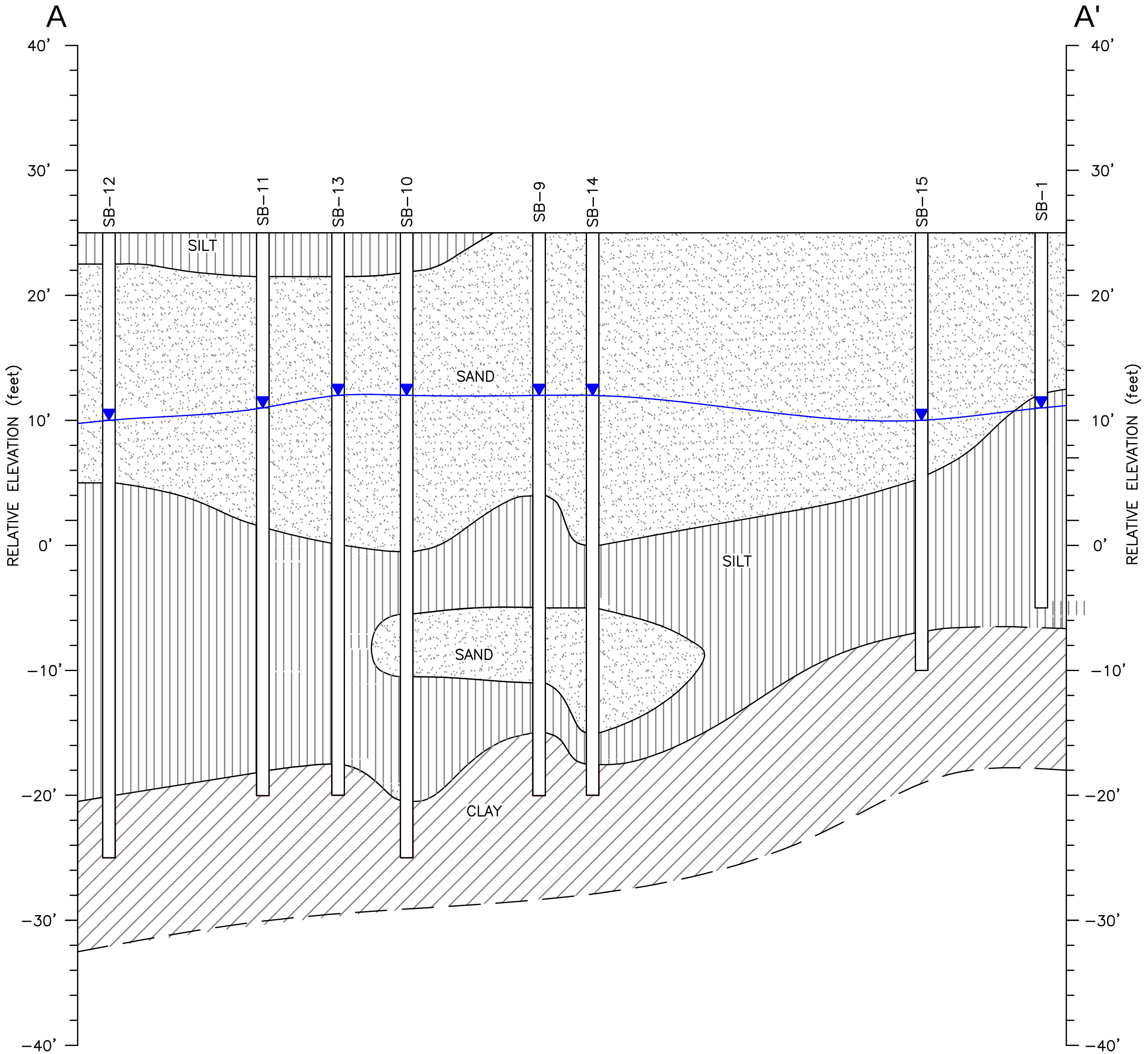
SITE LAYOUT

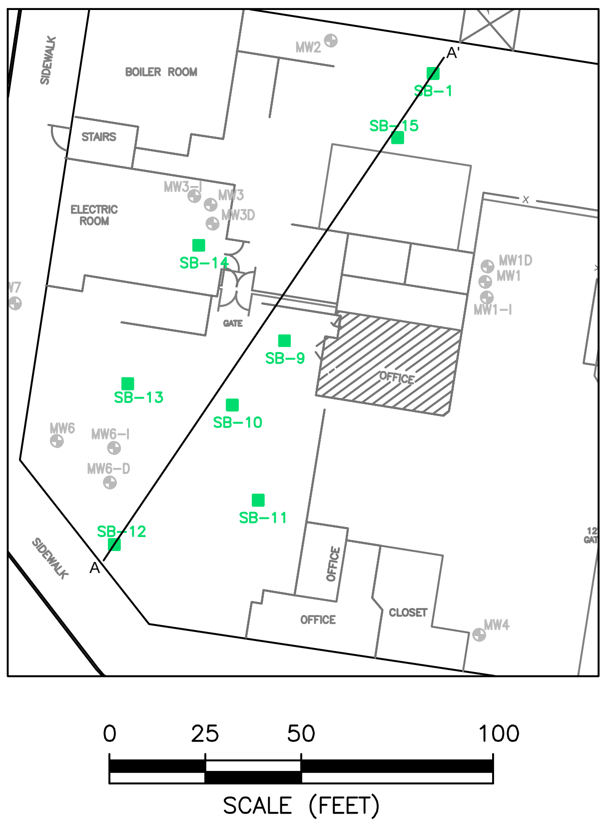
Date
March 2015

Project Number
10195-001

LEGEND

🟪 OPERABLE UNIT 1 BOUNDARY
🟦 OPERABLE UNIT 2 BOUNDARY
▒ ELEVATED TRAIN (SUBWAY)





LEGEND

■ SB−11	SOIL BORING LOCATION
⊕ MW16−I	MONITORING WELL LOCATION
▨	SAND
▥	SILT
▧	CLAY
- - -	INFERRED Source: First Environment RAR April 2001 and GES RAWP August 2003
▼	WATER TABLE (OCTOBER 2013)

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FIGURE 3

GEOLOGIC CROSS-SECTION

Date
March 2015

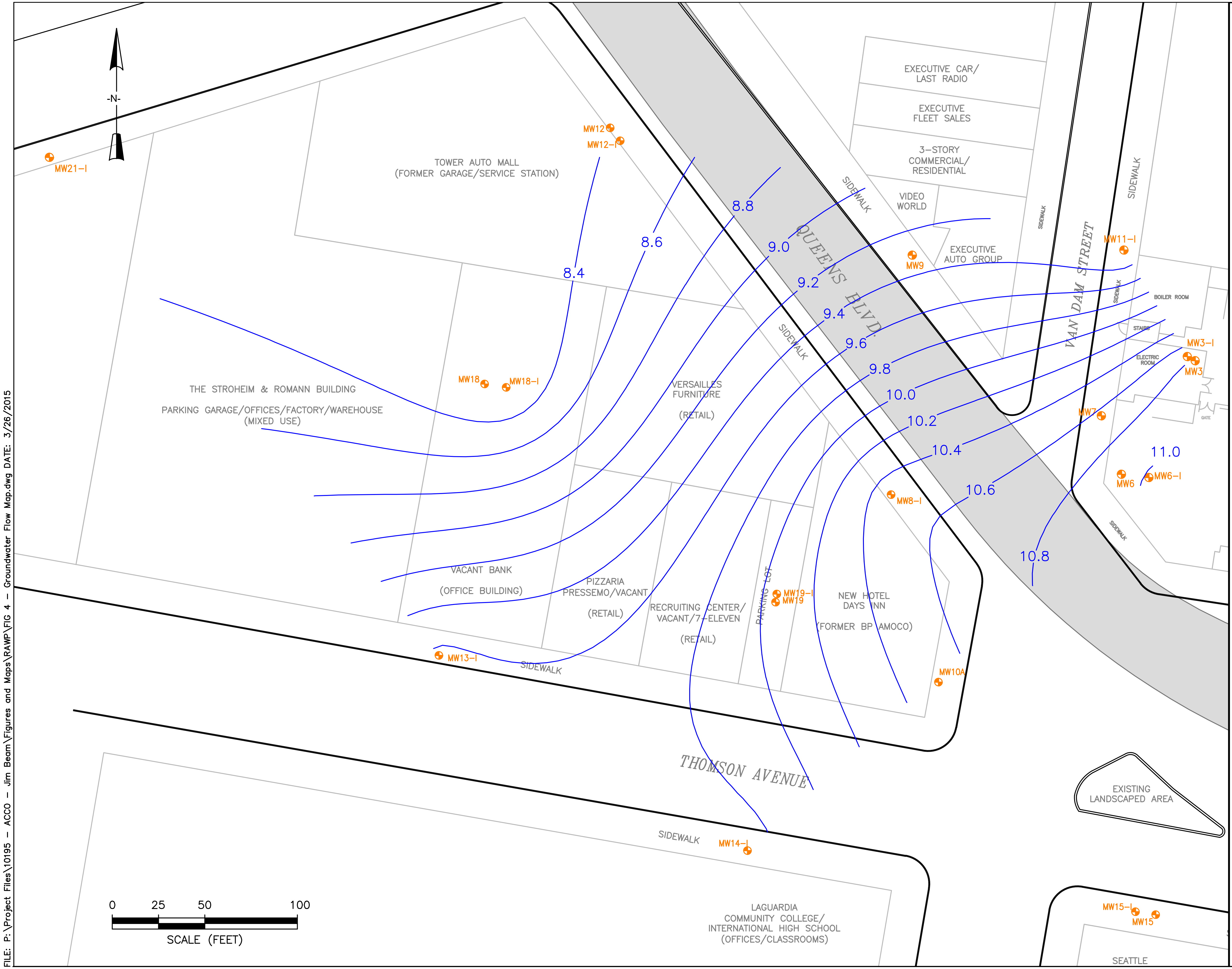
Project Number
10195-001

SCALES

0 10 20 40
SCALE (FEET)
(Horizontal)

0 5 10 20
SCALE (FEET)
(Vertical)

FILE: P:\Project Files\10195 − ACCO − Jim Beam\Figures and Maps\RAWP\FIG 3 − Geologic Cross-Section.dwg DATE: 3/2/2015



FILE: P:\Project Files\10195 – ACCO – Jim Beam\Figures and Maps\RAWP\FIG 4 – Groundwater Flow Map.dwg DATE: 3/26/2015

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FIGURE 4

GROUNDWATER FLOW MAP

Date
March 2015

Project Number
10195-001

LEGEND

MW–16 ●	GROUNDWATER MONITORING WELL
—	GROUNDWATER ELEVATION (AUGUST 2014, QUEENSBORO DATUM)

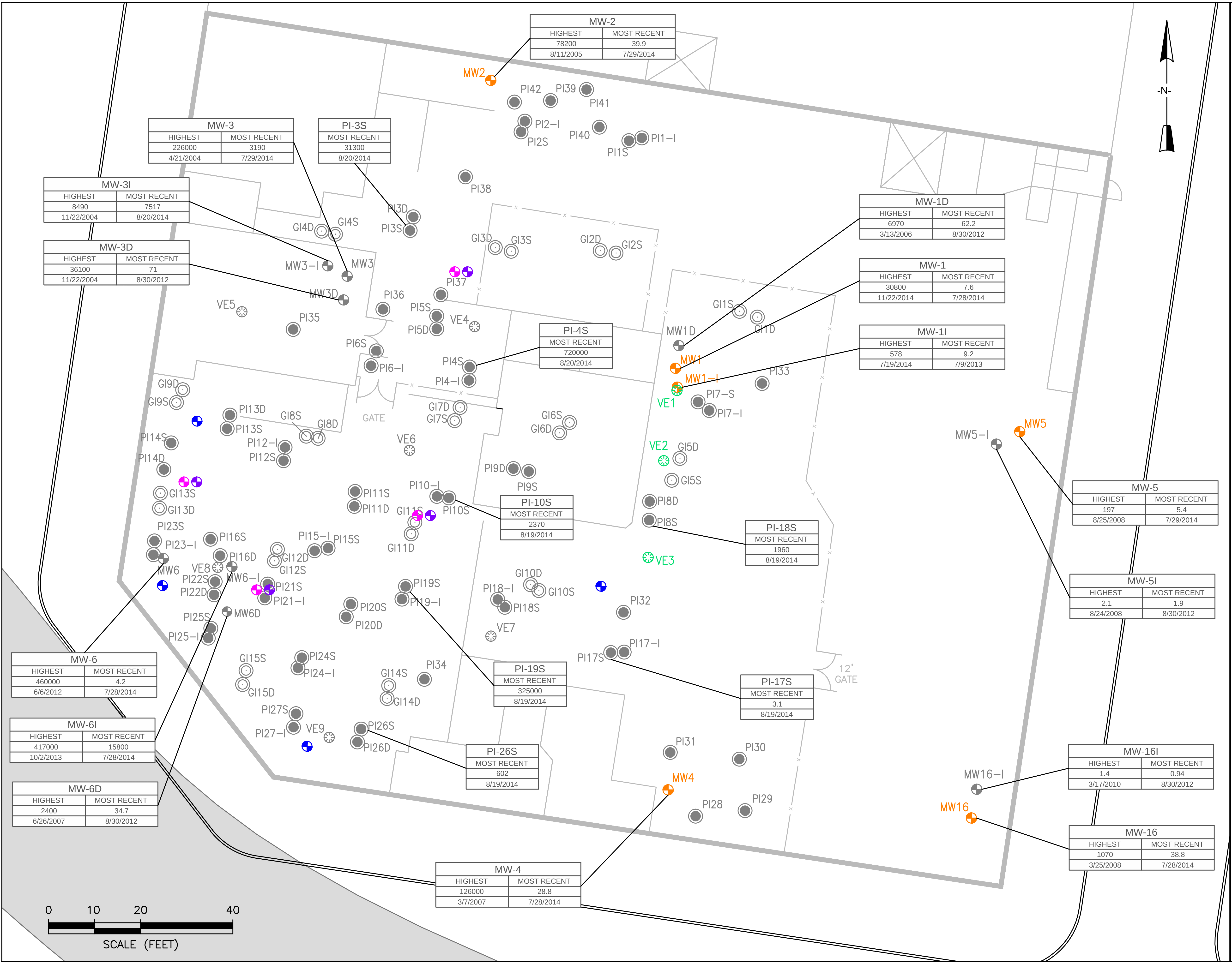

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FIGURE 5A

CURRENT MONITORING WELL NETWORK FOR OU-1 WITH PROPOSED ABANDONMENT

Date
March 2015

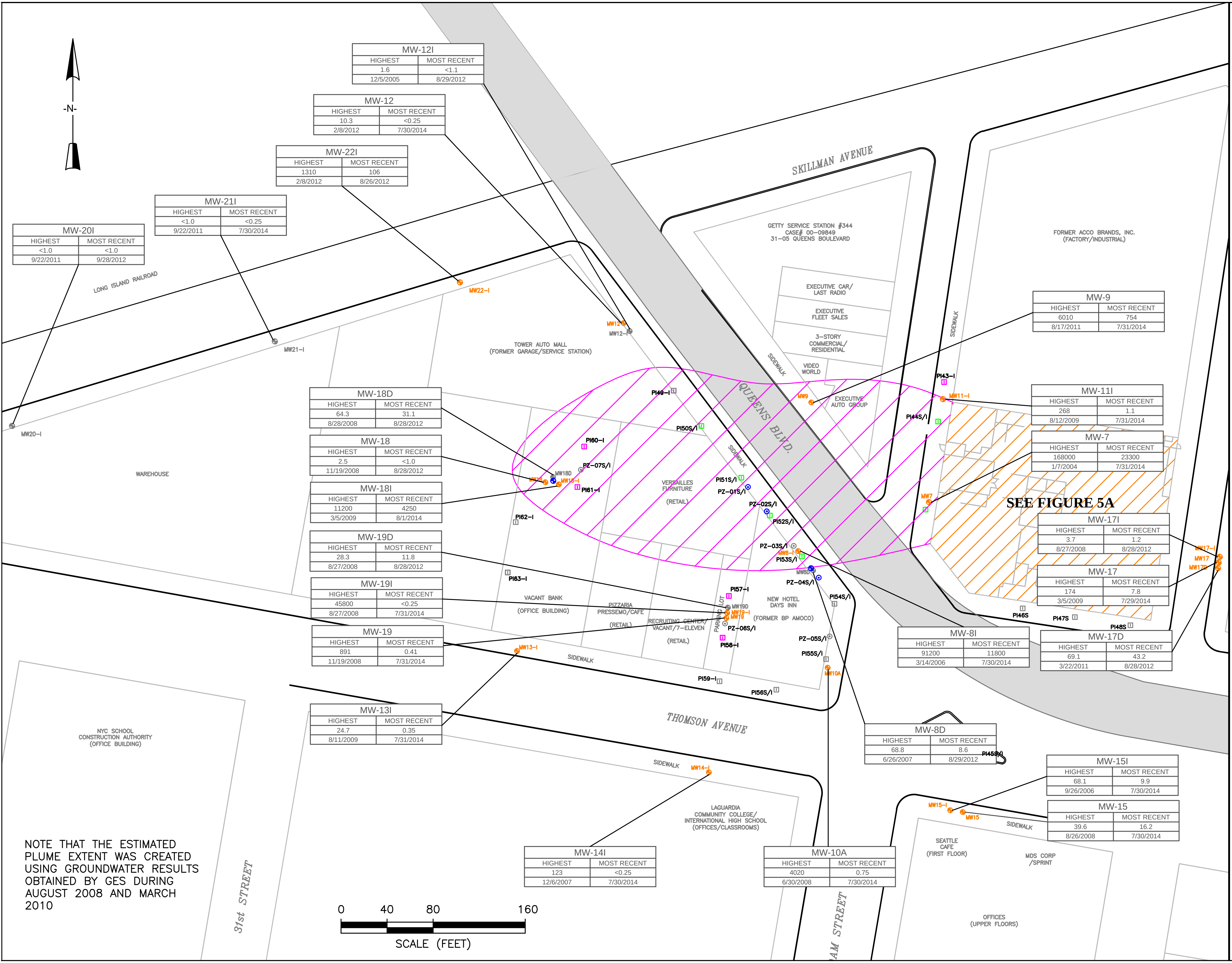
Project Number
10195-001

LEGEND

⊕	MONITORING WELL
◉	PERMANGANATE INJECTION WELL
◎	GAS INJECTION WELL
⊛	VAPOR EXTRACTION WELL
⊕	PROPOSED DOUBLE CASED SHALLOW MONITORING WELL
⊕	PROPOSED DOUBLE CASED INTERMEDIATE MONITORING WELL
⊕	PROPOSED DOUBLE CASED DEEP MONITORING WELL
⊛ ◉ ◎ ⊕	WELLS TO BE ABANDONED

FILE: P:\Project Files\10195 – ACCO – Jim Beam\Figures and Maps\RAWP\FIG 5A – Current Monitoring Well Network for OU-1 with Proposed Abandonment.dwg DATE: 3/26/2015

FILE: P:\Project Files\10195 - ACCO - Jim Beam\Figures and Maps\RAWP\FIG 5B - Current Monitoring Well Network for OU-2 with Proposed Abandonment.dwg DATE: 3/26/2015



MW-12I	
HIGHEST	MOST RECENT
1.6	<1.1
12/5/2005	8/29/2012

MW-12	
HIGHEST	MOST RECENT
10.3	<0.25
2/8/2012	7/30/2014

MW-22I	
HIGHEST	MOST RECENT
1310	106
2/8/2012	8/26/2012

MW-21I	
HIGHEST	MOST RECENT
<1.0	<0.25
9/22/2011	7/30/2014

MW-20I	
HIGHEST	MOST RECENT
<1.0	<1.0
9/22/2011	9/28/2012

MW-9	
HIGHEST	MOST RECENT
6010	754
8/17/2011	7/31/2014

MW-18D	
HIGHEST	MOST RECENT
64.3	31.1
8/28/2008	8/28/2012

MW-18	
HIGHEST	MOST RECENT
2.5	<1.0
11/19/2008	8/28/2012

MW-18I	
HIGHEST	MOST RECENT
11200	4250
3/5/2009	8/1/2014

MW-19D	
HIGHEST	MOST RECENT
28.3	11.8
8/27/2008	8/28/2012

MW-19I	
HIGHEST	MOST RECENT
45800	<0.25
8/27/2008	7/31/2014

MW-19	
HIGHEST	MOST RECENT
891	0.41
11/19/2008	7/31/2014

MW-11I	
HIGHEST	MOST RECENT
268	1.1
8/12/2009	7/31/2014

MW-7	
HIGHEST	MOST RECENT
168000	23300
1/7/2004	7/31/2014

MW-17I	
HIGHEST	MOST RECENT
3.7	1.2
8/27/2008	8/28/2012

MW-17	
HIGHEST	MOST RECENT
174	7.8
3/5/2009	7/29/2014

MW-8I	
HIGHEST	MOST RECENT
91200	11800
3/14/2006	7/30/2014

MW-17D	
HIGHEST	MOST RECENT
69.1	43.2
3/22/2011	8/28/2012

MW-13I	
HIGHEST	MOST RECENT
24.7	0.35
8/11/2009	7/31/2014

MW-8D	
HIGHEST	MOST RECENT
68.8	8.6
6/26/2007	8/29/2012

MW-15I	
HIGHEST	MOST RECENT
68.1	9.9
9/26/2006	7/30/2014

MW-15	
HIGHEST	MOST RECENT
39.6	16.2
8/26/2008	7/30/2014

MW-14I	
HIGHEST	MOST RECENT
123	<0.25
12/6/2007	7/30/2014

MW-10A	
HIGHEST	MOST RECENT
4020	0.75
6/30/2008	7/30/2014

NOTE THAT THE ESTIMATED PLUME EXTENT WAS CREATED USING GROUNDWATER RESULTS OBTAINED BY GES DURING AUGUST 2008 AND MARCH 2010

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FIGURE 5B

CURRENT MONITORING WELL NETWORK FOR OU-2 WITH PROPOSED ABANDONMENT

Date
March 2015

Project Number
10195-001

LEGEND

◍	MONITORING WELL
⊙	PIEZOMETER
◍	PROPOSED DOUBLE CASED DEEP MONITORING WELL
🟩	NESTED SHALLOW/INTERMEDIATE INJECTION WELL
▭	INTERMEDIATE INJECTION WELL
▭ ⊙ ◍	WELLS TO ABANDON
▨	ESTIMATED PLUME EXTENT

FILE: P:\Project Files\10195 – ACCO – Jim Beam\Figures and Maps\RAWP\FIG 5C – Proposed Final Monitoring Well Network.dwg DATE: 3/26/2015

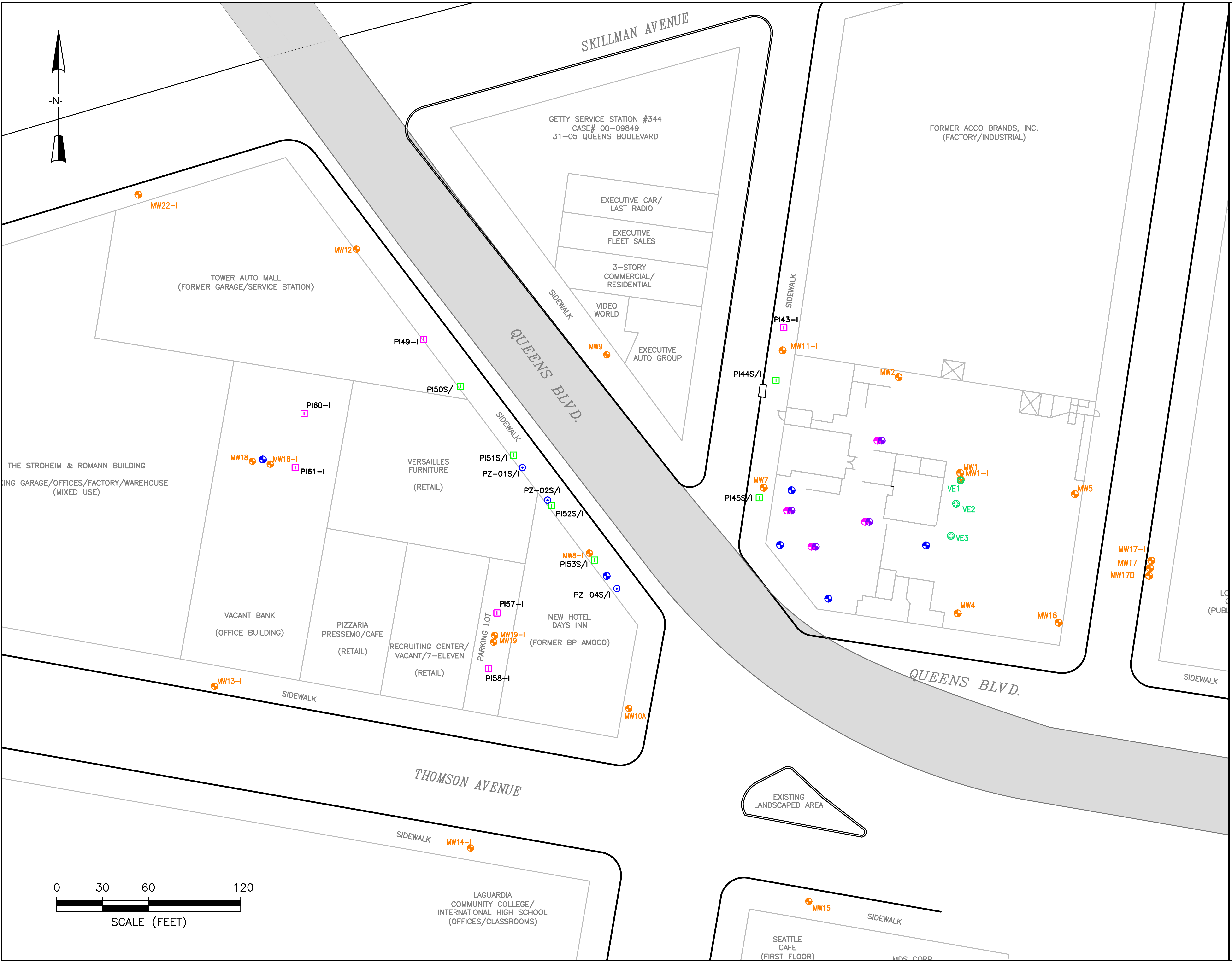

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FIGURE 5C

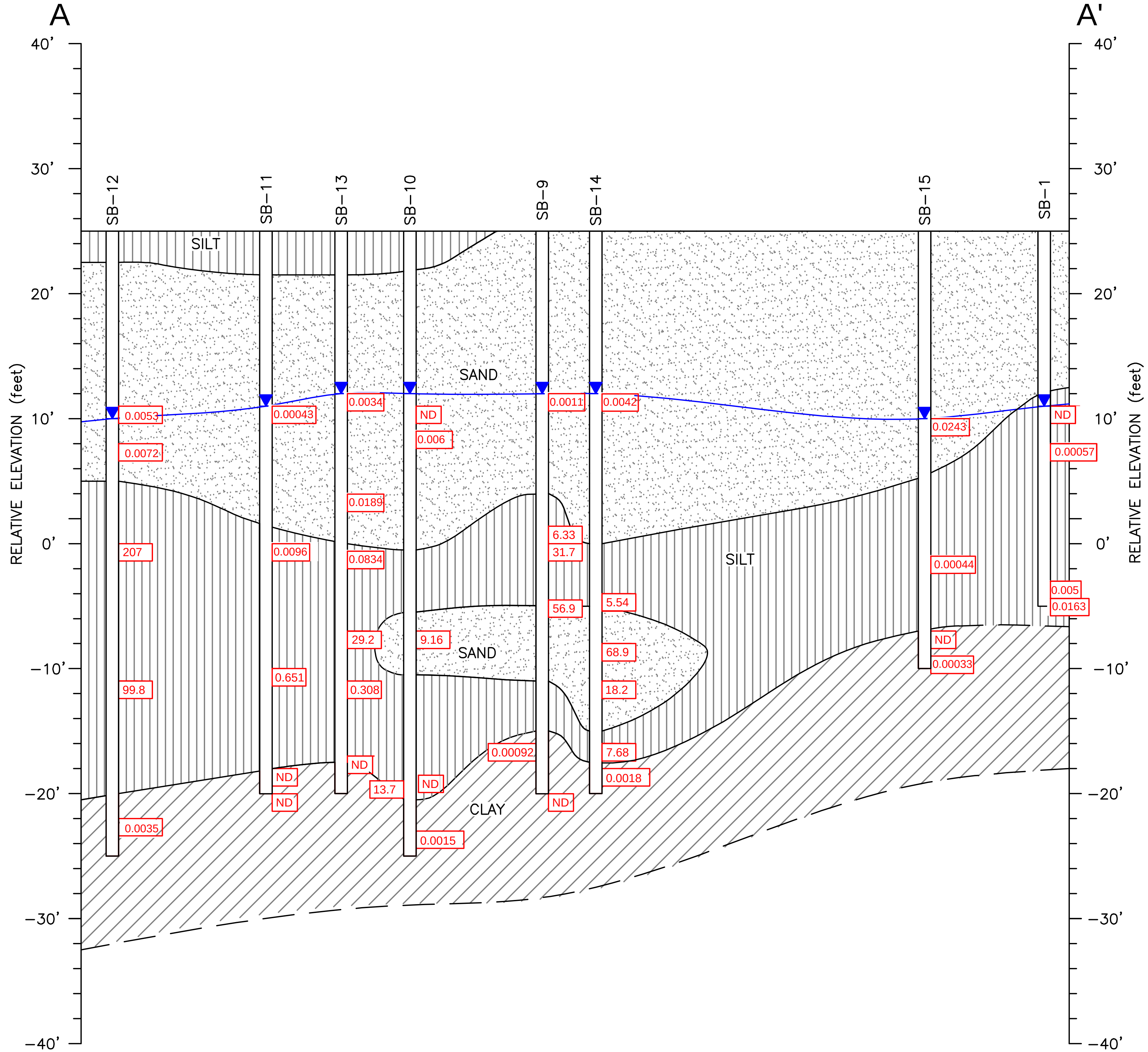
PROPOSED FINAL MONITORING WELL NETWORK

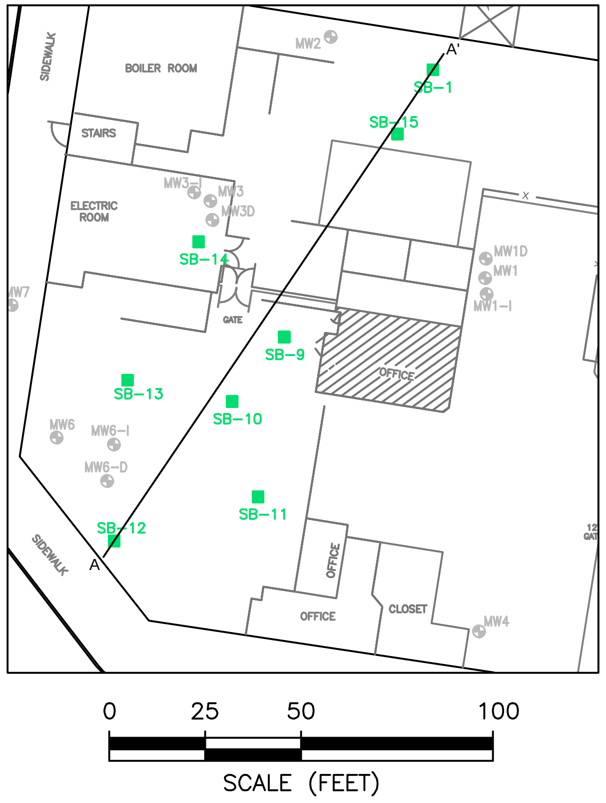
Date
March 2015

Project Number
10195-001

LEGEND

- ● MONITORING WELL
- ⊙ PIEZOMETER
- ⊛ VAPOR EXTRACTION WELL
- ● PROPOSED DOUBLE CASED SHALLOW MONITORING WELL
- ● PROPOSED DOUBLE CASED INTERMEDIATE MONITORING WELL
- ● PROPOSED DOUBLE CASED DEEP MONITORING WELL
- ☐ NESTED SHALLOW/INTERMEDIATE INJECTION WELL
- ☐ INTERMEDIATE INJECTION WELL





LEGEND

🟩 SB−11	SOIL BORING LOCATION
⊕ MW16−I	MONITORING WELL LOCATION
▨	SAND
▥	SILT
▨	CLAY
– – –	INFERRED Source: First Environment RAR April 2001 and GES RAWP August 2003
▼	WATER TABLE (OCTOBER 2013)
7.68	TCE CONCENTRATION IN SOIL SAMPLES (mg/kg)
ND	NOT DETECTED ABOVE METHOD DETECTION LIMIT

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FIGURE 6

TRICHLOROETHYLENE CONCENTRATIONS IN SOIL SAMPLES

Date
March 2015

Project Number
10195-001

SCALES

0 10 20 40
SCALE (FEET)
(Horizontal)

0 5 10 20
SCALE (FEET)
(Vertical)

FILE: P:\Project Files\10195 – ACCO – Jim Beam\Figures and Maps\RAWP\FIG 6 – TCE Concentrations in Soil.dwg DATE: 3/2/2015

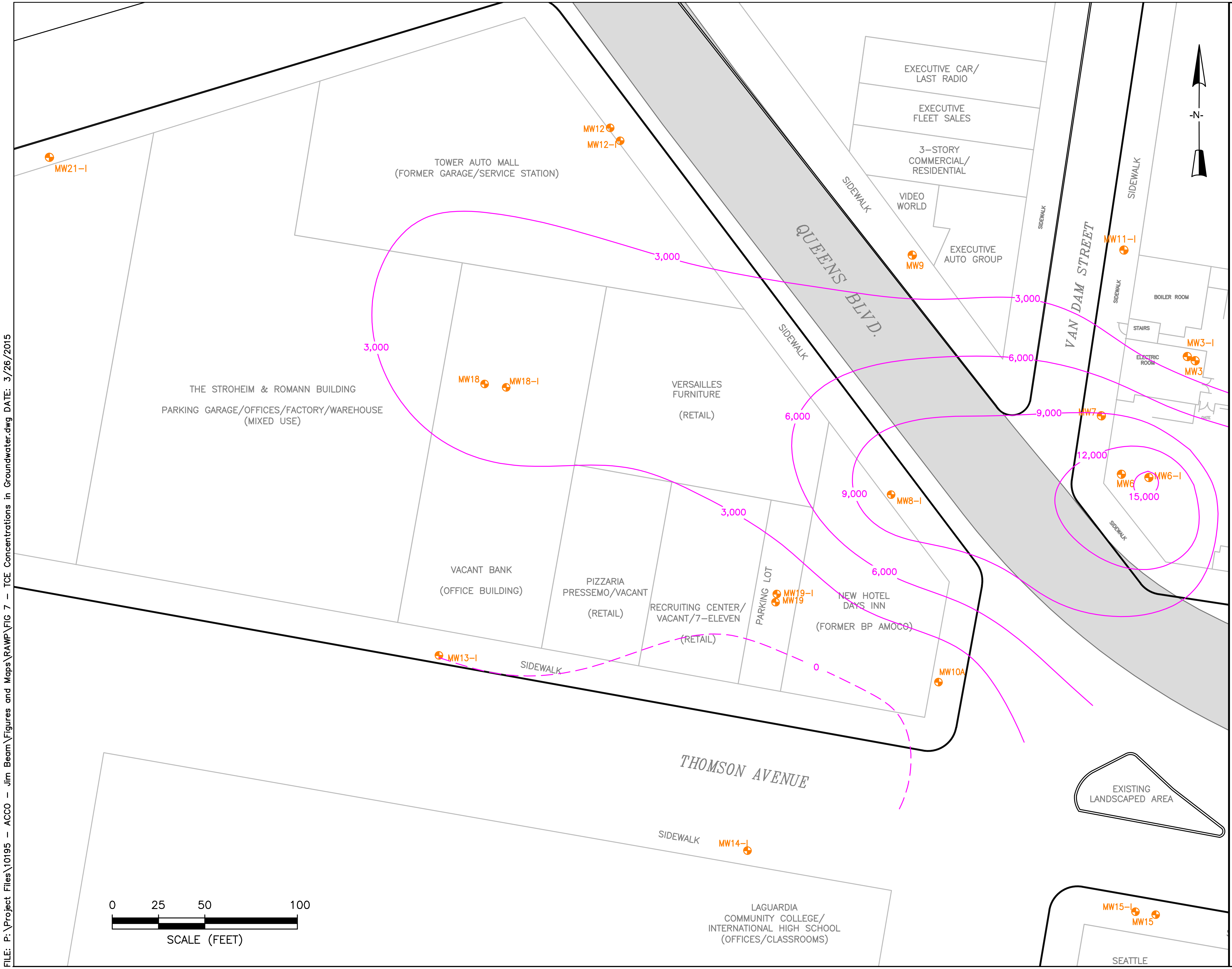

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FIGURE 7

TRICHLOROETHYLENE CONCENTRATIONS IN GROUNDWATER SAMPLES

Date
March 2015

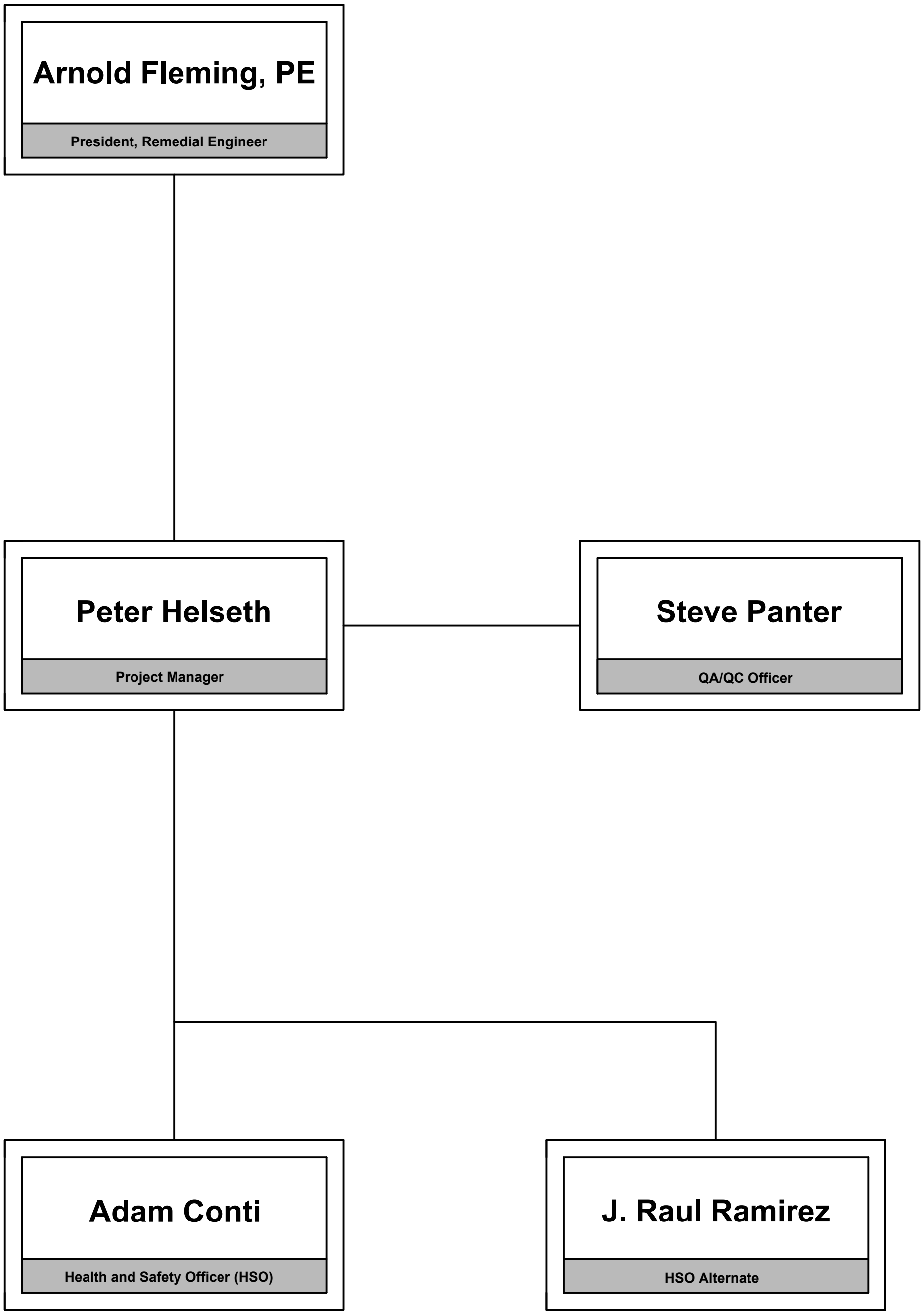
Project Number
10195-001

LEGEND

MW–16 ● GROUNDWATER MONITORING WELL

TCE CONCENTRATION (PPB)
(AUGUST 2014)

FILE: P:\Project Files\10195 – ACCO – Jim Beam\Figures and Maps\RAWP\FIG 7 – TCE Concentrations in Groundwater.dwg DATE: 3/26/2015



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Date
March 2015

FIGURE 8

Project Number
10195-001

PROJECT ORGANIZATION CHART

Formerly ACCo Brands, Inc.

VCP Site # V00331

FILE: P:\Project Files\10195 – ACCO – Jim Beam\Figures and Maps\RAWP\FIG 8 – Project Organization Chart.dwg DATE: 3/2/2015

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Long Island City, NY

FIGURE 9

PROPOSED ELECTRICAL RESISTANCE HEATING LAYOUT

Date
March 2015

Project Number
10195

LEGEND

○ BORED ELECTRODE (QTY. 52)

⊂⊃ ANGLED ELECTRODE (QTY. 8)

▽ TMP (QTY. 7)

⊕ REPLACEMENT SHALLOW MONITORING WELL (QTY. 4)

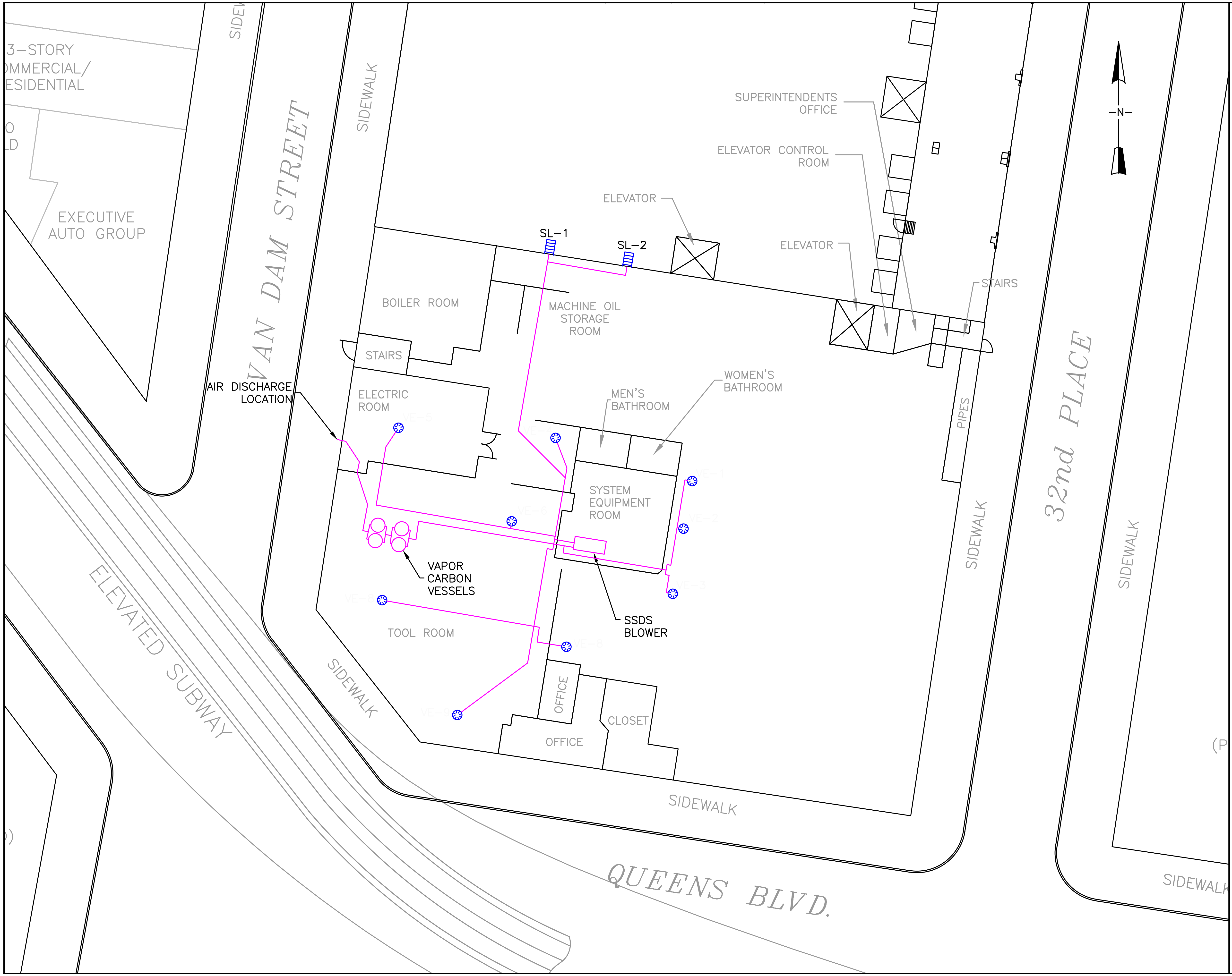
⊕ REPLACEMENT INTERMEDIATE MONITORING WELL (QTY. 4)

⊕ REPLACEMENT DEEP MONITORING WELL (QTY. 4)

— SECURITY FENCE

— TEMPORARY FENCE/BARRIER

FILE: P:\Project Files\10195 – ACCO – Jim Beam\Figures and Maps\RAWP\FIG 9 – Proposed ERH Layout.dwg DATE: 3/26/2015



FILE: P:\Project Files\10195 – ACCO – Jim Beam\Figures and Maps\RAWP\FIG 10A – Current SSDS Layout.dwg DATE: 3/2/2015

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Long Island City, NY

FIGURE 10A

CURRENT SOIL VAPOR EXTRACTION / SUB-SLAB DEPRESSURIZATION SYSTEM LAYOUT

Date
March 2015

Project Number
10195-001

LEGEND

❂ VE–1	SOIL VAPOR EXTRACTION POINT
▤ SL–1	SSDS LATERAL

0 15 30 60
SCALE (FEET)

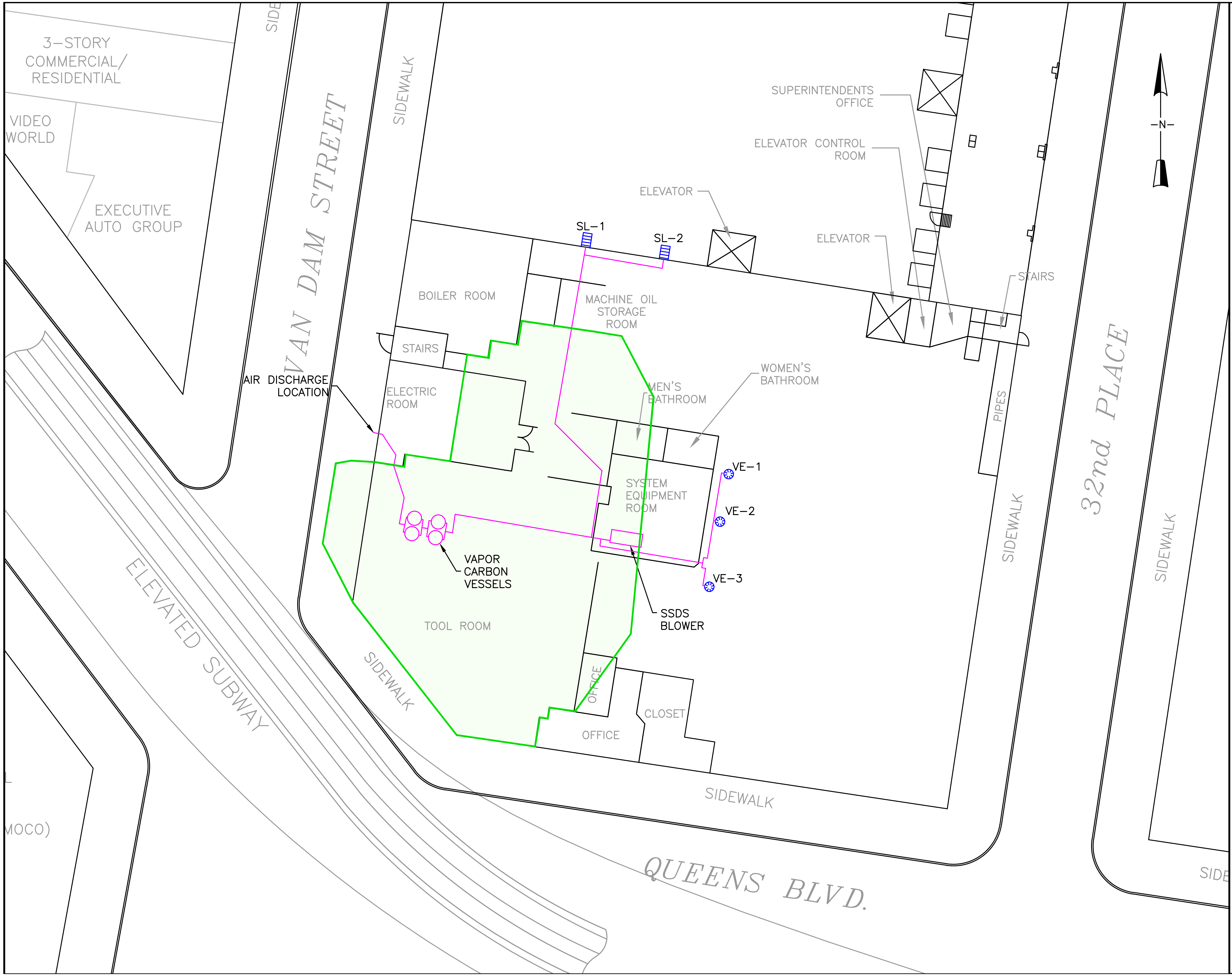

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FIGURE 10B

SUB-SLAB DEPRESSURIZATION SYSTEM LAYOUT WITH ERH SYSTEM OPERATION

Date
March 2015

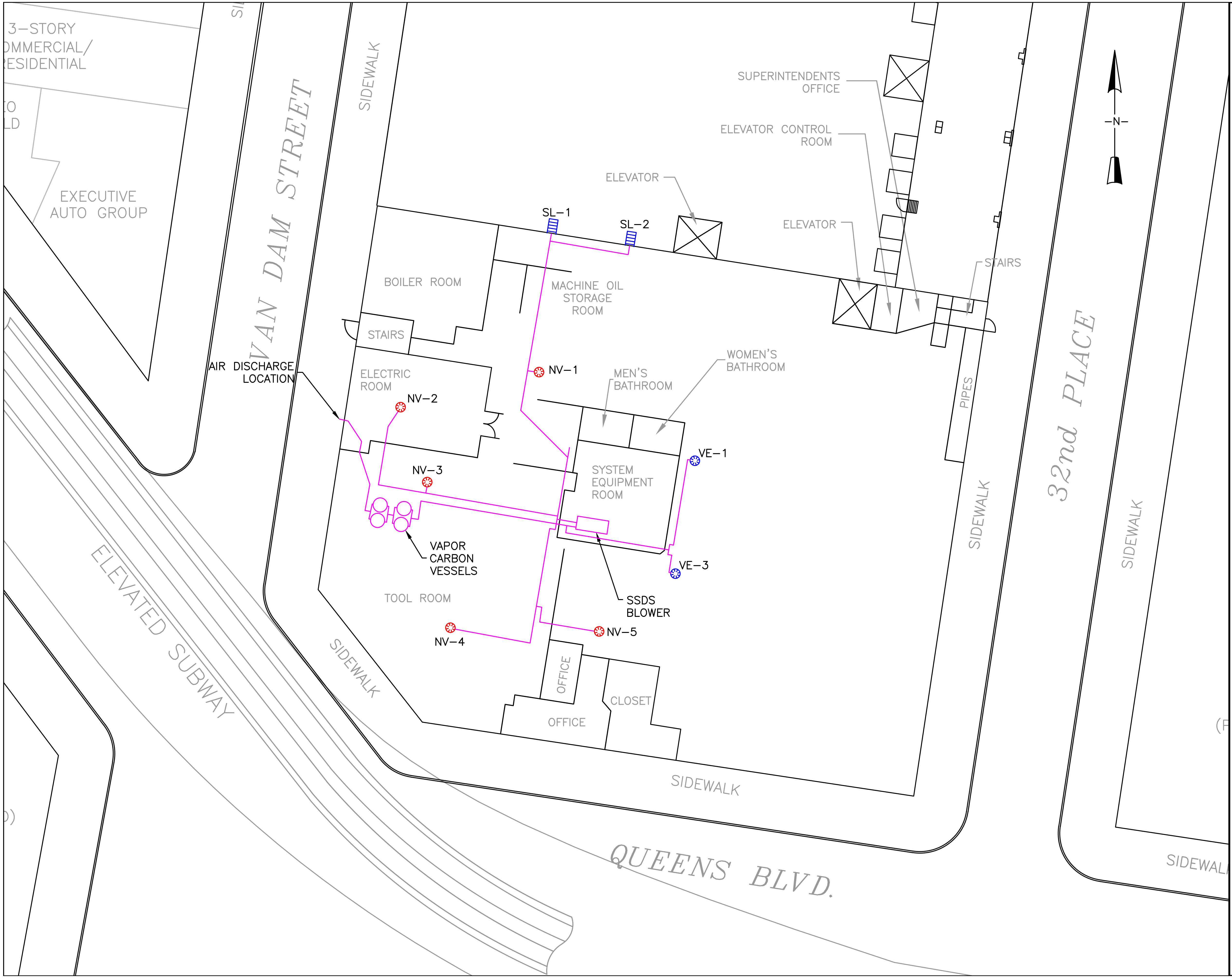
Project Number
10195-001

LEGEND

VE–1	RETROFITTED SOIL VAPOR EXTRACTION POINT
SL–1	SSDS LATERAL
🟩	ERH TREATMENT AREA

0 15 30 60
SCALE (FEET)

FILE: P:\Project Files\10195 – ACCO – Jim Beam\Figures and Maps\RAWP\FIG 10B – SSDS Layout with ERH.dwg DATE: 3/26/2015



FILE: P:\Project Files\10195 - ACCO - Jim Beam\Figures and Maps\RAWP\FIG 10C - Final SSDS Layout.dwg DATE: 3/2/2015

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Long Island City, NY

FIGURE 10C

FINAL SUB-SLAB DEPRESSURIZATION SYSTEM LAYOUT

Date
March 2015

Project Number
10195-001

LEGEND

● VE-1	RETROFITTED SOIL VAPOR EXTRACTION POINT
● NV-1	NEW SSDS PIT
▤ SL-1	SSDS LATERAL

0 15 30 60
SCALE (FEET)

Tables

Table 1 - Summary of Groundwater Analytical Results from Supplemental Remedial Investigation

Formerly ACCO Brands, Inc. Site
32-00 Skillman Avenue
Long Island City, New York

Client Sample ID:		NY TOGS Class GA GW Standards (NYSDEC 6/2004)[1]	MW-1	MW-1	MW-1(I)	MW-1(I)	MW-3	MW-3	MW-3(I)	MW-3(I)	MW-6	MW-6	MW-6(I)	MW-6(I)	MW-7	MW-7
Lab Sample ID:			JB41585-1	JB41585-1A	JB41585-2	JB41585-2A	JB41766-1	JB41766-1A	JB41585-3	JB41585-3A	JB41828-1	JB41828-1A	JB41828-2	JB41828-2A	JB41766-2	JB41766-2A
Date Sampled:			7/9/2013	7/9/2013	7/9/2013	7/9/2013	7/10/2013	7/10/2013	7/9/2013	7/9/2013	7/11/2013	7/11/2013	7/11/2013	7/11/2013	7/10/2013	7/10/2013
Matrix:			Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water
GC/MS Volatiles (SW846 8260B)																
Acetone	ug/l	-	ND (3.3)	ND (3.3)	ND (3.3)	ND (3.3)	29.9	54.8	ND (3.3)	ND (3.3)	580	596	ND (330)	ND (330)	ND (660)	ND (820)
Benzene	ug/l	1	ND (0.24)	ND (0.24)	ND (0.24)	ND (0.24)	**1.1 J**	1.0 J	ND (0.24)	ND (0.24)	ND (0.24)	ND (0.24)	ND (24)	ND (24)	ND (47)	ND (59)
Bromochloromethane	ug/l	5	ND (0.30)	ND (0.30)	ND (0.30)	ND (0.30)	ND (0.60)	ND (0.60)	ND (0.30)	ND (0.30)	ND (0.30)	ND (0.30)	ND (30)	ND (30)	ND (60)	ND (75)
Bromodichloromethane	ug/l	-	ND (0.21)	ND (0.21)	ND (0.21)	ND (0.21)	ND (0.41)	ND (0.41)	ND (0.21)	ND (0.21)	ND (0.21)	ND (0.21)	ND (21)	ND (21)	ND (41)	ND (52)
Bromoform	ug/l	-	ND (0.21)	ND (0.21)	ND (0.21)	ND (0.21)	ND (0.43)	ND (0.43)	ND (0.21)	ND (0.21)	ND (0.21)	ND (0.21)	ND (21)	ND (21)	ND (43)	ND (54)
Bromomethane	ug/l	5	ND (0.22)	ND (0.22)	ND (0.22)	ND (0.22)	ND (0.44)	ND (0.44)	ND (0.22)	ND (0.22)	ND (0.22)	ND (0.22)	ND (22)	ND (22)	ND (44)	ND (55)
2-Butanone (MEK)	ug/l	-	ND (2.4)	ND (2.4)	ND (2.4)	ND (2.4)	ND (4.7)	ND (4.7)	ND (2.4)	ND (2.4)	122	124	ND (240)	ND (240)	ND (470)	ND (590)
Carbon disulfide	ug/l	60	ND (0.19)	ND (0.19)	ND (0.19)	ND (0.19)	ND (0.38)	ND (0.38)	ND (0.19)	ND (0.19)	ND (0.19)	ND (0.19)	ND (19)	ND (19)	ND (38)	ND (47)
Carbon tetrachloride	ug/l	5	ND (0.22)	ND (0.22)	ND (0.22)	ND (0.22)	**7**	**6.7**	ND (0.22)	ND (0.22)	ND (0.22)	ND (0.22)	ND (22)	ND (22)	ND (43)	ND (54)
Chlorobenzene	ug/l	5	ND (0.23)	ND (0.23)	ND (0.23)	ND (0.23)	ND (0.46)	ND (0.46)	ND (0.23)	ND (0.23)	ND (0.23)	ND (0.23)	ND (23)	ND (23)	ND (46)	ND (57)
Chloroethane	ug/l	5	ND (0.26)	ND (0.26)	ND (0.26)	ND (0.26)	ND (0.52)	ND (0.52)	ND (0.26)	ND (0.26)	ND (0.26)	ND (0.26)	ND (26)	ND (26)	ND (52)	ND (66)
Chloroform	ug/l	7	0.75 J	0.66 J	0.74 J	0.65 J	**15.4**	**15.3**	0.68 J	0.65 J	1.7	1.7	ND (20)	ND (20)	ND (41)	ND (51)
Chloromethane	ug/l	5	ND (0.21)	ND (0.21)	ND (0.21)	ND (0.21)	ND (0.41)	ND (0.41)	ND (0.21)	ND (0.21)	ND (0.21)	ND (0.21)	ND (21)	ND (21)	ND (41)	ND (52)
Cyclohexane	ug/l	-	ND (0.35)	ND (0.35)	ND (0.35)	ND (0.35)	ND (0.71)	ND (0.71)	ND (0.35)	ND (0.35)	ND (0.35)	ND (0.35)	ND (35)	ND (35)	ND (71)	ND (89)
1,2-Dibromo-3-chloropropane	ug/l	0.04	ND (0.54)	ND (0.54)	ND (0.54)	ND (0.54)	ND (1.1)	ND (1.1)	ND (0.54)	ND (0.54)	ND (0.54)	ND (0.54)	ND (54)	ND (54)	ND (110)	ND (130)
Dibromochloromethane	ug/l	-	ND (0.14)	ND (0.14)	ND (0.14)	ND (0.14)	ND (0.27)	ND (0.27)	ND (0.14)	ND (0.14)	ND (0.14)	ND (0.14)	ND (14)	ND (14)	ND (27)	ND (34)
1,2-Dibromoethane	ug/l	0.0006	ND (0.20)	ND (0.20)	ND (0.20)	ND (0.20)	ND (0.39)	ND (0.39)	ND (0.20)	ND (0.20)	ND (0.20)	ND (0.20)	ND (20)	ND (20)	ND (39)	ND (49)
1,2-Dichlorobenzene	ug/l	3	ND (0.22)	ND (0.22)	ND (0.22)	ND (0.22)	0.97 J	1.0 J	ND (0.22)	ND (0.22)	ND (0.22)	ND (0.22)	ND (22)	ND (22)	ND (43)	ND (54)
1,3-Dichlorobenzene	ug/l	3	ND (0.22)	ND (0.22)	ND (0.22)	ND (0.22)	ND (0.45)	ND (0.45)	ND (0.22)	ND (0.22)	ND (0.22)	ND (0.22)	ND (22)	ND (22)	ND (45)	ND (56)
1,4-Dichlorobenzene	ug/l	3	ND (0.30)	ND (0.30)	ND (0.30)	ND (0.30)	ND (0.60)	ND (0.60)	ND (0.30)	ND (0.30)	ND (0.30)	ND (0.30)	ND (30)	ND (30)	ND (60)	ND (75)
Dichlorodifluoromethane	ug/l	5	ND (0.27)	ND (0.27)	ND (0.27)	ND (0.27)	ND (0.54)	ND (0.54)	ND (0.27)	ND (0.27)	ND (0.27)	ND (0.27)	ND (27)	ND (27)	ND (54)	ND (67)
1,1-Dichloroethane	ug/l	5	0.22 J	ND (0.11)	ND (0.11)	0.21 J	0.48 J	ND (0.21)	ND (0.11)	0.20 J	ND (0.11)	ND (0.11)	ND (11)	ND (11)	ND (21)	ND (27)
1,2-Dichloroethane	ug/l	0.6	ND (0.26)	ND (0.26)	ND (0.26)	ND (0.26)	**9.1**	**8.8**	ND (0.26)	ND (0.26)	ND (0.26)	ND (0.26)	ND (26)	ND (26)	ND (52)	ND (65)
1,1-Dichloroethene	ug/l	5	ND (0.19)	ND (0.19)	ND (0.19)	ND (0.19)	1.8 J	1.6 J	ND (0.19)	ND (0.19)	ND (0.19)	ND (0.19)	ND (19)	ND (19)	ND (38)	ND (48)
cis-1,2-Dichloroethene	ug/l	5	ND (0.19)	ND (0.19)	ND (0.19)	ND (0.19)	1.6 J	1.6 J	ND (0.19)	ND (0.19)	ND (0.19)	ND (0.19)	**507**	**388**	**513**	**500**
trans-1,2-Dichloroethene	ug/l	5	ND (0.21)	ND (0.21)	ND (0.21)	ND (0.21)	ND (0.42)	ND (0.42)	ND (0.21)	ND (0.21)	ND (0.21)	ND (0.21)	ND (21)	ND (21)	ND (42)	ND (53)
1,2-Dichloropropane	ug/l	1	ND (0.48)	ND (0.48)	ND (0.48)	ND (0.48)	ND (0.97)	ND (0.97)	ND (0.48)	ND (0.48)	ND (0.48)	ND (0.48)	ND (48)	ND (48)	ND (97)	ND (120)
cis-1,3-Dichloropropene	ug/l	-	ND (0.21)	ND (0.21)	ND (0.21)	ND (0.21)	ND (0.41)	ND (0.41)	ND (0.21)	ND (0.21)	ND (0.21)	ND (0.21)	ND (21)	ND (21)	ND (41)	ND (52)
trans-1,3-Dichloropropene	ug/l	-	ND (0.19)	ND (0.19)	ND (0.19)	ND (0.19)	ND (0.38)	ND (0.38)	ND (0.19)	ND (0.19)	ND (0.19)	ND (0.19)	ND (19)	ND (19)	ND (38)	ND (47)
1,4-Dioxane	ug/l	-	ND (75)	ND (75)	ND (75)	ND (75)	ND (150)	ND (150)	ND (75)	ND (75)	ND (75)	ND (75)	ND (7500)	ND (7500)	ND (15000)	ND (19000)
Ethylbenzene	ug/l	5	ND (0.23)	ND (0.23)	ND (0.23)	ND (0.23)	0.89 J	0.79 J	ND (0.23)	ND (0.23)	ND (0.23)	ND (0.23)	ND (23)	ND (23)	ND (46)	ND (57)
Freon 113	ug/l	5	ND (0.53)	ND (0.53)	ND (0.53)	ND (0.53)	ND (1.1)	ND (1.1)	ND (0.53)	ND (0.53)	ND (0.53)	ND (0.53)	ND (53)	ND (53)	ND (110)	ND (130)
2-Hexanone	ug/l	-	ND (1.1)	ND (1.1)	ND (1.1)	ND (1.1)	ND (2.3)	ND (2.3)	ND (1.1)	ND (1.1)	25	24.2	ND (110)	ND (110)	ND (230)	ND (280)
Isopropylbenzene	ug/l	5	ND (0.45)	ND (0.45)	ND (0.45)	ND (0.45)	ND (0.89)	ND (0.89)	ND (0.45)	ND (0.45)	ND (0.45)	ND (0.45)	ND (45)	ND (45)	ND (89)	ND (110)
Methyl Acetate	ug/l	-	ND (1.2)	ND (1.2)	ND (1.2)	ND (1.2)	ND (2.3)	ND (2.3)	ND (1.2)	ND (1.2)	ND (1.2)	ND (1.2)	ND (120)	ND (120)	ND (230)	ND (290)
Methylcyclohexane	ug/l	-	ND (0.26)	ND (0.26)	ND (0.26)	ND (0.26)	ND (0.52)	ND (0.52)	ND (0.26)	ND (0.26)	5.5	4.5 J	ND (26)	ND (26)	ND (52)	ND (66)
Methyl Tert Butyl Ether	ug/l	10	ND (0.16)	ND (0.16)	ND (0.16)	ND (0.16)	ND (0.33)	ND (0.33)	ND (0.16)	ND (0.16)	ND (0.16)	ND (0.16)	ND (16)	ND (16)	ND (33)	ND (41)
4-Methyl-2-pentanone(MIBK)	ug/l	-	ND (0.83)	ND (0.83)	ND (0.83)	ND (0.83)	ND (1.7)	ND (1.7)	ND (0.83)	ND (0.83)	2.2 J	2.4 J	ND (83)	ND (83)	ND (170)	ND (210)
Methylene chloride	ug/l	5	ND (0.70)	ND (0.70)	ND (0.70)	ND (0.70)	1.9 J	2.0 J	ND (0.70)	ND (0.70)	ND (0.70)	ND (0.70)	ND (70)	ND (70)	ND (140)	ND (180)
Styrene	ug/l	5	ND (0.21)	ND (0.21)	ND (0.21)	ND (0.21)	ND (0.43)	ND (0.43)	ND (0.21)	ND (0.21)	ND (0.21)	ND (0.21)	ND (21)	ND (21)	ND (43)	ND (54)
1,1,2,2-Tetrachloroethane	ug/l	5	ND (0.21)	ND (0.21)	ND (0.21)	ND (0.21)	ND (0.43)	ND (0.43)	ND (0.21)	ND (0.21)	ND (0.21)	ND (0.21)	ND (21)	ND (21)	ND (43)	ND (54)
Tetrachloroethene	ug/l	5	ND (0.28)	ND (0.28)	ND (0.28)	ND (0.28)	**158**	**156**	ND (0.28)	ND (0.28)	ND (0.28)	ND (0.28)	**39.2 J**	**36.8 J**	ND (56)	ND (70)
Toluene	ug/l	5	ND (0.23)	ND (0.23)	ND (0.23)	ND (0.23)	**8.7**	**7.8**	ND (0.23)	ND (0.23)	ND (0.23)	ND (0.23)	ND (23)	ND (23)	ND (45)	ND (57)
1,2,3-Trichlorobenzene	ug/l	5	ND (0.28)	ND (0.28)	ND (0.28)	ND (0.28)	ND (0.56)	ND (0.56)	ND (0.28)	ND (0.28)	ND (0.28)	ND (0.28)	ND (28)	ND (28)	ND (56)	ND (71)
1,2,4-Trichlorobenzene	ug/l	5	ND (0.20)	ND (0.20)	ND (0.20)	ND (0.20)	ND (0.41)	ND (0.41)	ND (0.20)	ND (0.20)	ND (0.20)	ND (0.20)	ND (20)	ND (20)	ND (41)	ND (51)
1,1,1-Trichloroethane	ug/l	5	ND (0.24)	ND (0.24)	ND (0.24)	ND (0.24)	**36.3**	**36.1**	ND (0.24)	ND (0.24)	ND (0.24)	ND (0.24)	ND (24)	ND (24)	ND (47)	ND (59)
1,1,2-Trichloroethane	ug/l	1	ND (0.29)	ND (0.29)	ND (0.29)	ND (0.29)	**141**	**134**	ND (0.29)	ND (0.29)	ND (0.29)	ND (0.29)	ND (29)	ND (29)	ND (57)	ND (72)
Trichloroethene	ug/l	5	**9.6**	**9.1**	**9.2**	**8.9**	**84300**	**76200**	**9.5**	**9.6**	**7.3**	ND (0.22)	**24800**	**19600**	**37000**	**37600**
Trichlorofluoromethane	ug/l	5	ND (0.27)	ND (0.27)	ND (0.27)	ND (0.27)	ND (0.53)	ND (0.53)	ND (0.27)	ND (0.27)	ND (0.27)	ND (0.27)	ND (27)	ND (27)	ND (53)	ND (67)
Vinyl chloride	ug/l	2	ND (0.21)	ND (0.21)	ND (0.21)	ND (0.21)	ND (0.41)	ND (0.41)	ND (0.21)	ND (0.21)	ND (0.21)	ND (0.21)	ND (21)	ND (21)	ND (41)	ND (52)
m,p-Xylene	ug/l	-	ND (0.42)	ND (0.42)	ND (0.42)	ND (0.42)	1.3 J	ND (0.85)	ND (0.42)	ND (0.42)	ND (0.42)	ND (0.42)	ND (42)	ND (42)	ND (85)	ND (110)
o-Xylene	ug/l	5	ND (0.24)	ND (0.24)	ND (0.24)	ND (0.24)	ND (0.48)	ND (0.48)	ND (0.24)	ND (0.24)	ND (0.24)	ND (0.24)	ND (24)	ND (24)	ND (48)	ND (60)
Xylene (total)	ug/l	5	ND (0.24)	ND (0.24)	ND (0.24)	ND (0.24)	1.3 J	ND (0.48)	ND (0.24)	ND (0.24)	ND (0.24)	ND (0.24)	ND (24)	ND (24)	ND (48)	ND (60)

Legend:

Compound detected above method detection limit

Compound detected above Commercial SCO

Table 2 - Summary of Soil Analytical Results from Supplemental Remedial Investigation

Formerly ACCO Brands, Inc. Site
32-00 Skillman Avenue
Long Island City, New York

Client Sample ID:		NY SCO - Commercial w/CP-51 (10/10) (6 NYCRR 375-6 12/06)	SB-1(14')	SB-1(17')	SB-1(28')	SB-1(29')	SB-9(13')	SB-9(21'-25')	SB-9(25')	SB-9(26')	SB-9(27')	SB-9(29.5')	SB-9(40'-42')
Lab Sample ID:			JB49551-1	JB49551-2	JB49551-10	JB49551-6	JB49551-9	JB49551-14	JB49551-7	JB49551-8	JB49551-12	JB49551-11	JB49551-13
Date Sampled:			10/8/2013	10/8/2013	10/8/2013	10/8/2013	10/9/2013	10/9/2013	10/9/2013	10/9/2013	10/9/2013	10/9/2013	10/9/2013
Matrix:			Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
GC/MS Volatiles (SW846 8260C)													
Acetone	mg/kg	500	ND (0.0048)	ND (0.0044)	ND (0.0047)	ND (0.0048)	ND (0.0045)	-	ND (0.0046)	ND (0.0051)	-	0.0399	-
Benzene	mg/kg	44	ND (0.00013)	ND (0.00012)	ND (0.00013)	ND (0.00013)	ND (0.00012)	-	ND (0.00013)	ND (0.00014)	-	0.00035 J	-
Bromochloromethane	mg/kg	-	ND (0.00054)	ND (0.00051)	ND (0.00053)	ND (0.00055)	ND (0.00051)	-	ND (0.00052)	ND (0.00058)	-	ND (0.00054)	-
Bromodichloromethane	mg/kg	-	ND (0.00029)	ND (0.00027)	ND (0.00029)	ND (0.00030)	ND (0.00028)	-	ND (0.00028)	ND (0.00032)	-	0.00094 J	-
Bromoform	mg/kg	-	ND (0.00027)	ND (0.00026)	ND (0.00027)	ND (0.00028)	ND (0.00026)	-	ND (0.00026)	ND (0.00029)	-	ND (0.00027)	-
Bromomethane	mg/kg	-	ND (0.00050)	ND (0.00047)	ND (0.00049)	ND (0.00051)	ND (0.00047)	-	ND (0.00048)	ND (0.00054)	-	ND (0.00050)	-
2-Butanone (MEK)	mg/kg	500	ND (0.0046)	ND (0.0043)	ND (0.0045)	ND (0.0047)	ND (0.0043)	-	ND (0.0044)	ND (0.0049)	-	0.0135	-
Carbon disulfide	mg/kg		ND (0.00015)	ND (0.00014)	ND (0.00014)	ND (0.00015)	ND (0.00014)	-	ND (0.00014)	ND (0.00016)	-	ND (0.00015)	-
Carbon tetrachloride	mg/kg	22	ND (0.00026)	ND (0.00024)	ND (0.00026)	ND (0.00027)	ND (0.00025)	-	ND (0.00025)	ND (0.00028)	-	0.00092 J	-
Chlorobenzene	mg/kg	500	ND (0.00021)	ND (0.00019)	ND (0.00020)	ND (0.00021)	ND (0.00019)	-	ND (0.00020)	ND (0.00022)	-	ND (0.00020)	-
Chloroethane	mg/kg		ND (0.0010)	ND (0.00097)	ND (0.0010)	ND (0.0011)	ND (0.00098)	-	ND (0.0010)	ND (0.0011)	-	ND (0.0010)	-
Chloroform	mg/kg	350	ND (0.00026)	ND (0.00025)	ND (0.00026)	ND (0.00027)	ND (0.00025)	-	ND (0.00025)	0.0011 J	-	0.0027 J	-
Chloromethane	mg/kg	-	ND (0.00036)	ND (0.00033)	ND (0.00035)	ND (0.00036)	ND (0.00034)	-	ND (0.00034)	ND (0.00038)	-	ND (0.00035)	-
Cyclohexane	mg/kg	-	ND (0.00027)	ND (0.00025)	ND (0.00026)	ND (0.00027)	ND (0.00025)	-	ND (0.00026)	ND (0.00029)	-	ND (0.00027)	-
1,2-Dibromo-3-chloropropane	mg/kg	-	ND (0.0014)	ND (0.0013)	ND (0.0014)	ND (0.0014)	ND (0.0013)	-	ND (0.0013)	ND (0.0015)	-	ND (0.0014)	-
Dibromochloromethane	mg/kg		ND (0.00025)	ND (0.00024)	ND (0.00025)	ND (0.00026)	ND (0.00024)	-	ND (0.00024)	ND (0.00027)	-	ND (0.00025)	-
1,2-Dibromoethane	mg/kg	-	ND (0.00057)	ND (0.00053)	ND (0.00056)	ND (0.00058)	ND (0.00054)	-	ND (0.00055)	ND (0.00062)	-	ND (0.00057)	-
1,2-Dichlorobenzene	mg/kg	500	ND (0.00035)	ND (0.00033)	ND (0.00035)	ND (0.00036)	ND (0.00033)	-	ND (0.00034)	ND (0.00038)	-	ND (0.00035)	-
1,3-Dichlorobenzene	mg/kg	280	ND (0.00023)	ND (0.00021)	ND (0.00022)	ND (0.00023)	ND (0.00021)	-	ND (0.00022)	ND (0.00024)	-	ND (0.00023)	-
1,4-Dichlorobenzene	mg/kg	130	ND (0.00026)	ND (0.00024)	ND (0.00026)	ND (0.00027)	ND (0.00025)	-	ND (0.00025)	ND (0.00028)	-	ND (0.00026)	-
Dichlorodifluoromethane	mg/kg	-	ND (0.00037)	ND (0.00034)	ND (0.00036)	ND (0.00037)	ND (0.00035)	-	ND (0.00035)	ND (0.00040)	-	ND (0.00036)	-
1,1-Dichloroethane	mg/kg	240	ND (0.00033)	ND (0.00031)	ND (0.00032)	ND (0.00033)	ND (0.00031)	-	ND (0.00031)	ND (0.00035)	-	ND (0.00032)	-
1,2-Dichloroethane	mg/kg	30	ND (0.00033)	ND (0.00031)	ND (0.00033)	ND (0.00034)	ND (0.00031)	-	ND (0.00032)	ND (0.00036)	-	0.0017	-
1,1-Dichloroethene	mg/kg	500	ND (0.00030)	ND (0.00028)	ND (0.00029)	ND (0.00030)	ND (0.00028)	-	ND (0.00029)	0.0010 J	-	0.0020 J	-
cis-1,2-Dichloroethene	mg/kg	500	0.00027 J	0.0209	ND (0.00021)	ND (0.00022)	ND (0.00020)	-	0.422	1.06	-	0.0657	-
trans-1,2-Dichloroethene	mg/kg	500	ND (0.00044)	ND (0.00041)	ND (0.00043)	ND (0.00045)	ND (0.00041)	-	0.00045 J	0.0012 J	-	ND (0.00044)	-
1,2-Dichloropropane	mg/kg		ND (0.00045)	ND (0.00043)	ND (0.00045)	ND (0.00046)	ND (0.00043)	-	ND (0.00044)	ND (0.00049)	-	ND (0.00045)	-
cis-1,3-Dichloropropene	mg/kg	-	ND (0.00024)	ND (0.00022)	ND (0.00023)	ND (0.00024)	ND (0.00022)	-	ND (0.00023)	ND (0.00025)	-	ND (0.00023)	-
trans-1,3-Dichloropropene	mg/kg	-	ND (0.00028)	ND (0.00026)	ND (0.00028)	ND (0.00029)	ND (0.00026)	-	ND (0.00027)	ND (0.00030)	-	ND (0.00028)	-
1,4-Dioxane	mg/kg	130	ND (0.080)	ND (0.075)	ND (0.078)	ND (0.081)	ND (0.075)	-	ND (0.077)	ND (0.086)	-	ND (0.079)	-
Ethylbenzene	mg/kg	390	ND (0.00018)	ND (0.00017)	ND (0.00018)	ND (0.00019)	ND (0.00017)	-	ND (0.00018)	ND (0.00020)	-	0.00032 J	-
Freon 113	mg/kg		ND (0.00045)	ND (0.00042)	ND (0.00045)	ND (0.00046)	ND (0.00043)	-	ND (0.00044)	ND (0.00049)	-	ND (0.00045)	-
2-Hexanone	mg/kg	-	ND (0.0019)	ND (0.0017)	ND (0.0018)	ND (0.0019)	ND (0.0017)	-	ND (0.0018)	ND (0.0020)	-	ND (0.0018)	-
Isopropylbenzene	mg/kg		ND (0.00015)	ND (0.00014)	ND (0.00015)	ND (0.00016)	ND (0.00014)	-	ND (0.00015)	ND (0.00016)	-	ND (0.00015)	-
Methyl Acetate	mg/kg	-	ND (0.0017)	ND (0.0016)	ND (0.0017)	ND (0.0018)	ND (0.0016)	-	ND (0.0017)	ND (0.0019)	-	ND (0.0017)	-
Methylcyclohexane	mg/kg	-	ND (0.00017)	ND (0.00016)	ND (0.00017)	ND (0.00017)	ND (0.00016)	-	ND (0.00016)	ND (0.00018)	-	ND (0.00017)	-
Methyl Tert Butyl Ether	mg/kg	500	ND (0.00036)	ND (0.00033)	ND (0.00035)	ND (0.00036)	ND (0.00034)	-	ND (0.00034)	ND (0.00038)	-	ND (0.00035)	-
4-Methyl-2-pentanone(MIBK)	mg/kg		ND (0.0014)	ND (0.0013)	ND (0.0014)	ND (0.0014)	ND (0.0013)	-	ND (0.0013)	ND (0.0015)	-	ND (0.0014)	-
Methylene chloride	mg/kg	500	0.0026 J	0.0017 J	0.0051	0.0046 J	0.0055	-	0.0028 J	0.0067	-	0.0050 J	-
Styrene	mg/kg		ND (0.00024)	ND (0.00023)	ND (0.00024)	ND (0.00025)	ND (0.00023)	-	ND (0.00023)	ND (0.00026)	-	ND (0.00024)	-
1,1,2,2-Tetrachloroethane	mg/kg		ND (0.00036)	ND (0.00033)	ND (0.00035)	ND (0.00036)	ND (0.00034)	-	ND (0.00034)	ND (0.00038)	-	ND (0.00035)	-
Tetrachloroethene	mg/kg	150	ND (0.00043)	ND (0.00040)	ND (0.00042)	ND (0.00044)	ND (0.00040)	-	0.0041 J	0.0342	-	0.0334	-
Toluene	mg/kg	500	ND (0.00015)	ND (0.00014)	ND (0.00015)	ND (0.00015)	0.00032 J	-	0.00042 J	0.0013	-	0.0029	-
1,2,3-Trichlorobenzene	mg/kg		ND (0.00022)	ND (0.00020)	ND (0.00021)	ND (0.00022)	ND (0.00020)	-	ND (0.00021)	ND (0.00023)	-	ND (0.00021)	-
1,2,4-Trichlorobenzene	mg/kg		ND (0.00019)	ND (0.00018)	ND (0.00019)	ND (0.00019)	ND (0.00018)	-	ND (0.00018)	ND (0.00020)	-	ND (0.00019)	-
1,1,1-Trichloroethane	mg/kg	500	ND (0.00030)	ND (0.00028)	ND (0.00029)	ND (0.00030)	ND (0.00028)	-	ND (0.00029)	0.0034 J	-	0.0078	-
1,1,2-Trichloroethane	mg/kg	-	ND (0.00086)	ND (0.00080)	ND (0.00084)	ND (0.00087)	ND (0.00080)	-	ND (0.00082)	0.0038 J	-	0.0503	-
Trichloroethene	mg/kg	200	ND (0.00037)	0.00057 J	0.0050 J	0.0163	0.0011 J	-	6.33	31.7	-	56.9	-
Trichlorofluoromethane	mg/kg	-	ND (0.00023)	ND (0.00022)	ND (0.00023)	ND (0.00024)	ND (0.00022)	-	ND (0.00023)	ND (0.00025)	-	ND (0.00023)	-
Vinyl chloride	mg/kg	13	ND (0.00036)	ND (0.00033)	ND (0.00035)	ND (0.00036)	ND (0.00034)	-	ND (0.00034)	ND (0.00038)	-	ND (0.00035)	-
m,p-Xylene	mg/kg	500	ND (0.00050)	ND (0.00047)	ND (0.00050)	ND (0.00051)	ND (0.00047)	-	ND (0.00049)	ND (0.00054)	-	0.00080 J	-
o-Xylene	mg/kg	500	ND (0.00019)	ND (0.00017)	ND (0.00018)	ND (0.00019)	ND (0.00017)	-	ND (0.00018)	ND (0.00020)	-	0.00022 J	-
Xylene (total)	mg/kg	500	ND (0.00019)	ND (0.00017)	ND (0.00018)	ND (0.00019)	ND (0.00017)	-	ND (0.00018)	ND (0.00020)	-	0.001	-
Metals Analysis													
Aluminum	mg/kg		-	-	-	-	-	4330	-	-	-	-	10200
Antimony	mg/kg		-	-	-	-	-	ND (2.4)	-	-	-	-	ND (2.4)
Arsenic	mg/kg	16	-	-	-	-	-	ND (2.4)	-	-	-	-	ND (2.4)
Barium	mg/kg	400	-	-	-	-	-	31.1	-	-	-	-	127
Beryllium	mg/kg	590	-	-	-	-	-	0.36	-	-	-	-	0.73
Cadmium	mg/kg	9.3	-	-	-	-	-	ND (0.61)	-	-	-	-	ND (0.61)
Calcium	mg/kg		-	-	-	-	-	10100	-	-	-	-	20600
Chromium	mg/kg	-	-	-	-	-	-	11.4	-	-	-	-	24
Cobalt	mg/kg		-	-	-	-	-	ND (6.1)	-	-	-	-	7.8
Copper	mg/kg	270	-	-	-	-	-	8.5	-	-	-	-	18.1
Iron	mg/kg		-	-	-	-	-	8680	-	-	-	-	16500
Lead	mg/kg	1000	-	-	-	-	-	3.8	-	-	-	-	6.4
Magnesium	mg/kg	-	-	-	-	-	-	5320	-	-	-	-	12300
Manganese	mg/kg	10000	-	-	-	-	-	245	-	-	-	-	348
Mercury	mg/kg	2.8	-	-	-	-	-	ND (0.035)	-	-	-	-	ND (0.039)
Nickel	mg/kg	310	-	-	-	-	-	12	-	-	-	-	18.8
Potassium	mg/kg	-	-	-	-	-	-	ND (1200)	-	-	-	-	3220
Selenium	mg/kg	1500	-	-	-	-	-	ND (2.4)	-	-	-	-	ND (2.4)
Silver	mg/kg	1500	-	-	-	-	-	0.62	-	-	-	-	1.4
Sodium	mg/kg	-	-	-	-	-	-	ND (1200)	-	-	-	-	ND (1200)
Thallium	mg/kg		-	-	-	-	-	ND (1.2)	-	-	-	-	ND (1.2)
Vanadium	mg/kg		-	-	-	-	-	13.8	-	-	-	-	30.8
Zinc	mg/kg	10000	-	-	-	-	-	16.7	-	-	-	-	38.8
General Chemistry													
Bulk Density (Dry Basis)	g/ml	-	-	-	-	-	-	1.5	-	-	-	-	1.1
Solids, Percent	%	-	84.1	84	85.6	84.1	85	83.9	83.1	81	79.7	82.1	82.5
Total Organic Content	%	-	-	-	-	-	-	2.1	-	-	-	-	4.7

Client Sample ID:		SB-9(41')	SB-9(45')	SB-11 (14')	SB-11 (25'-26')	SB-11 (35')	SB-11 (35'-40')	SB-11 (43')	SB-11 (45')	SB-12(14'-15')	SB-12(17')
Lab Sample ID:		JB49551-5	JB49551-4	JB49551-16	JB49551-17	JB49551-18	JB49551-21	JB49551-19	JB49551-20	JB49551-23	JB49551-24
Date Sampled:		10/9/2013	10/9/2013	10/10/2013	10/10/2013	10/10/2013	10/10/2013	10/10/2013	10/10/2013	10/11/2013	10/11/2013
Matrix:		Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
GC/MS Volatiles (SW846 8260C)											
Acetone	mg/kg	ND (0.0051)	ND (0.0052)	ND (0.0047)	ND (0.0046)	ND (0.0049)	-	ND (0.0044)	ND (0.0048)	ND (0.0045)	ND (0.0047)
Benzene	mg/kg	ND (0.00014)	ND (0.00014)	ND (0.00013)	ND (0.00013)	ND (0.00013)	-	ND (0.00012)	ND (0.00013)	ND (0.00012)	ND (0.00013)
Bromochloromethane	mg/kg	ND (0.00058)	ND (0.00059)	ND (0.00054)	ND (0.00053)	ND (0.00055)	-	ND (0.00051)	ND (0.00054)	ND (0.00051)	ND (0.00053)
Bromodichloromethane	mg/kg	ND (0.00031)	ND (0.00032)	ND (0.00029)	ND (0.00028)	ND (0.00030)	-	ND (0.00027)	ND (0.00029)	ND (0.00028)	ND (0.00029)
Bromoform	mg/kg	ND (0.00029)	ND (0.00030)	ND (0.00027)	ND (0.00027)	ND (0.00028)	-	ND (0.00026)	ND (0.00027)	ND (0.00026)	ND (0.00027)
Bromomethane	mg/kg	ND (0.00053)	ND (0.00055)	ND (0.00050)	ND (0.00049)	ND (0.00051)	-	ND (0.00047)	ND (0.00050)	ND (0.00048)	ND (0.00049)
2-Butanone (MEK)	mg/kg	ND (0.0049)	ND (0.0050)	ND (0.0045)	ND (0.0045)	ND (0.0047)	-	ND (0.0043)	ND (0.0046)	ND (0.0043)	ND (0.0045)
Carbon disulfide	mg/kg	ND (0.00016)	ND (0.00016)	ND (0.00015)	ND (0.00014)	ND (0.00015)	-	ND (0.00014)	ND (0.00015)	ND (0.00014)	ND (0.00014)
Carbon tetrachloride	mg/kg	ND (0.00028)	ND (0.00029)	ND (0.00026)	ND (0.00025)	ND (0.00027)	-	ND (0.00024)	ND (0.00026)	ND (0.00025)	ND (0.00026)
Chlorobenzene	mg/kg	ND (0.00022)	ND (0.00022)	ND (0.00020)	ND (0.00020)	ND (0.00021)	-	ND (0.00019)	ND (0.00021)	ND (0.00019)	ND (0.00020)
Chloroethane	mg/kg	ND (0.0011)	ND (0.0011)	ND (0.0010)	ND (0.0010)	ND (0.0011)	-	ND (0.00097)	ND (0.0010)	ND (0.00098)	ND (0.0010)
Chloroform	mg/kg	0.0011 J	ND (0.00029)	ND (0.00026)	ND (0.00026)	0.00039 J	-	0.0011 J	0.00078 J	ND (0.00025)	ND (0.00026)
Chloromethane	mg/kg	ND (0.00038)	ND (0.00039)	ND (0.00035)	ND (0.00035)	ND (0.00036)	-	ND (0.00033)	ND (0.00036)	ND (0.00034)	ND (0.00035)
Cyclohexane	mg/kg	ND (0.00029)	ND (0.00029)	ND (0.00026)	ND (0.00026)	ND (0.00027)	-	ND (0.00025)	ND (0.00027)	ND (0.00025)	ND (0.00026)
1,2-Dibromo-3-chloropropane	mg/kg	ND (0.0015)	ND (0.0015)	ND (0.0014)	ND (0.0013)	ND (0.0014)	-	ND (0.0013)	ND (0.0014)	ND (0.0013)	ND (0.0014)
Dibromochloromethane	mg/kg	ND (0.00027)	ND (0.00028)	ND (0.00025)	ND (0.00025)	ND (0.00026)	-	ND (0.00024)	ND (0.00025)	ND (0.00024)	ND (0.00025)
1,2-Dibromoethane	mg/kg	ND (0.00061)	ND (0.00063)	ND (0.00056)	ND (0.00056)	ND (0.00058)	-	ND (0.00053)	ND (0.00057)	ND (0.00054)	ND (0.00056)
1,2-Dichlorobenzene	mg/kg	ND (0.00038)	ND (0.00039)	ND (0.00035)	ND (0.00034)	ND (0.00036)	-	ND (0.00033)	ND (0.00035)	ND (0.00033)	ND (0.00035)
1,3-Dichlorobenzene	mg/kg	ND (0.00024)	ND (0.00025)	ND (0.00022)	ND (0.00022)	ND (0.00023)	-	ND (0.00021)	ND (0.00023)	ND (0.00022)	ND (0.00022)
1,4-Dichlorobenzene	mg/kg	ND (0.00028)	ND (0.00029)	ND (0.00026)	ND (0.00025)	ND (0.00027)	-	ND (0.00024)	ND (0.00026)	ND (0.00025)	ND (0.00026)
Dichlorodifluoromethane	mg/kg	ND (0.00039)	ND (0.00040)	ND (0.00036)	ND (0.00036)	ND (0.00038)	-	ND (0.00034)	ND (0.00037)	ND (0.00035)	ND (0.00036)
1,1-Dichloroethane	mg/kg	ND (0.00035)	ND (0.00036)	ND (0.00032)	ND (0.00032)	ND (0.00033)	-	ND (0.00031)	ND (0.00033)	ND (0.00031)	ND (0.00032)
1,2-Dichloroethane	mg/kg	ND (0.00036)	ND (0.00037)	ND (0.00033)	ND (0.00033)	ND (0.00034)	-	ND (0.00031)	ND (0.00034)	ND (0.00032)	ND (0.00033)
1,1-Dichloroethene	mg/kg	ND (0.00032)	ND (0.00033)	ND (0.00030)	ND (0.00029)	ND (0.00031)	-	ND (0.00028)	ND (0.00030)	ND (0.00028)	ND (0.00029)
cis-1,2-Dichloroethene	mg/kg	ND (0.00023)	ND (0.00024)	ND (0.00021)	ND (0.00021)	ND (0.00022)	-	ND (0.00020)	ND (0.00022)	ND (0.00020)	ND (0.00021)
trans-1,2-Dichloroethene	mg/kg	ND (0.00047)	ND (0.00048)	ND (0.00044)	ND (0.00043)	ND (0.00045)	-	ND (0.00041)	ND (0.00044)	ND (0.00042)	ND (0.00043)
1,2-Dichloropropane	mg/kg	ND (0.00048)	ND (0.00050)	ND (0.00045)	ND (0.00044)	ND (0.00046)	-	ND (0.00043)	ND (0.00046)	ND (0.00043)	ND (0.00045)
cis-1,3-Dichloropropene	mg/kg	ND (0.00025)	ND (0.00026)	ND (0.00023)	ND (0.00023)	ND (0.00024)	-	ND (0.00022)	ND (0.00024)	ND (0.00022)	ND (0.00023)
trans-1,3-Dichloropropene	mg/kg	ND (0.00030)	ND (0.00031)	ND (0.00028)	ND (0.00027)	ND (0.00029)	-	ND (0.00026)	ND (0.00028)	ND (0.00027)	ND (0.00028)
1,4-Dioxane	mg/kg	ND (0.085)	ND (0.087)	ND (0.079)	ND (0.077)	ND (0.081)	-	ND (0.075)	ND (0.080)	ND (0.076)	ND (0.078)
Ethylbenzene	mg/kg	ND (0.00019)	ND (0.00020)	ND (0.00018)	ND (0.00018)	ND (0.00019)	-	ND (0.00017)	ND (0.00018)	ND (0.00017)	ND (0.00018)
Freon 113	mg/kg	ND (0.00048)	ND (0.00050)	ND (0.00045)	ND (0.00044)	ND (0.00046)	-	ND (0.00042)	ND (0.00046)	ND (0.00043)	ND (0.00045)
2-Hexanone	mg/kg	ND (0.0020)	ND (0.0020)	ND (0.0018)	ND (0.0018)	ND (0.0019)	-	ND (0.0017)	ND (0.0019)	ND (0.0018)	ND (0.0018)
Isopropylbenzene	mg/kg	ND (0.00016)	ND (0.00017)	ND (0.00015)	ND (0.00015)	ND (0.00016)	-	ND (0.00014)	ND (0.00015)	ND (0.00015)	ND (0.00015)
Methyl Acetate	mg/kg	ND (0.0019)	ND (0.0019)	ND (0.0017)	ND (0.0017)	ND (0.0018)	-	ND (0.0016)	ND (0.0017)	ND (0.0017)	ND (0.0017)
Methylcyclohexane	mg/kg	ND (0.00018)	ND (0.00019)	ND (0.00017)	ND (0.00017)	ND (0.00017)	-	ND (0.00016)	ND (0.00017)	ND (0.00016)	ND (0.00017)
Methyl Tert Butyl Ether	mg/kg	ND (0.00038)	ND (0.00039)	ND (0.00035)	ND (0.00035)	ND (0.00036)	-	ND (0.00033)	ND (0.00036)	ND (0.00034)	ND (0.00035)
4-Methyl-2-pentanone(MIBK)	mg/kg	ND (0.0015)	ND (0.0015)	ND (0.0014)	ND (0.0013)	ND (0.0014)	-	ND (0.0013)	ND (0.0014)	ND (0.0013)	ND (0.0014)
Methylene chloride	mg/kg	0.0092	0.0046 J	0.0030 J	0.0017 J	0.0026 J	-	0.0032 J	0.0023 J	0.006	0.0036 J
Styrene	mg/kg	ND (0.00026)	ND (0.00026)	ND (0.00024)	ND (0.00024)	ND (0.00025)	-	ND (0.00023)	ND (0.00024)	ND (0.00023)	ND (0.00024)
1,1,2,2-Tetrachloroethane	mg/kg	ND (0.00038)	ND (0.00039)	ND (0.00035)	ND (0.00035)	ND (0.00036)	-	ND (0.00033)	ND (0.00036)	ND (0.00034)	ND (0.00035)
Tetrachloroethene	mg/kg	ND (0.00045)	ND (0.00047)	ND (0.00042)	ND (0.00042)	ND (0.00044)	-	ND (0.00040)	ND (0.00043)	ND (0.00041)	ND (0.00042)
Toluene	mg/kg	ND (0.00016)	ND (0.00016)	ND (0.00015)	ND (0.00014)	ND (0.00015)	-	ND (0.00014)	ND (0.00015)	ND (0.00014)	0.00020 J
1,2,3-Trichlorobenzene	mg/kg	ND (0.00023)	ND (0.00024)	ND (0.00021)	ND (0.00021)	ND (0.00022)	-	ND (0.00020)	ND (0.00022)	ND (0.00020)	ND (0.00021)
1,2,4-Trichlorobenzene	mg/kg	ND (0.00020)	ND (0.00021)	ND (0.00019)	ND (0.00018)	ND (0.00019)	-	ND (0.00018)	ND (0.00019)	ND (0.00018)	ND (0.00019)
1,1,1-Trichloroethane	mg/kg	ND (0.00032)	ND (0.00033)	ND (0.00030)	ND (0.00029)	ND (0.00031)	-	ND (0.00028)	ND (0.00030)	ND (0.00028)	ND (0.00029)
1,1,2-Trichloroethane	mg/kg	ND (0.00091)	ND (0.00094)	ND (0.00085)	ND (0.00083)	ND (0.00087)	-	ND (0.00080)	ND (0.00086)	ND (0.00081)	ND (0.00084)
Trichloroethene	mg/kg	0.00092 J	ND (0.00040)	0.00043 J	0.0096	0.651	-	ND (0.00034)	ND (0.00037)	0.0053	0.0072
Trichlorofluoromethane	mg/kg	ND (0.00025)	ND (0.00026)	ND (0.00023)	ND (0.00023)	ND (0.00024)	-	ND (0.00022)	ND (0.00024)	ND (0.00022)	ND (0.00023)
Vinyl chloride	mg/kg	ND (0.00038)	ND (0.00039)	ND (0.00035)	ND (0.00035)	ND (0.00036)	-	ND (0.00033)	ND (0.00036)	ND (0.00034)	ND (0.00035)
m,p-Xylene	mg/kg	ND (0.00054)	ND (0.00055)	ND (0.00050)	ND (0.00049)	ND (0.00051)	-	ND (0.00047)	ND (0.00051)	ND (0.00048)	ND (0.00050)
o-Xylene	mg/kg	ND (0.00020)	ND (0.00020)	ND (0.00018)	ND (0.00018)	ND (0.00019)	-	ND (0.00017)	ND (0.00019)	ND (0.00018)	ND (0.00018)
Xylene (total)	mg/kg	ND (0.00020)	ND (0.00020)	ND (0.00018)	ND (0.00018)	ND (0.00019)	-	ND (0.00017)	ND (0.00019)	ND (0.00018)	ND (0.00018)
Metals Analysis											
Aluminum	mg/kg	-	-	-	-	-	5790	-	-	-	-
Antimony	mg/kg	-	-	-	-	-	ND (2.5)	-	-	-	-
Arsenic	mg/kg	-	-	-	-	-	ND (2.5)	-	-	-	-
Barium	mg/kg	-	-	-	-	-	43.9	-	-	-	-
Beryllium	mg/kg	-	-	-	-	-	0.34	-	-	-	-
Cadmium	mg/kg	-	-	-	-	-	ND (0.63)	-	-	-	-
Calcium	mg/kg	-	-	-	-	-	13200	-	-	-	-
Chromium	mg/kg	-	-	-	-	-	11.8	-	-	-	-
Cobalt	mg/kg	-	-	-	-	-	ND (6.3)	-	-	-	-
Copper	mg/kg	-	-	-	-	-	11.4	-	-	-	-
Iron	mg/kg	-	-	-	-	-	10700	-	-	-	-
Lead	mg/kg	-	-	-	-	-	3.7	-	-	-	-
Magnesium	mg/kg	-	-	-	-	-	7050	-	-	-	-
Manganese	mg/kg	-	-	-	-	-	353	-	-	-	-
Mercury	mg/kg	-	-	-	-	-	ND (0.036)	-	-	-	-
Nickel	mg/kg	-	-	-	-	-	13.7	-	-	-	-
Potassium	mg/kg	-	-	-	-	-	1620	-	-	-	-
Selenium	mg/kg	-	-	-	-	-	ND (2.5)	-	-	-	-
Silver	mg/kg	-	-	-	-	-	ND (0.63)	-	-	-	-
Sodium	mg/kg	-	-	-	-	-	ND (1300)	-	-	-	-
Thallium	mg/kg	-	-	-	-	-	ND (1.3)	-	-	-	-
Vanadium	mg/kg	-	-	-	-	-	16.9	-	-	-	-
Zinc	mg/kg	-	-	-	-	-	19.7	-	-	-	-
General Chemistry											
Bulk Density (Dry Basis)	g/ml	-	-	-	-	-	1.4	-	-	-	-
Solids, Percent	%	75.1	74.2	86.6	80.9	75.8	80.7	80.1	80.9	84.3	82.8
Total Organic Content	%	-	-	-	-	-	2.7	-	-	-	-

Client Sample ID:		SB-12(25'-26')	SB-12(36'-37')	SB-12(47'-48')	SB-13(13'-14')	SB-13(17'-18')	SB-13(21'-22')	SB-13(27'-28')	SB-13(32'-33')	SB-13(36'-37')	SB-13(42'-43')
Lab Sample ID:		JB49551-25	JB49551-27	JB49551-26	JB49551-29	JB49551-30	JB49551-31	JB49551-32	JB49551-33	JB49551-34	JB49551-35
Date Sampled:		10/11/2013	10/11/2013	10/11/2013	10/14/2013	10/14/2013	10/14/2013	10/14/2013	10/14/2013	10/14/2013	10/14/2013
Matrix:		Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil
GC/MS Volatiles (SW846 8260C)											
Acetone	mg/kg	ND (1.4)	ND (2.7)	0.0186	ND (0.0047)	-	ND (0.0051)	ND (0.0051)	ND (0.0050)	ND (0.0054)	ND (0.0046)
Benzene	mg/kg	ND (0.040)	ND (0.076)	ND (0.00015)	ND (0.00013)	-	ND (0.00014)	ND (0.00014)	ND (0.00014)	ND (0.00015)	ND (0.00013)
Bromochloromethane	mg/kg	ND (0.16)	ND (0.31)	ND (0.00062)	ND (0.00054)	-	ND (0.00058)	ND (0.00058)	ND (0.00057)	ND (0.00061)	ND (0.00052)
Bromodichloromethane	mg/kg	ND (0.089)	ND (0.17)	ND (0.00033)	ND (0.00029)	-	ND (0.00031)	ND (0.00031)	ND (0.00031)	ND (0.00033)	ND (0.00028)
Bromoform	mg/kg	ND (0.083)	ND (0.16)	ND (0.00031)	ND (0.00027)	-	ND (0.00029)	ND (0.00029)	ND (0.00029)	ND (0.00031)	ND (0.00026)
Bromomethane	mg/kg	ND (0.15)	ND (0.29)	ND (0.00057)	ND (0.00050)	-	ND (0.00054)	ND (0.00054)	ND (0.00053)	ND (0.00056)	ND (0.00048)
2-Butanone (MEK)	mg/kg	ND (1.4)	ND (2.6)	ND (0.0052)	ND (0.0045)	-	ND (0.0049)	ND (0.0049)	ND (0.0048)	ND (0.0052)	ND (0.0044)
Carbon disulfide	mg/kg	ND (0.045)	ND (0.085)	ND (0.00017)	ND (0.00015)	-	ND (0.00016)	ND (0.00016)	ND (0.00015)	ND (0.00017)	ND (0.00014)
Carbon tetrachloride	mg/kg	ND (0.080)	ND (0.15)	ND (0.00030)	ND (0.00026)	-	ND (0.00028)	ND (0.00028)	ND (0.00028)	ND (0.00029)	ND (0.00025)
Chlorobenzene	mg/kg	ND (0.063)	ND (0.12)	ND (0.00023)	ND (0.00020)	-	ND (0.00022)	ND (0.00022)	ND (0.00022)	ND (0.00023)	ND (0.00020)
Chloroethane	mg/kg	ND (0.32)	ND (0.60)	ND (0.0012)	ND (0.0010)	-	ND (0.0011)	ND (0.0011)	ND (0.0011)	ND (0.0012)	ND (0.0010)
Chloroform	mg/kg	ND (0.081)	ND (0.15)	ND (0.00030)	ND (0.00026)	-	0.00044 J	ND (0.00028)	0.0013 J	0.00052 J	0.00081 J
Chloromethane	mg/kg	ND (0.11)	ND (0.21)	ND (0.00041)	ND (0.00035)	-	ND (0.00038)	ND (0.00038)	ND (0.00038)	ND (0.00040)	ND (0.00034)
Cyclohexane	mg/kg	1.35 J	ND (0.15)	ND (0.00031)	ND (0.00027)	-	ND (0.00029)	ND (0.00029)	ND (0.00028)	ND (0.00030)	ND (0.00026)
1,2-Dibromo-3-chloropropane	mg/kg	ND (0.42)	ND (0.80)	ND (0.0016)	ND (0.0014)	-	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0016)	ND (0.0013)
Dibromochloromethane	mg/kg	ND (0.077)	ND (0.15)	ND (0.00029)	ND (0.00025)	-	ND (0.00027)	ND (0.00027)	ND (0.00027)	ND (0.00028)	ND (0.00024)
1,2-Dibromoethane	mg/kg	ND (0.17)	ND (0.33)	ND (0.00065)	ND (0.00057)	-	ND (0.00061)	ND (0.00061)	ND (0.00060)	ND (0.00064)	ND (0.00055)
1,2-Dichlorobenzene	mg/kg	ND (0.11)	ND (0.20)	ND (0.00040)	ND (0.00035)	-	ND (0.00038)	ND (0.00038)	ND (0.00037)	ND (0.00040)	ND (0.00034)
1,3-Dichlorobenzene	mg/kg	ND (0.069)	ND (0.13)	ND (0.00026)	ND (0.00023)	-	ND (0.00024)	ND (0.00024)	ND (0.00024)	ND (0.00026)	ND (0.00022)
1,4-Dichlorobenzene	mg/kg	ND (0.080)	ND (0.15)	ND (0.00030)	ND (0.00026)	-	ND (0.00028)	ND (0.00028)	ND (0.00028)	ND (0.00029)	ND (0.00025)
Dichlorodifluoromethane	mg/kg	ND (0.11)	ND (0.21)	ND (0.00042)	ND (0.00036)	-	ND (0.00039)	ND (0.00039)	ND (0.00039)	ND (0.00041)	ND (0.00035)
1,1-Dichloroethane	mg/kg	ND (0.10)	ND (0.19)	ND (0.00037)	ND (0.00032)	-	ND (0.00035)	ND (0.00035)	ND (0.00035)	ND (0.00037)	ND (0.00031)
1,2-Dichloroethane	mg/kg	ND (0.10)	ND (0.19)	ND (0.00038)	ND (0.00033)	-	ND (0.00036)	ND (0.00036)	ND (0.00035)	ND (0.00038)	ND (0.00032)
1,1-Dichloroethene	mg/kg	ND (0.091)	ND (0.17)	ND (0.00034)	ND (0.00030)	-	ND (0.00032)	ND (0.00032)	0.00038 J	ND (0.00034)	ND (0.00029)
cis-1,2-Dichloroethene	mg/kg	38.5	0.275 J	ND (0.00025)	0.00039 J	-	0.00070 J	0.0147	0.0028 J	ND (0.00024)	ND (0.00021)
trans-1,2-Dichloroethene	mg/kg	ND (0.13)	ND (0.25)	ND (0.00050)	ND (0.00044)	-	ND (0.00047)	ND (0.00047)	ND (0.00046)	ND (0.00050)	ND (0.00042)
1,2-Dichloropropane	mg/kg	ND (0.14)	ND (0.26)	ND (0.00052)	ND (0.00045)	-	ND (0.00049)	ND (0.00049)	ND (0.00048)	ND (0.00051)	ND (0.00044)
cis-1,3-Dichloropropene	mg/kg	ND (0.072)	ND (0.14)	ND (0.00027)	ND (0.00023)	-	ND (0.00025)	ND (0.00025)	ND (0.00025)	ND (0.00027)	ND (0.00023)
trans-1,3-Dichloropropene	mg/kg	ND (0.086)	ND (0.16)	ND (0.00032)	ND (0.00028)	-	ND (0.00030)	ND (0.00030)	ND (0.00030)	ND (0.00032)	ND (0.00027)
1,4-Dioxane	mg/kg	ND (24)	ND (46)	ND (0.091)	ND (0.079)	-	ND (0.085)	ND (0.085)	ND (0.084)	ND (0.090)	ND (0.077)
Ethylbenzene	mg/kg	1.89	ND (0.11)	ND (0.00021)	ND (0.00018)	-	ND (0.00019)	ND (0.00020)	ND (0.00019)	ND (0.00021)	ND (0.00018)
Freon 113	mg/kg	ND (0.14)	ND (0.26)	ND (0.00052)	ND (0.00045)	-	ND (0.00048)	ND (0.00049)	ND (0.00048)	ND (0.00051)	ND (0.00044)
2-Hexanone	mg/kg	ND (0.57)	ND (1.1)	ND (0.0021)	ND (0.0018)	-	ND (0.0020)	ND (0.0020)	ND (0.0020)	ND (0.0021)	ND (0.0018)
Isopropylbenzene	mg/kg	6	ND (0.088)	ND (0.00017)	ND (0.00015)	-	ND (0.00016)	ND (0.00016)	ND (0.00016)	ND (0.00017)	ND (0.00015)
Methyl Acetate	mg/kg	ND (0.53)	ND (1.0)	ND (0.0020)	ND (0.0017)	-	ND (0.0019)	ND (0.0019)	ND (0.0018)	ND (0.0020)	ND (0.0017)
Methylcyclohexane	mg/kg	50	0.205 J	ND (0.00019)	ND (0.00017)	-	ND (0.00018)	ND (0.00018)	ND (0.00018)	ND (0.00019)	ND (0.00016)
Methyl Tert Butyl Ether	mg/kg	ND (0.11)	ND (0.21)	ND (0.00041)	ND (0.00035)	-	ND (0.00038)	ND (0.00038)	ND (0.00038)	ND (0.00040)	ND (0.00034)
4-Methyl-2-pentanone(MIBK)	mg/kg	ND (0.42)	ND (0.79)	ND (0.0016)	ND (0.0014)	-	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0015)	ND (0.0013)
Methylene chloride	mg/kg	ND (0.54)	ND (1.0)	0.0069	0.0053	-	0.0048 J	0.0044 J	0.0052 J	0.0026 J	0.0034 J
Styrene	mg/kg	ND (0.074)	ND (0.14)	ND (0.00028)	ND (0.00024)	-	ND (0.00026)	ND (0.00026)	ND (0.00026)	ND (0.00027)	ND (0.00023)
1,1,2,2-Tetrachloroethane	mg/kg	ND (0.11)	ND (0.21)	ND (0.00041)	ND (0.00035)	-	ND (0.00038)	ND (0.00038)	ND (0.00038)	ND (0.00040)	ND (0.00034)
Tetrachloroethene	mg/kg	ND (0.13)	ND (0.25)	ND (0.00049)	ND (0.00042)	-	ND (0.00046)	ND (0.00046)	0.0075	0.00080 J	ND (0.00041)
Toluene	mg/kg	ND (0.045)	ND (0.085)	ND (0.00017)	ND (0.00015)	-	ND (0.00016)	ND (0.00016)	0.00028 J	0.00024 J	ND (0.00014)
1,2,3-Trichlorobenzene	mg/kg	ND (0.066)	ND (0.12)	ND (0.00025)	ND (0.00021)	-	ND (0.00023)	ND (0.00023)	ND (0.00023)	ND (0.00024)	ND (0.00021)
1,2,4-Trichlorobenzene	mg/kg	ND (0.057)	ND (0.11)	ND (0.00022)	ND (0.00019)	-	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00021)	ND (0.00018)
1,1,1-Trichloroethane	mg/kg	ND (0.091)	ND (0.17)	ND (0.00034)	ND (0.00030)	-	ND (0.00032)	ND (0.00032)	0.00085 J	ND (0.00034)	ND (0.00029)
1,1,2-Trichloroethane	mg/kg	ND (0.26)	ND (0.49)	ND (0.00098)	ND (0.00085)	-	ND (0.00091)	ND (0.00092)	0.0228	ND (0.00096)	ND (0.00082)
Trichloroethene	mg/kg	**207**	99.8	0.0035 J	0.0034 J	-	0.0189	0.0834	29.2	0.308 J	ND (0.00035)
Trichlorofluoromethane	mg/kg	ND (0.071)	ND (0.14)	ND (0.00027)	ND (0.00023)	-	ND (0.00025)	ND (0.00025)	ND (0.00025)	ND (0.00026)	ND (0.00023)
Vinyl chloride	mg/kg	ND (0.11)	ND (0.21)	ND (0.00041)	ND (0.00035)	-	ND (0.00038)	ND (0.00038)	ND (0.00038)	ND (0.00040)	ND (0.00034)
m,p-Xylene	mg/kg	6.18	ND (0.29)	ND (0.00058)	ND (0.00050)	-	ND (0.00054)	ND (0.00054)	ND (0.00053)	ND (0.00057)	ND (0.00049)
o-Xylene	mg/kg	0.349	ND (0.11)	ND (0.00021)	ND (0.00018)	-	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00021)	ND (0.00018)
Xylene (total)	mg/kg	6.53	ND (0.11)	ND (0.00021)	ND (0.00018)	-	ND (0.00020)	ND (0.00020)	ND (0.00020)	ND (0.00021)	ND (0.00018)
Metals Analysis											
Aluminum	mg/kg	-	6820	-	-	-	3690	5250	5050	-	12800
Antimony	mg/kg	-	ND (2.3)	-	-	-	ND (2.5)	ND (2.4)	ND (2.5)	-	ND (2.0)
Arsenic	mg/kg	-	ND (2.3)	-	-	-	ND (2.5)	ND (2.4)	ND (2.5)	-	2.5
Barium	mg/kg	-	51.8	-	-	-	29.8	43	38.4	-	169
Beryllium	mg/kg	-	0.31	-	-	-	ND (0.25)	0.35	0.27	-	0.54
Cadmium	mg/kg	-	ND (0.58)	-	-	-	ND (0.63)	ND (0.60)	ND (0.62)	-	ND (0.51)
Calcium	mg/kg	-	14400	-	-	-	1820	12300	12000	-	24900
Chromium	mg/kg	-	15.8	-	-	-	9.2	12.6	12.3	-	28.1
Cobalt	mg/kg	-	6.3	-	-	-	ND (6.3)	ND (6.0)	ND (6.2)	-	9.8
Copper	mg/kg	-	13.6	-	-	-	6.7	9.7	9.8	-	21.7
Iron	mg/kg	-	13100	-	-	-	7890	10400	9860	-	19300
Lead	mg/kg	-	4.5	-	-	-	3	3.6	3.4	-	6.2
Magnesium	mg/kg	-	7570	-	-	-	2440	6300	6230	-	15500
Manganese	mg/kg	-	270	-	-	-	223	242	248	-	1150
Mercury	mg/kg	-	ND (0.038)	-	-	-	ND (0.040)	ND (0.039)	ND (0.039)	-	ND (0.039)
Nickel	mg/kg	-	15.6	-	-	-	9.8	13.5	12.6	-	22.4
Potassium	mg/kg	-	1880	-	-	-	ND (1300)	1450	1340	-	5000
Selenium	mg/kg	-	ND (2.3)	-	-	-	ND (2.5)	ND (2.4)	ND (2.5)	-	ND (2.0)
Silver	mg/kg	-	ND (0.58)	-	-	-	ND (0.63)	ND (0.60)	ND (0.62)	-	ND (0.51)
Sodium	mg/kg	-	ND (1200)	-	-	-	ND (1300)	ND (1200)	ND (1200)	-	ND (1000)
Thallium	mg/kg	-	ND (1.2)	-	-	-	ND (1.3)	ND (1.2)	ND (1.2)	-	ND (1.0)
Vanadium	mg/kg	-	21.7	-	-	-	11.5	16.9	15.9	-	36
Zinc	mg/kg	-	23.5	-	-	-	14.1	18.3	17.2	-	49.2
General Chemistry											
Bulk Density (Dry Basis)	g/ml	-	1.4	-	-	-	1.5	1.4	1.4	-	1
Solids, Percent	%	82.7	82.7	80.9	83.5	80.1	80.2	81.3	82.7	81.9	77.9
Total Organic Content	%	-	3.1	-	-	-	0.7	2.2	2.5	-	4.5

Legend:

Compound detected above method detection limit
Compound detected above Commercial SCO

Table 3 - Summary of Treatability Study Results
Formerly ACCO Brands, Inc. Site
32-00 Skillman Avenue
Long Island City, New York

Client Sample ID:	NY TOGS Class GA GW Standards (NYSDEC 6/2004)[1]	MW-1	MW-10A	MW-11I	MW-12	MW-13I	MW-14I	MW-15
Lab Sample ID:		JB72911-4	JB73122-2	JB73122-6	JB73122-4	JB73122-9	JB73122-1	JB72911-11
Date Sampled:		7/28/2014	7/30/2014	7/31/2014	7/30/2014	7/31/2014	7/30/2014	7/30/2014
Matrix:		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
GC/MS Volatiles (SW846 8260C)								
Acetone	-	ND (2.7)	10.2	ND (2.7)	ND (2.7)	ND (2.7)	ND (2.7)	ND (2.7)
Benzene	1	ND (0.21)	ND (0.21)	ND (0.21)	**118**	**2.5**	ND (0.21)	ND (0.21)
Bromochloromethane	5	ND (0.49)	ND (0.49)	ND (0.49)	ND (0.49)	ND (0.49)	ND (0.49)	ND (0.49)
Bromodichloromethane	-	ND (0.19)	ND (0.19)	ND (0.19)	ND (0.19)	ND (0.19)	ND (0.19)	ND (0.19)
Bromoform	-	ND (0.31)	0.76 J	ND (0.31)	ND (0.31)	ND (0.31)	ND (0.31)	ND (0.31)
Bromomethane	5	ND (0.39)	ND (0.39)	ND (0.39)	ND (0.39)	ND (0.39)	ND (0.39)	ND (0.39)
2-Butanone (MEK)	-	ND (2.3)	ND (2.3)	ND (2.3)	ND (2.3)	ND (2.3)	ND (2.3)	ND (2.3)
Carbon disulfide	60	ND (0.17)	ND (0.17)	ND (0.17)	ND (0.17)	ND (0.17)	ND (0.17)	ND (0.17)
Carbon tetrachloride	5	ND (0.22)	ND (0.22)	ND (0.22)	ND (0.22)	ND (0.22)	ND (0.22)	ND (0.22)
Chlorobenzene	5	ND (0.19)	ND (0.19)	ND (0.19)	2	0.35 J	ND (0.19)	ND (0.19)
Chloroethane	5	ND (0.65)	ND (0.65)	ND (0.65)	ND (0.65)	ND (0.65)	ND (0.65)	ND (0.65)
Chloroform	7	0.63 J	0.95 J	ND (0.20)	ND (0.20)	ND (0.20)	ND (0.20)	0.40 J
Chloromethane	5	ND (0.24)	ND (0.24)	ND (0.24)	ND (0.24)	ND (0.24)	ND (0.24)	ND (0.24)
Cyclohexane	-	ND (0.23)	ND (0.23)	ND (0.23)	150	0.33 J	0.78 J	ND (0.23)
1,2-Dibromo-3-chloropropane	0.04	ND (1.2)	ND (1.2)	ND (1.2)	ND (1.2)	ND (1.2)	ND (1.2)	ND (1.2)
Dibromochloromethane	-	ND (0.22)	ND (0.22)	ND (0.22)	ND (0.22)	ND (0.22)	ND (0.22)	ND (0.22)
1,2-Dibromoethane	0.0006	ND (0.21)	ND (0.21)	ND (0.21)	ND (0.21)	ND (0.21)	ND (0.21)	ND (0.21)
1,2-Dichlorobenzene	3	ND (0.16)	ND (0.16)	ND (0.16)	2	ND (0.16)	ND (0.16)	ND (0.16)
1,3-Dichlorobenzene	3	ND (0.22)	ND (0.22)	ND (0.22)	ND (0.22)	ND (0.22)	ND (0.22)	ND (0.22)
1,4-Dichlorobenzene	3	ND (0.24)	ND (0.24)	ND (0.24)	ND (0.24)	ND (0.24)	ND (0.24)	ND (0.24)
Dichlorodifluoromethane	5	ND (0.31)	ND (0.31)	ND (0.31)	ND (0.31)	ND (0.31)	ND (0.31)	ND (0.31)
1,1-Dichloroethane	5	ND (0.35)	ND (0.35)	0.44 J	ND (0.35)	ND (0.35)	ND (0.35)	ND (0.35)
1,2-Dichloroethane	0.6	ND (0.30)	ND (0.30)	ND (0.30)	ND (0.30)	ND (0.30)	ND (0.30)	**0.78 J**
1,1-Dichloroethene	5	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	0.58 J
cis-1,2-Dichloroethene	5	ND (0.33)	ND (0.33)	**11.1**	ND (0.33)	ND (0.33)	ND (0.33)	**68.3**
trans-1,2-Dichloroethene	5	ND (0.51)	ND (0.51)	1.1	ND (0.51)	ND (0.51)	ND (0.51)	1.4
1,2-Dichloropropane	1	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.34)
cis-1,3-Dichloropropene	-	ND (0.18)	ND (0.18)	ND (0.18)	ND (0.18)	ND (0.18)	ND (0.18)	ND (0.18)
trans-1,3-Dichloropropene	-	ND (0.32)	ND (0.32)	ND (0.32)	ND (0.32)	ND (0.32)	ND (0.32)	ND (0.32)
1,4-Dioxane	-	ND (39)	ND (39)	ND (39)	ND (39)	ND (39)	ND (39)	ND (39)
Ethylbenzene	5	ND (0.31)	ND (0.31)	ND (0.31)	**64.6**	ND (0.31)	ND (0.31)	ND (0.31)
Freon 113	5	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)
2-Hexanone	-	ND (2.3)	ND (2.3)	ND (2.3)	ND (2.3)	ND (2.3)	ND (2.3)	ND (2.3)
Isopropylbenzene	5	ND (0.22)	ND (0.22)	ND (0.22)	**168**	ND (0.22)	1.5 J	ND (0.22)
Methyl Acetate	-	ND (1.4)	ND (1.4)	ND (1.4)	ND (1.4)	ND (1.4)	ND (1.4)	ND (1.4)
Methylcyclohexane	-	ND (0.22)	ND (0.22)	ND (0.22)	103	ND (0.22)	ND (0.22)	ND (0.22)
Methyl Tert Butyl Ether	10	ND (0.19)	ND (0.19)	ND (0.19)	ND (0.19)	9.9	1.8	2.8
4-Methyl-2-pentanone(MIBK)	-	ND (1.2)	ND (1.2)	ND (1.2)	ND (1.2)	ND (1.2)	ND (1.2)	ND (1.2)
Methylene chloride	5	ND (0.89)	ND (0.89)	ND (0.89)	ND (0.89)	ND (0.89)	ND (0.89)	ND (0.89)
Styrene	5	ND (0.19)	ND (0.19)	ND (0.19)	ND (0.19)	ND (0.19)	ND (0.19)	ND (0.19)
1,1,2,2-Tetrachloroethane	5	ND (0.39)	ND (0.39)	ND (0.39)	ND (0.39)	ND (0.39)	ND (0.39)	ND (0.39)
Tetrachloroethene	5	ND (0.35)	ND (0.35)	ND (0.35)	ND (0.35)	ND (0.35)	ND (0.35)	**44.8**
Toluene	5	ND (0.22)	ND (0.22)	ND (0.22)	**7.7**	ND (0.22)	ND (0.22)	ND (0.22)
1,2,3-Trichlorobenzene	5	ND (0.27)	ND (0.27)	ND (0.27)	ND (0.27)	ND (0.27)	ND (0.27)	ND (0.27)
1,2,4-Trichlorobenzene	5	ND (0.22)	ND (0.22)	ND (0.22)	ND (0.22)	ND (0.22)	ND (0.22)	ND (0.22)
1,1,1-Trichloroethane	5	ND (0.32)	ND (0.32)	ND (0.32)	ND (0.32)	ND (0.32)	ND (0.32)	ND (0.32)
1,1,2-Trichloroethane	1	ND (0.36)	ND (0.36)	ND (0.36)	ND (0.36)	ND (0.36)	ND (0.36)	ND (0.36)
Trichloroethene	5	**7.6**	0.75 J	1.1	ND (0.25)	0.35 J	ND (0.25)	**16.2**
Trichlorofluoromethane	5	ND (0.47)	ND (0.47)	ND (0.47)	ND (0.47)	ND (0.47)	ND (0.47)	ND (0.47)
Vinyl chloride	2	ND (0.16)	ND (0.16)	**2.7**	ND (0.16)	ND (0.16)	ND (0.16)	**13.8**
m,p-Xylene	-	ND (0.35)	ND (0.35)	ND (0.35)	275	ND (0.35)	ND (0.35)	ND (0.35)
o-Xylene	5	ND (0.20)	ND (0.20)	ND (0.20)	**39.8**	ND (0.20)	ND (0.20)	ND (0.20)
Xylene (total)	5	ND (0.20)	ND (0.20)	ND (0.20)	**315**	ND (0.20)	0.28 J	ND (0.20)

Client Sample ID:	NY TOGS Class GA GW Standards (NYSDEC 6/2004)[1]	MW-16	MW-17	MW-18	MW-18I	MW-19	MW-19I	MW-2	MW-21I	MW-3
Lab Sample ID:		JB72911-1	JB72911-9	JB73122-12	JB73122-13	JB73122-10	JB73122-11	JB72911-6	JB73122-5	JB72911-8
Date Sampled:		7/28/2014	7/29/2014	8/1/2014	8/1/2014	7/31/2014	7/31/2014	7/29/2014	7/30/2014	7/29/2014
Matrix:		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
GC/MS Volatiles (SW846 8260C)										
Acetone	-	ND (2.7)	ND (2.7)	ND (2.7)	ND (68)	ND (2.7)	29	ND (2.7)	ND (2.7)	ND (55)
Benzene	1	ND (0.21)	ND (0.21)	ND (0.21)	ND (5.3)	**16.3**	0.45 J	ND (0.21)	0.27 J	ND (4.2)
Bromochloromethane	5	ND (0.49)	ND (0.49)	ND (0.49)	ND (12)	ND (0.49)	ND (0.49)	ND (0.49)	ND (0.49)	ND (9.7)
Bromodichloromethane	-	ND (0.19)	ND (0.19)	ND (0.19)	ND (4.7)	ND (0.19)	ND (0.19)	ND (0.19)	ND (0.19)	ND (3.7)
Bromoform	-	ND (0.31)	ND (0.31)	ND (0.31)	ND (7.8)	ND (0.31)	ND (0.31)	ND (0.31)	ND (0.31)	ND (6.2)
Bromomethane	5	ND (0.39)	ND (0.39)	ND (0.39)	ND (9.6)	ND (0.39)	ND (0.39)	ND (0.39)	ND (0.39)	ND (7.7)
2-Butanone (MEK)	-	ND (2.3)	ND (2.3)	ND (2.3)	ND (58)	ND (2.3)	ND (2.3)	ND (2.3)	ND (2.3)	ND (46)
Carbon disulfide	60	ND (0.17)	ND (0.17)	ND (0.17)	ND (4.2)	ND (0.17)	ND (0.17)	ND (0.17)	ND (0.17)	ND (3.3)
Carbon tetrachloride	5	ND (0.22)	ND (0.22)	ND (0.22)	ND (5.4)	ND (0.22)	ND (0.22)	ND (0.22)	ND (0.22)	ND (4.3)
Chlorobenzene	5	ND (0.19)	ND (0.19)	ND (0.19)	ND (4.8)	ND (0.19)	ND (0.19)	ND (0.19)	ND (0.19)	ND (3.8)
Chloroethane	5	ND (0.65)	ND (0.65)	ND (0.65)	ND (16)	ND (0.65)	ND (0.65)	ND (0.65)	ND (0.65)	ND (13)
Chloroform	7	1.4	2.1	ND (0.20)	ND (5.1)	ND (0.20)	3.5	ND (0.20)	ND (0.20)	**7.1 J**
Chloromethane	5	ND (0.24)	ND (0.24)	ND (0.24)	ND (6.0)	ND (0.24)	ND (0.24)	ND (0.24)	ND (0.24)	ND (4.8)
Cyclohexane	-	ND (0.23)	ND (0.23)	ND (0.23)	ND (5.7)	9.8	ND (0.23)	ND (0.23)	2.0 J	ND (4.5)
1,2-Dibromo-3-chloropropane	0.04	ND (1.2)	ND (1.2)	ND (1.2)	ND (29)	ND (1.2)	ND (1.2)	ND (1.2)	ND (1.2)	ND (23)
Dibromochloromethane	-	ND (0.22)	ND (0.22)	ND (0.22)	ND (5.5)	ND (0.22)	ND (0.22)	ND (0.22)	ND (0.22)	ND (4.4)
1,2-Dibromoethane	0.0006	ND (0.21)	ND (0.21)	ND (0.21)	ND (5.3)	ND (0.21)	ND (0.21)	ND (0.21)	ND (0.21)	ND (4.2)
1,2-Dichlorobenzene	3	ND (0.16)	ND (0.16)	ND (0.16)	ND (4.0)	ND (0.16)	ND (0.16)	ND (0.16)	ND (0.16)	ND (3.2)
1,3-Dichlorobenzene	3	ND (0.22)	ND (0.22)	ND (0.22)	ND (5.6)	ND (0.22)	ND (0.22)	ND (0.22)	ND (0.22)	ND (4.4)
1,4-Dichlorobenzene	3	ND (0.24)	ND (0.24)	ND (0.24)	ND (5.9)	ND (0.24)	ND (0.24)	ND (0.24)	ND (0.24)	ND (4.7)
Dichlorodifluoromethane	5	ND (0.31)	ND (0.31)	ND (0.31)	ND (7.8)	ND (0.31)	ND (0.31)	ND (0.31)	ND (0.31)	ND (6.2)
1,1-Dichloroethane	5	ND (0.35)	ND (0.35)	ND (0.35)	ND (8.7)	ND (0.35)	ND (0.35)	1.9	ND (0.35)	ND (6.9)
1,2-Dichloroethane	0.6	ND (0.30)	ND (0.30)	ND (0.30)	ND (7.5)	ND (0.30)	**3**	ND (0.30)	ND (0.30)	ND (6.0)
1,1-Dichloroethene	5	ND (0.50)	ND (0.50)	ND (0.50)	**22.1 J**	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (9.9)
cis-1,2-Dichloroethene	5	ND (0.33)	ND (0.33)	ND (0.33)	**2230**	2.9	ND (0.33)	**191**	ND (0.33)	**1100**
trans-1,2-Dichloroethene	5	ND (0.51)	ND (0.51)	ND (0.51)	**211**	ND (0.51)	ND (0.51)	ND (0.51)	ND (0.51)	**10.1 J**
1,2-Dichloropropane	1	ND (0.34)	ND (0.34)	ND (0.34)	ND (8.4)	ND (0.34)	ND (0.34)	ND (0.34)	ND (0.34)	ND (6.7)
cis-1,3-Dichloropropene	-	ND (0.18)	ND (0.18)	ND (0.18)	ND (4.6)	ND (0.18)	ND (0.18)	ND (0.18)	ND (0.18)	ND (3.7)
trans-1,3-Dichloropropene	-	ND (0.32)	ND (0.32)	ND (0.32)	ND (7.9)	ND (0.32)	ND (0.32)	ND (0.32)	ND (0.32)	ND (6.3)
1,4-Dioxane	-	ND (39)	ND (39)	ND (39)	ND (970)	ND (39)	ND (39)	ND (39)	ND (39)	ND (780)
Ethylbenzene	5	ND (0.31)	ND (0.31)	ND (0.31)	ND (7.7)	0.40 J	ND (0.31)	ND (0.31)	ND (0.31)	ND (6.2)
Freon 113	5	ND (0.50)	ND (0.50)	ND (0.50)	ND (13)	ND (0.50)	ND (0.50)	ND (0.50)	ND (0.50)	ND (10)
2-Hexanone	-	ND (2.3)	ND (2.3)	ND (2.3)	ND (56)	ND (2.3)	ND (2.3)	ND (2.3)	ND (2.3)	ND (45)
Isopropylbenzene	5	ND (0.22)	ND (0.22)	ND (0.22)	ND (5.6)	**18.2**	ND (0.22)	ND (0.22)	0.95 J	ND (4.5)
Methyl Acetate	-	ND (1.4)	ND (1.4)	ND (1.4)	ND (34)	ND (1.4)	ND (1.4)	ND (1.4)	ND (1.4)	ND (27)
Methylcyclohexane	-	ND (0.22)	ND (0.22)	ND (0.22)	ND (5.4)	8.6	ND (0.22)	ND (0.22)	ND (0.22)	ND (4.3)
Methyl Tert Butyl Ether	10	ND (0.19)	ND (0.19)	ND (0.19)	**229**	6.3	1.3	ND (0.19)	1.1	ND (3.7)
4-Methyl-2-pentanone(MIBK)	-	ND (1.2)	ND (1.2)	ND (1.2)	ND (30)	ND (1.2)	ND (1.2)	ND (1.2)	ND (1.2)	ND (24)
Methylene chloride	5	ND (0.89)	ND (0.89)	ND (0.89)	ND (22)	ND (0.89)	ND (0.89)	ND (0.89)	ND (0.89)	ND (18)
Styrene	5	ND (0.19)	ND (0.19)	ND (0.19)	ND (4.7)	ND (0.19)	ND (0.19)	ND (0.19)	ND (0.19)	ND (3.7)
1,1,2,2-Tetrachloroethane	5	ND (0.39)	ND (0.39)	ND (0.39)	ND (9.9)	ND (0.39)	ND (0.39)	ND (0.39)	ND (0.39)	ND (7.9)
Tetrachloroethene	5	ND (0.35)	ND (0.35)	ND (0.35)	**20.0 J**	ND (0.35)	0.43 J	0.35 J	ND (0.35)	**118**
Toluene	5	ND (0.22)	ND (0.22)	ND (0.22)	ND (5.5)	0.65 J	ND (0.22)	ND (0.22)	ND (0.22)	ND (4.4)
1,2,3-Trichlorobenzene	5	ND (0.27)	ND (0.27)	ND (0.27)	ND (6.8)	ND (0.27)	ND (0.27)	ND (0.27)	ND (0.27)	ND (5.4)
1,2,4-Trichlorobenzene	5	ND (0.22)	ND (0.22)	ND (0.22)	ND (5.6)	ND (0.22)	ND (0.22)	ND (0.22)	ND (0.22)	ND (4.5)
1,1,1-Trichloroethane	5	ND (0.32)	ND (0.32)	ND (0.32)	ND (8.0)	ND (0.32)	ND (0.32)	0.39 J	ND (0.32)	ND (6.4)
1,1,2-Trichloroethane	1	ND (0.36)	ND (0.36)	ND (0.36)	ND (8.9)	ND (0.36)	**16.5**	ND (0.36)	ND (0.36)	ND (7.1)
Trichloroethene	5	**38.8**	**7.8**	ND (0.25)	**4250**	0.41 J	ND (0.25)	**39.9**	ND (0.25)	**3190**
Trichlorofluoromethane	5	ND (0.47)	ND (0.47)	ND (0.47)	ND (12)	ND (0.47)	ND (0.47)	ND (0.47)	ND (0.47)	ND (9.4)
Vinyl chloride	2	ND (0.16)	ND (0.16)	ND (0.16)	**600**	**9.8**	ND (0.16)	ND (0.16)	ND (0.16)	ND (3.3)
m,p-Xylene	-	ND (0.35)	ND (0.35)	ND (0.35)	ND (8.7)	1.5	ND (0.35)	ND (0.35)	ND (0.35)	ND (6.9)
o-Xylene	5	ND (0.20)	ND (0.20)	ND (0.20)	ND (5.0)	0.52 J	ND (0.20)	ND (0.20)	ND (0.20)	ND (4.0)
Xylene (total)	5	ND (0.20)	ND (0.20)	ND (0.20)	ND (5.0)	2	ND (0.20)	ND (0.20)	ND (0.20)	ND (4.0)

Client Sample ID:	NY TOGS Class GA GW Standards (NYSDEC 6/2004)[1]	MW-3I	MW-3I	MW-4	MW-5	MW-6	MW-6I	MW-7	MW-8I	MW-9
Lab Sample ID:		JB72911-7	JB74594-8	JB72911-2	JB72911-5	JB72911-10	JB72911-3	JB73122-7	JB73122-3	JB73122-8
Date Sampled:		7/29/2014	8/20/2014	7/28/2014	7/29/2014	7/28/2014	7/28/2014	7/31/2014	7/30/2014	7/31/2014
Matrix:		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
GC/MS Volatiles (SW846 8260C)										
Acetone	-	ND (2.7)	ND (140)	ND (2.7)	ND (2.7)	70	ND (270)	ND (270)	ND (140)	ND (5.5)
Benzene	1	ND (0.21)	ND (11)	ND (0.21)	ND (0.21)	ND (0.21)	ND (21)	ND (21)	ND (11)	ND (0.42)
Bromochloromethane	5	ND (0.49)	ND (24)	ND (0.49)	ND (0.49)	ND (0.49)	ND (49)	ND (49)	ND (24)	ND (0.97)
Bromodichloromethane	-	ND (0.19)	ND (9.4)	ND (0.19)	ND (0.19)	ND (0.19)	ND (19)	ND (19)	ND (9.4)	ND (0.37)
Bromoform	-	ND (0.31)	ND (16)	ND (0.31)	ND (0.31)	ND (0.31)	ND (31)	ND (31)	ND (16)	ND (0.62)
Bromomethane	5	ND (0.39)	ND (19)	ND (0.39)	ND (0.39)	ND (0.39)	ND (39)	ND (39)	ND (19)	ND (0.77)
2-Butanone (MEK)	-	ND (2.3)	ND (120)	ND (2.3)	ND (2.3)	5.4 J	ND (230)	ND (230)	ND (120)	ND (4.6)
Carbon disulfide	60	ND (0.17)	ND (8.4)	ND (0.17)	ND (0.17)	ND (0.17)	ND (17)	ND (17)	ND (8.4)	ND (0.33)
Carbon tetrachloride	5	ND (0.22)	ND (11)	ND (0.22)	ND (0.22)	ND (0.22)	ND (22)	ND (22)	ND (11)	ND (0.43)
Chlorobenzene	5	ND (0.19)	ND (9.6)	ND (0.19)	ND (0.19)	ND (0.19)	ND (19)	ND (19)	ND (9.6)	ND (0.38)
Chloroethane	5	ND (0.65)	ND (32)	ND (0.65)	ND (0.65)	ND (0.65)	ND (65)	ND (65)	ND (32)	ND (1.3)
Chloroform	7	ND (0.20)	ND (10)	**7.8**	0.66 J	0.48 J	ND (20)	ND (20)	ND (10)	1.3 J
Chloromethane	5	ND (0.24)	ND (12)	ND (0.24)	ND (0.24)	ND (0.24)	ND (24)	ND (24)	ND (12)	ND (0.48)
Cyclohexane	-	ND (0.23)	ND (11)	ND (0.23)	ND (0.23)	0.52 J	ND (23)	ND (23)	ND (11)	ND (0.45)
1,2-Dibromo-3-chloropropane	0.04	ND (1.2)	ND (59)	ND (1.2)	ND (1.2)	ND (1.2)	ND (120)	ND (120)	ND (59)	ND (2.3)
Dibromochloromethane	-	ND (0.22)	ND (11)	ND (0.22)	ND (0.22)	ND (0.22)	ND (22)	ND (22)	ND (11)	ND (0.44)
1,2-Dibromoethane	0.0006	ND (0.21)	ND (11)	ND (0.21)	ND (0.21)	ND (0.21)	ND (21)	ND (21)	ND (11)	ND (0.42)
1,2-Dichlorobenzene	3	ND (0.16)	ND (8.0)	ND (0.16)	ND (0.16)	ND (0.16)	ND (16)	ND (16)	ND (8.0)	ND (0.32)
1,3-Dichlorobenzene	3	ND (0.22)	ND (11)	ND (0.22)	ND (0.22)	ND (0.22)	ND (22)	ND (22)	ND (11)	ND (0.44)
1,4-Dichlorobenzene	3	ND (0.24)	ND (12)	ND (0.24)	ND (0.24)	ND (0.24)	ND (24)	ND (24)	ND (12)	ND (0.47)
Dichlorodifluoromethane	5	ND (0.31)	ND (16)	ND (0.31)	ND (0.31)	ND (0.31)	ND (31)	ND (31)	ND (16)	ND (0.62)
1,1-Dichloroethane	5	ND (0.35)	ND (17)	ND (0.35)	ND (0.35)	ND (0.35)	ND (35)	ND (35)	ND (17)	ND (0.69)
1,2-Dichloroethane	0.6	ND (0.30)	ND (15)	ND (0.30)	ND (0.30)	ND (0.30)	ND (30)	ND (30)	ND (15)	ND (0.60)
1,1-Dichloroethene	5	ND (0.50)	ND (25)	ND (0.50)	ND (0.50)	ND (0.50)	ND (50)	ND (50)	ND (25)	ND (0.99)
cis-1,2-Dichloroethene	5	2.7	**88.4**	ND (0.33)	ND (0.33)	ND (0.33)	**1670**	**556**	**59.9**	0.93 J
trans-1,2-Dichloroethene	5	ND (0.51)	ND (26)	ND (0.51)	ND (0.51)	ND (0.51)	ND (51)	ND (51)	ND (26)	ND (1.0)
1,2-Dichloropropane	1	ND (0.34)	ND (17)	ND (0.34)	ND (0.34)	ND (0.34)	ND (34)	ND (34)	ND (17)	ND (0.67)
cis-1,3-Dichloropropene	-	ND (0.18)	ND (9.2)	ND (0.18)	ND (0.18)	ND (0.18)	ND (18)	ND (18)	ND (9.2)	ND (0.37)
trans-1,3-Dichloropropene	-	ND (0.32)	ND (16)	ND (0.32)	ND (0.32)	ND (0.32)	ND (32)	ND (32)	ND (16)	ND (0.63)
1,4-Dioxane	-	ND (39)	ND (1900)	ND (39)	ND (39)	ND (39)	ND (3900)	ND (3900)	ND (1900)	ND (78)
Ethylbenzene	5	ND (0.31)	ND (15)	ND (0.31)	ND (0.31)	ND (0.31)	ND (31)	ND (31)	ND (15)	ND (0.62)
Freon 113	5	ND (0.50)	ND (25)	ND (0.50)	ND (0.50)	ND (0.50)	ND (50)	ND (50)	ND (25)	ND (1.0)
2-Hexanone	-	ND (2.3)	ND (110)	ND (2.3)	ND (2.3)	2.6 J	ND (230)	ND (230)	ND (110)	ND (4.5)
Isopropylbenzene	5	ND (0.22)	ND (11)	ND (0.22)	ND (0.22)	0.26 J	ND (22)	ND (22)	ND (11)	ND (0.45)
Methyl Acetate	-	ND (1.4)	ND (68)	ND (1.4)	ND (1.4)	ND (1.4)	ND (140)	ND (140)	ND (68)	ND (2.7)
Methylcyclohexane	-	ND (0.22)	ND (11)	ND (0.22)	ND (0.22)	3.8 J	ND (22)	ND (22)	ND (11)	ND (0.43)
Methyl Tert Butyl Ether	10	ND (0.19)	ND (9.3)	ND (0.19)	ND (0.19)	ND (0.19)	ND (19)	ND (19)	ND (9.3)	ND (0.37)
4-Methyl-2-pentanone(MIBK)	-	ND (1.2)	ND (59)	ND (1.2)	ND (1.2)	ND (1.2)	ND (120)	ND (120)	ND (59)	ND (2.4)
Methylene chloride	5	ND (0.89)	ND (45)	ND (0.89)	ND (0.89)	ND (0.89)	ND (89)	ND (89)	ND (45)	ND (1.8)
Styrene	5	ND (0.19)	ND (9.4)	ND (0.19)	ND (0.19)	ND (0.19)	ND (19)	ND (19)	ND (9.4)	ND (0.37)
1,1,2,2-Tetrachloroethane	5	ND (0.39)	ND (20)	ND (0.39)	ND (0.39)	ND (0.39)	ND (39)	ND (39)	ND (20)	ND (0.79)
Tetrachloroethene	5	ND (0.35)	ND (18)	ND (0.35)	ND (0.35)	ND (0.35)	ND (35)	**67.1 J**	ND (18)	0.97 J
Toluene	5	ND (0.22)	ND (11)	ND (0.22)	ND (0.22)	ND (0.22)	ND (22)	ND (22)	ND (11)	ND (0.44)
1,2,3-Trichlorobenzene	5	ND (0.27)	ND (14)	ND (0.27)	ND (0.27)	ND (0.27)	ND (27)	ND (27)	ND (14)	ND (0.54)
1,2,4-Trichlorobenzene	5	ND (0.22)	ND (11)	ND (0.22)	ND (0.22)	ND (0.22)	ND (22)	ND (22)	ND (11)	ND (0.45)
1,1,1-Trichloroethane	5	ND (0.32)	ND (16)	ND (0.32)	ND (0.32)	ND (0.32)	ND (32)	ND (32)	ND (16)	ND (0.64)
1,1,2-Trichloroethane	1	ND (0.36)	ND (18)	ND (0.36)	ND (0.36)	ND (0.36)	ND (36)	ND (36)	ND (18)	**3.7**
Trichloroethene	5	**98.9**	**7510**	**28.8**	**5.4**	4.2	**15800**	**23300**	**11800**	**754**
Trichlorofluoromethane	5	ND (0.47)	ND (23)	ND (0.47)	ND (0.47)	ND (0.47)	ND (47)	ND (47)	ND (23)	ND (0.94)
Vinyl chloride	2	ND (0.16)	ND (8.2)	ND (0.16)	ND (0.16)	ND (0.16)	ND (16)	ND (16)	ND (8.2)	ND (0.33)
m,p-Xylene	-	ND (0.35)	ND (17)	ND (0.35)	ND (0.35)	ND (0.35)	ND (35)	ND (35)	ND (17)	ND (0.69)
o-Xylene	5	ND (0.20)	ND (10)	ND (0.20)	ND (0.20)	ND (0.20)	ND (20)	ND (20)	ND (10)	ND (0.40)
Xylene (total)	5	ND (0.20)	ND (10)	ND (0.20)	ND (0.20)	ND (0.20)	ND (20)	ND (20)	ND (10)	ND (0.40)

Client Sample ID:	NY TOGS Class GA GW Standards (NYSDEC 6/2004)[1]	PI-10S	PI-17S	PI-18S	PI-19S	PI-26S	PI-3S	PI-4S
Lab Sample ID:		JB74594-5	JB74594-1	JB74594-2	JB74594-3	JB74594-4	JB74594-6	JB74594-7
Date Sampled:		8/19/2014	8/19/2014	8/19/2014	8/19/2014	8/19/2014	8/20/2014	8/20/2014
Matrix:		Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
GC/MS Volatiles (SW846 8260C)								
Acetone	-	ND (55)	11.1	ND (27)	ND (6800)	ND (11)	ND (270)	ND (2700)
Benzene	1	ND (4.2)	ND (0.21)	ND (2.1)	ND (530)	ND (0.85)	ND (21)	ND (210)
Bromochloromethane	5	ND (9.7)	ND (0.49)	ND (4.9)	ND (1200)	ND (1.9)	ND (49)	ND (490)
Bromodichloromethane	-	ND (3.7)	ND (0.19)	ND (1.9)	ND (470)	ND (0.75)	ND (19)	ND (190)
Bromoform	-	ND (6.2)	ND (0.31)	ND (3.1)	ND (780)	ND (1.2)	ND (31)	ND (310)
Bromomethane	5	ND (7.7)	ND (0.39)	ND (3.9)	ND (960)	ND (1.5)	ND (39)	ND (390)
2-Butanone (MEK)	-	ND (46)	5.9 J	ND (23)	ND (5800)	12.8 J	ND (230)	ND (2300)
Carbon disulfide	60	ND (3.3)	ND (0.17)	ND (1.7)	ND (420)	ND (0.67)	ND (17)	ND (170)
Carbon tetrachloride	5	ND (4.3)	ND (0.22)	ND (2.2)	ND (540)	ND (0.86)	ND (22)	ND (220)
Chlorobenzene	5	ND (3.8)	ND (0.19)	ND (1.9)	ND (480)	ND (0.77)	ND (19)	ND (190)
Chloroethane	5	ND (13)	ND (0.65)	ND (6.5)	ND (1600)	ND (2.6)	ND (65)	ND (650)
Chloroform	7	ND (4.1)	4.5	6.3 J	ND (510)	**11**	ND (20)	ND (200)
Chloromethane	5	ND (4.8)	ND (0.24)	ND (2.4)	ND (600)	ND (0.95)	ND (24)	ND (240)
Cyclohexane	-	ND (4.5)	ND (0.23)	ND (2.3)	ND (570)	ND (0.90)	ND (23)	ND (230)
1,2-Dibromo-3-chloropropane	0.04	ND (23)	ND (1.2)	ND (12)	ND (2900)	ND (4.7)	ND (120)	ND (1200)
Dibromochloromethane	-	ND (4.4)	ND (0.22)	ND (2.2)	ND (550)	ND (0.88)	ND (22)	ND (220)
1,2-Dibromoethane	0.0006	ND (4.2)	ND (0.21)	ND (2.1)	ND (530)	ND (0.84)	ND (21)	ND (210)
1,2-Dichlorobenzene	3	ND (3.2)	ND (0.16)	ND (1.6)	ND (400)	ND (0.64)	ND (16)	ND (160)
1,3-Dichlorobenzene	3	ND (4.4)	ND (0.22)	ND (2.2)	ND (560)	ND (0.89)	ND (22)	ND (220)
1,4-Dichlorobenzene	3	ND (4.7)	ND (0.24)	ND (2.4)	ND (590)	ND (0.94)	ND (24)	ND (240)
Dichlorodifluoromethane	5	ND (6.2)	ND (0.31)	ND (3.1)	ND (780)	ND (1.2)	ND (31)	ND (310)
1,1-Dichloroethane	5	ND (6.9)	0.48 J	ND (3.5)	ND (870)	1.8 J	ND (35)	ND (350)
1,2-Dichloroethane	0.6	ND (6.0)	ND (0.30)	ND (3.0)	ND (750)	ND (1.2)	ND (30)	ND (300)
1,1-Dichloroethene	5	ND (9.9)	ND (0.50)	ND (5.0)	ND (1200)	ND (2.0)	ND (50)	ND (500)
cis-1,2-Dichloroethene	5	ND (6.5)	ND (0.33)	ND (3.3)	ND (820)	ND (1.3)	ND (33)	ND (330)
trans-1,2-Dichloroethene	5	ND (10)	ND (0.51)	ND (5.1)	ND (1300)	ND (2.1)	ND (51)	ND (510)
1,2-Dichloropropane	1	ND (6.7)	ND (0.34)	ND (3.4)	ND (840)	ND (1.3)	ND (34)	ND (340)
cis-1,3-Dichloropropene	-	ND (3.7)	ND (0.18)	ND (1.8)	ND (460)	ND (0.74)	ND (18)	ND (180)
trans-1,3-Dichloropropene	-	ND (6.3)	ND (0.32)	ND (3.2)	ND (790)	ND (1.3)	ND (32)	ND (320)
1,4-Dioxane	-	ND (780)	ND (39)	ND (390)	ND (97000)	ND (160)	ND (3900)	ND (39000)
Ethylbenzene	5	ND (6.2)	ND (0.31)	ND (3.1)	ND (770)	ND (1.2)	ND (31)	ND (310)
Freon 113	5	ND (10)	ND (0.50)	ND (5.0)	ND (1300)	ND (2.0)	ND (50)	ND (500)
2-Hexanone	-	ND (45)	ND (2.3)	ND (23)	ND (5600)	ND (9.0)	ND (230)	ND (2300)
Isopropylbenzene	5	ND (4.5)	ND (0.22)	ND (2.2)	ND (560)	ND (0.90)	ND (22)	ND (220)
Methyl Acetate	-	ND (27)	ND (1.4)	ND (14)	ND (3400)	ND (5.4)	ND (140)	ND (1400)
Methylcyclohexane	-	ND (4.3)	ND (0.22)	ND (2.2)	ND (540)	ND (0.86)	ND (22)	ND (220)
Methyl Tert Butyl Ether	10	ND (3.7)	ND (0.19)	ND (1.9)	ND (460)	ND (0.74)	ND (19)	ND (190)
4-Methyl-2-pentanone(MIBK)	-	ND (24)	ND (1.2)	ND (12)	ND (3000)	ND (4.7)	ND (120)	ND (1200)
Methylene chloride	5	ND (18)	ND (0.89)	ND (8.9)	ND (2200)	ND (3.6)	ND (89)	ND (890)
Styrene	5	ND (3.7)	ND (0.19)	ND (1.9)	ND (470)	ND (0.75)	ND (19)	ND (190)
1,1,2,2-Tetrachloroethane	5	ND (7.9)	ND (0.39)	ND (3.9)	ND (990)	ND (1.6)	ND (39)	ND (390)
Tetrachloroethene	5	**7.3 J**	ND (0.35)	4.8 J	ND (880)	ND (1.4)	**65.5 J**	ND (350)
Toluene	5	ND (4.4)	ND (0.22)	ND (2.2)	ND (550)	ND (0.88)	ND (22)	ND (220)
1,2,3-Trichlorobenzene	5	ND (5.4)	ND (0.27)	ND (2.7)	ND (680)	ND (1.1)	ND (27)	ND (270)
1,2,4-Trichlorobenzene	5	ND (4.5)	ND (0.22)	ND (2.2)	ND (560)	ND (0.90)	ND (22)	ND (220)
1,1,1-Trichloroethane	5	ND (6.4)	ND (0.32)	ND (3.2)	ND (800)	ND (1.3)	ND (32)	ND (320)
1,1,2-Trichloroethane	1	ND (7.1)	ND (0.36)	ND (3.6)	ND (890)	ND (1.4)	ND (36)	**462 J**
Trichloroethene	5	**2370**	3.1	**1960**	**325000**	**602**	**31300**	**720000**
Trichlorofluoromethane	5	ND (9.4)	ND (0.47)	ND (4.7)	ND (1200)	ND (1.9)	ND (47)	ND (470)
Vinyl chloride	2	ND (3.3)	ND (0.16)	ND (1.6)	ND (410)	ND (0.66)	ND (16)	ND (160)
m,p-Xylene	-	ND (6.9)	ND (0.35)	ND (3.5)	ND (870)	ND (1.4)	ND (35)	ND (350)
o-Xylene	5	ND (4.0)	ND (0.20)	ND (2.0)	ND (500)	ND (0.80)	ND (20)	ND (200)
Xylene (total)	5	ND (4.0)	ND (0.20)	ND (2.0)	ND (500)	ND (0.80)	ND (20)	ND (200)

Legend:

Compound detected above method detection limit

Compound detected above Commercial SCO

Table 4 - Remedial Alternative Analysis
Formerly ACCO Brands Inc. Site
32-00 Skillman Avenue
Long Island City, New York

Remedy Selection Factor	1	2	3	4
(1) Protection of Human Health & the Environment [Note - Inserted numbers correspond to 375-1.8(f) – list in order]	Promotes increased level of biodegradation in groundwater, marginally above natural attenuation. Leaves source contamination in place.	Remediates the entire footprint of OU-1, including the source contamination. Remediates shallow and intermediate groundwater TCE levels to below 100 ppb.	Remediates the source contamination in OU-1. Remediates shallow and intermediate groundwater TCE levels to below 100 ppb.	Remediates the source contamination in OU-1. Remediates shallow and intermediate groundwater TCE levels to below 100 ppb. Promotes increased level of biodegradation once the source contamination is removed.
(2) Conformance with Standards, Criteria, and Guidelines (SCGs)	Site remains out of compliance with most standards and leaves areas of contamination, including pockets of hazardous soil, in the ground.	Site VOC concentrations drop to levels within compliance.	Site VOC concentrations drop to levels within compliance.	Site VOC concentrations drop to levels within compliance.
(4) Reduction in Toxicity, Mobility, or Volume	Negligible effect.	Virtually complete removal of contaminant.	Virtually complete removal of contaminant.	Virtually complete removal of contaminant.
(5) Short-term Effectiveness and Impacts	Limited effectiveness in the short term	OU-1 remediation of VOCs can be achieved within a year. Measurable progress is expected in OU-2.	Source contamination remediation can be achieved within a year. Measurable progress is expected in OU-2.	Source contamination remediation can be achieved within a year. Promotes progress is in OU-2.
(3) Long-term Effectiveness and Permanence	Limited. Does not treat contaminant source.	Effective long-term remedy. Remediates VOCs in OU-1.	Effective long-term remedy. Remediates contaminant source.	Effective long-term remedy. Remediates contaminant source and promotes remediation in OU-2.
(6) Implementability	Easy to implement by injecting substrate and Dhc.	Difficult to implement. Requires significant coordination and intrusive work.	Difficult to implement. Requires significant coordination and intrusive work.	Difficult to implement. Requires significant coordination and intrusive work.
(8) Community Acceptance	Probably accepted by community because it is unobtrusive and not disruptive.	Probably accepted by community because it is unobtrusive and not disruptive.	Probably accepted by community because it is unobtrusive and not disruptive.	Probably accepted by community because it is unobtrusive and not disruptive.
(9) Land Use	Compatible with current land use as a commercial building.	Compatible with current land use as a commercial building.	Compatible with current land use as a commercial building.	Compatible with current land use as a commercial building.

Table 5 - Remedial Action Schedule
Formerly ACCO Brands Inc. Site
32-00 Skillman Avenue
Long Island City, New York

		Months after NYSDEC Approval															
ERH Implementation	**Duration (months)**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Design	**2.0**	🟦	🟦														
Acquire Materials	**0.3**		🟦														
Drill Electrode Borings	**3.0**			🟦	🟦	🟦											
Installation of Electrodes	**2.0**				🟦	🟦	🟦										
Operation of System	**6.4**						🟦	🟦	🟦	🟦	🟦	🟦	🟦	🟦			
Demobilization of System	**2.5**													🟦	🟦	🟦	

Bioremediation Implementation																	
Finalize Design	**1.0**	🟦															
Acquire Materials	**0.3**		🟦														
Drill Additional Wells	**1.0**		🟦														
Injection of Materials	**1.5**			🟦	🟦												
Initial Round of Groundwater Sampling	**0.5**						🟦										
First Round of Confirmatory Sampling	**0.5**									🟦							
Second Round of Confirmatory Sampling	**0.5**												🟦				
Third Round of Confirmatory Sampling	**0.5**															🟦	

Table 6 - Typical Site Permit List
Formerly ACCO Brands Inc. Site
32-00 Skillman Avenue
Long Island City, New York

Regulatory Agency	Typical Project Permits
Department of Transportation (NYCDOT)	Access, staging, sidewalk closure
Fire Department (FDNY)	Access, roadway width, circulation and fire protection
New York State Department of Environmental Conservation (NYSDEC)	Remedial Action Work Plan, Site Management Plan, Final Engineering Report
Department of Environmental Protection (NYCDEP)	Hydrant fire flow test, domestic water and fire service, sanitary service, amended drainage plan, sewer improvements
Department of Buildings (NYCDOB)	Flood zone requirements, building permits
Landfill	Disposal
Con Edison	Electrical supply

Table 7 - Emergency Contact Numbers
Formerly ACCO Brands Inc. Site
32-00 Skillman Avenue
Long Island City, New York

Emergency	
New York City Police Department	911
New York City Fire Department	911
Emergency Medical Service (ambulance)	911
NYSDEC Spill Hotline	(800) 457-7362
National Response Center	(800) 424-8802
Mount Sinai of Queens 25-10 30th Avenue Astoria, NY	(212) 562-1000
FLS Project Staff	
Peter Helseth, FLS Project Manager	(212) 675-3225 ext. 308
Adam Conti, Health and Safety Officer	(212) 675-3225 ext. 313
J. Raul Ramirez, Site Supervisor	(212) 675-3225 ext. 321

Table 8 - Well Abandonment Summary
Formerly ACCO Brands Inc. Site
32-00 Skillman Avenue
Long Island City, New York

Area	Well ID	Highest TCE concentration	Date	Consultant	Most Recent TCE Concentration	Date	Consultant	Screen Puncturing Clay?	Abandon?
Wells to be Abandoned									
OU-1	MW-1D	6,970	3/13/2006	GES	2	8/30/2012	FLS	Yes	Yes
OU-1	MW-3	226,000	4/21/2004	GES	3,190	7/29/2014	FLS	No	Yes
OU-1	MW-3I	84,900	11/22/2004	GES	7,515	8/20/2014	FLS	No	Yes
OU-1	MW-3D	36,100	11/22/2004	GES	71	8/30/2012	FLS	Yes	Yes
OU-1	MW-5I	2	8/24/2008	GES	2	8/30/2012	FLS	Yes	Yes
OU-1	MW-6	460,000	6/6/2012	FLS	4	7/28/2014	FLS	No	Yes
OU-1	MW-6I	417,000	10/21/2013	FLS	15,800	7/28/2014	FLS	No	Yes
OU-1	MW-6D	2,400	6/26/2007	GES	35	8/30/2012	FLS	Yes	Yes
OU-1	MW-16I	1	3/17/2010	GES	0.94J	8/30/2012	FLS	Yes	Yes
OU-1	PI-1S	---	---	---	---	---	---	Yes	Yes
OU-1	PI-1I	---	---	---	---	---	---	No	Yes
OU-1	PI-2S	---	---	---	---	---	---	Yes	Yes
OU-1	PI-2I	---	---	---	---	---	---	No	Yes
OU-1	PI-3S	Not Sampled	---	---	31,300	8/20/2014	FLS	No	Yes
OU-1	PI-3D	---	---	---	---	---	---	Yes	Yes
OU-1	PI-4S	Not Sampled	---	---	720,000	8/20/2014	FLS	No	Yes
OU-1	PI-4I	---	---	---	---	---	---	Yes	Yes
OU-1	PI-5S	---	---	---	---	---	---	No	Yes
OU-1	PI-5D	---	---	---	---	---	---	Yes	Yes
OU-1	PI-6S	---	---	---	---	---	---	No	Yes
OU-1	PI-6I	---	---	---	---	---	---	Yes	Yes
OU-1	PI-7S	---	---	---	---	---	---	No	Yes
OU-1	PI-7I	---	---	---	---	---	---	Yes	Yes
OU-1	PI-8S	---	---	---	---	---	---	No	Yes
OU-1	PI-8D	---	---	---	---	---	---	Yes	Yes
OU-1	PI-9S	---	---	---	---	---	---	Yes	Yes
OU-1	PI-9D	---	---	---	---	---	---	Yes	Yes
OU-1	PI-10S	Not Sampled	---	---	2,370	8/19/2014	FLS	Yes	Yes
OU-1	PI-10I	---	---	---	---	---	---	Yes	Yes
OU-1	PI-11S	---	---	---	---	---	---	No	Yes
OU-1	PI-11D	---	---	---	---	---	---	Yes	Yes
OU-1	PI-12S	---	---	---	---	---	---	No	Yes
OU-1	PI-12I	---	---	---	---	---	---	Yes	Yes
OU-1	PI-13S	---	---	---	---	---	---	No	Yes
OU-1	PI-13D	---	---	---	---	---	---	Yes	Yes
OU-1	PI-14S	---	---	---	---	---	---	No	Yes
OU-1	PI-14D	---	---	---	---	---	---	Yes	Yes
OU-1	PI-15S	---	---	---	---	---	---	No	Yes
OU-1	PI-15I	---	---	---	---	---	---	Yes	Yes
OU-1	PI-16S	---	---	---	---	---	---	No	Yes
OU-1	PI-16I	---	---	---	---	---	---	No	Yes
OU-1	PI-17S	Not Sampled	---	---	3	8/19/2014	FLS	No	Yes
OU-1	PI-17I	---	---	---	---	---	---	Yes	Yes
OU-1	PI-18S	Not Sampled	---	---	1,960	8/19/2014	FLS	No	Yes
OU-1	PI-18I	---	---	---	---	---	---	Yes	Yes
OU-1	PI-19S	Not Sampled	---	---	325,000	8/19/2014	FLS	No	Yes
OU-1	PI-19I	---	---	---	---	---	---	Yes	Yes
OU-1	PI-20S	---	---	---	---	---	---	No	Yes
OU-1	PI-20D	---	---	---	---	---	---	Yes	Yes
OU-1	PI-21S	---	---	---	---	---	---	No	Yes
OU-1	PI-21I	---	---	---	---	---	---	No	Yes
OU-1	PI-22S	---	---	---	---	---	---	No	Yes
OU-1	PI-22D	---	---	---	---	---	---	Yes	Yes
OU-1	PI-23S	---	---	---	---	---	---	No	Yes
OU-1	PI-23I	---	---	---	---	---	---	No	Yes
OU-1	PI-24S	---	---	---	---	---	---	No	Yes
OU-1	PI-24I	---	---	---	---	---	---	No	Yes
OU-1	PI-25S	---	---	---	---	---	---	No	Yes
OU-1	PI-25I	---	---	---	---	---	---	No	Yes
OU-1	PI-26S	Not Sampled	---	---	602	8/19/2014	FLS	No	Yes
OU-1	PI-26D	---	---	---	---	---	---	Yes	Yes
OU-1	PI-27S	---	---	---	---	---	---	No	Yes
OU-1	PI-27I	---	---	---	---	---	---	Yes	Yes
OU-1	PI-28	---	---	---	---	---	---	No	Yes
OU-1	PI-29	---	---	---	---	---	---	No	Yes
OU-1	PI-30	---	---	---	---	---	---	No	Yes
OU-1	PI-31	---	---	---	---	---	---	No	Yes
OU-1	PI-32	---	---	---	---	---	---	No	Yes
OU-1	PI-33	---	---	---	---	---	---	No	Yes
OU-1	PI-34	---	---	---	---	---	---	No	Yes
OU-1	PI-35	---	---	---	---	---	---	No	Yes
OU-1	PI-36	---	---	---	---	---	---	No	Yes
OU-1	PI-37	---	---	---	---	---	---	No	Yes
OU-1	PI-38	---	---	---	---	---	---	No	Yes
OU-1	PI-39	---	---	---	---	---	---	No	Yes
OU-1	PI-40	---	---	---	---	---	---	No	Yes
OU-1	PI-41	---	---	---	---	---	---	No	Yes
OU-1	PI-42	---	---	---	---	---	---	No	Yes
OU-1	VE4	---	---	---	---	---	---	No	Yes
OU-1	VE5	---	---	---	---	---	---	No	Yes
OU-1	VE6	---	---	---	---	---	---	No	Yes
OU-1	VE7	---	---	---	---	---	---	No	Yes
OU-1	VE8	---	---	---	---	---	---	No	Yes
OU-1	VE9	---	---	---	---	---	---	No	Yes
OU-1	GI-1S	---	---	---	---	---	---	No	Yes
OU-1	GI-1D	---	---	---	---	---	---	No	Yes
OU-1	GI-2S	---	---	---	---	---	---	No	Yes
OU-1	GI-2D	---	---	---	---	---	---	No	Yes
OU-1	GI-3S	---	---	---	---	---	---	No	Yes
OU-1	GI-3D	---	---	---	---	---	---	No	Yes
OU-1	GI-4S	---	---	---	---	---	---	No	Yes
OU-1	GI-4D	---	---	---	---	---	---	No	Yes
OU-1	GI-6S	---	---	---	---	---	---	No	Yes
OU-1	GI-6D	---	---	---	---	---	---	No	Yes
OU-1	GI-7S	---	---	---	---	---	---	No	Yes
OU-1	GI-7D	---	---	---	---	---	---	No	Yes

Table 8 - Well Abandonment Summary
Formerly ACCO Brands Inc. Site
32-00 Skillman Avenue
Long Island City, New York

Area	Well ID	Highest TCE concentration	Date	Consultant	Most Recent TCE Concentration	Date	Consultant	Screen Puncturing Clay?	Abandon?
Wells to be Abandoned (Continued)									
OU-1	GI-8S	---	---	---	---	---	---	No	Yes
OU-1	GI-8D	---	---	---	---	---	---	No	Yes
OU-1	GI-9S	---	---	---	---	---	---	No	Yes
OU-1	GI-9D	---	---	---	---	---	---	No	Yes
OU-1	GI-10S	---	---	---	---	---	---	No	Yes
OU-1	GI-10D	---	---	---	---	---	---	No	Yes
OU-1	GI-11S	---	---	---	---	---	---	No	Yes
OU-1	GI-11D	---	---	---	---	---	---	No	Yes
OU-1	GI-12S	---	---	---	---	---	---	No	Yes
OU-1	GI-12D	---	---	---	---	---	---	No	Yes
OU-1	GI-13S	---	---	---	---	---	---	No	Yes
OU-1	GI-13D	---	---	---	---	---	---	No	Yes
OU-1	GI-14S	---	---	---	---	---	---	No	Yes
OU-1	GI-14D	---	---	---	---	---	---	No	Yes
OU-1	GI-15S	---	---	---	---	---	---	No	Yes
OU-1	GI-15D	---	---	---	---	---	---	No	Yes
OU-2	MW-8D	68.8	6/26/2007	GES	8.6	8/29/2012	FLS	Yes	Yes
OU-2	MW-12I	1.6	12/5/2005	GES	<1.1	8/29/2012	FLS	No	Yes
OU-2	MW-18D	64.3	8/28/2008	GES	31.1	8/28/2012	FLS	Yes	Yes
OU-2	MW-19D	28.3	8/27/2008	GES	11.8	8/28/2012	FLS	Yes	Yes
OU-2	MW-20I	<1.0	8/28/2012	FLS	<1.0	8/28/2012	FLS	Yes	Yes
OU-2	MW-21I	<1.0	9/22/2011	FLS	<0.25	7/30/2014	FLS	Yes	Yes
OU-2	PI-46S	---	---	---	---	---	---	No	Yes
OU-2	PI-47S	---	---	---	---	---	---	No	Yes
OU-2	PI-48S	---	---	---	---	---	---	No	Yes
OU-2	PI-49I	---	---	---	---	---	---	No	Yes
OU-2	PI-54I	---	---	---	---	---	---	No	Yes
OU-2	PI-55I	---	---	---	---	---	---	No	Yes
OU-2	PI-56I	---	---	---	---	---	---	No	Yes
OU-2	PI-59I	---	---	---	---	---	---	Yes	Yes
OU-2	PI-62I	---	---	---	---	---	---	Yes	Yes
OU-2	PI-63I	---	---	---	---	---	---	Yes	Yes
OU-2	PZ-03S	---	---	---	---	---	---	Yes	Yes
OU-2	PZ-03I	---	---	---	---	---	---	Yes	Yes
OU-2	PZ-05S	---	---	---	---	---	---	Yes	Yes
OU-2	PZ-05I	---	---	---	---	---	---	Yes	Yes
OU-2	PZ-06S	---	---	---	---	---	---	Yes	Yes
OU-2	PZ-06I	---	---	---	---	---	---	Yes	Yes
OU-2	PZ-07S	---	---	---	---	---	---	Yes	Yes
OU-2	PZ-07I	---	---	---	---	---	---	Yes	Yes
Wells to Keep									
OU-1	MW-1	30,800	11/22/2004	GES	8	7/28/2014	FLS	No	No
OU-1	MW-1I	578	7/19/2004	GES	9	7/9/2013	FLS	No	No
OU-1	MW-2	78,200	8/11/2005	GES	40	7/29/2014	FLS	No	No
OU-1	MW-4	126,000	3/7/2007	GES	29	7/28/2014	FLS	No	No
OU-1	MW-5	197	8/25/2008	GES	5	7/29/2014	FLS	No	No
OU-1	MW-16	1,070	3/25/2008	GES	39	7/28/2014	FLS	No	No
OU-2	MW-7	168,000	1/7/2004	GES	23,300	7/31/2014	FLS	No	No
OU-2	MW-8I	91,200	3/14/2006	GES	11,800	7/30/2014	FLS	No	No
OU-2	MW-9	6,010	8/17/2011	FLS	754	7/31/2014	FLS	No	No
OU-2	MW-10A	4,020	6/30/2008	GES	0.75J	7/30/2014	FLS	Yes*	No
OU-2	MW-11I	268	8/12/2009	GES	1	7/31/2014	FLS	No	No
OU-2	MW-12	10	2/8/2012	FLS	<0.25	7/30/2014	FLS	No	No
OU-2	MW-13I	25	8/11/2009	GES	0.35J	7/31/2014	FLS	No	No
OU-2	MW-14I	123	12/6/2007	GES	<0.25	7/30/2014	FLS	No	No
OU-2	MW15	40	8/26/2008	GES	16	7/30/2014	FLS	No	No
OU-2	MW-15I	68.1	9/26/2006	GES	9.9	8/29/2012	FLS	No	Yes
OU-2	MW17	174	3/5/2009	GES	8	8/30/2012	FLS	No	No
OU-2	MW-17I	4	8/27/2008	GES	1	7/29/2014	FLS	Yes*	No
OU-2	MW-17D	69	3/22/2011	FLS	43	8/28/2012	FLS	Yes*	No
OU-2	MW-18	3	11/19/2008	GES	<1.0	8/28/2012	FLS	No	No
OU-2	MW-18I	11,200	3/5/2009	GES	4,250	8/1/2014	FLS	No	No
OU-2	MW-19	891	11/19/2008	GES	0.41J	7/31/2014	FLS	No	No
OU-2	MW-19I	45,800	8/27/2008	GES	<0.25	7/31/2014	FLS	No	No
OU-2	MW-22I	1310	2/8/2012	FLS	106	8/28/2012	FLS	Yes	Yes
OU-2	PI-43I	---	---	---	---	---	---	No	No
OU-2	PI-44I	---	---	---	---	---	---	No	No
OU-2	PI-45I	---	---	---	---	---	---	No	No
OU-2	PI-50I	---	---	---	---	---	---	No	No
OU-2	PI-51I	---	---	---	---	---	---	No	No
OU-2	PI-52I	---	---	---	---	---	---	No	No
OU-2	PI-53I	---	---	---	---	---	---	No	No
OU-2	PI-60I	---	---	---	---	---	---	No	No
OU-2	PI-61I	---	---	---	---	---	---	No	No
OU-2	PI-57I	---	---	---	---	---	---	No	No
OU-2	PI-58I	---	---	---	---	---	---	No	No
OU-1	VE1	---	---	---	---	---	---	No	No
OU-1	VE2	---	---	---	---	---	---	No	No
OU-1	VE3	---	---	---	---	---	---	No	No
OU-2	PZ-01S	---	---	---	---	---	---	No	No
OU-2	PZ-01I	---	---	---	---	---	---	No	No
OU-2	PZ-02S	---	---	---	---	---	---	No	No
OU-2	PZ-02I	---	---	---	---	---	---	No	No
OU-2	PZ-04S	---	---	---	---	---	---	No	No
OU-2	PZ-04I	---	---	---	---	---	---	No	No

Notes:

Clay layer thickness approximated using GES boring logs

*MW-10A 1' into clay, does not penetrate clay layer. Upgradient wells MW-17I and MW-17D are not affected by site

🟧	Monitoring Well
⬜	Injection Well
🟪	Gas Injection Well
🟩	Vapor Extraction Well
🟦	Piezometer

Table 9 - Estimated Costs

Formerly ACCO Brands Inc. Site
32-00 Skillman Avenue
Long Island City, New York

	Task	Estimated Costs	Totals
General Site Tasks			
	Project Management	$180,000	
	Remedial Systems Operations Monitoring	$20,000	
	Site Management Plan	$40,000	
	Final Engineering Report	$50,000	
	Annual Environmental Reserve Estimate	$5,000	
			Subtotal: $295,000
OU-1 Tasks			
	TRS Costs	$2,500,000	
	Electrode Installation	$550,000	
	ERH Operation & Electricity	$650,000	
	Well Abandonment	$40,000	
	Monitoring Well Installation	$60,000	
	Remediation Process Monitoring	$80,000	
	SVE Conversion to SSDS	$195,000	
			Subtotal: $4,075,000
OU-2 Tasks			
	In-Situ Biological Remediation	$200,000	
	Remediation Process Monitoring	$70,000	
	Well Abandonment	$40,000	
	SSDS Decommissioning	$40,000	
			Subtotal: $350,000
			Total: $4,720,000

Appendix A – Supplemental Remedial Investigation Report

Former ACCO Brands Site
32-00 Skillman Avenue,
Long Island City, New York
VCP Site Code V00331

SUPPLEMENTAL REMEDIAL INVESTIGATION REPORT

OPERABLE UNIT - 1

Prepared For:

Jim Beam, Inc.
149 Happy Hollow Road
Clermont, KY 40110

FLS Project Number: 10195-001-6

Submitted to:

New York City Department of Environmental Conservation

Division of Environmental Remediation
Region 2 – Long Island City
47-40 21st Street,
Long Island City, NY 11101

February 2014

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1.0 INTRODUCTION

On behalf of Jim Beam Inc., Fleming Lee Shue Inc. (FLS) has prepared this Supplemental Remedial Investigation (SRI) Report for the Former ACCO Brands (Site) located in 32-00 Skillman Avenue, Long Island City, Queens County, New York. Jim Beam Inc. (or its predecessor corporations, ACCO Brands Inc. and Fortune Brands Inc.) entered into a Voluntary Cleanup Agreement (VCA) with the New York State Department of Environmental Conservation (NYSDEC) under the Order of Consent # D2-0020-00-08, dated July 21, 2000. This SRI work was performed in accordance with the June 2013 SRI Workplan, which was approved by NYSDEC on July 1, 2013. The SRI Workplan, NYSDEC approval, and Consent and Agreement Documents are presented in Appendix A.

This section provides the Site history, briefly summarizes previous Site investigations and presents the SRI objectives. Section 2 describes the SRI field investigation activities and Section 3 presents the SRI results. Section 4 discusses the extent and nature of contamination and Section 5 provides the conclusions.

1.1 Site Description

The Site is located at 32-00 Skillman Avenue, Long Island City, New York and is identified as Block 245 and Lot 9 on the New York City Tax Map. The Site is approximately 1.8-acres and is bounded by Skillman Avenue to the north, Queens Boulevard to the south, 32nd Place to the east, and Van Dam Street to the west. Figure 1 shows the Site location.

The subject property is developed with a three-story commercial and light industrial building occupied by multiple tenants, including a newspaper printing facility on the ground floor and a tennis and racquet ball club on the upper floors. The soil and groundwater beneath the basement area is covered under Operable Unit-1 (OU1) of the Voluntary Cleanup Program (VCP) entered into by Jim Beam Inc. with the NYSDEC in October 2000. Figure 2 shows the Site Plan.

1.2 Topography, Geology and Hydrogeology

1.2.1 Topography

Based on information published by the United States Geological Survey 7.5 Minute Series Topographic Map of Brooklyn New York Quadrangle, the Site is located at approximately 10 to 15 feet (ft.) above mean sea level. The topographic gradient of the Site and the surrounding area gradually slopes south- southwest towards Dutch Kills. The Site Location is presented in Figure 1.

1.2.2 Regional Geology

The regional geology of Queens County is comprised of sequences of Wisconsin age Upper Pleistocene glacial moraine (northern part) and outwash (southern part) deposits (sand, gravel, cobbles, silt and clay); glacial-drift materials (lacustrine deposits, till, sand, gravel, and in some areas, fossil plant material disseminated in fine grained deposits); Upper Pleistocene deposits comprised of pre-Sangamon age Jameco gravel unit unconformably overlain by Gardiner's clay of Sangamon age; and Cretaceous age deposits of continental origin consisting of the Raritan Formation, the Magothy Formation – Matawan Group Undifferentiated (Soren 1978). Pre-Cambrian metamorphic bedrock underlying Queens is comprised of folded and faulted Ravenswood Granodiorite, and in some areas, Proterozoic Fordham Gneiss (Roberts – Dolgin 1989).

1.2.3 Local Geology

The Site subsurface consists of interbedded sand and silt units that overlie a clay unit. The sand/silt unit ranges from approximately 33 to 43 ft. in thickness. The underlying clay unit was not penetrated during this investigation, but based upon boring logs from investigations performed by others, it is believed that the clay unit is approximately 5 to 10 ft. in thickness. Both the sand/silt and clay units dip to the south-southwest. A geologic cross-section of the Site is presented in Figure 3.

1.2.4 Hydrogeology

The groundwater table was encountered within the sand stratum at a depth of approximately 14 to 15 ft. below ground surface. Groundwater is inferred to flow south/southwest.

1.3 Site History

The building was constructed in 1950 and was occupied by Jim Beam Inc.'s predecessor corporations, ACCO Brands Inc. and Fortune Brands Inc., in 1952. During ACCO's occupancy, staplers and stapler components were manufactured at the facility and included the use of paints, thinners, solvents and cleaners. The facility ceased operations in September 1999. An inspection of the Site conducted during the facility's closure revealed a small unlined sump in the basement adjacent to a former degreasing operations area. A closer evaluation indicated contamination of trichloroethene (TCE) in the subsurface soils and groundwater.

1.4 Previous Investigations

In July 2000, ACCO Brands Inc. entered into the NYSDEC VCP to investigate and remediate the subsurface contamination identified beneath the basement floor. An on-site investigation was conducted in 2000 and an off-site investigation in 2001. TCE was identified in the soils and groundwater beneath the basement.

The reports and summary of previous investigations conducted at the Site were included in the FLS June 2013 Supplemental Remedial Investigation Work Plan provided in Appendix A.

1.5 Supplemental Remedial Investigation Objectives

A review of the historical groundwater quality has shown a distinct rebound in the concentration of TCE despite several previous efforts to remediate the source. As a result, additional remediation will be necessary. The SRI was performed in an attempt to better clarify where the bulk of the residual TCE remained such that an appropriate final remedy can be designed and implemented. A reliable baseline assessment of the geochemical alteration of the subsurface resulting from the previous treatments was also conducted. Additional information regarding subsurface stratigraphy was also obtained. The SRI activities were completed in accordance with the June 2013 SRI Workplan that was approved by NYSDEC on July 1, 2013

2.0 SUPPLEMENTAL REMEDIAL INVESTIGATION ACTIVITIES

The SRI was conducted between April 11 and November 6, 2013. The activities were conducted in four phases which included; groundwater monitoring, that included aquifer testing and collection of groundwater samples; a geophysical survey; a Membrane Interface Probe/Hydraulic Profiling Tool (MIP/HPT) investigation; and the advancement of eight soil borings and collection of soil samples. All activities conducted during the SRI were performed in accordance with the NYSDEC-approved SRI Workplan, Quality Assurance Project Plan (QAPP) and the Health and Safety Plan (HASP).

2.1 Groundwater Monitoring

2.1.1 Aquifer Testing

On April 24, 2013, slug testing was conducted in two shallow wells (MW-1 and MW-6) and two intermediate wells (MW-1I and MW-6I) to determine the discrete hydraulic conductivity of OU-1 hydrogeologic unit. Slug testing involves displacing a known volume of water from the well and closely measuring the recovery. Specifically falling head slug test was performed. An electronic data logger (In-Situ Inc. Rugged Reader) with a pressure transducer (Schlumberger Micro-Diver) was used to measure the water levels. The hydraulic conductivity was estimated using the Bouwer and Rice Method. The monitoring well locations are presented in Figure 4.

2.1.2 Groundwater Sampling

The analytical data collected in 2003 indicated that the principal suspected source area for the TCE contamination was in the vicinity of well clusters MW-1, MW-3 and MW-6. Groundwater sampling was conducted in this vicinity to provide updated data. The initial groundwater sampling event, conducted on April 24 and 25, 2013, included the collection of groundwater samples from three shallow wells (MW-1, MW-3, and MW-6) and three intermediate wells (MW-1I, MW-3I and MW-6I). The monitoring well locations are presented on Figure 4.

Well purging and groundwater sampling were conducted in accordance with the approved QAPP and HASP. Each well was purged prior to sampling using a low flow peristaltic pump, minimizing turbulence. Each well was purged until groundwater parameters (temperature, pH, dissolved oxygen [DO], conductivity, oxidation reduction potential [ORP] and turbidity) stabilized. Purge rates ranged from 350 and 450 milliliters per minute. Well purging logs are included in Appendix C.

Groundwater samples were collected with a peristaltic pump and dedicated tubing which discharged the groundwater directly into laboratory-prepared pre-labeled containers, which were then placed on ice in an insulated cooler. The groundwater samples were managed in accordance with the NYSDEC Analytical Services Protocol (ASP) and analyzed for Target Compounds List (TCL) volatile organic compounds (VOCs) by EPA Method 8260B.

All investigation-derived waste was stored in covered 55-gallon Department of Transportation approved steel drums which were sealed at the end of each work day. Each drum was labeled with the date, waste type (purge water) and a point of contact.

During this sampling event, medium to coarse grain sediments were observed in the purged groundwater from MW-1 and MW-3. A comparison of well depth from the original well construction showed significant silt accumulations in MW-1 and MW-3. Based on these observations, the groundwater monitoring wells were redeveloped on May 24 and 25, 2013.

The analytical results from the April 2013 event were found to have very low concentrations of VOCs when compared to the historical data. During sampling, the groundwater was found to be stained purple (indicative of residual potassium permanganate [$KMnO_4$], the oxidant previously used for remediation). Research subsequently found that at sites where a chemical oxidant (such as $KMnO_{4)}$ was introduced into the subsurface, there is a significant potential for oxidative transformation of contaminants (“treatment”) to occur after the groundwater samples are collected and analyzed.

Because the well screens span varying lithologies, during purging and sampling, groundwater is pulled from coarser grained zones (where the oxidant may have already treated the VOCs) as well as finer grained zones (where VOCs have been adsorbed and oxidant has not penetrated). This is called a binary mixture of groundwater and has been documented at numerous sites. Not only can residual oxidant “treat” the sample after collection, but heating of the sample, which is part of the analytical process, only further enhances the “treatment.” An

EPA paper detailing the process, as well as a method to collect representative samples, entitled "Groundwater Sample Preservation at In-situ Chemical Oxidation Sites – Recommended Guidelines" (August 2012) is provided in Appendix D.

The monitoring wells were resampled on July 9-11, 2013. The second groundwater sampling event included all the wells previously sampled and MW-7. The samples collected from the second event were preserved in accordance with the EPA Recommended Guidelines for Groundwater Sample Preservation at In-Situ Chemical Oxidation Sites.

Quality assurance/quality control (QA/QC) samples were also collected and consisted of blind field duplicates obtained from MW-7. A field duplicate sample (MW77) was collected by splitting the pump discharge between two sets of sample bottles. Other QA/QC samples consisted of field blank samples and trip blank samples. Trip blank samples were collected and analyzed for VOCs to check for contamination during sampling and transport.

2.2 Geophysical Survey

On April 11, 2013, FLS contracted Diversified Geophysics to conduct a geophysical survey of the Site. The survey was performed to locate and mark subsurface utilities and structures in advance of the drilling associated with the planned MIP and soil borings. A ground-penetrating radar (GPR) and radio frequency/electromagnetic (RF/EM) surveys were performed. The Geophysical Survey Report is presented in Appendix E.

2.3 Membrane Interface Probe/Hydraulic Profiling Tool Investigation

A MIP/HPT investigation was completed to provide additional characterization of the subsurface soils in the vadose and saturated zones and aid in defining the impacts to OU-1 Between June 24 and August 2, 2013, FLS contracted Columbia Technologies Inc. of Baltimore, Maryland and Geosearch Inc. of Fitchburg, Massachusetts, to advance 15 MIP/HPT investigation points. The focus of the investigation was the vicinity of monitoring wells MW-1, MW-3 and MW-6, where the 2003 MIP investigation and more recent groundwater sampling indicated the highest concentration of contaminants were. The MIP/HPT utilizes several detectors; a soil electrical conductivity (EC) tool, a photoionization detector (PID), a flame ionization detector (FID) and an electron capture detector (ECD). The MIP/HPT locations are depicted on Figure 5. The MIP/HPT Subsurface Characterization Investigation report is presented in Appendix F.

In advance of the investigation, a hole was cored through the concrete basement floor at each location. A Geoprobe® 6620M Direct Push Technology rig was used to drive a 24-inch long by 1.5-inch diameter MIP/HPT probe to the targeted depths.

2.4 Soil Boring Installation and Sampling

The analytical data collected in 2003 indicated that the principal suspected source area for the TCE contamination was in the vicinity of well clusters MW-1, MW-3 and MW-6. The MIP/HPT has provided visual mapping and profiles of the subsurface on this area. To provide more information on stratigraphy, contaminant levels and mass estimates, eight soil borings were installed around this vicinity between October 8 through October 11, 2013 and on November 16, 2013. Due to physical limitations (i.e. limited vertical clearance in the basement for bigger rigs) and the challenges imposed by the lithology of the formation (i.e. tough drilling at very tight formation at deeper depths), the soil borings were installed at locations that provided the greatest representation of Site. The soil borings SB-1, SB-9, SB-10, SB-11, SB-12, SB-13, SB-14, SB-15, located in the vicinity of MW-1, MW-3 and MW-6, were successfully installed while soil borings SB-2 through SB-8, located at the periphery of wells MW-1, MW-3 and MW-6, were not installed.

Continuous soil samples were collected using a Geoprobe® 6620M drill rig with a dedicated 5 ft. DT21/22 PVC liner sections. Soils were field screened for volatile organic vapors using a PID and samples were collected from the soil/groundwater interface, the highest observed MIP/HPT reading, the highest observed PID reading and from any major lithological change (i.e. sand/silt and silt/clay interface). Soil boring logs, detailing all the observations and lithological description, are provided in Appendix G. The soil boring locations are shown on Figure 6.

3.0 SUPPLEMENTAL REMEDIAL INVESTIGATION RESULTS

3.1 Groundwater Monitoring

3.1.1 Aquifer Testing

Slug tests were conducted in two shallow wells (MW-1 and MW-6) and two intermediate wells (MW-1I and MW-6I) to determine the discrete vertical hydraulic conductivity of OU-1 hydrogeologic units. An analysis of the slug test results indicates calculated hydraulic conductivities ranging from 4.6 x 10^{-4} centimeter per second (cm/s) to 7.4 x 10^{-4} cm/s in the shallow wells and 1.6 x10^{-3} cm/s to 2.0 x 10^{-3} cm/s in the intermediate wells. The results of aquifer testing are presented in Appendix H. The results were generated using the Bouwer and Rice Method (Bouwer and Rice, 1976).

3.1.2 Groundwater Analytical Results

The groundwater analytical results were compared to NYSDEC Technical Operational Guidance Series 1.1.1 Ambient Water Quality Standards and Guidance Values (Groundwater Standards). The groundwater analytical results are presented in Table 1 and the laboratory reports are provided in Appendix I.

Total VOC concentrations in groundwater ranged from 6.7 microgram per liter (µg/L) in the sample from monitoring well MW-1(I) to 84,716.74 µg/L in the sample from monitoring well MW-3. Chlorinated VOCs were detected above Groundwater Standards in most of the samples. TCE was detected above the Groundwater Standards in all of the samples, with the greatest concentration observed at MW-3 (84,300 µg/L), MW-6(1) (24,800 µg/L) and MW-7(37,600 µg/L). PCE was detected above Groundwater Standards in the samples from monitoring wells MW-3 (158 µg/L), MW-6(I) (39.2 µg/L) and MW-7 field duplicate - MW-77 (46.5 µg/L). The degradation compound, cis-1,2 DCE was detected above Groundwater Standards in the samples from monitoring wells MW-6(I) (507 µg/L) and MW-7 (513 µg/L). Other organochlorides [carbon tetrachloride (7 µg/L), chloroform (15.4 µg/L), 1,2-dichloroethane (9.1 µg/L), 1,1,1-trichloroethane (36.3 µg/L)] and petroleum hydrocarbons (benzene [1.1 µg/L], toluene [8.7 µg/L]) were at concentrations exceeding the Groundwater Standards in the sample from monitoring well MW-3.

3.2 Geophysical Survey Results

The GPR and RF/EM Survey were conducted to map any subsurface utilities that may disrupt the installation and measurements of the MIP/HPT. All found subsurface utilities were traced and marked with paint on the floor of OU1. Any MIP-HPT points that were positioned in close proximity to the utilities were moved. Measured anomalies did not indicate large subsurface structures indicative of an underground storage tank. The GPR and RF/EM Survey Report is presented in Appendix E.

3.3 Membrane Interface Probe / Hydraulic Profiling Results

The MIP/HPT investigation was conducted to provide additional characterization of the subsurface soils and define the impacts to OU-1. The MIP/HPT investigation borings were advanced to depths ranging from 34.25 to 45.9 ft. below ground surface, just above the clay unit. The MIP locations are shown on Figure 5.

Based on the HPT measurements, the static groundwater level was between 14 and 15 ft. below ground surface. The EC measurements indicated that the subsurface consists of interbedded sand and silt units that overlie a clay unit. An increase in EC responses was recorded starting at 12 ft. below ground surface which is indicative of change in subsurface formation from coarser grained particles to finer grained particles.

The MIP investigation borings, MIP-01 through MIP-12, were placed in the vicinity of wells MW-1, MW-3 and MW-6. The results of the MIP investigation indicated that the highest measurable concentration of impacts lie in this vicinity. The highest ECD measurements were recorded at locations MIP-01 through MIP-11. The highest PID measurements were recorded at locations MIP-03, MIP-04, MIP -08, MIP-10 and MIP-11. The highest FID measurements were recorded at MIP-01, MIP-03, MIP-04, MIP-08, MIP-10 and MIP-11.

The MIP/HPT investigation borings were also advanced to vertically define the impacts in the vicinity of wells MW-1, MW-3 and MW-6. In this vicinity, the highest ECD, PID and FID measurements were between 22 and 38 ft. below ground surface. When analyzed with the corresponding HPT and EC measurements, the highest measurable impacts were found to be within the finer grained silt formation. A distinct drop off of ECD, PID and FID readings were observed with depth as the underlying clay unit was approached.

The results of the MIP/HPT investigation are provided in Appendix F MIP/HPT Subsurface Characterization Report.

3.4 Soil screening and Analytical Results

To provide more information on stratigraphy, contaminant distribution and mass estimates, eight soil borings were installed around the vicinity of wells MW-1, MW-3 and MW-6. Continuous soil samples were collected from all borings. The soils were field screened for VOCs using a PID. Soil samples were collected from the soil/groundwater interface, the highest observed MIP/HPT reading, the highest observed PID reading and from any major lithological change (i.e. sand/silt and silt/clay interface).

There were three major lithological features observed. A coarse-grained sand stratum that range in thickness from 12 to 22 ft. that is underlain by a silt stratum that range in thickness from 18 to 22 ft. interbedded by 1 to 6 ft. thick silty sand and sand lenses. A clay layer was encountered at approximately 33 to 43 ft. below ground surface and is inferred to be a continuous impermeable barrier underlying the silt stratum. The clay unit was not penetrated during this investigation. The soil boring logs are provided in Appendix G. The soil boring locations are shown on Figure 6.

The soil analytical results were compared to the NYSDEC Part 375 Restricted Use Soil Cleanup Objectives for the Protection of Groundwater Resources (RUSCOs-PGW). The soil analytical results are presented in Table 2 and the laboratory reports are provided in Appendix I.

Chlorinated VOCs were detected above RUSCO-PGW in soil samples collected from intervals approximately 25 ft. to 46 ft. below ground surface. TCE was detected above the RUSCOs-PGW in SB-9 (25 - 29.5 ft.), SB-10 (32 - 33 ft. and 45 - 46 ft.), SB-11 (35 ft.), SB-12 (25 - 26 ft. and 36-37 ft.) , SB-13 (32-33 ft.) and SB-14 (29-30, 33-34, 36-37 and 41-42 ft.), with the greatest concentration observed at SB-12 (25-26 ft.). Figure 7 shows the TCE concentrations superimposed on the geologic cross section.

The degradation compound cis-1,2 DCE was detected above RUSCOs -PGW in SB-9 (25 -26 ft.), SB-12 (25-26 ft.) and SB-12(36-37 ft.). Petroleum hydrocarbons were detected in SB-12 (25-26 ft.).

4.0 NATURE AND EXTENT OF CONTAMINATION

This section discusses the nature of contamination and provides a definition of Chlorinated VOC impacts, specifically TCE, based on the MIP/HPT and soil and groundwater characterization findings.

The groundwater analytical results indicate the greatest concentrations of dissolved phase TCE in the area of monitoring wells MW-1, MW-3 and MW-6. The soil sample analytical results, as well as the MIP/HPT investigation findings similarly indicate that the greatest TCE impacts are present in the vicinity of monitoring wells MW-1, MW-3 and MW-6 and that vertically, the highest impacts were found to be within the finer grained silt formation. Silt particles are more cohesive and inter-particle forces are stronger than sand (Palmer 1996). It is believed that the TCE is adsorbed in the tighter silt formation.

5.0 CONCLUSIONS

The objective of the SRI was to obtain a limited amount of data necessary to provide additional Site characterization to be used to design a final remedy of the Site. The SRI results yield the following conclusions:

- Based on the MIP /HPT and the groundwater monitoring findings, static groundwater level is approximately 14 to 15 ft. below ground surface
- The hydraulic conductivities ranged from 4.6×10^{-4} cm/s to 7.4×10^{-4} cm/s in the shallow wells and from 1.6×10^{-3} cm/s to 2.0×10^{-3} cm/s in the intermediate wells.
- The subsurface lithology consists of three major lithological features. A sand stratum that ranges in thickness from 12 to 22 ft. that is underlain by a silt stratum that ranges in thickness from 18 to 22 ft. with interbedded 1 to 6 ft. thick silty sand and sand lenses. A basal clay layer was encountered at approximately 33 to 43 ft. below ground surface. The clay layer is continuous throughout the area of investigation.
- The groundwater analytical results indicate the presence of dissolved phase VOCs, primarily TCE at concentrations as high as 84,300 µg/L.

- The MIP/HPT investigation findings indicate that the greatest TCE impacts are present in the vicinity of monitoring wells MW-1, MW-3 and MW-6 and that vertically, the highest impacts were found to be within the finer grained silt formation
- Based on the soil analytical results, chlorinated VOC impacts were detected between 25 to 46 ft.below ground surface within the tighter silt formation.

Based upon the results of the SRI, a feasibility study should be conducted to evaluate remedial alternatives and select a final remedy.

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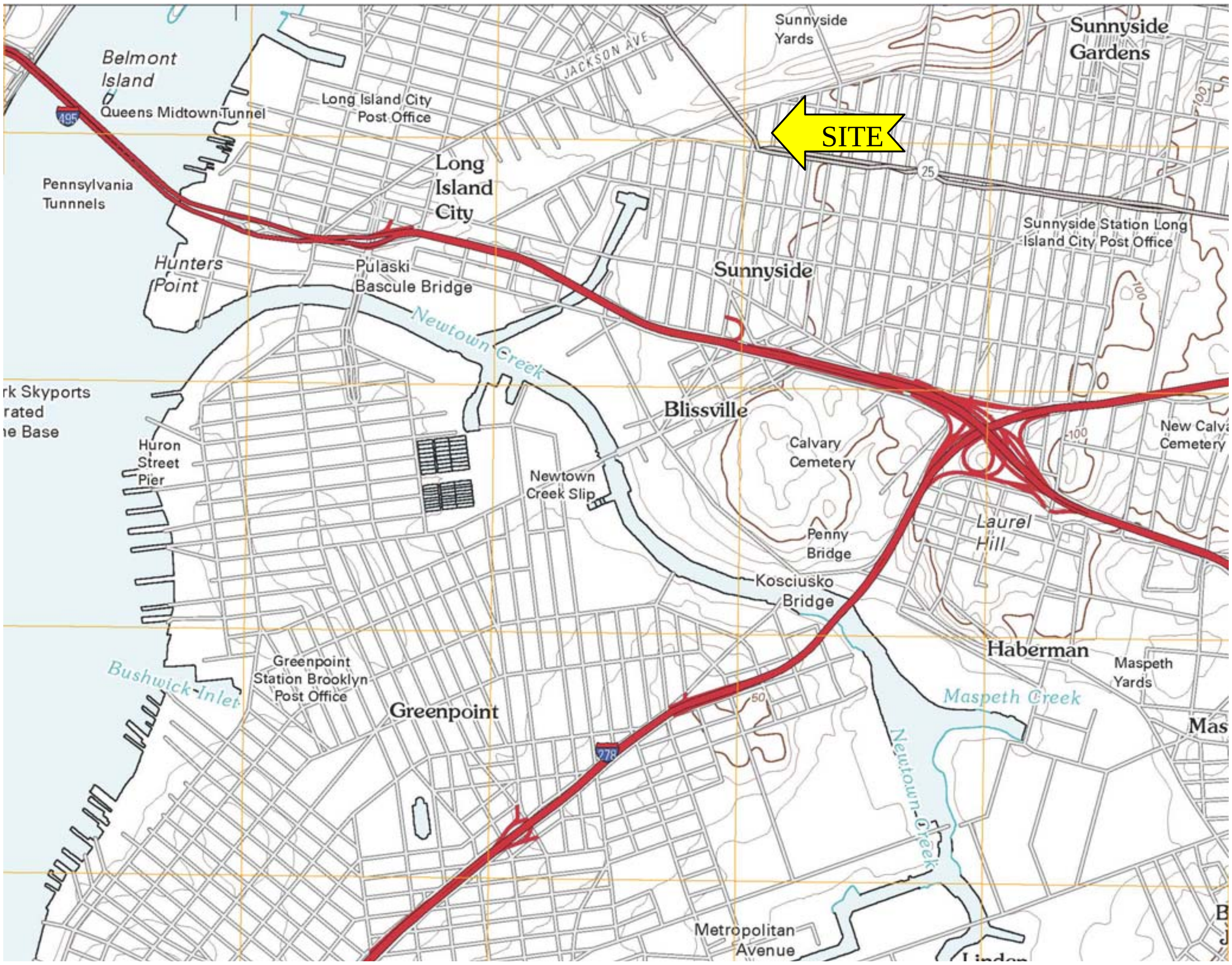
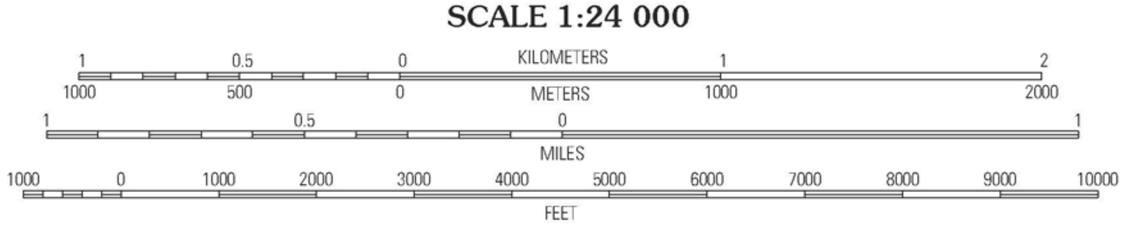
FIGURES





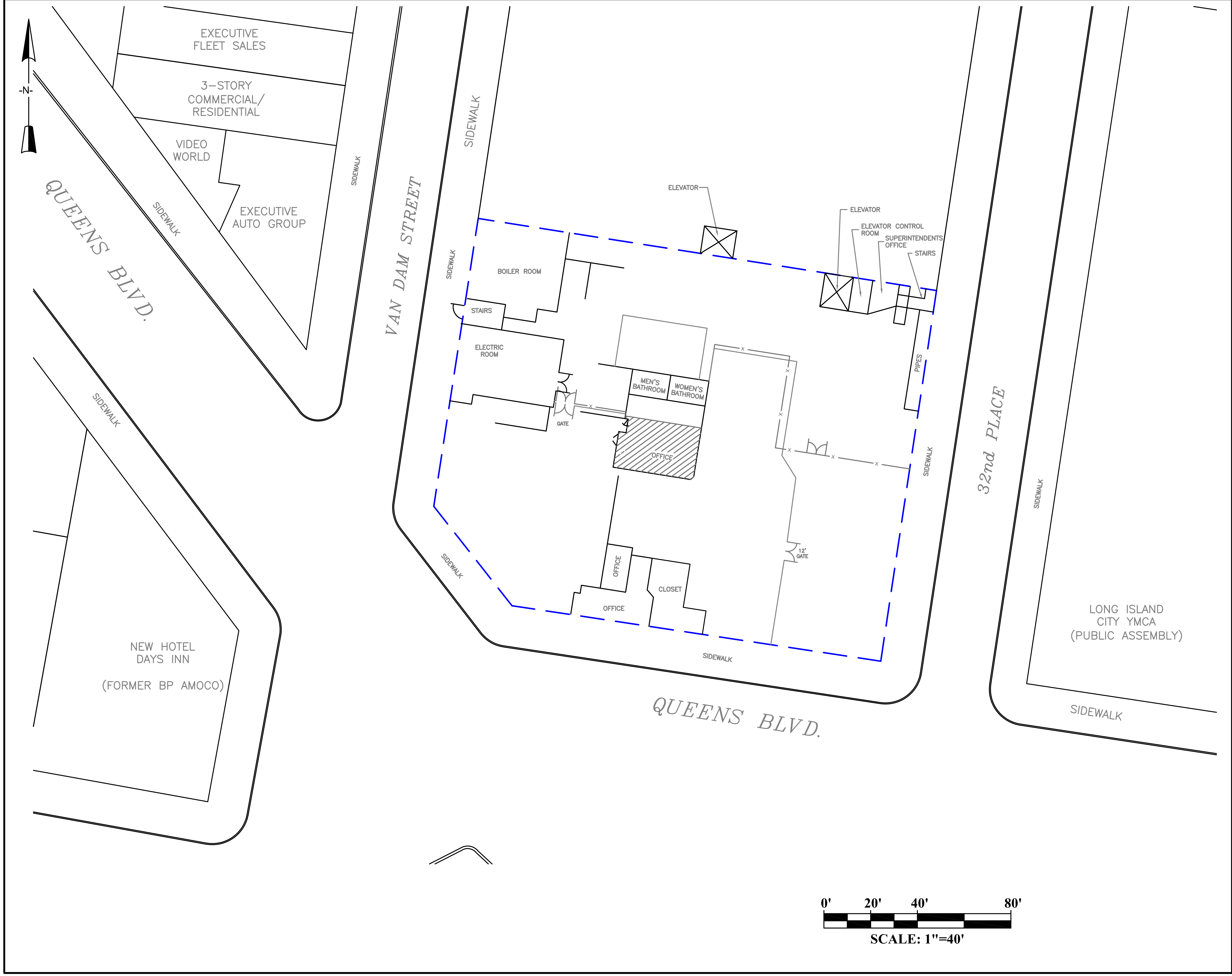
Site: Brooklyn, New York 7.5 Minute series USGS Topographic Map (79287)
Obtained from United States Geological Survey topography compiled 2010

FIGURE 1: SITE LOCATION

SITE: FORMER ACCO BRANDS
32-00 SKILLMAN AVENUE
LONG ISLAND CITY, NEW YORK

Fleming
Lee Shue

Environmental Management & Consulting, 158 West 29th Street, 9th Fl., New York, NY 10001



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Environmental Management & Consulting

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New York, NY 10001

32-00 Skillman Avenue
Long Island City, NY

FIGURE 2

SITE PLAN

Date
January 2014

Project Number
10195-001

LEGEND

▭ OPERABLE UNIT –1

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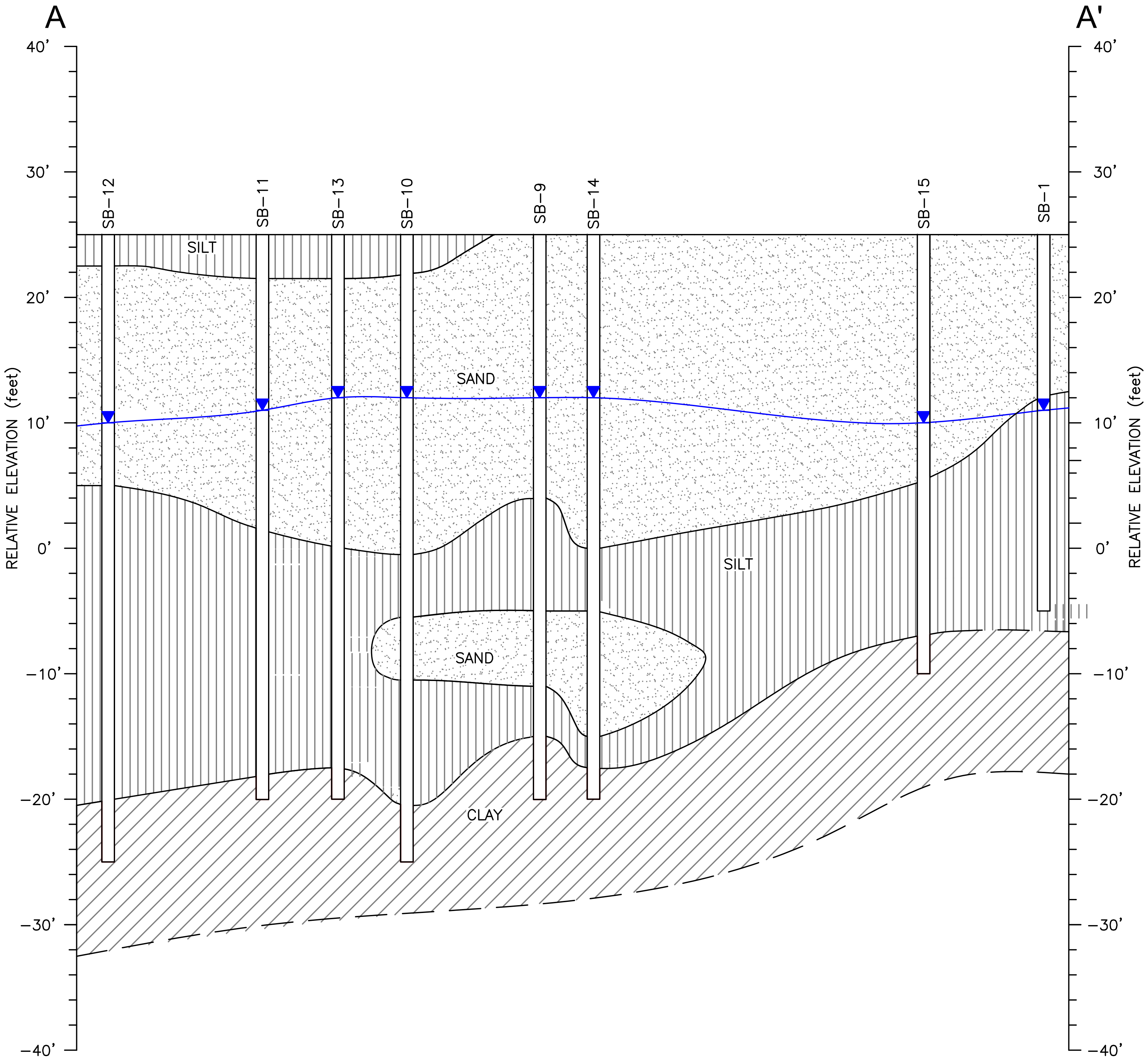

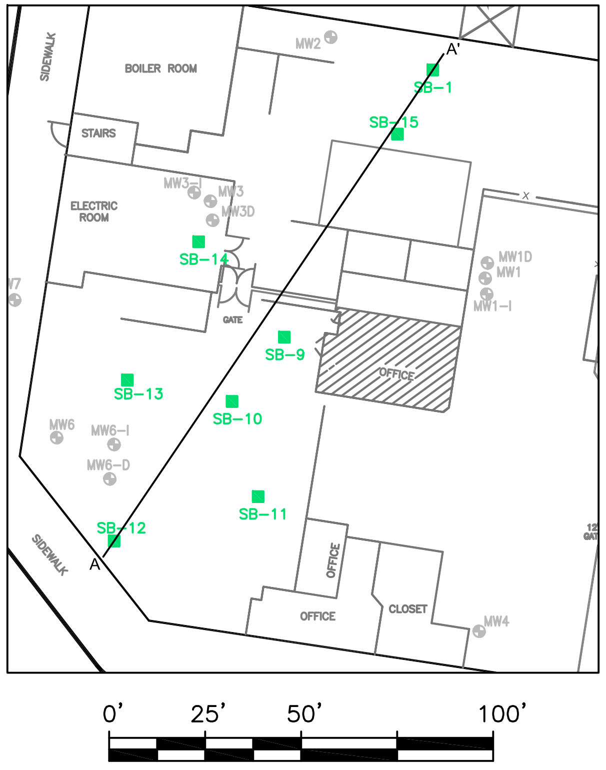

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LEGEND

■ SB-11	SOIL BORING LOCATION
⊕ MW16-I	MONITORING WELL LOCATION
▨	SAND
▥	SILT
▨	CLAY
- - -	INFERRED Source: First Environment RAR April 2001 and GES RAWP August 2003
▼	WATER TABLE (OCTOBER 2013)

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New York, NY 10001

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Long Island City, NY

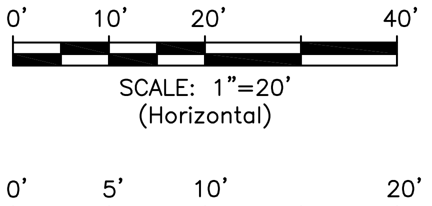
FIGURE 3

GEOLOGIC CROSS SECTION

Date
January 2014

Project Number
10195-001

SCALES



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(Horizontal)

SCALE: 1"=10'
(Vertical)

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Long Island City, NY

FIGURE 4

MONITORING WELL LOCATIONS

Date
January 2014

Project Number
10195-001

LEGEND

▭ OPERABLE UNIT –1

MW3 ● MONITORING WELL SAMPLED

MW3 ◐ MONITORING WELL NOT SAMPLED

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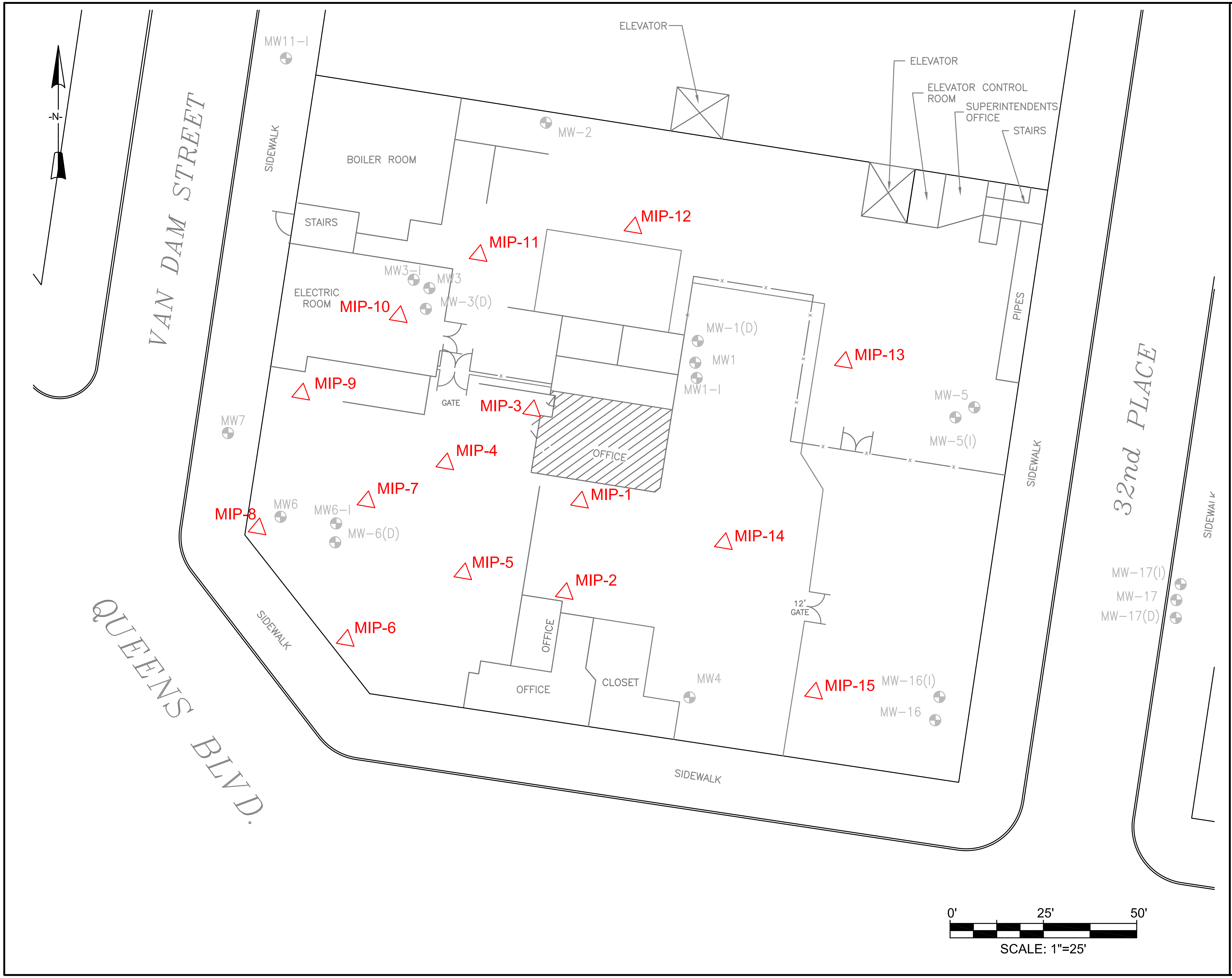

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FIGURE 5

MEMBRANE INTERFACE PROBE LOCATIONS

Date
January 2014

Project Number
10195-001

LEGEND

△ MIP	MEMBRANE INTERFACE PROBE LOCATION
MW3 ⊕	EXISTING MONITORING WELL

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Long Island City, NY

FIGURE 6

SOIL BORING LOCATIONS

Date
January 2014

Project Number
10195-001

LEGEND

⬚	OPERABLE UNIT -1
SB-1 🟩	SOIL BORING LOCATION
MW-5 ◒	EXISTING MONITORING WELL LOCATION

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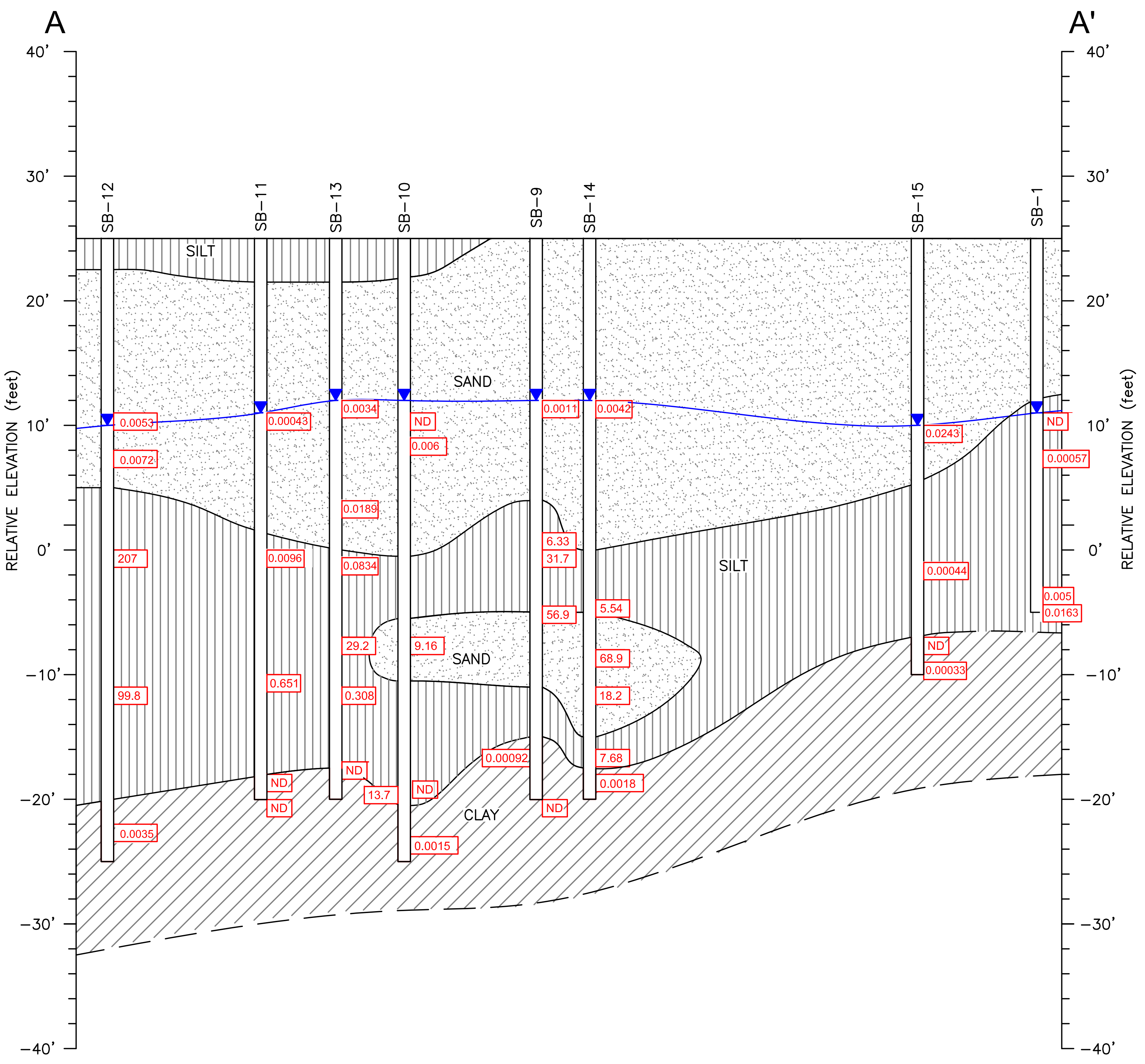

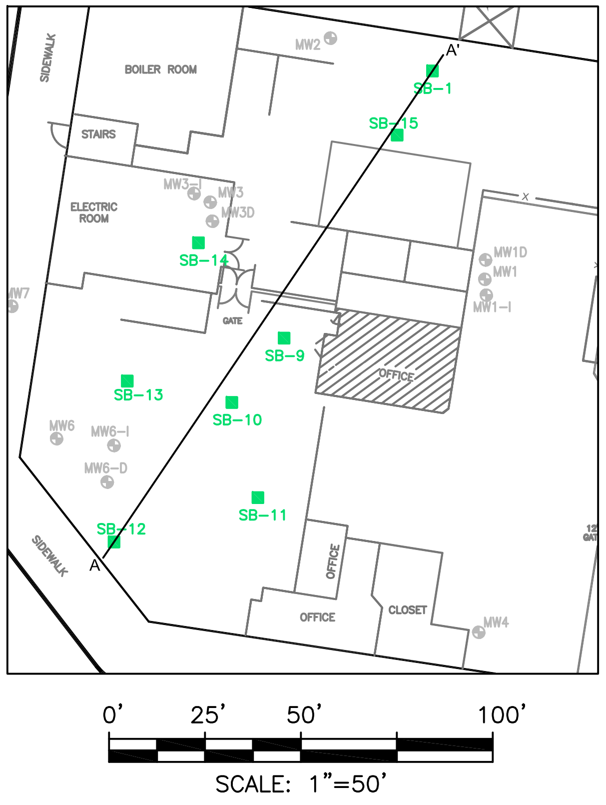

LEGEND

🟩 SB−11	SOIL BORING LOCATION
◐ MW16−I	MONITORING WELL LOCATION
▩	SAND
▥	SILT
▨	CLAY
— — —	INFERRED Source: First Environment RAR April 2001 and GES RAWP August 2003
▼	WATER TABLE (OCTOBER 2013)
7.68	TCE CONCENTRATION IN SOIL SAMPLES (mg/kg)
ND	NOT DETECTED ABOVE METHOD DETECTION LIMIT

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New York, NY 10001

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Long Island City, NY

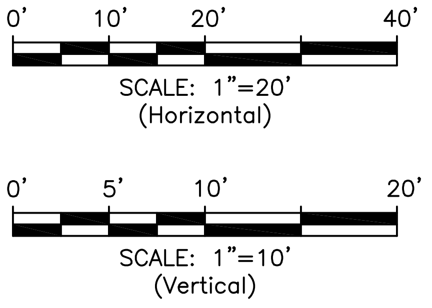
FIGURE 7

TRICHLOROETHENE IN SOIL SAMPLES

Date
January 2014

Project Number
10195-001

SCALES



TABLES

Table 1 - Volatile Organic Compounds in Groundwater

FORMER ACCO BRANDS SITE
VCP # V00331
32-00 Skilllman Avenue
Long Island City, New York

Client Sample ID:		NY TOGS Class GA GW Standards (NYSDEC 6/2004)[1]	MW-1		MW-1(I)		MW-3		MW-3(I)		MW-6		MW-6(I)	
Lab Sample ID:			JB41585-1		JB41585-2		JB41766-1		JB41585-3		JB41828-1		JB41828-2	
Date Sampled:			7/9/2013		7/9/2013		7/10/2013		7/9/2013		7/11/2013		7/11/2013	
Matrix:			Results	Q	Results	Q	Results	Q	Results	Q	Results	Q	Results	Q
Acetone	ug/l	-	ND (3.3)		ND (3.3)		29.9		ND (3.3)		580		ND (330)	
Benzene	ug/l	1	ND (0.24)		ND (0.24)		**1.1**	**J**	ND (0.24)		ND (0.24)		ND (24)	
Bromochloromethane	ug/l	5	ND (0.30)		ND (0.30)		ND (0.60)		ND (0.30)		ND (0.30)		ND (30)	
Bromodichloromethane	ug/l	-	ND (0.21)		ND (0.21)		ND (0.41)		ND (0.21)		ND (0.21)		ND (21)	
Bromoform	ug/l	-	ND (0.21)		ND (0.21)		ND (0.43)		ND (0.21)		ND (0.21)		ND (21)	
Bromomethane	ug/l	5	ND (0.22)		ND (0.22)		ND (0.44)		ND (0.22)		ND (0.22)		ND (22)	
2-Butanone (MEK)	ug/l	-	ND (2.4)		ND (2.4)		ND (4.7)		ND (2.4)		122		ND (240)	
Carbon disulfide	ug/l	60	ND (0.19)		ND (0.19)		ND (0.38)		ND (0.19)		ND (0.19)		ND (19)	
Carbon tetrachloride	ug/l	5	ND (0.22)		ND (0.22)		**7**		ND (0.22)		ND (0.22)		ND (22)	
Chlorobenzene	ug/l	5	ND (0.23)		ND (0.23)		ND (0.46)		ND (0.23)		ND (0.23)		ND (23)	
Chloroethane	ug/l	5	ND (0.26)		ND (0.26)		ND (0.52)		ND (0.26)		ND (0.26)		ND (26)	
Chloroform	ug/l	7	0.75	J	0.74	J	**15.4**		0.68	J	1.7		ND (20)	
Chloromethane	ug/l	5	ND (0.21)		ND (0.21)		ND (0.41)		ND (0.21)		ND (0.21)		ND (21)	
Cyclohexane	ug/l	-	ND (0.35)		ND (0.35)		ND (0.71)		ND (0.35)		ND (0.35)		ND (35)	
1,2-Dibromo-3-chloropropane	ug/l	0.04	ND (0.54)		ND (0.54)		ND (1.1)		ND (0.54)		ND (0.54)		ND (54)	
Dibromochloromethane	ug/l	-	ND (0.14)		ND (0.14)		ND (0.27)		ND (0.14)		ND (0.14)		ND (14)	
1,2-Dibromoethane	ug/l	0.0006	ND (0.20)		ND (0.20)		ND (0.39)		ND (0.20)		ND (0.20)		ND (20)	
1,2-Dichlorobenzene	ug/l	3	ND (0.22)		ND (0.22)		0.97	J	ND (0.22)		ND (0.22)		ND (22)	
1,3-Dichlorobenzene	ug/l	3	ND (0.22)		ND (0.22)		ND (0.45)		ND (0.22)		ND (0.22)		ND (22)	
1,4-Dichlorobenzene	ug/l	3	ND (0.30)		ND (0.30)		ND (0.60)		ND (0.30)		ND (0.30)		ND (30)	
Dichlorodifluoromethane	ug/l	5	ND (0.27)		ND (0.27)		ND (0.54)		ND (0.27)		ND (0.27)		ND (27)	
1,1-Dichloroethane	ug/l	5	0.22	J	ND (0.11)		0.48	J	ND (0.11)		ND (0.11)		ND (11)	
1,2-Dichloroethane	ug/l	0.6	ND (0.26)		ND (0.26)		**9.1**		ND (0.26)		ND (0.26)		ND (26)	
1,1-Dichloroethene	ug/l	5	ND (0.19)		ND (0.19)		1.8	J	ND (0.19)		ND (0.19)		ND (19)	
cis-1,2-Dichloroethene	ug/l	5	ND (0.19)		ND (0.19)		1.6	J	ND (0.19)		ND (0.19)		**507**	
trans-1,2-Dichloroethene	ug/l	5	ND (0.21)		ND (0.21)		ND (0.42)		ND (0.21)		ND (0.21)		ND (21)	
1,2-Dichloropropane	ug/l	1	ND (0.48)		ND (0.48)		ND (0.97)		ND (0.48)		ND (0.48)		ND (48)	
cis-1,3-Dichloropropene	ug/l	-	ND (0.21)		ND (0.21)		ND (0.41)		ND (0.21)		ND (0.21)		ND (21)	
trans-1,3-Dichloropropene	ug/l	-	ND (0.19)		ND (0.19)		ND (0.38)		ND (0.19)		ND (0.19)		ND (19)	
1,4-Dioxane	ug/l	-	ND (75)		ND (75)		ND (150)		ND (75)		ND (75)		ND (7500)	
Ethylbenzene	ug/l	5	ND (0.23)		ND (0.23)		0.89	J	ND (0.23)		ND (0.23)		ND (23)	
Freon 113	ug/l	5	ND (0.53)		ND (0.53)		ND (1.1)		ND (0.53)		ND (0.53)		ND (53)	
2-Hexanone	ug/l	-	ND (1.1)		ND (1.1)		ND (2.3)		ND (1.1)		25		ND (110)	
Isopropylbenzene	ug/l	5	ND (0.45)		ND (0.45)		ND (0.89)		ND (0.45)		ND (0.45)		ND (45)	
Methyl Acetate	ug/l	-	ND (1.2)		ND (1.2)		ND (2.3)		ND (1.2)		ND (1.2)		ND (120)	
Methylcyclohexane	ug/l	-	ND (0.26)		ND (0.26)		ND (0.52)		ND (0.26)		5.5		ND (26)	
Methyl Tert Butyl Ether	ug/l	10	ND (0.16)		ND (0.16)		ND (0.33)		ND (0.16)		ND (0.16)		ND (16)	
4-Methyl-2-pentanone(MIBK)	ug/l	-	ND (0.83)		ND (0.83)		ND (1.7)		ND (0.83)		2.2	J	ND (83)	
Methylene chloride	ug/l	5	ND (0.70)		ND (0.70)		1.9	J	ND (0.70)		ND (0.70)		ND (70)	
Styrene	ug/l	5	ND (0.21)		ND (0.21)		ND (0.43)		ND (0.21)		ND (0.21)		ND (21)	
1,1,2,2-Tetrachloroethane	ug/l	5	ND (0.21)		ND (0.21)		ND (0.43)		ND (0.21)		ND (0.21)		ND (21)	
Tetrachloroethene	ug/l	5	ND (0.28)		ND (0.28)		**158**		ND (0.28)		ND (0.28)		**39.2**	**J**
Toluene	ug/l	5	ND (0.23)		ND (0.23)		**8.7**		ND (0.23)		ND (0.23)		ND (23)	
1,2,3-Trichlorobenzene	ug/l	5	ND (0.28)		ND (0.28)		ND (0.56)		ND (0.28)		ND (0.28)		ND (28)	
1,2,4-Trichlorobenzene	ug/l	5	ND (0.20)		ND (0.20)		ND (0.41)		ND (0.20)		ND (0.20)		ND (20)	
1,1,1-Trichloroethane	ug/l	5	ND (0.24)		ND (0.24)		**36.3**		ND (0.24)		ND (0.24)		ND (24)	
1,1,2-Trichloroethane	ug/l	1	ND (0.29)		ND (0.29)		**141**		ND (0.29)		ND (0.29)		ND (29)	
Trichloroethene	ug/l	5	**9.6**		**9.2**		**84300**		**9.5**		**7.3**		**24800**	
Trichlorofluoromethane	ug/l	5	ND (0.27)		ND (0.27)		ND (0.53)		ND (0.27)		ND (0.27)		ND (27)	
Vinyl chloride	ug/l	2	ND (0.21)		ND (0.21)		ND (0.41)		ND (0.21)		ND (0.21)		ND (21)	
m,p-Xylene	ug/l	-	ND (0.42)		ND (0.42)		1.3	J	ND (0.42)		ND (0.42)		ND (42)	
o-Xylene	ug/l	5	ND (0.24)		ND (0.24)		ND (0.48)		ND (0.24)		ND (0.24)		ND (24)	
Xylene (total)	ug/l	5	ND (0.24)		ND (0.24)		1.3	J	ND (0.24)		ND (0.24)		ND (24)	
TOTAL VOCS			10.57		9.94		84716.74		10.18		743.7		25346.2	

Notes:

NY TOGS Class GA GW Standard = Class GA Standards and Guidance Values (NYSDEC's June 1998 Division of Water Technical and Operational Guidance Series plus amendments 6/2004)

Q = Qualifier

ND= Not detected above method detection limit

(0.42) = Method detection limit

J = Estimated Value

ug/L = micrograms per liter

Yellow shade with black text values exceed
NY TOGS Class GA GW Standard

Table 1 - Volatile Organic Compounds in Groundwater

FORMER ACCO BRANDS SITE
VCP # V00331
32-00 Skilllman Avenue
Long Island City, New York

Client Sample ID:		**NY TOGS Class GA GW Standards (NYSDEC 6/2004)[1]**	**MW-7**		**MW-77**		**FB071013**		**TRIP BLANK**		**TRIP BLANK**		**TRIP BLANK**	
Lab Sample ID:			**JB41766-3**		**JB41766-3A**		**JB41766-4**		**JB41585-4**		**JB41766-5**		**JB41828-3**	
Date Sampled:			**7/10/2013**		**7/10/2013**		**7/10/2013**		**7/9/2013**		**7/10/2013**		**7/11/2013**	
Matrix:			**Results**	**Q**	**Results**	**Q**	**Results**	**Q**	**Results**	**Q**	**Results**	**Q**	**Results**	**Q**
Acetone	ug/l	-	ND (660)		ND (330)		8.6	J	ND (3.3)		ND (3.3)		ND (3.3)	
Benzene	ug/l	1	ND (47)		ND (24)		ND (0.24)		ND (0.24)		ND (0.24)		ND (0.24)	
Bromochloromethane	ug/l	5	ND (60)		ND (30)		ND (0.30)		ND (0.30)		ND (0.30)		ND (0.30)	
Bromodichloromethane	ug/l	-	ND (41)		ND (21)		ND (0.21)		ND (0.21)		ND (0.21)		ND (0.21)	
Bromoform	ug/l	-	ND (43)		ND (21)		ND (0.21)		ND (0.21)		ND (0.21)		ND (0.21)	
Bromomethane	ug/l	5	ND (44)		ND (22)		ND (0.22)		ND (0.22)		ND (0.22)		ND (0.22)	
2-Butanone (MEK)	ug/l	-	ND (470)		ND (240)		ND (2.4)		ND (2.4)		ND (2.4)		ND (2.4)	
Carbon disulfide	ug/l	60	ND (38)		ND (19)		0.55	J	ND (0.19)		ND (0.19)		ND (0.19)	
Carbon tetrachloride	ug/l	5	ND (43)		ND (22)		ND (0.22)		ND (0.22)		ND (0.22)		ND (0.22)	
Chlorobenzene	ug/l	5	ND (46)		ND (23)		ND (0.23)		ND (0.23)		ND (0.23)		ND (0.23)	
Chloroethane	ug/l	5	ND (52)		ND (26)		ND (0.26)		ND (0.26)		ND (0.26)		ND (0.26)	
Chloroform	ug/l	7	ND (41)		ND (20)		ND (0.20)		ND (0.20)		ND (0.20)		ND (0.20)	
Chloromethane	ug/l	5	ND (41)		ND (21)		ND (0.21)		ND (0.21)		ND (0.21)		ND (0.21)	
Cyclohexane	ug/l	-	ND (71)		ND (35)		ND (0.35)		ND (0.35)		ND (0.35)		ND (0.35)	
1,2-Dibromo-3-chloropropane	ug/l	0.04	ND (110)		ND (54)		ND (0.54)		ND (0.54)		ND (0.54)		ND (0.54)	
Dibromochloromethane	ug/l	-	ND (27)		ND (14)		ND (0.14)		ND (0.14)		ND (0.14)		ND (0.14)	
1,2-Dibromoethane	ug/l	0.0006	ND (39)		ND (20)		ND (0.20)		ND (0.20)		ND (0.20)		ND (0.20)	
1,2-Dichlorobenzene	ug/l	3	ND (43)		ND (22)		ND (0.22)		ND (0.22)		ND (0.22)		ND (0.22)	
1,3-Dichlorobenzene	ug/l	3	ND (45)		ND (22)		ND (0.22)		ND (0.22)		ND (0.22)		ND (0.22)	
1,4-Dichlorobenzene	ug/l	3	ND (60)		ND (30)		ND (0.30)		ND (0.30)		ND (0.30)		ND (0.30)	
Dichlorodifluoromethane	ug/l	5	ND (54)		ND (27)		ND (0.27)		ND (0.27)		ND (0.27)		ND (0.27)	
1,1-Dichloroethane	ug/l	5	ND (21)		ND (11)		ND (0.11)		ND (0.11)		ND (0.11)		ND (0.11)	
1,2-Dichloroethane	ug/l	0.6	ND (52)		ND (26)		ND (0.26)		ND (0.26)		ND (0.26)		ND (0.26)	
1,1-Dichloroethene	ug/l	5	ND (38)		ND (19)		ND (0.19)		ND (0.19)		ND (0.19)		ND (0.19)	
cis-1,2-Dichloroethene	ug/l	5	**513**		**590**		ND (0.19)		ND (0.19)		ND (0.19)		ND (0.19)	
trans-1,2-Dichloroethene	ug/l	5	ND (42)		ND (21)		ND (0.21)		ND (0.21)		ND (0.21)		ND (0.21)	
1,2-Dichloropropane	ug/l	1	ND (97)		ND (48)		ND (0.48)		ND (0.48)		ND (0.48)		ND (0.48)	
cis-1,3-Dichloropropene	ug/l	-	ND (41)		ND (21)		ND (0.21)		ND (0.21)		ND (0.21)		ND (0.21)	
trans-1,3-Dichloropropene	ug/l	-	ND (38)		ND (19)		ND (0.19)		ND (0.19)		ND (0.19)		ND (0.19)	
1,4-Dioxane	ug/l	-	ND (15000)		ND (7500)		ND (75)		ND (75)		ND (75)		ND (75)	
Ethylbenzene	ug/l	5	ND (46)		ND (23)		ND (0.23)		ND (0.23)		ND (0.23)		ND (0.23)	
Freon 113	ug/l	5	ND (110)		ND (53)		ND (0.53)		ND (0.53)		ND (0.53)		ND (0.53)	
2-Hexanone	ug/l	-	ND (230)		ND (110)		ND (1.1)		ND (1.1)		ND (1.1)		ND (1.1)	
Isopropylbenzene	ug/l	5	ND (89)		ND (45)		ND (0.45)		ND (0.45)		ND (0.45)		ND (0.45)	
Methyl Acetate	ug/l	-	ND (230)		ND (120)		ND (1.2)		ND (1.2)		ND (1.2)		ND (1.2)	
Methylcyclohexane	ug/l	-	ND (52)		ND (26)		ND (0.26)		ND (0.26)		ND (0.26)		ND (0.26)	
Methyl Tert Butyl Ether	ug/l	10	ND (33)		ND (16)		ND (0.16)		ND (0.16)		ND (0.16)		ND (0.16)	
4-Methyl-2-pentanone(MIBK)	ug/l	-	ND (170)		ND (83)		ND (0.83)		ND (0.83)		ND (0.83)		ND (0.83)	
Methylene chloride	ug/l	5	ND (140)		ND (70)		ND (0.70)		ND (0.70)		ND (0.70)		ND (0.70)	
Styrene	ug/l	5	ND (43)		ND (21)		ND (0.21)		ND (0.21)		ND (0.21)		ND (0.21)	
1,1,2,2-Tetrachloroethane	ug/l	5	ND (43)		ND (21)		ND (0.21)		ND (0.21)		ND (0.21)		ND (0.21)	
Tetrachloroethene	ug/l	5	ND (56)		**46.5**	**J**	ND (0.28)		ND (0.28)		ND (0.28)		ND (0.28)	
Toluene	ug/l	5	ND (45)		ND (23)		0.37	J	ND (0.23)		ND (0.23)		ND (0.23)	
1,2,3-Trichlorobenzene	ug/l	5	ND (56)		ND (28)		ND (0.28)		ND (0.28)		ND (0.28)		ND (0.28)	
1,2,4-Trichlorobenzene	ug/l	5	ND (41)		ND (20)		ND (0.20)		ND (0.20)		ND (0.20)		ND (0.20)	
1,1,1-Trichloroethane	ug/l	5	ND (47)		ND (24)		ND (0.24)		ND (0.24)		ND (0.24)		ND (0.24)	
1,1,2-Trichloroethane	ug/l	1	ND (57)		ND (29)		ND (0.29)		ND (0.29)		ND (0.29)		ND (0.29)	
Trichloroethene	ug/l	5	**37000**		**37800**		ND (0.22)		ND (0.22)		ND (0.22)		ND (0.22)	
Trichlorofluoromethane	ug/l	5	ND (53)		ND (27)		ND (0.27)		ND (0.27)		ND (0.27)		ND (0.27)	
Vinyl chloride	ug/l	2	ND (41)		ND (21)		ND (0.21)		ND (0.21)		ND (0.21)		ND (0.21)	
m,p-Xylene	ug/l	-	ND (85)		ND (42)		ND (0.42)		ND (0.42)		ND (0.42)		ND (0.42)	
o-Xylene	ug/l	5	ND (48)		ND (24)		ND (0.24)		ND (0.24)		ND (0.24)		ND (0.24)	
Xylene (total)	ug/l	5	ND (48)		ND (24)		ND (0.24)		ND (0.24)		ND (0.24)		ND (0.24)	
TOTAL VOCS			37513		38436.5		9.52		0		0		0	

Notes:

NY TOGS Class GA GW Standard = Class GA Standards and Guidance Values (NYSDEC's June 1998 Division of Water Technical and Operational Guidance Series plus amendments 6/2004)

Q = Qualifier

ND= Not detected above method detection limit

(0.42) = Method detection limit

J = Estimated Value

ug/L = micrograms per liter

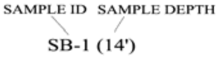
Yellow shade with black text values exceed
NY TOGS Class GA GW Standard

Table 2
Volatile Organic Compounds in Soil

FORMER ACCO BRANDS SITE
VCP # V00331
32-00 Skilllman Avenue
Long Island City, New York

Client Sample ID:		NY SCO - Protection of Groundwater w/CP-51 (10/10) (6 NYCRR 375-6 12/06)	SB-1(14')		SB-1(17')		SB-1(28')		SB-1(29')	
Lab Sample ID:			JB49551-1		JB49551-2		JB49551-10		JB49551-6	
Date Sampled:			10/8/2013		10/8/2013		10/8/2013		10/8/2013	
Matrix:			Soil		Soil		Soil		Soil	
			Results	Q	Results	Q	Results	Q	Results	Q
Acetone	mg/kg	0.05	ND (0.0048)		ND (0.0044)		ND (0.0047)		ND (0.0048)	
Benzene	mg/kg	0.06	ND (0.00013)		ND (0.00012)		ND (0.00013)		ND (0.00013)	
Bromochloromethane	mg/kg	-	ND (0.00054)		ND (0.00051)		ND (0.00053)		ND (0.00055)	
Bromodichloromethane	mg/kg	-	ND (0.00029)		ND (0.00027)		ND (0.00029)		ND (0.00030)	
Bromoform	mg/kg	-	ND (0.00027)		ND (0.00026)		ND (0.00027)		ND (0.00028)	
Bromomethane	mg/kg	-	ND (0.00050)		ND (0.00047)		ND (0.00049)		ND (0.00051)	
2-Butanone (MEK)	mg/kg	0.3	ND (0.0046)		ND (0.0043)		ND (0.0045)		ND (0.0047)	
Carbon disulfide	mg/kg	2.7	ND (0.00015)		ND (0.00014)		ND (0.00014)		ND (0.00015)	
Carbon tetrachloride	mg/kg	0.76	ND (0.00026)		ND (0.00024)		ND (0.00026)		ND (0.00027)	
Chlorobenzene	mg/kg	1.1	ND (0.00021)		ND (0.00019)		ND (0.00020)		ND (0.00021)	
Chloroethane	mg/kg	1.9	ND (0.0010)		ND (0.00097)		ND (0.0010)		ND (0.0011)	
Chloroform	mg/kg	0.37	ND (0.00026)		ND (0.00025)		ND (0.00026)		ND (0.00027)	
Chloromethane	mg/kg	-	ND (0.00036)		ND (0.00033)		ND (0.00035)		ND (0.00036)	
Cyclohexane	mg/kg	-	ND (0.00027)		ND (0.00025)		ND (0.00026)		ND (0.00027)	
1,2-Dibromo-3-chloropropane	mg/kg	-	ND (0.0014)		ND (0.0013)		ND (0.0014)		ND (0.0014)	
Dibromochloromethane	mg/kg		ND (0.00025)		ND (0.00024)		ND (0.00025)		ND (0.00026)	
1,2-Dibromoethane	mg/kg	-	ND (0.00057)		ND (0.00053)		ND (0.00056)		ND (0.00058)	
1,2-Dichlorobenzene	mg/kg	1.1	ND (0.00035)		ND (0.00033)		ND (0.00035)		ND (0.00036)	
1,3-Dichlorobenzene	mg/kg	2.4	ND (0.00023)		ND (0.00021)		ND (0.00022)		ND (0.00023)	
1,4-Dichlorobenzene	mg/kg	1.8	ND (0.00026)		ND (0.00024)		ND (0.00026)		ND (0.00027)	
Dichlorodifluoromethane	mg/kg	-	ND (0.00037)		ND (0.00034)		ND (0.00036)		ND (0.00037)	
1,1-Dichloroethane	mg/kg	0.27	ND (0.00033)		ND (0.00031)		ND (0.00032)		ND (0.00033)	
1,2-Dichloroethane	mg/kg	0.02	ND (0.00033)		ND (0.00031)		ND (0.00033)		ND (0.00034)	
1,1-Dichloroethene	mg/kg	0.33	ND (0.00030)		ND (0.00028)		ND (0.00029)		ND (0.00030)	
cis-1,2-Dichloroethene	mg/kg	0.25	0.00027	J	0.0209		ND (0.00021)		ND (0.00022)	
trans-1,2-Dichloroethene	mg/kg	0.19	ND (0.00044)		ND (0.00041)		ND (0.00043)		ND (0.00045)	
1,2-Dichloropropane	mg/kg		ND (0.00045)		ND (0.00043)		ND (0.00045)		ND (0.00046)	
cis-1,3-Dichloropropene	mg/kg	-	ND (0.00024)		ND (0.00022)		ND (0.00023)		ND (0.00024)	
trans-1,3-Dichloropropene	mg/kg	-	ND (0.00028)		ND (0.00026)		ND (0.00028)		ND (0.00029)	
1,4-Dioxane	mg/kg	0.1	ND (0.080)		ND (0.075)		ND (0.078)		ND (0.081)	
Ethylbenzene	mg/kg	1	ND (0.00018)		ND (0.00017)		ND (0.00018)		ND (0.00019)	
Freon 113	mg/kg	6	ND (0.00045)		ND (0.00042)		ND (0.00045)		ND (0.00046)	
2-Hexanone	mg/kg	-	ND (0.0019)		ND (0.0017)		ND (0.0018)		ND (0.0019)	
Isopropylbenzene	mg/kg	2.3	ND (0.00015)		ND (0.00014)		ND (0.00015)		ND (0.00016)	
Methyl Acetate	mg/kg	-	ND (0.0017)		ND (0.0016)		ND (0.0017)		ND (0.0018)	
Methylcyclohexane	mg/kg	-	ND (0.00017)		ND (0.00016)		ND (0.00017)		ND (0.00017)	
Methyl Tert Butyl Ether	mg/kg	0.93	ND (0.00036)		ND (0.00033)		ND (0.00035)		ND (0.00036)	
4-Methyl-2-pentanone(MIBK)	mg/kg	1	ND (0.0014)		ND (0.0013)		ND (0.0014)		ND (0.0014)	
Methylene chloride	mg/kg	0.05	0.0026	J	0.0017	J	0.0051		0.0046	J
Styrene	mg/kg		ND (0.00024)		ND (0.00023)		ND (0.00024)		ND (0.00025)	
1,1,2,2-Tetrachloroethane	mg/kg	0.6	ND (0.00036)		ND (0.00033)		ND (0.00035)		ND (0.00036)	
Tetrachloroethene	mg/kg	1.3	ND (0.00043)		ND (0.00040)		ND (0.00042)		ND (0.00044)	
Toluene	mg/kg	0.7	ND (0.00015)		ND (0.00014)		ND (0.00015)		ND (0.00015)	
1,2,3-Trichlorobenzene	mg/kg		ND (0.00022)		ND (0.00020)		ND (0.00021)		ND (0.00022)	
1,2,4-Trichlorobenzene	mg/kg	3.4	ND (0.00019)		ND (0.00018)		ND (0.00019)		ND (0.00019)	
1,1,1-Trichloroethane	mg/kg	0.68	ND (0.00030)		ND (0.00028)		ND (0.00029)		ND (0.00030)	
1,1,2-Trichloroethane	mg/kg	-	ND (0.00086)		ND (0.00080)		ND (0.00084)		ND (0.00087)	
Trichloroethene	mg/kg	0.47	ND (0.00037)		0.00057	J	0.005	J	0.0163	
Trichlorofluoromethane	mg/kg	-	ND (0.00023)		ND (0.00022)		ND (0.00023)		ND (0.00024)	
Vinyl chloride	mg/kg	0.02	ND (0.00036)		ND (0.00033)		ND (0.00035)		ND (0.00036)	
m,p-Xylene	mg/kg	1.6	ND (0.00050)		ND (0.00047)		ND (0.00050)		ND (0.00051)	
o-Xylene	mg/kg	1.6	ND (0.00019)		ND (0.00017)		ND (0.00018)		ND (0.00019)	
Xylene (total)	mg/kg	1.6	ND (0.00019)		ND (0.00017)		ND (0.00018)		ND (0.00019)	
TOTAL VOCs			0.00287		0.02317		0.0101		0.0209	

Notes:



NYSCO Restricted Use - Protection of Groundwater Resources
(6 NYCRR 375-6 12/06) Soil Cleanup Objectives
(0.00023) = Method detection limit
Q= Qualifier
ND= Not detected above method detection limit
J = Estimated Value
mg/kg = milligrams per kilogram

Yellow shade with black text values exceed Part 375 Restricted Use for the Protection of Groundwater Resources

Table 2
Volatile Organic Compounds in Soil

FORMER ACCO BRANDS SITE
VCP # V00331
32-00 Skilllman Avenue
Long Island City, New York

Client Sample ID:		NY SCO - Protection of Groundwater w/CP-51 (10/10) (6 NYCRR 375-6 12/06)	SB-9(13')		SB-9(25')		SB-9(26')		SB-9(29.5')		SB-9(41')		SB-9(45')	
Lab Sample ID:			JB49551-9		JB49551-7		JB49551-8		JB49551-11		JB49551-5		JB49551-4	
Date Sampled:			10/9/2013		10/9/2013		10/9/2013		10/9/2013		10/9/2013		10/9/2013	
Matrix:			Soil		Soil		Soil		Soil		Soil		Soil	
			Results	Q	Results	Q	Results	Q	Results	Q	Results	Q	Results	Q
Acetone	mg/kg	0.05	ND (0.0045)		ND (0.0046)		ND (0.0051)		0.0399		ND (0.0051)		ND (0.0052)	
Benzene	mg/kg	0.06	ND (0.00012)		ND (0.00013)		ND (0.00014)		0.00035	J	ND (0.00014)		ND (0.00014)	
Bromochloromethane	mg/kg	-	ND (0.00051)		ND (0.00052)		ND (0.00058)		ND (0.00054)		ND (0.00058)		ND (0.00059)	
Bromodichloromethane	mg/kg	-	ND (0.00028)		ND (0.00028)		ND (0.00032)		0.00094	J	ND (0.00031)		ND (0.00032)	
Bromoform	mg/kg	-	ND (0.00026)		ND (0.00026)		ND (0.00029)		ND (0.00027)		ND (0.00029)		ND (0.00030)	
Bromomethane	mg/kg	-	ND (0.00047)		ND (0.00048)		ND (0.00054)		ND (0.00050)		ND (0.00053)		ND (0.00055)	
2-Butanone (MEK)	mg/kg	0.3	ND (0.0043)		ND (0.0044)		ND (0.0049)		0.0135		ND (0.0049)		ND (0.0050)	
Carbon disulfide	mg/kg	2.7	ND (0.00014)		ND (0.00014)		ND (0.00016)		ND (0.00015)		ND (0.00016)		ND (0.00016)	
Carbon tetrachloride	mg/kg	0.76	ND (0.00025)		ND (0.00025)		ND (0.00028)		0.00092	J	ND (0.00028)		ND (0.00029)	
Chlorobenzene	mg/kg	1.1	ND (0.00019)		ND (0.00020)		ND (0.00022)		ND (0.00020)		ND (0.00022)		ND (0.00022)	
Chloroethane	mg/kg	1.9	ND (0.00098)		ND (0.0010)		ND (0.0011)		ND (0.0010)		ND (0.0011)		ND (0.0011)	
Chloroform	mg/kg	0.37	ND (0.00025)		ND (0.00025)		0.0011	J	0.0027	J	0.0011	J	ND (0.00029)	
Chloromethane	mg/kg	-	ND (0.00034)		ND (0.00034)		ND (0.00038)		ND (0.00035)		ND (0.00038)		ND (0.00039)	
Cyclohexane	mg/kg	-	ND (0.00025)		ND (0.00026)		ND (0.00029)		ND (0.00027)		ND (0.00029)		ND (0.00029)	
1,2-Dibromo-3-chloropropane	mg/kg	-	ND (0.0013)		ND (0.0013)		ND (0.0015)		ND (0.0014)		ND (0.0015)		ND (0.0015)	
Dibromochloromethane	mg/kg		ND (0.00024)		ND (0.00024)		ND (0.00027)		ND (0.00025)		ND (0.00027)		ND (0.00028)	
1,2-Dibromoethane	mg/kg	-	ND (0.00054)		ND (0.00055)		ND (0.00062)		ND (0.00057)		ND (0.00061)		ND (0.00063)	
1,2-Dichlorobenzene	mg/kg	1.1	ND (0.00033)		ND (0.00034)		ND (0.00038)		ND (0.00035)		ND (0.00038)		ND (0.00039)	
1,3-Dichlorobenzene	mg/kg	2.4	ND (0.00021)		ND (0.00022)		ND (0.00024)		ND (0.00023)		ND (0.00024)		ND (0.00025)	
1,4-Dichlorobenzene	mg/kg	1.8	ND (0.00025)		ND (0.00025)		ND (0.00028)		ND (0.00026)		ND (0.00028)		ND (0.00029)	
Dichlorodifluoromethane	mg/kg	-	ND (0.00035)		ND (0.00035)		ND (0.00040)		ND (0.00036)		ND (0.00039)		ND (0.00040)	
1,1-Dichloroethane	mg/kg	0.27	ND (0.00031)		ND (0.00031)		ND (0.00035)		ND (0.00032)		ND (0.00035)		ND (0.00036)	
1,2-Dichloroethane	mg/kg	0.02	ND (0.00031)		ND (0.00032)		ND (0.00036)		0.0017		ND (0.00036)		ND (0.00037)	
1,1-Dichloroethene	mg/kg	0.33	ND (0.00028)		ND (0.00029)		0.001	J	0.002	J	ND (0.00032)		ND (0.00033)	
cis-1,2-Dichloroethene	mg/kg	0.25	ND (0.00020)		**0.422**		**1.06**		0.0657		ND (0.00023)		ND (0.00024)	
trans-1,2-Dichloroethene	mg/kg	0.19	ND (0.00041)		0.00045	J	0.0012	J	ND (0.00044)		ND (0.00047)		ND (0.00048)	
1,2-Dichloropropane	mg/kg		ND (0.00043)		ND (0.00044)		ND (0.00049)		ND (0.00045)		ND (0.00048)		ND (0.00050)	
cis-1,3-Dichloropropene	mg/kg	-	ND (0.00022)		ND (0.00023)		ND (0.00025)		ND (0.00023)		ND (0.00025)		ND (0.00026)	
trans-1,3-Dichloropropene	mg/kg	-	ND (0.00026)		ND (0.00027)		ND (0.00030)		ND (0.00028)		ND (0.00030)		ND (0.00031)	
1,4-Dioxane	mg/kg	0.1	ND (0.075)		ND (0.077)		ND (0.086)		ND (0.079)		ND (0.085)		ND (0.087)	
Ethylbenzene	mg/kg	1	ND (0.00017)		ND (0.00018)		ND (0.00020)		0.00032	J	ND (0.00019)		ND (0.00020)	
Freon 113	mg/kg	6	ND (0.00043)		ND (0.00044)		ND (0.00049)		ND (0.00045)		ND (0.00048)		ND (0.00050)	
2-Hexanone	mg/kg	-	ND (0.0017)		ND (0.0018)		ND (0.0020)		ND (0.0018)		ND (0.0020)		ND (0.0020)	
Isopropylbenzene	mg/kg	2.3	ND (0.00014)		ND (0.00015)		ND (0.00016)		ND (0.00015)		ND (0.00016)		ND (0.00017)	
Methyl Acetate	mg/kg	-	ND (0.0016)		ND (0.0017)		ND (0.0019)		ND (0.0017)		ND (0.0019)		ND (0.0019)	
Methylcyclohexane	mg/kg	-	ND (0.00016)		ND (0.00016)		ND (0.00018)		ND (0.00017)		ND (0.00018)		ND (0.00019)	
Methyl Tert Butyl Ether	mg/kg	0.93	ND (0.00034)		ND (0.00034)		ND (0.00038)		ND (0.00035)		ND (0.00038)		ND (0.00039)	
4-Methyl-2-pentanone(MIBK)	mg/kg	1	ND (0.0013)		ND (0.0013)		ND (0.0015)		ND (0.0014)		ND (0.0015)		ND (0.0015)	
Methylene chloride	mg/kg	0.05	0.0055		0.0028	J	0.0067		0.005	J	0.0092		0.0046	
Styrene	mg/kg		ND (0.00023)		ND (0.00023)		ND (0.00026)		ND (0.00024)		ND (0.00026)		ND (0.00026)	
1,1,2,2-Tetrachloroethane	mg/kg	0.6	ND (0.00034)		ND (0.00034)		ND (0.00038)		ND (0.00035)		ND (0.00038)		ND (0.00039)	
Tetrachloroethene	mg/kg	1.3	ND (0.00040)		0.0041	J	0.0342		0.0334		ND (0.00045)		ND (0.00047)	
Toluene	mg/kg	0.7	0.00032	J	0.00042	J	0.0013		0.0029		ND (0.00016)		ND (0.00016)	
1,2,3-Trichlorobenzene	mg/kg		ND (0.00020)		ND (0.00021)		ND (0.00023)		ND (0.00021)		ND (0.00023)		ND (0.00024)	
1,2,4-Trichlorobenzene	mg/kg	3.4	ND (0.00018)		ND (0.00018)		ND (0.00020)		ND (0.00019)		ND (0.00020)		ND (0.00021)	
1,1,1-Trichloroethane	mg/kg	0.68	ND (0.00028)		ND (0.00029)		0.0034	J	0.0078		ND (0.00032)		ND (0.00033)	
1,1,2-Trichloroethane	mg/kg	-	ND (0.00080)		ND (0.00082)		0.0038	J	0.0503		ND (0.00091)		ND (0.00094)	
Trichloroethene	mg/kg	0.47	0.0011	J	**6.33**		**31.7**		**56.9**		0.00092	J	ND (0.00040)	
Trichlorofluoromethane	mg/kg	-	ND (0.00022)		ND (0.00023)		ND (0.00025)		ND (0.00023)		ND (0.00025)		ND (0.00026)	
Vinyl chloride	mg/kg	0.02	ND (0.00034)		ND (0.00034)		ND (0.00038)		ND (0.00035)		ND (0.00038)		ND (0.00039)	
m,p-Xylene	mg/kg	1.6	ND (0.00047)		ND (0.00049)		ND (0.00054)		0.0008	J	ND (0.00054)		ND (0.00055)	
o-Xylene	mg/kg	1.6	ND (0.00017)		ND (0.00018)		ND (0.00020)		0.00022	J	ND (0.00020)		ND (0.00020)	
Xylene (total)	mg/kg	1.6	ND (0.00017)		ND (0.00018)		ND (0.00020)		0.001		ND (0.00020)		ND (0.00020)	
TOTAL VOCs			0.00692		6.75977		32.8127		57.12945		0.01122		0.0046	

Notes:

SAMPLE ID SAMPLE DEPTH

SB-1 (14')

NYSCO Restricted Use - Protection of Groundwater Resources
(6 NYCRR 375-6 12/06) Soil Cleanup Objectives
(0.00023) = Method detection limit
Q= Qualifier
ND= Not detected above method detection limit
J = Estimated Value
mg/kg = milligrams per kilogram

Yellow shade with black text values exceed Part 375 Restricted Use for the Protection of Groundwater Resources

Fleming Lee Shue

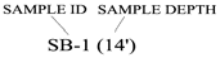
Environmental Management and Consulting

Table 2
Volatile Organic Compounds in Soil

FORMER ACCO BRANDS SITE
VCP # V00331
32-00 Skilllman Avenue
Long Island City, New York

Client Sample ID:		NY SCO - Protection of Groundwater w/CP-51 (10/10) (6 NYCRR 375-6 12/06)	SB-10 (14'-15')		SB-10 (16'-17')		SB-10 (32'-33')		SB-10 (44'-45')		SB-10 (45'-46')		SB-10 (48'-49')	
Lab Sample ID:			JB52130-1		JB52130-2		JB52130-3		JB52130-4		JB52130-5		JB52130-6	
Date Sampled:			11/4/2013		11/4/2013		11/5/2013		11/5/2013		11/5/2013		11/5/2013	
Matrix:			Soil		Soil		Soil		Soil		Soil		Soil	
			Results	Q	Results	Q	Results	Q	Results	Q	Results	Q	Results	Q
Acetone	mg/kg	0.05	ND (0.0041)		ND (0.0044)		ND (0.23)		ND (0.0042)		ND (0.21)		ND (0.0041)	
Benzene	mg/kg	0.06	ND (0.00011)		ND (0.00012)		ND (0.0063)		ND (0.00012)		ND (0.0058)		ND (0.00011)	
Bromochloromethane	mg/kg	-	ND (0.00047)		ND (0.00050)		ND (0.026)		ND (0.00048)		ND (0.024)		ND (0.00047)	
Bromodichloromethane	mg/kg	-	ND (0.00026)		ND (0.00027)		ND (0.014)		ND (0.00026)		ND (0.013)		ND (0.00026)	
Bromoform	mg/kg	-	ND (0.00024)		ND (0.00025)		ND (0.013)		ND (0.00024)		ND (0.012)		ND (0.00024)	
Bromomethane	mg/kg	-	ND (0.00044)		ND (0.00046)		ND (0.024)		ND (0.00045)		ND (0.022)		ND (0.00044)	
2-Butanone (MEK)	mg/kg	0.3	ND (0.0040)		ND (0.0042)		ND (0.22)		ND (0.0041)		ND (0.20)		ND (0.0040)	
Carbon disulfide	mg/kg	2.7	ND (0.00013)		ND (0.00014)		ND (0.0071)		ND (0.00013)		ND (0.0065)		ND (0.00013)	
Carbon tetrachloride	mg/kg	0.76	ND (0.00023)		ND (0.00024)		ND (0.013)		ND (0.00023)		ND (0.012)		ND (0.00023)	
Chlorobenzene	mg/kg	1.1	ND (0.00018)		ND (0.00019)		ND (0.0099)		ND (0.00018)		ND (0.0091)		ND (0.00018)	
Chloroethane	mg/kg	1.9	ND (0.00090)		ND (0.00096)		ND (0.050)		ND (0.00092)		ND (0.046)		ND (0.00090)	
Chloroform	mg/kg	0.37	ND (0.00023)		ND (0.00024)		ND (0.013)		0.0017	J	ND (0.012)		ND (0.00023)	
Chloromethane	mg/kg	-	ND (0.00031)		ND (0.00033)		ND (0.017)		ND (0.00032)		ND (0.016)		ND (0.00031)	
Cyclohexane	mg/kg	-	ND (0.00023)		ND (0.00025)		ND (0.013)		ND (0.00024)		ND (0.012)		ND (0.00023)	
1,2-Dibromo-3-chloropropane	mg/kg	-	ND (0.0012)		ND (0.0013)		ND (0.067)		ND (0.0012)		ND (0.062)		ND (0.0012)	
Dibromochloromethane	mg/kg		ND (0.00022)		ND (0.00023)		ND (0.012)		ND (0.00022)		ND (0.011)		ND (0.00022)	
1,2-Dibromoethane	mg/kg	-	ND (0.00050)		ND (0.00053)		ND (0.027)		ND (0.00051)		ND (0.025)		ND (0.00050)	
1,2-Dichlorobenzene	mg/kg	1.1	ND (0.00031)		ND (0.00032)		ND (0.017)		ND (0.00031)		ND (0.016)		ND (0.00031)	
1,3-Dichlorobenzene	mg/kg	2.4	ND (0.00020)		ND (0.00021)		ND (0.011)		ND (0.00020)		ND (0.010)		ND (0.00020)	
1,4-Dichlorobenzene	mg/kg	1.8	ND (0.00023)		ND (0.00024)		ND (0.013)		ND (0.00023)		ND (0.012)		ND (0.00023)	
Dichlorodifluoromethane	mg/kg	-	ND (0.00032)		ND (0.00034)		ND (0.018)		ND (0.00033)		ND (0.016)		ND (0.00032)	
1,1-Dichloroethane	mg/kg	0.27	ND (0.00029)		ND (0.00030)		ND (0.016)		ND (0.00029)		ND (0.015)		ND (0.00029)	
1,2-Dichloroethane	mg/kg	0.02	ND (0.00029)		ND (0.00031)		ND (0.016)		ND (0.00030)		ND (0.015)		ND (0.00029)	
1,1-Dichloroethene	mg/kg	0.33	ND (0.00026)		ND (0.00028)		ND (0.014)		ND (0.00027)		ND (0.013)		ND (0.00026)	
cis-1,2-Dichloroethene	mg/kg	0.25	ND (0.00019)		ND (0.00020)		ND (0.010)		ND (0.00019)		ND (0.0096)		ND (0.00019)	
trans-1,2-Dichloroethene	mg/kg	0.19	ND (0.00038)		ND (0.00041)		ND (0.021)		ND (0.00039)		ND (0.020)		ND (0.00038)	
1,2-Dichloropropane	mg/kg		ND (0.00040)		ND (0.00042)		ND (0.022)		ND (0.00040)		ND (0.020)		ND (0.00040)	
cis-1,3-Dichloropropene	mg/kg	-	ND (0.00021)		ND (0.00022)		ND (0.011)		ND (0.00021)		ND (0.011)		ND (0.00021)	
trans-1,3-Dichloropropene	mg/kg	-	ND (0.00025)		ND (0.00026)		ND (0.014)		ND (0.00025)		ND (0.013)		ND (0.00025)	
1,4-Dioxane	mg/kg	0.1	ND (0.069)		ND (0.073)		ND (3.8)		ND (0.071)		ND (3.5)		ND (0.069)	
Ethylbenzene	mg/kg	1	ND (0.00016)		ND (0.00017)		ND (0.0088)		ND (0.00016)		ND (0.0081)		ND (0.00016)	
Freon 113	mg/kg	6	ND (0.00040)		ND (0.00042)		ND (0.022)		ND (0.00040)		ND (0.020)		ND (0.00040)	
2-Hexanone	mg/kg	-	ND (0.0016)		ND (0.0017)		ND (0.089)		ND (0.0016)		ND (0.082)		ND (0.0016)	
Isopropylbenzene	mg/kg	2.3	ND (0.00013)		ND (0.00014)		ND (0.0074)		ND (0.00014)		ND (0.0068)		ND (0.00013)	
Methyl Acetate	mg/kg	-	ND (0.0015)		ND (0.0016)		ND (0.084)		ND (0.0015)		ND (0.077)		ND (0.0015)	
Methylcyclohexane	mg/kg	-	ND (0.00015)		ND (0.00016)		ND (0.0082)		ND (0.00015)		ND (0.0076)		ND (0.00015)	
Methyl Tert Butyl Ether	mg/kg	0.93	ND (0.00031)		ND (0.00033)		ND (0.017)		ND (0.00032)		ND (0.016)		ND (0.00031)	
4-Methyl-2-pentanone(MIBK)	mg/kg	1	ND (0.0012)		ND (0.0013)		ND (0.066)		ND (0.0012)		ND (0.061)		ND (0.0012)	
Methylene chloride	mg/kg	0.05	0.0027	J	0.0029	J	ND (0.085)		0.0029	J	ND (0.079)		0.0029	J
Styrene	mg/kg		ND (0.00021)		ND (0.00022)		ND (0.012)		ND (0.00021)		ND (0.011)		ND (0.00021)	
1,1,2,2-Tetrachloroethane	mg/kg	0.6	ND (0.00031)		ND (0.00033)		ND (0.017)		ND (0.00032)		ND (0.016)		ND (0.00031)	
Tetrachloroethene	mg/kg	1.3	ND (0.00037)		ND (0.00039)		0.397		ND (0.00038)		0.333		ND (0.00037)	
Toluene	mg/kg	0.7	ND (0.00013)		0.00028	J	0.0143	J	0.00022	J	0.0153	J	ND (0.00013)	
1,2,3-Trichlorobenzene	mg/kg		ND (0.00019)		ND (0.00020)		ND (0.010)		ND (0.00019)		ND (0.0096)		ND (0.00019)	
1,2,4-Trichlorobenzene	mg/kg	3.4	ND (0.00016)		ND (0.00017)		ND (0.0091)		ND (0.00017)		ND (0.0084)		ND (0.00016)	
1,1,1-Trichloroethane	mg/kg	0.68	ND (0.00026)		ND (0.00028)		ND (0.014)		ND (0.00027)		ND (0.013)		ND (0.00026)	
1,1,2-Trichloroethane	mg/kg	-	ND (0.00075)		ND (0.00079)		ND (0.041)		ND (0.00076)		ND (0.038)		ND (0.00075)	
Trichloroethene	mg/kg	0.47	ND (0.00032)		0.006		**9.16**		ND (0.00032)		**13.7**		0.0015	J
Trichlorofluoromethane	mg/kg	-	ND (0.00020)		ND (0.00022)		ND (0.011)		ND (0.00021)		ND (0.010)		ND (0.00020)	
Vinyl chloride	mg/kg	0.02	ND (0.00031)		ND (0.00033)		ND (0.017)		ND (0.00032)		ND (0.016)		ND (0.00031)	
m,p-Xylene	mg/kg	1.6	ND (0.00044)		ND (0.00047)		ND (0.024)		ND (0.00045)		ND (0.022)		ND (0.00044)	
o-Xylene	mg/kg	1.6	ND (0.00016)		ND (0.00017)		ND (0.0089)		ND (0.00016)		ND (0.0082)		ND (0.00016)	
Xylene (total)	mg/kg	1.6	ND (0.00016)		ND (0.00017)		ND (0.0089)		ND (0.00016)		ND (0.0082)		ND (0.00016)	
TOTAL VOCs			0.0027		0.00918		9.5713		0.00482		14.0483		0.0044	

Notes:



NYSCO Restricted Use - Protection of Groundwater Resources
(6 NYCRR 375-6 12/06) Soil Cleanup Objectives
(0.00023) = Method detection limit
Q= Qualifier
ND= Not detected above method detection limit
J = Estimated Value
mg/kg = milligrams per kilogram

Yellow shade with black text values exceed Part 375 Restricted Use for the Protection of Groundwater Resources

Environmental Management and Consulting

Table 2
Volatile Organic Compounds in Soil

FORMER ACCO BRANDS SITE
VCP # V00331
32-00 Skilllman Avenue
Long Island City, New York

Client Sample ID:		**NY SCO - Protection of Groundwater w/CP-51 (10/10) (6 NYCRR 375-6 12/06)**	**SB-11 (14')**		**SB-11 (25'-26')**		**SB-11 (35')**		**SB-11 (43')**		**SB-11 (45')**	
Lab Sample ID:			**JB49551-16**		**JB49551-17**		**JB49551-18**		**JB49551-19**		**JB49551-20**	
Date Sampled:			**10/10/2013**		**10/10/2013**		**10/10/2013**		**10/10/2013**		**10/10/2013**	
Matrix:			**Soil**		**Soil**		**Soil**		**Soil**		**Soil**	
			Results	**Q**	**Results**	**Q**	**Results**	**Q**	**Results**	**Q**	**Results**	**Q**
Acetone	mg/kg	0.05	ND (0.0047)		ND (0.0046)		ND (0.0049)		ND (0.0044)		ND (0.0048)	
Benzene	mg/kg	0.06	ND (0.00013)		ND (0.00013)		ND (0.00013)		ND (0.00012)		ND (0.00013)	
Bromochloromethane	mg/kg	-	ND (0.00054)		ND (0.00053)		ND (0.00055)		ND (0.00051)		ND (0.00054)	
Bromodichloromethane	mg/kg	-	ND (0.00029)		ND (0.00028)		ND (0.00030)		ND (0.00027)		ND (0.00029)	
Bromoform	mg/kg	-	ND (0.00027)		ND (0.00027)		ND (0.00028)		ND (0.00026)		ND (0.00027)	
Bromomethane	mg/kg	-	ND (0.00050)		ND (0.00049)		ND (0.00051)		ND (0.00047)		ND (0.00050)	
2-Butanone (MEK)	mg/kg	0.3	ND (0.0045)		ND (0.0045)		ND (0.0047)		ND (0.0043)		ND (0.0046)	
Carbon disulfide	mg/kg	2.7	ND (0.00015)		ND (0.00014)		ND (0.00015)		ND (0.00014)		ND (0.00015)	
Carbon tetrachloride	mg/kg	0.76	ND (0.00026)		ND (0.00025)		ND (0.00027)		ND (0.00024)		ND (0.00026)	
Chlorobenzene	mg/kg	1.1	ND (0.00020)		ND (0.00020)		ND (0.00021)		ND (0.00019)		ND (0.00021)	
Chloroethane	mg/kg	1.9	ND (0.0010)		ND (0.0010)		ND (0.0011)		ND (0.00097)		ND (0.0010)	
Chloroform	mg/kg	0.37	ND (0.00026)		ND (0.00026)		0.00039	J	0.0011	J	0.00078	J
Chloromethane	mg/kg	-	ND (0.00035)		ND (0.00035)		ND (0.00036)		ND (0.00033)		ND (0.00036)	
Cyclohexane	mg/kg	-	ND (0.00026)		ND (0.00026)		ND (0.00027)		ND (0.00025)		ND (0.00027)	
1,2-Dibromo-3-chloropropane	mg/kg	-	ND (0.0014)		ND (0.0013)		ND (0.0014)		ND (0.0013)		ND (0.0014)	
Dibromochloromethane	mg/kg		ND (0.00025)		ND (0.00025)		ND (0.00026)		ND (0.00024)		ND (0.00025)	
1,2-Dibromoethane	mg/kg	-	ND (0.00056)		ND (0.00056)		ND (0.00058)		ND (0.00053)		ND (0.00057)	
1,2-Dichlorobenzene	mg/kg	1.1	ND (0.00035)		ND (0.00034)		ND (0.00036)		ND (0.00033)		ND (0.00035)	
1,3-Dichlorobenzene	mg/kg	2.4	ND (0.00022)		ND (0.00022)		ND (0.00023)		ND (0.00021)		ND (0.00023)	
1,4-Dichlorobenzene	mg/kg	1.8	ND (0.00026)		ND (0.00025)		ND (0.00027)		ND (0.00024)		ND (0.00026)	
Dichlorodifluoromethane	mg/kg	-	ND (0.00036)		ND (0.00036)		ND (0.00038)		ND (0.00034)		ND (0.00037)	
1,1-Dichloroethane	mg/kg	0.27	ND (0.00032)		ND (0.00032)		ND (0.00033)		ND (0.00031)		ND (0.00033)	
1,2-Dichloroethane	mg/kg	0.02	ND (0.00033)		ND (0.00033)		ND (0.00034)		ND (0.00031)		ND (0.00034)	
1,1-Dichloroethene	mg/kg	0.33	ND (0.00030)		ND (0.00029)		ND (0.00031)		ND (0.00028)		ND (0.00030)	
cis-1,2-Dichloroethene	mg/kg	0.25	ND (0.00021)		ND (0.00021)		ND (0.00022)		ND (0.00020)		ND (0.00022)	
trans-1,2-Dichloroethene	mg/kg	0.19	ND (0.00044)		ND (0.00043)		ND (0.00045)		ND (0.00041)		ND (0.00044)	
1,2-Dichloropropane	mg/kg		ND (0.00045)		ND (0.00044)		ND (0.00046)		ND (0.00043)		ND (0.00046)	
cis-1,3-Dichloropropene	mg/kg	-	ND (0.00023)		ND (0.00023)		ND (0.00024)		ND (0.00022)		ND (0.00024)	
trans-1,3-Dichloropropene	mg/kg	-	ND (0.00028)		ND (0.00027)		ND (0.00029)		ND (0.00026)		ND (0.00028)	
1,4-Dioxane	mg/kg	0.1	ND (0.079)		ND (0.077)		ND (0.081)		ND (0.075)		ND (0.080)	
Ethylbenzene	mg/kg	1	ND (0.00018)		ND (0.00018)		ND (0.00019)		ND (0.00017)		ND (0.00018)	
Freon 113	mg/kg	6	ND (0.00045)		ND (0.00044)		ND (0.00046)		ND (0.00042)		ND (0.00046)	
2-Hexanone	mg/kg	-	ND (0.0018)		ND (0.0018)		ND (0.0019)		ND (0.0017)		ND (0.0019)	
Isopropylbenzene	mg/kg	2.3	ND (0.00015)		ND (0.00015)		ND (0.00016)		ND (0.00014)		ND (0.00015)	
Methyl Acetate	mg/kg	-	ND (0.0017)		ND (0.0017)		ND (0.0018)		ND (0.0016)		ND (0.0017)	
Methylcyclohexane	mg/kg	-	ND (0.00017)		ND (0.00017)		ND (0.00017)		ND (0.00016)		ND (0.00017)	
Methyl Tert Butyl Ether	mg/kg	0.93	ND (0.00035)		ND (0.00035)		ND (0.00036)		ND (0.00033)		ND (0.00036)	
4-Methyl-2-pentanone(MIBK)	mg/kg	1	ND (0.0014)		ND (0.0013)		ND (0.0014)		ND (0.0013)		ND (0.0014)	
Methylene chloride	mg/kg	0.05	0.003	J	0.0017	J	0.0026	J	0.0032	J	0.0023	J
Styrene	mg/kg		ND (0.00024)		ND (0.00024)		ND (0.00025)		ND (0.00023)		ND (0.00024)	
1,1,2,2-Tetrachloroethane	mg/kg	0.6	ND (0.00035)		ND (0.00035)		ND (0.00036)		ND (0.00033)		ND (0.00036)	
Tetrachloroethene	mg/kg	1.3	ND (0.00042)		ND (0.00042)		ND (0.00044)		ND (0.00040)		ND (0.00043)	
Toluene	mg/kg	0.7	ND (0.00015)		ND (0.00014)		ND (0.00015)		ND (0.00014)		ND (0.00015)	
1,2,3-Trichlorobenzene	mg/kg		ND (0.00021)		ND (0.00021)		ND (0.00022)		ND (0.00020)		ND (0.00022)	
1,2,4-Trichlorobenzene	mg/kg	3.4	ND (0.00019)		ND (0.00018)		ND (0.00019)		ND (0.00018)		ND (0.00019)	
1,1,1-Trichloroethane	mg/kg	0.68	ND (0.00030)		ND (0.00029)		ND (0.00031)		ND (0.00028)		ND (0.00030)	
1,1,2-Trichloroethane	mg/kg	-	ND (0.00085)		ND (0.00083)		ND (0.00087)		ND (0.00080)		ND (0.00086)	
Trichloroethene	mg/kg	0.47	0.00043	J	0.0096		**0.651**		ND (0.00034)		ND (0.00037)	
Trichlorofluoromethane	mg/kg	-	ND (0.00023)		ND (0.00023)		ND (0.00024)		ND (0.00022)		ND (0.00024)	
Vinyl chloride	mg/kg	0.02	ND (0.00035)		ND (0.00035)		ND (0.00036)		ND (0.00033)		ND (0.00036)	
m,p-Xylene	mg/kg	1.6	ND (0.00050)		ND (0.00049)		ND (0.00051)		ND (0.00047)		ND (0.00051)	
o-Xylene	mg/kg	1.6	ND (0.00018)		ND (0.00018)		ND (0.00019)		ND (0.00017)		ND (0.00019)	
Xylene (total)	mg/kg	1.6	ND (0.00018)		ND (0.00018)		ND (0.00019)		ND (0.00017)		ND (0.00019)	
TOTAL VOCs			0.00343		0.0113		0.65399		0.0043		0.00308	

Notes:

SAMPLE ID SAMPLE DEPTH

SB-1 (14')

NYSCO Restricted Use - Protection of Groundwater Resources
(6 NYCRR 375-6 12/06) Soil Cleanup Objectives
(0.00023) = Method detection limit
Q= Qualifier
ND= Not detected above method detection limit
J = Estimated Value
mg/kg = milligrams per kilogram

Yellow shade with black text values exceed Part 375 Restricted Use for the Protection of Groundwater Resources

Table 2
Volatile Organic Compounds in Soil

FORMER ACCO BRANDS SITE
VCP # V00331
32-00 Skilllman Avenue
Long Island City, New York

Client Sample ID:		NY SCO - Protection of Groundwater w/CP-51 (10/10) (6 NYCRR 375-6 12/06)	SB-12(14'-15')		SB-12(17')		SB-12(25'-26')		SB-12(36'-37')		SB-12(47'-48')	
Lab Sample ID:			JB49551-23		JB49551-24		JB49551-25		JB49551-27		JB49551-26	
Date Sampled:			10/11/2013		10/11/2013		10/11/2013		10/11/2013		10/11/2013	
Matrix:			Soil		Soil		Soil		Soil		Soil	
			Results	Q	Results	Q	Results	Q	Results	Q	Results	Q
Acetone	mg/kg	0.05	ND (0.0045)		ND (0.0047)		ND (1.4)		ND (2.7)		0.0186	
Benzene	mg/kg	0.06	ND (0.00012)		ND (0.00013)		ND (0.040)		ND (0.076)		ND (0.00015)	
Bromochloromethane	mg/kg	-	ND (0.00051)		ND (0.00053)		ND (0.16)		ND (0.31)		ND (0.00062)	
Bromodichloromethane	mg/kg	-	ND (0.00028)		ND (0.00029)		ND (0.089)		ND (0.17)		ND (0.00033)	
Bromoform	mg/kg	-	ND (0.00026)		ND (0.00027)		ND (0.083)		ND (0.16)		ND (0.00031)	
Bromomethane	mg/kg	-	ND (0.00048)		ND (0.00049)		ND (0.15)		ND (0.29)		ND (0.00057)	
2-Butanone (MEK)	mg/kg	0.3	ND (0.0043)		ND (0.0045)		ND (1.4)		ND (2.6)		ND (0.0052)	
Carbon disulfide	mg/kg	2.7	ND (0.00014)		ND (0.00014)		ND (0.045)		ND (0.085)		ND (0.00017)	
Carbon tetrachloride	mg/kg	0.76	ND (0.00025)		ND (0.00026)		ND (0.080)		ND (0.15)		ND (0.00030)	
Chlorobenzene	mg/kg	1.1	ND (0.00019)		ND (0.00020)		ND (0.063)		ND (0.12)		ND (0.00023)	
Chloroethane	mg/kg	1.9	ND (0.00098)		ND (0.0010)		ND (0.32)		ND (0.60)		ND (0.0012)	
Chloroform	mg/kg	0.37	ND (0.00025)		ND (0.00026)		ND (0.081)		ND (0.15)		ND (0.00030)	
Chloromethane	mg/kg	-	ND (0.00034)		ND (0.00035)		ND (0.11)		ND (0.21)		ND (0.00041)	
Cyclohexane	mg/kg	-	ND (0.00025)		ND (0.00026)		1.35	J	ND (0.15)		ND (0.00031)	
1,2-Dibromo-3-chloropropane	mg/kg	-	ND (0.0013)		ND (0.0014)		ND (0.42)		ND (0.80)		ND (0.0016)	
Dibromochloromethane	mg/kg		ND (0.00024)		ND (0.00025)		ND (0.077)		ND (0.15)		ND (0.00029)	
1,2-Dibromoethane	mg/kg	-	ND (0.00054)		ND (0.00056)		ND (0.17)		ND (0.33)		ND (0.00065)	
1,2-Dichlorobenzene	mg/kg	1.1	ND (0.00033)		ND (0.00035)		ND (0.11)		ND (0.20)		ND (0.00040)	
1,3-Dichlorobenzene	mg/kg	2.4	ND (0.00022)		ND (0.00022)		ND (0.069)		ND (0.13)		ND (0.00026)	
1,4-Dichlorobenzene	mg/kg	1.8	ND (0.00025)		ND (0.00026)		ND (0.080)		ND (0.15)		ND (0.00030)	
Dichlorodifluoromethane	mg/kg	-	ND (0.00035)		ND (0.00036)		ND (0.11)		ND (0.21)		ND (0.00042)	
1,1-Dichloroethane	mg/kg	0.27	ND (0.00031)		ND (0.00032)		ND (0.10)		ND (0.19)		ND (0.00037)	
1,2-Dichloroethane	mg/kg	0.02	ND (0.00032)		ND (0.00033)		ND (0.10)		ND (0.19)		ND (0.00038)	
1,1-Dichloroethene	mg/kg	0.33	ND (0.00028)		ND (0.00029)		ND (0.091)		ND (0.17)		ND (0.00034)	
cis-1,2-Dichloroethene	mg/kg	0.25	ND (0.00020)		ND (0.00021)		**38.5**		**0.275**	J	ND (0.00025)	
trans-1,2-Dichloroethene	mg/kg	0.19	ND (0.00042)		ND (0.00043)		ND (0.13)		ND (0.25)		ND (0.00050)	
1,2-Dichloropropane	mg/kg		ND (0.00043)		ND (0.00045)		ND (0.14)		ND (0.26)		ND (0.00052)	
cis-1,3-Dichloropropene	mg/kg	-	ND (0.00022)		ND (0.00023)		ND (0.072)		ND (0.14)		ND (0.00027)	
trans-1,3-Dichloropropene	mg/kg	-	ND (0.00027)		ND (0.00028)		ND (0.086)		ND (0.16)		ND (0.00032)	
1,4-Dioxane	mg/kg	0.1	ND (0.076)		ND (0.078)		ND (24)		ND (46)		ND (0.091)	
Ethylbenzene	mg/kg	1	ND (0.00017)		ND (0.00018)		**1.89**		ND (0.11)		ND (0.00021)	
Freon 113	mg/kg	6	ND (0.00043)		ND (0.00045)		ND (0.14)		ND (0.26)		ND (0.00052)	
2-Hexanone	mg/kg	-	ND (0.0018)		ND (0.0018)		ND (0.57)		ND (1.1)		ND (0.0021)	
Isopropylbenzene	mg/kg	2.3	ND (0.00015)		ND (0.00015)		**6**		ND (0.088)		ND (0.00017)	
Methyl Acetate	mg/kg	-	ND (0.0017)		ND (0.0017)		ND (0.53)		ND (1.0)		ND (0.0020)	
Methylcyclohexane	mg/kg	-	ND (0.00016)		ND (0.00017)		50		0.205	J	ND (0.00019)	
Methyl Tert Butyl Ether	mg/kg	0.93	ND (0.00034)		ND (0.00035)		ND (0.11)		ND (0.21)		ND (0.00041)	
4-Methyl-2-pentanone(MIBK)	mg/kg	1	ND (0.0013)		ND (0.0014)		ND (0.42)		ND (0.79)		ND (0.0016)	
Methylene chloride	mg/kg	0.05	0.006		0.0036	J	ND (0.54)		ND (1.0)		0.0069	
Styrene	mg/kg		ND (0.00023)		ND (0.00024)		ND (0.074)		ND (0.14)		ND (0.00028)	
1,1,2,2-Tetrachloroethane	mg/kg	0.6	ND (0.00034)		ND (0.00035)		ND (0.11)		ND (0.21)		ND (0.00041)	
Tetrachloroethene	mg/kg	1.3	ND (0.00041)		ND (0.00042)		ND (0.13)		ND (0.25)		ND (0.00049)	
Toluene	mg/kg	0.7	ND (0.00014)		0.0002	J	ND (0.045)		ND (0.085)		ND (0.00017)	
1,2,3-Trichlorobenzene	mg/kg		ND (0.00020)		ND (0.00021)		ND (0.066)		ND (0.12)		ND (0.00025)	
1,2,4-Trichlorobenzene	mg/kg	3.4	ND (0.00018)		ND (0.00019)		ND (0.057)		ND (0.11)		ND (0.00022)	
1,1,1-Trichloroethane	mg/kg	0.68	ND (0.00028)		ND (0.00029)		ND (0.091)		ND (0.17)		ND (0.00034)	
1,1,2-Trichloroethane	mg/kg	-	ND (0.00081)		ND (0.00084)		ND (0.26)		ND (0.49)		ND (0.00098)	
Trichloroethene	mg/kg	0.47	0.0053		0.0072		**207**		**99.8**		0.0035	J
Trichlorofluoromethane	mg/kg	-	ND (0.00022)		ND (0.00023)		ND (0.071)		ND (0.14)		ND (0.00027)	
Vinyl chloride	mg/kg	0.02	ND (0.00034)		ND (0.00035)		ND (0.11)		ND (0.21)		ND (0.00041)	
m,p-Xylene	mg/kg	1.6	ND (0.00048)		ND (0.00050)		**6.18**		ND (0.29)		ND (0.00058)	
o-Xylene	mg/kg	1.6	ND (0.00018)		ND (0.00018)		0.349		ND (0.11)		ND (0.00021)	
Xylene (total)	mg/kg	1.6	ND (0.00018)		ND (0.00018)		**6.53**		ND (0.11)		ND (0.00021)	
TOTAL VOCs			0.0113		0.011		317.799		100.28		0.029	

Notes:

SAMPLE ID SAMPLE DEPTH

SB-1 (14')

NYSCO Restricted Use - Protection of Groundwater Resources
(6 NYCRR 375-6 12/06) Soil Cleanup Objectives
(0.00023) = Method detection limit
Q= Qualifier
ND= Not detected above method detection limit
J = Estimated Value
mg/kg = milligrams per kilogram

Yellow shade with black text values exceed Part 375 Restricted Use for the Protection of Groundwater Resources

Table 2
Volatile Organic Compounds in Soil

FORMER ACCO BRANDS SITE
VCP # V00331
32-00 Skilllman Avenue
Long Island City, New York

Client Sample ID:		NY SCO - Protection of Groundwater w/CP-51 (10/10) (6 NYCRR 375-6 12/06)	SB-13(13'-14')		SB-13(21'-22')		SB-13(27'-28')		SB-13(32'-33')		SB-13(36'-37')		SB-13(42'-43')	
Lab Sample ID:			**JB49551-29**		**JB49551-31**		**JB49551-32**		**JB49551-33**		**JB49551-34**		**JB49551-35**	
Date Sampled:			**10/14/2013**		**10/14/2013**		**10/14/2013**		**10/14/2013**		**10/14/2013**		**10/14/2013**	
Matrix:			**Soil**		**Soil**		**Soil**		**Soil**		**Soil**		**Soil**	
			Results	**Q**	**Results**	**Q**	**Results**	**Q**	**Results**	**Q**	**Results**	**Q**	**Results**	**Q**
Acetone	mg/kg	0.05	ND (0.0047)		ND (0.0051)		ND (0.0051)		ND (0.0050)		ND (0.0054)		ND (0.0046)	
Benzene	mg/kg	0.06	ND (0.00013)		ND (0.00014)		ND (0.00014)		ND (0.00014)		ND (0.00015)		ND (0.00013)	
Bromochloromethane	mg/kg	-	ND (0.00054)		ND (0.00058)		ND (0.00058)		ND (0.00057)		ND (0.00061)		ND (0.00052)	
Bromodichloromethane	mg/kg	-	ND (0.00029)		ND (0.00031)		ND (0.00031)		ND (0.00031)		ND (0.00033)		ND (0.00028)	
Bromoform	mg/kg	-	ND (0.00027)		ND (0.00029)		ND (0.00029)		ND (0.00029)		ND (0.00031)		ND (0.00026)	
Bromomethane	mg/kg	-	ND (0.00050)		ND (0.00054)		ND (0.00054)		ND (0.00053)		ND (0.00056)		ND (0.00048)	
2-Butanone (MEK)	mg/kg	0.3	ND (0.0045)		ND (0.0049)		ND (0.0049)		ND (0.0048)		ND (0.0052)		ND (0.0044)	
Carbon disulfide	mg/kg	2.7	ND (0.00015)		ND (0.00016)		ND (0.00016)		ND (0.00015)		ND (0.00017)		ND (0.00014)	
Carbon tetrachloride	mg/kg	0.76	ND (0.00026)		ND (0.00028)		ND (0.00028)		ND (0.00028)		ND (0.00029)		ND (0.00025)	
Chlorobenzene	mg/kg	1.1	ND (0.00020)		ND (0.00022)		ND (0.00022)		ND (0.00022)		ND (0.00023)		ND (0.00020)	
Chloroethane	mg/kg	1.9	ND (0.0010)		ND (0.0011)		ND (0.0011)		ND (0.0011)		ND (0.0012)		ND (0.0010)	
Chloroform	mg/kg	0.37	ND (0.00026)		0.00044	J	ND (0.00028)		0.0013	J	0.00052	J	0.00081	J
Chloromethane	mg/kg	-	ND (0.00035)		ND (0.00038)		ND (0.00038)		ND (0.00038)		ND (0.00040)		ND (0.00034)	
Cyclohexane	mg/kg	-	ND (0.00027)		ND (0.00029)		ND (0.00029)		ND (0.00028)		ND (0.00030)		ND (0.00026)	
1,2-Dibromo-3-chloropropane	mg/kg	-	ND (0.0014)		ND (0.0015)		ND (0.0015)		ND (0.0015)		ND (0.0016)		ND (0.0013)	
Dibromochloromethane	mg/kg		ND (0.00025)		ND (0.00027)		ND (0.00027)		ND (0.00027)		ND (0.00028)		ND (0.00024)	
1,2-Dibromoethane	mg/kg	-	ND (0.00057)		ND (0.00061)		ND (0.00061)		ND (0.00060)		ND (0.00064)		ND (0.00055)	
1,2-Dichlorobenzene	mg/kg	1.1	ND (0.00035)		ND (0.00038)		ND (0.00038)		ND (0.00037)		ND (0.00040)		ND (0.00034)	
1,3-Dichlorobenzene	mg/kg	2.4	ND (0.00023)		ND (0.00024)		ND (0.00024)		ND (0.00024)		ND (0.00026)		ND (0.00022)	
1,4-Dichlorobenzene	mg/kg	1.8	ND (0.00026)		ND (0.00028)		ND (0.00028)		ND (0.00028)		ND (0.00029)		ND (0.00025)	
Dichlorodifluoromethane	mg/kg	-	ND (0.00036)		ND (0.00039)		ND (0.00039)		ND (0.00039)		ND (0.00041)		ND (0.00035)	
1,1-Dichloroethane	mg/kg	0.27	ND (0.00032)		ND (0.00035)		ND (0.00035)		ND (0.00035)		ND (0.00037)		ND (0.00031)	
1,2-Dichloroethane	mg/kg	0.02	ND (0.00033)		ND (0.00036)		ND (0.00036)		ND (0.00035)		ND (0.00038)		ND (0.00032)	
1,1-Dichloroethene	mg/kg	0.33	ND (0.00030)		ND (0.00032)		ND (0.00032)		0.00038	J	ND (0.00034)		ND (0.00029)	
cis-1,2-Dichloroethene	mg/kg	0.25	0.00039	J	0.0007	J	0.0147		0.0028	J	ND (0.00024)		ND (0.00021)	
trans-1,2-Dichloroethene	mg/kg	0.19	ND (0.00044)		ND (0.00047)		ND (0.00047)		ND (0.00046)		ND (0.00050)		ND (0.00042)	
1,2-Dichloropropane	mg/kg		ND (0.00045)		ND (0.00049)		ND (0.00049)		ND (0.00048)		ND (0.00051)		ND (0.00044)	
cis-1,3-Dichloropropene	mg/kg	-	ND (0.00023)		ND (0.00025)		ND (0.00025)		ND (0.00025)		ND (0.00027)		ND (0.00023)	
trans-1,3-Dichloropropene	mg/kg	-	ND (0.00028)		ND (0.00030)		ND (0.00030)		ND (0.00030)		ND (0.00032)		ND (0.00027)	
1,4-Dioxane	mg/kg	0.1	ND (0.079)		ND (0.085)		ND (0.085)		ND (0.084)		ND (0.090)		ND (0.077)	
Ethylbenzene	mg/kg	1	ND (0.00018)		ND (0.00019)		ND (0.00020)		ND (0.00019)		ND (0.00021)		ND (0.00018)	
Freon 113	mg/kg	6	ND (0.00045)		ND (0.00048)		ND (0.00049)		ND (0.00048)		ND (0.00051)		ND (0.00044)	
2-Hexanone	mg/kg	-	ND (0.0018)		ND (0.0020)		ND (0.0020)		ND (0.0020)		ND (0.0021)		ND (0.0018)	
Isopropylbenzene	mg/kg	2.3	ND (0.00015)		ND (0.00016)		ND (0.00016)		ND (0.00016)		ND (0.00017)		ND (0.00015)	
Methyl Acetate	mg/kg	-	ND (0.0017)		ND (0.0019)		ND (0.0019)		ND (0.0018)		ND (0.0020)		ND (0.0017)	
Methylcyclohexane	mg/kg	-	ND (0.00017)		ND (0.00018)		ND (0.00018)		ND (0.00018)		ND (0.00019)		ND (0.00016)	
Methyl Tert Butyl Ether	mg/kg	0.93	ND (0.00035)		ND (0.00038)		ND (0.00038)		ND (0.00038)		ND (0.00040)		ND (0.00034)	
4-Methyl-2-pentanone(MIBK)	mg/kg	1	ND (0.0014)		ND (0.0015)		ND (0.0015)		ND (0.0015)		ND (0.0015)		ND (0.0013)	
Methylene chloride	mg/kg	0.05	0.0053		0.0048	J	0.0044	J	0.0052	J	0.0026	J	0.0034	J
Styrene	mg/kg		ND (0.00024)		ND (0.00026)		ND (0.00026)		ND (0.00026)		ND (0.00027)		ND (0.00023)	
1,1,2,2-Tetrachloroethane	mg/kg	0.6	ND (0.00035)		ND (0.00038)		ND (0.00038)		ND (0.00038)		ND (0.00040)		ND (0.00034)	
Tetrachloroethene	mg/kg	1.3	ND (0.00042)		ND (0.00046)		ND (0.00046)		0.0075		0.0008	J	ND (0.00041)	
Toluene	mg/kg	0.7	ND (0.00015)		ND (0.00016)		ND (0.00016)		0.00028	J	0.00024	J	ND (0.00014)	
1,2,3-Trichlorobenzene	mg/kg		ND (0.00021)		ND (0.00023)		ND (0.00023)		ND (0.00023)		ND (0.00024)		ND (0.00021)	
1,2,4-Trichlorobenzene	mg/kg	3.4	ND (0.00019)		ND (0.00020)		ND (0.00020)		ND (0.00020)		ND (0.00021)		ND (0.00018)	
1,1,1-Trichloroethane	mg/kg	0.68	ND (0.00030)		ND (0.00032)		ND (0.00032)		0.00085	J	ND (0.00034)		ND (0.00029)	
1,1,2-Trichloroethane	mg/kg	-	ND (0.00085)		ND (0.00091)		ND (0.00092)		0.0228		ND (0.00096)		ND (0.00082)	
Trichloroethene	mg/kg	0.47	0.0034	J	0.0189		0.0834		**29.2**		0.308	J	ND (0.00035)	
Trichlorofluoromethane	mg/kg	-	ND (0.00023)		ND (0.00025)		ND (0.00025)		ND (0.00025)		ND (0.00026)		ND (0.00023)	
Vinyl chloride	mg/kg	0.02	ND (0.00035)		ND (0.00038)		ND (0.00038)		ND (0.00038)		ND (0.00040)		ND (0.00034)	
m,p-Xylene	mg/kg	1.6	ND (0.00050)		ND (0.00054)		ND (0.00054)		ND (0.00053)		ND (0.00057)		ND (0.00049)	
o-Xylene	mg/kg	1.6	ND (0.00018)		ND (0.00020)		ND (0.00020)		ND (0.00020)		ND (0.00021)		ND (0.00018)	
Xylene (total)	mg/kg	1.6	ND (0.00018)		ND (0.00020)		ND (0.00020)		ND (0.00020)		ND (0.00021)		ND (0.00018)	
TOTAL VOCs			0.00909		0.02484		0.1025		29.24111		0.31216		0.00421	

Notes:

SAMPLE ID SAMPLE DEPTH
SB-1 (14')

NYSCO Restricted Use - Protection of Groundwater Resources
(6 NYCRR 375-6 12/06) Soil Cleanup Objectives
(0.00023) = Method detection limit
Q= Qualifier
ND= Not detected above method detection limit
J = Estimated Value
mg/kg = milligrams per kilogram

Yellow shade with black text values exceed Part 375 Restricted Use for the Protection of Groundwater Resources

Fleming Lee Shue

Environmental Management and Consulting

Table 2
Volatile Organic Compounds in Soil

FORMER ACCO BRANDS SITE
VCP # V00331
32-00 Skilllman Avenue
Long Island City, New York

Client Sample ID:		NY SCO - Protection of Groundwater w/CP-51 (10/10) (6 NYCRR 375-6 12/06)	SB-14 (13'-14')		SB-14 (29'-30')		SB-14 (33'-34')		SB-14 (36'-37')		SB-14 (41'-42')		SB-14 (43'-44')	
Lab Sample ID:			JB52130-8		JB52130-9		JB52130-10		JB52130-11		JB52130-12		JB52130-13	
Date Sampled:			11/5/2013		11/6/2013		11/6/2013		11/6/2013		11/6/2013		11/6/2013	
Matrix:			Soil		Soil		Soil		Soil		Soil		Soil	
			Results	Q	Results	Q	Results	Q	Results	Q	Results	Q	Results	Q
Acetone	mg/kg	0.05	ND (0.0047)		ND (0.23)		ND (1.1)		ND (0.23)		ND (0.23)		ND (0.0041)	
Benzene	mg/kg	0.06	ND (0.00013)		ND (0.0063)		ND (0.032)		ND (0.0063)		ND (0.0063)		ND (0.00011)	
Bromochloromethane	mg/kg	-	ND (0.00053)		ND (0.026)		ND (0.13)		ND (0.026)		ND (0.026)		ND (0.00047)	
Bromodichloromethane	mg/kg	-	ND (0.00029)		ND (0.014)		ND (0.070)		ND (0.014)		ND (0.014)		ND (0.00026)	
Bromoform	mg/kg	-	ND (0.00027)		ND (0.013)		ND (0.066)		ND (0.013)		ND (0.013)		ND (0.00024)	
Bromomethane	mg/kg	-	ND (0.00049)		ND (0.024)		ND (0.12)		ND (0.024)		ND (0.024)		ND (0.00044)	
2-Butanone (MEK)	mg/kg	0.3	ND (0.0045)		ND (0.22)		ND (1.1)		ND (0.22)		ND (0.22)		ND (0.0040)	
Carbon disulfide	mg/kg	2.7	ND (0.00014)		ND (0.0071)		ND (0.035)		ND (0.0071)		ND (0.0071)		ND (0.00013)	
Carbon tetrachloride	mg/kg	0.76	ND (0.00026)		ND (0.013)		ND (0.063)		ND (0.013)		ND (0.013)		ND (0.00023)	
Chlorobenzene	mg/kg	1.1	ND (0.00020)		ND (0.0099)		ND (0.049)		ND (0.0099)		ND (0.0099)		ND (0.00018)	
Chloroethane	mg/kg	1.9	ND (0.0010)		ND (0.050)		ND (0.25)		ND (0.050)		ND (0.050)		ND (0.00090)	
Chloroform	mg/kg	0.37	ND (0.00026)		ND (0.013)		ND (0.064)		ND (0.013)		ND (0.013)		ND (0.00023)	
Chloromethane	mg/kg	-	ND (0.00035)		ND (0.017)		ND (0.086)		ND (0.017)		ND (0.017)		ND (0.00031)	
Cyclohexane	mg/kg	-	ND (0.00026)		ND (0.013)		ND (0.064)		ND (0.013)		ND (0.013)		ND (0.00023)	
1,2-Dibromo-3-chloropropane	mg/kg	-	ND (0.0014)		ND (0.067)		ND (0.33)		ND (0.067)		ND (0.067)		ND (0.0012)	
Dibromochloromethane	mg/kg		ND (0.00025)		ND (0.012)		ND (0.061)		ND (0.012)		ND (0.012)		ND (0.00022)	
1,2-Dibromoethane	mg/kg	-	ND (0.00056)		ND (0.027)		ND (0.14)		ND (0.027)		ND (0.027)		ND (0.00050)	
1,2-Dichlorobenzene	mg/kg	1.1	ND (0.00034)		ND (0.017)		ND (0.085)		ND (0.017)		ND (0.017)		ND (0.00031)	
1,3-Dichlorobenzene	mg/kg	2.4	ND (0.00022)		ND (0.011)		ND (0.055)		ND (0.011)		ND (0.011)		ND (0.00020)	
1,4-Dichlorobenzene	mg/kg	1.8	ND (0.00026)		ND (0.013)		ND (0.063)		ND (0.013)		ND (0.013)		ND (0.00023)	
Dichlorodifluoromethane	mg/kg	-	ND (0.00036)		ND (0.018)		ND (0.088)		ND (0.018)		ND (0.018)		ND (0.00032)	
1,1-Dichloroethane	mg/kg	0.27	ND (0.00032)		ND (0.016)		ND (0.079)		ND (0.016)		ND (0.016)		ND (0.00029)	
1,2-Dichloroethane	mg/kg	0.02	ND (0.00033)		ND (0.016)		ND (0.080)		ND (0.016)		ND (0.016)		ND (0.00029)	
1,1-Dichloroethene	mg/kg	0.33	ND (0.00029)		ND (0.014)		ND (0.072)		ND (0.014)		ND (0.014)		ND (0.00026)	
cis-1,2-Dichloroethene	mg/kg	0.25	0.0117		ND (0.010)		ND (0.052)		ND (0.010)		ND (0.010)		ND (0.00019)	
trans-1,2-Dichloroethene	mg/kg	0.19	ND (0.00043)		ND (0.021)		ND (0.11)		ND (0.021)		ND (0.021)		ND (0.00038)	
1,2-Dichloropropane	mg/kg		ND (0.00044)		ND (0.022)		ND (0.11)		ND (0.022)		ND (0.022)		ND (0.00040)	
cis-1,3-Dichloropropene	mg/kg	-	ND (0.00023)		ND (0.011)		ND (0.057)		ND (0.011)		ND (0.011)		ND (0.00021)	
trans-1,3-Dichloropropene	mg/kg	-	ND (0.00028)		ND (0.014)		ND (0.068)		ND (0.014)		ND (0.014)		ND (0.00025)	
1,4-Dioxane	mg/kg	0.1	ND (0.078)		ND (3.8)		ND (19)		ND (3.8)		ND (3.8)		ND (0.069)	
Ethylbenzene	mg/kg	1	ND (0.00018)		ND (0.0088)		ND (0.044)		ND (0.0088)		ND (0.0088)		ND (0.00016)	
Freon 113	mg/kg	6	ND (0.00044)		ND (0.022)		ND (0.11)		ND (0.022)		ND (0.022)		ND (0.00040)	
2-Hexanone	mg/kg	-	ND (0.0018)		ND (0.089)		ND (0.45)		ND (0.089)		ND (0.089)		ND (0.0016)	
Isopropylbenzene	mg/kg	2.3	ND (0.00015)		ND (0.0074)		ND (0.037)		ND (0.0074)		ND (0.0074)		ND (0.00013)	
Methyl Acetate	mg/kg	-	ND (0.0017)		ND (0.084)		ND (0.42)		ND (0.084)		ND (0.084)		ND (0.0015)	
Methylcyclohexane	mg/kg	-	ND (0.00017)		ND (0.0082)		ND (0.041)		ND (0.0082)		ND (0.0082)		ND (0.00015)	
Methyl Tert Butyl Ether	mg/kg	0.93	ND (0.00035)		ND (0.017)		ND (0.086)		ND (0.017)		ND (0.017)		ND (0.00031)	
4-Methyl-2-pentanone(MIBK)	mg/kg	1	ND (0.0013)		ND (0.066)		ND (0.33)		ND (0.066)		ND (0.066)		ND (0.0012)	
Methylene chloride	mg/kg	0.05	0.0049	J	ND (0.085)		ND (0.43)		ND (0.085)		ND (0.085)		0.0017	J
Styrene	mg/kg		ND (0.00024)		ND (0.012)		ND (0.058)		ND (0.012)		ND (0.012)		ND (0.00021)	
1,1,2,2-Tetrachloroethane	mg/kg	0.6	ND (0.00035)		ND (0.017)		ND (0.086)		ND (0.017)		ND (0.017)		ND (0.00031)	
Tetrachloroethene	mg/kg	1.3	0.0052		ND (0.021)		ND (0.10)		ND (0.021)		ND (0.021)		ND (0.00037)	
Toluene	mg/kg	0.7	ND (0.00014)		ND (0.0071)		ND (0.036)		ND (0.0071)		ND (0.0071)		ND (0.00013)	
1,2,3-Trichlorobenzene	mg/kg		ND (0.00021)		ND (0.010)		ND (0.052)		ND (0.010)		ND (0.010)		ND (0.00019)	
1,2,4-Trichlorobenzene	mg/kg	3.4	ND (0.00018)		ND (0.0091)		ND (0.045)		ND (0.0091)		ND (0.0091)		ND (0.00016)	
1,1,1-Trichloroethane	mg/kg	0.68	ND (0.00029)		ND (0.014)		ND (0.072)		ND (0.014)		ND (0.014)		ND (0.00026)	
1,1,2-Trichloroethane	mg/kg	-	ND (0.00084)		ND (0.041)		ND (0.21)		ND (0.041)		ND (0.041)		ND (0.00075)	
Trichloroethene	mg/kg	0.47	0.0042	J	**5.54**		**68.9**		**18.2**		**7.68**		0.0018	J
Trichlorofluoromethane	mg/kg	-	ND (0.00023)		ND (0.011)		ND (0.056)		ND (0.011)		ND (0.011)		ND (0.00020)	
Vinyl chloride	mg/kg	0.02	ND (0.00035)		ND (0.017)		ND (0.086)		ND (0.017)		ND (0.017)		ND (0.00031)	
m,p-Xylene	mg/kg	1.6	ND (0.00049)		ND (0.024)		ND (0.12)		ND (0.024)		ND (0.024)		ND (0.00044)	
o-Xylene	mg/kg	1.6	ND (0.00018)		ND (0.0089)		ND (0.045)		ND (0.0089)		ND (0.0089)		ND (0.00016)	
Xylene (total)	mg/kg	1.6	ND (0.00018)		ND (0.0089)		ND (0.045)		ND (0.0089)		ND (0.0089)		ND (0.00016)	
TOTAL VOCs			0.026		5.54		68.9		18.2		7.68		0.0035	

Notes:

SAMPLE ID SAMPLE DEPTH

SB-1 (14')

NYSCO Restricted Use - Protection of Groundwater Resources
(6 NYCRR 375-6 12/06) Soil Cleanup Objectives
(0.00023) = Method detection limit
Q= Qualifier
ND= Not detected above method detection limit
J = Estimated Value
mg/kg = milligrams per kilogram

Yellow shade with black text values exceed Part 375 Restricted Use for the Protection of Groundwater Resources

Fleming Lee Shue *Environmental Management and Consulting*

Table 2
Volatile Organic Compounds in Soil

FORMER ACCO BRANDS SITE
VCP # V00331
32-00 Skilllman Avenue
Long Island City, New York

Client Sample ID:		NY SCO - Protection of Groundwater w/CP-51 (10/10) (6 NYCRR 375-6 12/06)	SB-15 (15'-16')		SB-15 (26'-27')		SB-15 (32'-33')		SB-15 (34'-35')	
Lab Sample ID:			JB52130-14		JB52130-20		JB52130-16		JB52130-17	
Date Sampled:			11/6/2013		11/6/2013		11/7/2013		11/7/2013	
Matrix:			Soil		Soil		Soil		Soil	
			Results	Q	Results	Q	Results	Q	Results	Q
Acetone	mg/kg	0.05	ND (0.0044)		ND (0.0037)		0.0194		ND (0.0036)	
Benzene	mg/kg	0.06	ND (0.00012)		ND (0.00010)		ND (0.00011)		ND (0.00010)	
Bromochloromethane	mg/kg	-	ND (0.00050)		ND (0.00043)		ND (0.00044)		ND (0.00041)	
Bromodichloromethane	mg/kg	-	ND (0.00027)		ND (0.00023)		ND (0.00024)		ND (0.00022)	
Bromoform	mg/kg	-	ND (0.00025)		ND (0.00021)		ND (0.00022)		ND (0.00021)	
Bromomethane	mg/kg	-	ND (0.00046)		ND (0.00039)		ND (0.00041)		ND (0.00038)	
2-Butanone (MEK)	mg/kg	0.3	ND (0.0042)		ND (0.0036)		ND (0.0037)		ND (0.0035)	
Carbon disulfide	mg/kg	2.7	ND (0.00014)		ND (0.00012)		ND (0.00012)		ND (0.00011)	
Carbon tetrachloride	mg/kg	0.76	ND (0.00024)		ND (0.00021)		ND (0.00021)		ND (0.00020)	
Chlorobenzene	mg/kg	1.1	ND (0.00019)		ND (0.00016)		ND (0.00017)		ND (0.00016)	
Chloroethane	mg/kg	1.9	ND (0.00096)		ND (0.00082)		ND (0.00084)		ND (0.00079)	
Chloroform	mg/kg	0.37	0.00074	J	0.00036	J	0.00088	J	0.0011	J
Chloromethane	mg/kg	-	ND (0.00033)		ND (0.00028)		ND (0.00029)		ND (0.00027)	
Cyclohexane	mg/kg	-	ND (0.00025)		ND (0.00021)		ND (0.00022)		ND (0.00020)	
1,2-Dibromo-3-chloropropane	mg/kg	-	ND (0.0013)		ND (0.0011)		ND (0.0011)		ND (0.0011)	
Dibromochloromethane	mg/kg		ND (0.00023)		ND (0.00020)		ND (0.00021)		ND (0.00019)	
1,2-Dibromoethane	mg/kg	-	ND (0.00053)		ND (0.00045)		ND (0.00046)		ND (0.00043)	
1,2-Dichlorobenzene	mg/kg	1.1	ND (0.00032)		ND (0.00028)		ND (0.00029)		ND (0.00027)	
1,3-Dichlorobenzene	mg/kg	2.4	ND (0.00021)		ND (0.00018)		ND (0.00018)		ND (0.00017)	
1,4-Dichlorobenzene	mg/kg	1.8	ND (0.00024)		ND (0.00021)		ND (0.00021)		ND (0.00020)	
Dichlorodifluoromethane	mg/kg	-	ND (0.00034)		ND (0.00029)		ND (0.00030)		ND (0.00028)	
1,1-Dichloroethane	mg/kg	0.27	ND (0.00030)		ND (0.00026)		ND (0.00027)		0.00069	J
1,2-Dichloroethane	mg/kg	0.02	ND (0.00031)		ND (0.00026)		ND (0.00027)		ND (0.00025)	
1,1-Dichloroethene	mg/kg	0.33	ND (0.00028)		ND (0.00024)		ND (0.00024)		ND (0.00023)	
cis-1,2-Dichloroethene	mg/kg	0.25	0.0016	J	ND (0.00017)		ND (0.00018)		0.00049	J
trans-1,2-Dichloroethene	mg/kg	0.19	ND (0.00041)		ND (0.00035)		ND (0.00036)		ND (0.00034)	
1,2-Dichloropropane	mg/kg		ND (0.00042)		ND (0.00036)		ND (0.00037)		ND (0.00035)	
cis-1,3-Dichloropropene	mg/kg	-	ND (0.00022)		ND (0.00019)		ND (0.00019)		ND (0.00018)	
trans-1,3-Dichloropropene	mg/kg	-	ND (0.00026)		ND (0.00022)		ND (0.00023)		ND (0.00021)	
1,4-Dioxane	mg/kg	0.1	ND (0.073)		ND (0.063)		ND (0.065)		ND (0.061)	
Ethylbenzene	mg/kg	1	ND (0.00017)		ND (0.00014)		ND (0.00015)		ND (0.00014)	
Freon 113	mg/kg	6	ND (0.00042)		ND (0.00036)		ND (0.00037)		ND (0.00035)	
2-Hexanone	mg/kg	-	ND (0.0017)		ND (0.0015)		ND (0.0015)		ND (0.0014)	
Isopropylbenzene	mg/kg	2.3	ND (0.00014)		ND (0.00012)		ND (0.00012)		ND (0.00012)	
Methyl Acetate	mg/kg	-	ND (0.0016)		ND (0.0014)		ND (0.0014)		ND (0.0013)	
Methylcyclohexane	mg/kg	-	ND (0.00016)		ND (0.00013)		ND (0.00014)		ND (0.00013)	
Methyl Tert Butyl Ether	mg/kg	0.93	ND (0.00033)		ND (0.00028)		ND (0.00029)		ND (0.00027)	
4-Methyl-2-pentanone(MIBK)	mg/kg	1	ND (0.0013)		ND (0.0011)		ND (0.0011)		ND (0.0010)	
Methylene chloride	mg/kg	0.05	ND (0.0016)		ND (0.0014)		ND (0.0014)		ND (0.0013)	
Styrene	mg/kg		ND (0.00022)		ND (0.00019)		ND (0.00020)		ND (0.00018)	
1,1,2,2-Tetrachloroethane	mg/kg	0.6	ND (0.00033)		ND (0.00028)		ND (0.00029)		ND (0.00027)	
Tetrachloroethene	mg/kg	1.3	ND (0.00039)		ND (0.00034)		ND (0.00035)		ND (0.00033)	
Toluene	mg/kg	0.7	0.00023	J	0.0002	J	0.00018	J	ND (0.00011)	
1,2,3-Trichlorobenzene	mg/kg		ND (0.00020)		ND (0.00017)		ND (0.00018)		ND (0.00016)	
1,2,4-Trichlorobenzene	mg/kg	3.4	ND (0.00017)		ND (0.00015)		ND (0.00015)		ND (0.00014)	
1,1,1-Trichloroethane	mg/kg	0.68	ND (0.00028)		ND (0.00024)		ND (0.00024)		ND (0.00023)	
1,1,2-Trichloroethane	mg/kg	-	ND (0.00079)		ND (0.00067)		ND (0.00070)		ND (0.00065)	
Trichloroethene	mg/kg	0.47	0.0243		0.00044	J	ND (0.00030)		0.00033	J
Trichlorofluoromethane	mg/kg	-	ND (0.00022)		ND (0.00018)		ND (0.00019)		ND (0.00018)	
Vinyl chloride	mg/kg	0.02	ND (0.00033)		ND (0.00028)		ND (0.00029)		ND (0.00027)	
m,p-Xylene	mg/kg	1.6	ND (0.00047)		ND (0.00040)		ND (0.00041)		ND (0.00038)	
o-Xylene	mg/kg	1.6	ND (0.00017)		ND (0.00015)		ND (0.00015)		ND (0.00014)	
Xylene (total)	mg/kg	1.6	ND (0.00017)		ND (0.00015)		ND (0.00015)		ND (0.00014)	
TOTAL VOCs			0.02687		0.001		0.02046		0.00261	

Notes:

SAMPLE ID SAMPLE DEPTH

SB-1 (14')

NYSCO Restricted Use - Protection of Groundwater Resources
(6 NYCRR 375-6 12/06) Soil Cleanup Objectives
(0.00023) = Method detection limit
Q= Qualifier
ND= Not detected above method detection limit
J = Estimated Value
mg/kg = milligrams per kilogram

Yellow shade with black text values exceed Part 375 Restricted Use for the Protection of Groundwater Resources

Appendix B

Quality Assurance Project Plan

Former ACCO Brands Site
32-00 Skillman Avenue
Long Island City, NY

NYSDEC BCP#V00331

QUALITY ASSURANCE PROJECT PLAN

Prepared for:
Jim Beam Co., Inc.
510 Lake Cook Road
Deerfield, IL 60015

FLS Project Number: 10195-001

Submitted to:
New York State Department of Environmental Conservation
Division of Environmental Remediation
1 Hunters Point Plaza
47-40 21st Street
Long Island City, NY 11101

June 2013

Arnold F. Fleming, P.E.
&

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APPENDIX A - Resumes

1.0 INTRODUCTION

The Quality Assurance Project Plan (QAPP) outlines the protocols and procedures that will be followed during the Supplemental Remedial Investigation (SRI) at the former ACCO Brands site, located at 32-00 Skillman Ave., Long Island City (Queens), NY, (hereafter referred to as the “Site”). The Site is part of the Brownfield Cleanup Program (BCP# V00331). A Site Location Map is included as Figure 1. The SRI will be conducted in accordance with the approved SRI Work Plan (SRIWP) for Operable Unit 1(OU-1) of the Site. This QAPP has been prepared in order to ensure Quality Assurance (QA) and Quality Control (QC) for the environmental sampling activities which will be conducted under the SRIWP and to ensure the acquisition of defensible data.

2.0 PROJECT TEAM

The project team will consist of Fleming Lee-Shue Inc. (FLS) personnel and subcontractors. All field personnel and subcontractors will have completed a 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training course and the annual HAZWOPER 8-hour refresher in accordance with the Occupational Safety and Health Administration (OSHA) regulations and will have the training required for their respective duties as outlined for this investigation. The project team qualifications are provided in Attachment I.

2.1 Remedial Engineer

The oversight of all aspects of the project will be conducted by the Remedial Engineer (RE). The RE is responsible for compliance with the SRIWP. Mr. Arnold F. Fleming, P.E., will act as the RE for the site investigation and remedial action at the Site.

2.2 Project Director

The general oversight of all aspects of the project will be conducted by the Project Director. Tasks will include the scheduling, budgeting, data management and decision-making for the field program. Mr. Kevin McGuinness, PG will act as the Project Director for the Site investigation.

2.3 Project Manager

All components of the Remedial Investigation will be directed and coordinated by the Project Manager. The Project Manager will ensure a smooth flow of information between all parties involved in the investigation by communicating regularly with professionals from the New York State Department of Environmental Conservation (NYSDEC), the Site management personnel, and all members of the FLS project team. Ms. Susan Bianchetti, CPG will act as the Project Manager for the project.

2.4 Field Team Leader

Daily onsite sampling and health and safety activities will be supervised by a Field Team Leader. The Team Leader's responsibilities will include ensuring adherence to the SRIWP and Health and Safety Plan (HASP) and regularly reporting daily progress and deviations from the SRIWP to the Project Manager. Upon approval of the SRIWP, FLS will assign the role of Field Team Leader to appropriate FLS personnel.

2.5 Project Quality Assurance / Quality Control Officer

Adherence to the QAPP will be ensured by a FLS QA/QC Officer. Tasks will include reviewing the QA procedures with all personnel before any fieldwork is conducted onsite as well as completing periodic site visits in order to assess the implementation of these procedures. Mr. Bill Maniquez, will act as the QA/QC officer for the remedial action.

2.6 Laboratory Quality Assurance / Quality Control Officer

Quality control procedures will be ensured by the selected laboratory, Accutest, QA/QC officer. This officer will be responsible for the adherence to laboratory protocols, quality control procedures, and checks in the laboratory. The officer will track the movement of the samples from check-in to issue of the analytical results, conducting a final check on the analytical calculations. The laboratory groups performing the respective analyses will complete their own QA/QC and sign off on the data. The Accutest QA/QC manual is attached to the end of this document.

3.0 LABORATORY PROCEDURES

3.1 Laboratory Methods

The sample container type, preservation, applicable holding time, and laboratory methods of analysis of the field samples have been included as Table 1. Holding times are based on the SW-846 analytical method which, when adjusted to account for an assumed 2-day sample shipping time, match NYSDEC Analytical Services Protocol (ASP) holding times. Sample analyses will be completed by a New York State Department of Health Environmental Laboratory Approval Program (NYSDOH-ELAP) certified laboratory and reported as NYSDEC ASP Category B deliverables. The data will be submitted to NYSDEC in EqUIS Electronic Data Deliverable format.

A data usability review and validation of the laboratory analytical results will be performed by a third party. The purpose of the data usability review is to determine whether or not the data meets the Site-specific criteria for data quality and use. A Data Usability Summary Report (DUSR) will be prepared in accordance with NYSDEC DER-10 - Appendix 2B Guidance for Data Deliverables of Data Usability Summary Reports.

3.2 Quality Control Sampling

Additional analysis will be conducted for quality control assurance in addition to the laboratory analysis of the field soil and groundwater samples. Quality control samples will include: equipment rinsate blanks, duplicate samples, and trip blanks. The quantities of field samples and quality control samples have been summarized in Table 2.

The equipment blank and duplicate samples will be analyzed for the same parameters as the samples, as shown on Table 1.

4.0 STANDARD OPERATING PROCEDURES

The standard operating procedures for the high resolution vertical profiling, soil sampling, groundwater sampling, and sampling equipment decontamination have been described in the following sections. Safety monitoring will be performed in accordance with the Site-specific HASP, which mandates that all field personnel wear the appropriate personal protective equipment (PPE).

4.1 High Resolution Vertical Profiling

High resolution vertical profiling will be completed using a Membrane Interface Probe (MIP) to delineate zones of chlorinated solvent contamination and confirm the source area. An 8-inch diameter core hole will be advanced through the concrete floor to accommodate the multiple sensors that will be used in the vertical profiling. The sensor detection system includes a photo-ionization detector (PID), flame-ionization detector and a halogen specific detector. All drilling and sampling equipment, including the sensors, will be decontaminated between each sampling location. The MIP locations are provided in Figure 2 of the SRIWP.

4.2 Soil Sampling

An estimated total of 12 soil borings will be advanced in OU-1. The placement of these borings will be finalized based on the results of the high resolution vertical profiling. The soil boring locations are provided in Figure 3 of the SRIWP.

The soil borings will be advanced to a total depth of approximately 30 feet-below-grade with a direct push Geoprobe® rig. Continuous soil samples will be collected utilizing a dedicated PVC liner for each soil sample. Samples from the vadose zone will be screened for volatile organic compound (VOCs) vapors using a PID. Soil samples will be collected from each soil boring for laboratory analysis. Detailed soil boring log describing the subsurface lithology will be developed for each boring.

The soil samples will be analyzed for the following:

- Target Compound List (TCL) VOCs + 10 Tentatively Identified Compounds (TICs) by EPA Method 8260 and EPA Method 5035 A
- Total Organic Carbon / Fraction Organic Carbon
- Metals
- Bulk Density

As an alternative, soil samples for VOCs will be managed in accordance with EPA Method 5035 A – Closed System Purge-and-Trap and Extraction Procedure for Volatile Organics. A TerraCore sampler will be used to collect at least 5 grams of soil and transfer carefully in laboratory provided and sealed vials. The entire sample vial will be placed, unopened, into the instrument by the laboratory to ensure minimal loss of volatile constituents.

Soil samples will also be collected for bench scale treatability testing as well. The analytical parameters will include determination of total oxidant demands, measurement of reduced soil minerals, natural organic matter and VOCs.

4.3 Groundwater Sampling

Four shallow wells (MW-1, MW-3, MW-6 and MW-7) and three intermediate wells (MW-1I, MW-3I and MW-6I) in OU-1 will be sampled by FLS. The groundwater samples will be collected using low-flow sampling methods to minimize loss of VOCs. The groundwater samples will be analyzed for TCL VOCs + 10 TICs using EPA Method 8260. The monitoring well locations are provided in Figure 4 of the SRIWP.

In addition to the routine VOC analysis, groundwater samples collected from the shallow and intermediate wells from the proposed treatment area will be analyzed for additional indicators to provide sufficient information to conduct a treatability analysis. This analysis will include the following parameters:

- Dissolved Oxygen
- Oxidant Reductive Potential
- Conductivity
- pH
- Temperature
- Turbidity
- Metals – Target Analyte List
- Dissolved Iron
- Sulfate, Sulfide, Chloride
- Alkalinity, Carbonate, Bicarbonate
- Methane

A slug test will be conducted in two shallow and two intermediate OU-1 wells to measure the hydraulic conductivity in the source area. This slug test will be either rising-head or falling-head (or both).

Groundwater sampling methods will include the following:

- Each monitoring well will be purged to ensure that a representative groundwater sample is obtained. Purge samples will be collected periodically (every 5 minutes) and analyzed for water-quality parameters (e.g., turbidity, pH, temperature, dissolved oxygen, reduction-oxidation potential, and specific conductivity). Each well will be purged until the water-quality parameters stabilize (three successive readings) or three well volumes have been removed. All purge water will be containerized in a 55-gallon drum.

- After purging is complete, the tubing will be disconnected. The groundwater samples will be collected directly from the discharge end of the tubing into the required sample containers listed in Table 1. The containers will be labeled as described in Section 4.4.1 and stored in cooler with ice. The samples will be maintained at 4° +/- 2° C in the field and during transport.

- A final field sample will be collected and analyzed for water-quality parameters (e.g., turbidity, pH, temperature, dissolved oxygen, reduction-oxidation potential, and specific conductivity). The final parameter readings will be recorded in the field notes.

- When the sampling is completed, the pump and tubing will be removed from the well.

- The pump, water-level meter and flow-through cell will be decontaminated as described in Section 4.5.

- All field measurements (depth-to-water, water-quality parameters), calculations (well volume) and observations will be recorded in the project logbook and on field data sheet.

4.4 Sample Handling

4.4.1 Sample Identification

All sample containers will be labeled with the following information:

- Project identification
- Sample identification
- Date and time of collection
- Analysis(es) to be performed
- Samplers initials

Collected and labeled samples will be placed in ice-filled coolers away from direct sunlight to await shipment/delivery to the laboratory.

Prior to shipment each sample will be placed in a sealable plastic bag. Fresh ice will be placed in two sealable plastic bags, or “blue ice” blocks will be put into the cooler along with the COC form. The samples may be shipped overnight (e.g., via Federal Express) or transported by a laboratory courier. Any coolers that are shipped to the laboratory will be sealed with tape and a COC seal to ensure that the coolers remain sealed during delivery.

4.4.2 Sample Custody

The field personnel will be responsible for maintaining the sample coolers in a secured area until arrival at the laboratory. Sample possession record from the time of obtainment in the field to the time of delivery to the laboratory or shipping off-site will be documented on COC forms. The COC forms will contain the following information: project name; names of sampling personnel; sample number; date and time of collection and matrix; signatures of individuals involved in sample transfer; and the dates and times of transfers. The laboratory personnel will examine the custody seal’s condition at sample check-in.

4.5 Decontamination Procedures

Decontamination will be performed on plastic sheeting or other containment area that is deemed to prevent runoff to the ground. Prior to use onsite and between sampling locations, pump, water-level meter and other non-disposable sampling equipment will be decontaminated using the following protocol:

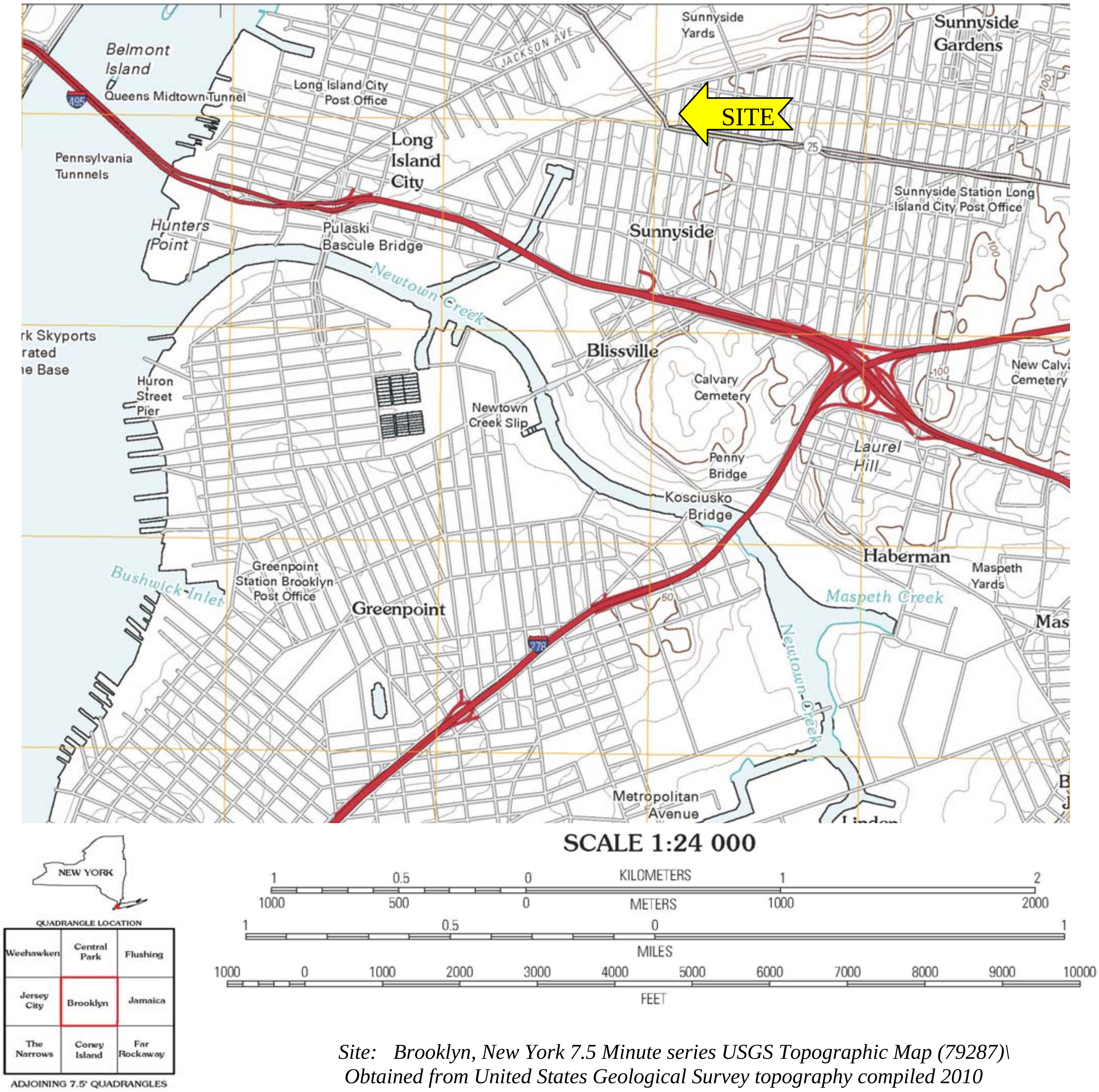
1. Scrub using tap water /non-phosphate detergent mixture and bristle brush.
2. Rinse with tap water.
3. Repeat step 1 and 2.
4. Final rinse with distilled water.
5. Air-dry.

4.6 Field Instrumentation

All field instruments will be calibrated at the start of each day of field work in accordance with the manufacturer’s specifications. In the instance that an instrument fails calibration, the Project Manager or QA/QC Officer must be contacted so as to arrange repairs or obtain a replacement instrument. A calibration log will be maintained onsite in the field book in order to record specific details regarding instrument calibration, including: dates, problems, and corrective actions. The PID will be calibrated each day using a standard of 100 parts per million (ppm) isobutylene, zeroed as per manufacturer specifications.

All field personnel will be trained in the proper operation of all field instruments at the start of the field program; however, instruction manuals for all equipment will be stored onsite as a reference of the proper procedures for operation, maintenance and calibration.

Figure



*Site: Brooklyn, New York 7.5 Minute series USGS Topographic Map (79287)\
Obtained from United States Geological Survey topography compiled 2010*

FIGURE 1: SITE LOCATION

SITE: FORMER ACCO BRANDS
32-00 SKILLMAN AVENUE
LONG ISLAND CITY, NEW YORK

Fleming
Lee Shue

Environmental Management & Consulting, 158 West 29th Street, 9th Fl., New York, NY 10001

Tables

Table 1
Summary of Analytical Methods
Former ACCO Brands
Long Island City, New York

Sample Type	Sample Matrix	Analytical Parameter	No. of Samples[1]	Analytical Method	Sample Preservation	Holding Time[2]	Sample Container[3]
Soil Boring Grab	Soil	TCL VOCS	12	SW-846 Method 8260B	Cool to 4° C; no headspace	14 days to analysis	(2) 2 oz. glass jars
Soil Boring Grab	Soil	Total Organic Carbon Fraction Organic Carbon	12	ELAP Method (1210) - Lloyd Kahn Method	Cool to 4° C	28 days to extraction	(1) 8 oz. glass jar; H_2SO_4 to preserve
Soil Boring Grab	Soil	Metals, TAL	12	SW-846 Method 6010B/7000 Series Hg –SW-846 7471A or 7471B	Cool to 4° C	6 months to analysis	(1) 8 oz. glass jar
Trip Blank	Aqueous	VOCs, TCL	1	SW-846 Method 8260B	Cool to 4° C; no headspace, HCl	14 days to analysis	(2) 40mL VOA Vials
Groundwater	Aqueous	VOCs, TCL	7	SW-846 Method 8260B	Cool to 4° C; no headspace, HCl	14 days to analysis	(3) 40mL VOA Vials
Groundwater	Aqueous	Dissolved Iron	7	EPA Method 200.7 Revision 4.4	Cool to 4° C	6 months	(1) 1 Liter amber glass jar w/HNO_3
Groundwater	Aqueous	TAL Metals	7	SW-846 Method 6010B/7000	Cool to 4° C HNO3	28 days to analysis for Hg; 6 months to analysis for other metals	(1) 500 or 950 mL Polyethylene container
Groundwater	Aqueous	Sulfate	7	EPA Method 300.0 Revision 2.3 or Method 301.1 Revision 1.	Cool to 4° C	7 days to analysis	(1) 200 ml amber glass jar
Groundwater	Aqueous	Sulfide	7	Standard Method 4500 S2	Cool to 4° C	7 days to analysis	(2) plastic 250-ml bottles with ZnAc preservative

Table 1
Summary of Analytical Methods
Former ACCO Brands
Long Island City, New York

Groundwater	Aqueous	Chloride	7	EPA Method 300.0 Revision 2.3 or Method 301.1 Revision 1.	Cool to 4° C	28 days to analysis	(2) plastic 250-ml bottles
Groundwater	Aqueous	Alkalinity	7	Std. Method 20/4500CO$_2$D	Cool to 4° C	14 days to analysis	(1) 500 ml plastic
Groundwater	Aqueous	Carbonate	7	Std. Method 20/2023B	Cool to 4° C	14 days to analysis	(1) 500 ml plastic
Groundwater	Aqueous	Bicarbonate	7	Std. Method 20/4500CO$_2$D	Cool to 4° C	14 days to analysis	(1) 500 ml plastic
Groundwater	Aqueous	Methane	7	RSK 175	Cool to 4° C	14 days to analysis	(1) 340 ml glass w/HCL

[1] Actual number of samples may vary depending on field conditions, sample material availability, and field observations. If found necessary additional samples can be taken.

[2] From date of sample collection, based on SW-846 and consistent with NYSDEC ASP when assuming 2 days for sample shipping

TBD - To Be Determined

TCL – Target Compound List

TAL – Target Analyte List

Table 2
Summary of Quality Control Samples
Former ACCO Brands
Long Island City, New York

Sample Type	Sample Matrix	Analytical Parameter	No. of QA/QC Samples
Trip Blank	Water	VOCs	1 per cooler
Duplicate	Soil/Water	VOC, Metals	1 per 20 samples
Equipment Blank	Water	VOC, Metals	1 per 20 samples per equipment type used

Appendix A

Resumes

Susan Bianchetti, CPG
Senior Project Manager

Education

Boston College, Chestnut Hill, Massachusetts; Bachelors of Science in Geology, 1979
State University of Stony Brook, Stony Brook, NY; Masters in Aqueous Geochemistry, 1986
Colorado School of Mines, Groundwater Modeling Course, 1998.

Professional Registration

Certified Professional Geologist 1993

General Expertise

Susan Bianchetti is a Certified Professional Geologist with over 25 years of experience in the design, management, costing and implementation of Phase I and Phase II ESAs, and remedial investigations/feasibility studies. Project management experience includes client contact and proposal preparation; development and oversight of project budgeting; regulatory interactions and negotiations; selection and oversight of subcontractors; design of field operations; implementation of quality assurance/quality control measures; and site closure activities. Ms. Bianchetti has interacted with multiple regulatory agencies including NYS Department of Environmental Conservation, NYC Department of Environmental Protection and the Mayor's Office of Environmental Remediation. She has also managed large projects for the NYC Department of Design and Construction and NYC Housing Authority.

Project Experience

NYS Department of Environmental Conservation

On-call senior geologist for underground storage tank program for NYSDEC Regions 2 and 3. Managed multiple Phase II investigations for leaking USTs throughout the five boroughs and Rockland County. Tasks included design of sampling programs, delineation of soil and groundwater contamination, fingerprinting petroleum products and determining liability. Soil vapor samples were collected along with indoor air samples to determine potential impacts on existing buildings. Remedial measures were proposed for the type and extent of contamination. An oriented bedrock fracture zone was completed to determine the source of a gasoline plume from two adjacent service stations.

For the sites under a NYSDEC Consent Order, sampling plans for soil/groundwater disposal characterization were developed in addition to conducting aquifer tests, providing oversight for the installation of soil borings/monitoring wells, communicating with client and subcontractors, and preparing deliverables, including Remedial Investigation Work Plans, Remedial Action Work Plans and Health and Safety Plans.

NYC Department of Design and Construction
Designed and implemented multiple Phase I Environmental Site Assessments (ESA) and Phase II Environmental Site Investigations for the redevelopment of the proposed Hudson Yards property between from 34th to 36th Street and 10th and 11th Avenue. The project included a due diligence of an 11-story building complex, identification of fuel oil tanks, and the design and implementation of subsurface investigations. Where contamination was identified remedial measures were developed. A bedrock and groundwater investigation was designed and completed in the street to delineate potential contaminant migration pathways. Phase I and Phase II reports were completed for each building and submitted to the NYCDDC.

Additional investigations completed for the NYCDDC included corridor inspections to identify potential environmental concerns prior to utility installations, subsurface investigations and remedial recommendations for identified contaminants.

Mayor's Office of Environmental Remediation
Designed and implemented subsurface investigations on "e"-designated sites in NYC. Following completion of the field work, and submittal of required reports, initiated negotiations with regulatory agencies to obtain permits for development on these sites. The scopes included a subsurface investigation to determine potential contamination, typically from on-site USTs. Soil samples were collected and overburden or bedrock groundwater monitoring wells installed to delineate soil and groundwater contamination. The remedial actions included the removal of the tanks, excavation of impacted soils, endpoint sampling and backfilling. At another site, following the delineation of soil contamination with a soil vapor investigation, a vapor barrier was installed as part of the proposed renovation of an existing building.

NYC Housing Authority
Developed and implemented multiple tank investigations and soil vapor studies for housing projects throughout the five boroughs. Many of the sites included multiple buildings with fuel oil tanks located throughout basements. Typically, there was little to no information about these tanks or the potential existence of other tanks on the properties. Groundwater sampling and soil vapor surveys were conducted on a number of these sites.

Private Client, Lake Success, NY
Provided environmental consulting and peer review for the redevelopment of a 93-acre NYSDEC Class 2 Inactive Hazardous Waste Disposal Site on Long Island. The Site had historically been used by the military for manufacturing purposes and, as a result, the former operator entered into an Administrative Order on Consent with the NYSDEC. As a result of historical operations, contaminants were present in the groundwater, soil,

sediments and soil vapor. The source of the contamination found to be a series of dry wells located near the main building that were historically used for liquid chemical disposal. Responsibilities included the development of a subsurface soil and groundwater investigation, environmental assessment of onsite buildings, investigation and redesign of two onsite retention ponds, negotiations with town officials and the NYSDEC and peer review of ongoing groundwater remediation.

Private Client, Manhattan, NY
Provided oversight and management of an investigation and delineation of a multi-acre development site that was a former car rental facility with an associated 10,000-gallon gasoline UST. Tasks included waste characterization, on and off-site soil/groundwater delineation, and excavation and disposal of over 20,000 tons of petroleum-impacted soil and bedrock. In addition to the 10,000-gallon UST, eight additional USTs were located and removed from the property. Potential offsite sources of groundwater contamination were also identified. A delineation study was completed which identified on-site point sources of contamination and determined tenant liability. The initial remedial design included the removal and disposal of contaminated soil and bedrock. Additional remedial action included the installation of a vapor barrier and design and installation of a soil vapor extraction system. A cost analysis was done and required deliverables submitted to the regulatory agencies regarding site remediation.

Private Client, Hempstead, NY
Provided project management for subsurface investigation and remediation of a former military base located on Long Island. The site was used as an air base during World War II. The scope of work included abandonment of dry wells, removal and testing of impacted soil, removal and disposal of chlorine gas cylinders, and abandonment of a 500-foot deep water supply well.

Brooklyn Army Terminal, Brooklyn, NY
Designed, managed and implemented the investigation and remediation of a fuel oil spill adjacent to the East River. The spill was caused by the collapse of an old boiler in an abandoned boiler house. The initial cleanup focused on placing booms around the oil spill in the river. The U.S. Coast Guard conducted cleanup of the river. The focus of the remediation shifted to containing the remaining fuel oil in the boiler prior to removal. The scope included draining the fuel oil from the boiler before cutting it up for scrap removal. In addition to removal of this boiler, two 10,000-gallon ASTs were abandoned in place. Following removal of the point source, a series of groundwater remediation wells were installed between the boiler house and the river.

NYS Psychiatric Hospitals
Designed, scoped and executed an investigation of remote coal ash piles at the Wassaic and Harlem Valley Psychiatric Hospitals in Duchess County, NY and the Pilgrim Psychiatric Hospital on Long Island, NY. Psychiatric hospitals generally disposed of coal ash on a distant part of the property. This ash was typically in a pile and sometimes mixed with medical waste. Soil borings were advanced immediately adjacent to the piles for collection of soil and grab groundwater samples. Samples of ash were also collected.

Based on the results, interim remedial measures were developed for coal and ash piles, including removal and disposal at an approved facility.

Phase I ESAs

Completed numerous Phase I ESAs within the five boroughs of NYC, including several that required the completion of HUD-4128 Forms. Conducted Phase I ESAs along the East Coast that included large multi-purpose developments, hospitals and nursing homes, industrial complexes, abandoned warehouses and multi-acre national parks.

Publications

Bianchetti, Susan F. and Michael V. Tumulty, P.E., "Environmental Site Assessments", the Association of the Bar of the City of New York, 1992.

Bianchetti, Susan F. and Richard Reeder, "Variable Dissolution Rates of Deformed and Undeformed Calcite", USGS Annual National Meeting, Abstract and Presentation, November 1985.

Fleming
Lee Shue

Environmental Management & Consulting

Bill Maniquez

Project Scientist

Education

Masters of Arts Major in Geology (2012); Brooklyn College - City University of New York

NYC Brownfield Scholar (Spring 2010); New York City Brownfield Partnership, Office of Environmental Remediation

Bachelor of Arts, Development Studies; Ateneo de Manila University (2000)

Certifications/Training

- OSHA 30-Hour Construction Safety and Health Training (2010)
- OSHA 10-Hour Construction Safety Refresher (2012)
- Amtrak Contractor Safety Training (2012)
- Better Construction Site Management; Stormwater Pollution, Erosion and Sediment Control Training. NYS Department Of Environmental Conservation, Division of Water (2010)
- ASTM Technical and Professional Training course for Phase I Environmental Site Assessments for Commercial Real Estate (2009)
- ASTM Standards training related to Phase II Environmental Site Assessment Process (2009)
- OSHA 40-Hour Health and Safety Training for Hazardous Waste Site Investigations (2005)
- OSHA 8-Hour Refresher (2006-2012)
- Account Relationship Management Workshop, American Executive Search & Organization Development Company (March 2001)

General Expertise

Mr. Maniquez is a Project Scientist with six years of experience in environmental consulting. He is experienced in conducting hydrogeologic investigations for clients in the private sector, including industrial facilities (manufacturing, oil refining, etc.); commercial facilities; redevelopment of Sites in the Brownfields program; and redevelopment of New York City e-designation sites (sites with a zoning map amendment) with potential hazardous material contamination.

Mr. Maniquez has conducted Phase I Environmental Site Assessments (ESAs) of multi-use properties, and been involved in planning and performing subsequent remedial investigations. These tasks have included soil boring and monitoring well installation, groundwater sampling, monitoring well development, aquifer pumping tests, remedial design, and implementation of remedial strategies. Investigations led to the preparation of Remedial Investigation Work Plans (RIWPs), Remedial Investigation Reports (RIRs), Remedial Action Work Plans (RAWPs), specifications, and Remedial Action Reports.

- Six years of experience performing environmental services for various clients in the private sector, including industrial facilities (manufacturing, oil refining, etc.); commercial facilities; redevelopment of Sites in the Brownfields program; and redevelopment of New York City ‘e’ designation sites (sites with a zoning map amendment) with potential hazardous material contamination.
- Familiar with a variety of sample collection technologies including soil core collection and monitoring well installation using direct push, hollow-stem, and air-rotary drill rigs; groundwater sample collection using mechanical pumps; and air sample collection using summa canisters.
- Implemented Remedial Investigation Work Plans (RIWPs) and Remedial Action Work Plans (RAWPs) that included soil boring and monitoring well installation, groundwater sampling and monitoring well development.
- Performed Phase I Environmental Site Assessments in accordance with ASTM standard E1527- 05. Properties investigated include large and small industrial complexes, high rise commercial and residential buildings, commercial office parks, high density housing, and undeveloped properties
- Worked with client and other subcontractors on New York City Department of Environmental Protection “E” designated sites, to ensure all concerned parties were aware of scope of work to be completed and completed tasks on time, within budgetary confines.
- Coordinated with external laboratory, making sure lab vessels and tools were prepared correctly and passed on to the laboratory for timely analysis.
- Implemented remedial action plans including removal of hazardous materials left on site from historic site operations; Leaking Underground Storage Tank Removals; and is familiar with enhanced remediation methodology such as accelerated bioremediation of petroleum constituents via the application of Oxygen Releasing Compound (ORC);
- Fulfilled site Health and Safety Officer role by implementing site specific Health and Safety Plan and providing environmental health and safety oversight to ensure work is done in accordance with Occupational Safety and Health Administration (OSHA) regulations and internal safety standards;
- Managed the operations, maintenance and monitoring activities for hazardous sites with residual contamination in New York including collection of air samples from vapor extraction systems; mechanical oversight of vapor extraction units; and collection of quarterly groundwater samples from monitoring wells.

Softwares: Autocad, Autocad LT, Microsoft Office, ArcGIS, MATLAB

Appendix C

Health and Safety Plan

Former ACCO Brands Site
32-00 Skillman Avenue
Long Island City, New York

NYSDEC BCP#V00331

HEALTH & SAFETY PLAN

Prepared for
Jim Beam Co., Inc.
510 Lake Cook Road
Deerfield, IL 60015

FLS Project Number: 10195

Submitted to:
New York State Department of Environmental Conservation
Division of Environmental Remediation, Region 2
47-40 21st Street
Long Island City, New York 11101-5407

April 2013

Fleming
Lee Shue

Environmental Management & Consulting
158 West 29th Street, 9th Floor
New York, New York 10001
http://www.flemingleeshue.com

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List of Attachments

PROJECT INFORMATION SHEET

Project/Site Name: ACCO Brands

Site Address: 32-00 Skillman Ave., Long Island City (Queens), NY

Project No: 10195

Client: Jim Beam Co., Inc.

FLS Project Manager: Kevin McGuinness PG

Date Health and Safety Plan Prepared: 04/16/2013

Date(s) of Site Work: Anticipate April 2013 – April 2014

Site Access: No Prior Notification Required

Site Description and History

The former ACCO building, located at 32-00 Skillman Avenue, was constructed in 1950 and used for the manufacturing of staplers. The facility was closed between 1998 and 1999. As part of this closure Dames and Moore conducted a Phase I Environmental Site Assessment (ESA) and a Hazardous Waste Facility Closure Plan which was approved by the NYSDEC in 1999. During the initial site inspection an unlined pit was identified in the building's basement and found to be contaminated. In October 2000, ACCO entered into the New York State Department of Environmental Conservation (NYSDEC) Voluntary Cleanup Program (VCP) to investigate and remediate the subsurface contamination identified beneath the basement floor. An on-site investigation was initiated in 2000 and an off-site investigation in 2001. The site is currently part of the Brownfield Cleanup Program (BCP# V00331). Trichlorethene (TCE), and to a lesser extent tetrachlorethene (PCE), was identified in the soils and groundwater beneath the building in addition to off-site. Concentrations as high as 417,000 ppb have been identified in one of the on-site groundwater monitoring wells. This gross level of impact is indicative of free phrase TCE product, which is a Dense Non-Aqueous Phase Liquid (DNAPL).

The site has been undergoing active remediation since 2003, when the initial soil vapor extraction system was activated. Remedial measures have included soil vapor extraction (2003 to present), air sparging (2004 to 2005), ozone injection (2005 to 2008) and chemical oxidation (2004 to 2010.) To date, these remedial measures have not been successful at removing the TCE source. The chemical oxidation treatment was effective for a limited period of time after treatment, but the TCE concentrations continued to rebound once the oxidant was spent. The rebound occurs due to the TCE desorbing into the sand from the underlying finer silt layer. A more detailed breakdown of past and current remediation, including volume of potassium permanganate (KMnO4) injected into the system, iso-contour maps and graphs of TCE concentrations over time is provided in the CSM.

Description of Specific Tasks

This project involves the following tasks to be completed in the building's basement:

- Geophysical survey of the concrete basement floor prior to drilling.
- Conduct a Membrane Interface Probe (MIP) investigation.
- Install multiple soil borings and collect soil samples.
- Conduct slug tests and collect groundwater samples from six interior groundwater monitoring wells and one exterior well.

1.0 INTRODUCTION

Fleming-Lee Shue, Inc. (FLS) prepared this Health and Safety Plan (HASP) on behalf of Jim Beam Co., Inc. for use and implementation by FLS employees and their representatives during Supplemental Remedial Investigation (SRI) at the ACCO Building, 32-00 Skillman Avenue, Long Island City, NY (Site.) The parcel is bounded on the north by Skillman Avenue, to the east by 32nd Place, to the south by Queens Boulevard and to the west by Van Dam Street. Figure 1 is a site location map.

The purpose of this HASP is to identify the real and potential hazards associated with environmental field activities and to stipulate appropriate health and safety procedures, particularly where hazardous materials are potentially present. The procedures and guidelines contained in this document are intended to minimize exposure to chemical, physical, and biological hazards that may be present in the soil, groundwater, or air, and to reduce the potential for accidents and injuries.

The procedures described in this document were developed in accordance with the provisions of Occupational Safety and Health Administration (OSHA) rule 29 CFR 1910.120 and FLS' experience with similar projects. All Site workers must review this generic HASP before entering the Site. The Health and Safety Officer (HSO) or designee will ensure that personnel have reviewed the HASP and will provide an opportunity to ask health and safety questions during attendance at a pre-field safety meeting. Field personnel will sign the acknowledgment form (Attachment A) maintained on-Site during the investigation. The recommended health and safety guidelines in this document may be modified, if warranted, by additional information obtained prior to, or during Site investigation. The Health & Safety Officer (HSO) will also maintain copies of pertinent health and safety records for all field personnel.

The Occupational Safety and Health Act (1970) requires the following:

- Employers shall furnish each employee with a place of employment free from recognized hazards that are causing or likely to cause death or serious physical harm.

- Employers must comply with occupational health and safety standards and rules, regulations and orders pursuant to the Act, that are applicable to company business and operations.

- All employees must comply with occupational health and safety standards and regulations under the Act, which are applicable to their actions and situations.

- Employees are encouraged to contact their immediate superior for information that will help them understand their responsibilities under the Act.

1.1 Purpose of Supplemental Remedial Investigation

The purpose of this SRI is to collect the data needed to design a final cleanup remedy for the Site. Critical data gaps, such as effective porosity, hydraulic conductivity, groundwater velocity and subsurface contaminant mass were not adequately defined in previous studies.

1.2 Site History

The former ACCO building, located at 32-00 Skillman Avenue, was constructed in 1950 and used for the manufacturing of staplers. The facility was closed between 1998 and 1999. As part of this closure Dames and Moore conducted a Phase I Environmental Site Assessment (ESA) and a Hazardous Waste Facility Closure Plan which was approved by the NYSDEC in 1999. During the initial site inspection an unlined pit was identified in the building's basement and found to be contaminated. In October 2000, ACCO entered into the NYSDEC VCP to investigate and remediate the subsurface contamination identified beneath the basement floor. An on-site investigation was initiated in 2000 and an off-site investigation in 2001. TCE, and to a lesser extent PCE, was identified in the soils and groundwater beneath the building in addition to off-site. Concentrations as high as 417,000 ppb have been identified in one of the on-site groundwater monitoring wells. This gross level of impact is indicative of free phrase TCE product, which is a Dense Non-Aqueous Phase Liquid (DNAPL).

The site has been undergoing active remediation since 2003, when the initial soil vapor extraction (SVE) system was activated. Remedial measures have included soil vapor extraction (SVE) (2003 to present), air sparging (2004 to 2005), ozone injection (2005 to 2008) and chemical oxidation (2004 to 2010.) To date, these remedial measures have not been successful at removing the TCE source. The chemical oxidation treatment was effective for a limited period of time after treatment, but the TCE concentrations continued to rebound once the oxidant was spent. The rebound occurs due to the TCE desorbing into the sand from the underlying finer silt layer. A more detailed breakdown of past and current remediation, including volume of potassium permanganate (KMnO4) injected into the system, iso-contour maps and graphs of TCE concentrations over time is provided in the CSM. More details of the investigation history and the results of past investigations are provided in the SRIWP and the CSM.

2.0 TASKS TO BE PERFORMED UNDER THIS PLAN

The tasks to be performed under this plan can be divided into two categories: 1) tasks regulated by the OSHA Hazardous Waste Operations and Emergency Response (HAZWOPER) Standard and 2) tasks not regulated by the HAZWOPER Standard.

2.1 HAZWOPER Regulated Tasks

- Subsurface Soil Sampling
- Groundwater Sampling
- Application of Chemical Oxidation

2.2 Non-HAZWOPER Regulated Tasks

- Geophysical Survey Oversight

3.0 Potential Chemical, Physical, and Biological Hazards and Controls

This section discusses the potential chemical, physical, and biological hazards and controls associated with the investigation tasks above. A summary of potential site safety hazards and safety requirements is presented in Table 1.

3.1 Potential Chemical Hazards/Controls

Based on data collected during previous investigations at the Site, this HASP focuses on the identified chemicals of concern; TCE, PCE and Potassium Permanganate.

Attachment B lists the recognized and suspected health hazards, exposure limits, physical and chemical properties, recommended protection levels and symptoms of exposure for the chemicals known or suspected to be present at the site. The chemical hazards will be minimized by limiting exposure of personnel to soil and groundwater and by the use of personnel protective equipment (PPE).

3.2 Physical Hazards/Controls

Physical hazards potentially present at the site include, but are not limited to, the following:

Hazard	Control
Slip, trip and fall (uneven terrain and slippery surfaces)	Avoid Uneven Terrain, Walk Slowly, Wear Sturdy/Supportive Shoes
Environmental (heat/cold) stress	A discussion of heat stress and cold stress and related illnesses and controls is provided in Attachment C.
Subsurface/Aboveground Utilities	Ensure utility clearance has occurred in drilling area, respect subsurface utility marks. Inspect area where drill rig derrick will be hoisted for utilities.
Vehicular Traffic	Avoid working in high traffic areas. If necessary, use cones, reflective vests, and consider use of a flagman/additional protection.
Fire	Ensure class ABC fire extinguisher is nearby to work area when using equipment that can provide an ignition source (drill rigs, generators, power tools)
Noise hazards	Use ear plugs and/or ear muffs during drilling and boring.
Use of heavy equipment	Stay clear of heavy equipment during operation. Maintain eye contact with operator when approaching equipment.

Anticipated site operations do not include the need for specific operations such as, lockout/tag-out, scaffolds or confined spaces; therefore these items are not addressed in this HASP. If site activities require these operations, properly trained, experienced and competent personnel shall be utilized.

3.3 Biological Hazards/Controls

Hazard	Control
Bites or stings from insects/animals (particularly ticks) resulting in skin inflammation, disease, or allergic response	Keep exposed skin covered. Use insect repellant if necessary. Inspect yourself carefully after work is completed.
Allergens and toxins from plants and animals, producing dermatitis, rhinitis, or asthma	Keep exposed skin covered using proper PPE. Wash hands regularly.

3.4 Levels of Personal Protection

Personal protective equipment (PPE) must be worn as required for each job in all operations where there is an exposure to hazardous conditions. Upon review of contaminant levels, physical and biological hazards, exposure routes and the nature of the field tasks, it has been determined that Level D protection will be used during field If total organic compound concentrations in the breathing zone consistently reach or exceed 5 parts per million (ppm) as measured with a photoionization detector (PID) activities will be stopped and the area allowed to vent. If PID readings in the breathing zone consistently reach or exceed 25 ppm, work will be stopped and the Site HSO and Project Manager contacted. Protection levels are described in more detail in Section 4.6 and air monitoring is discussed in Section 6.

3.4.1 Level D

Level D applies to work in areas where the possibility of contact with potentially contaminated groundwater and soil exists. The protective equipment required for Level D includes, but is not limited to the following:

- Work clothes or coveralls
- Safety boots, with steel toe
- Safety glasses
- Hard hat
- Reflective vest
- Disposable latex gloves
- Hearing protection, to be used as needed
-

3.5 General Hazard Controls

3.5.1 General Workplace Safety Rules

- Report unsafe conditions, accidents, injuries, or incidents to the HSO and Project Manager.
- Use eye and/or face protection where there is danger from flying objects or particles, (such as when grinding, chipping, burning and welding, etc.) or from hazardous chemical splashes.
- Dress properly. Loose clothing and jewelry shall not be worn.
- Keep all equipment in safe working condition. Never use defective tools or equipment.
- Report any defective tools or equipment to immediate supervisor.
- Properly care for and be responsible for all PPE.
- Do not leave materials in aisles, walkways, stairways, work areas, roadways, or other points of egress.
- Practice good housekeeping at all times.

- Training on equipment is required prior to unsupervised operation.
- During work, pause every few minutes and assess surrounding conditions.
- Crossing highways and major roadways is not recommended. Expect movement of cars and buses at any time along any roadway, regardless of traffic signals, stop signs, yield signs, etc.
- When walking on right-of-ways or road-shoulders, keep a sharp lookout in both directions.
- For personal safety, be cognizant of your surroundings and ensure that equipment is properly secured.

3.5.2 Housekeeping

- Proper housekeeping is the foundation for a safe work environment. It definitely helps prevent accidents and fires, as well as creating a professional appearance in the work area.
- Material will be piled or stored in a stable manner so that it will not be subject to falling.
- Combustible scrap, debris, and garbage shall be removed from the work area at frequent and regular intervals.
- Stairways, walkways, exit doors, in front of electrical panels, or access to fire fighting equipment will be kept clear of materials, supplies, trash, and debris.

3.5.3 Fire Prevention

- All firefighting equipment shall be conspicuously located, accessible, and inspected periodically, and maintained in operating condition. An annual service check and monthly visual inspections are required for fire extinguisher.
- All employees must know the location of fire fighting equipment in the work area and have knowledge of its use and application.

3.5.4 Industrial Hygiene and Occupational Health

- Toilet facilities shall be provided as required for the number of workers.
- A first aid kit and portable eyewash station shall be kept on site.
- An adequate supply of potable water shall be provided.
- The use of a common drinking cup is prohibited.
- When no medical facility is reasonably accessible (time and distance) to the worksite, a person who has a valid certificate of first aid training will be available at the worksite to render first aid.
- Employees must be protected against exposure to hazardous noise levels by controlling exposure or by use of proper PPE.

- Any FLS Activities will be assessed for lead exposure (particularly if drywall or any painted surfaces or abrasive blasting/grinding is involved) and/or asbestos exposure.

3.5.5 Personal Hygiene

Eating, drinking and the use of tobacco products in the work area are prohibited. The use of alcohol or other non-prescription drugs by personnel that could impair the ability to function at the work site is prohibited. The use of some prescription drugs may impair the ability to function and can create safety problems on-site. Field personnel taking prescription medication should alert the HSO in case of an emergency. Dermal contact with groundwater should be avoided. This includes avoiding walking through puddles, pools, and mud, sitting or leaning on or against drums, equipment, or on the ground. Field personnel should wash their hands before eating, smoking, using the toilet, etc. Field personnel should wash their hands and face and shower (daily) as soon as possible after leaving the site.

4.0 Training, Project Organization, and Personnel

4.1 Training

Knowledge of the safety rules supplemented by compliance is essential to safety. New employees will be provided orientation training and will be furnished information and literature covering the company health and safety policies, rules, and procedures. This orientation training must be provided prior to the employee's visit to the Site.

All employees will have successfully completed the 40-hour OSHA health and safety training for hazardous material sites (29 CFR 1910.120[e][3][i]) and valid/up-to-date 8-hour refresher training (29 CFR 1910.120[e][4]).

Employees must read the HASP and project-specific Work Plan, which contains the applicable regulations/standards for their job.

Prior to beginning work on-Site, and weekly thereafter, the HSO will lead safety-training sessions and/or training meetings. These meetings will be conducted to provide information and training on new equipment, new procedures, new chemicals, refresher/remedial training in specific areas, or meet annual requirements. Such training may be held in conjunction with the safety briefings/meetings addressed elsewhere in this program.

If necessary, the HSO will ensure that employees are scheduled and provided specialized training as required. Examples of specified training include (but are not limited to):

- Safe handling/use of flammables, poisons, or toxics
- Confined space entry
- Hazard communication (hazardous chemicals)
- Slip, trip and fall hazards and fall protection
- Blood-borne Pathogens (Non-Medical)

Specialized training will be documented in the employees' personnel records and/or in a master training record.

4.2 Project Team Organization

All personnel who participate in field activities will be required to attend a Health and Safety meeting prior to the commencement of field activities. In addition, the FLS field supervisor will hold daily tailgate safety meetings before the work day begins. These meetings will review the scope of work to be accomplished, any specific safety concerns, address safety questions and issues, and asses the condition of crew and equipment. The tail gate meeting represents the first opportunity to prevent an accident. The meeting will be noted and summarized in the field log.

Health and Safety Officer (HSO)

- Administers all aspects of the occupational health and safety program;
- Develops programs and technical guidance to identify and remove physical, chemical, and biological hazards from facilities, operations, and sites;
- Assists management and supervisors in the health and safety training of employees;
- Conducts inspections to identify unhealthy or unsafe conditions or work practices;
- Investigates all accidents and takes action to eliminate accident causes;
- Monitors to determine the degree of hazard;
- Determines the protection levels and equipment required to ensure the safety of personnel;
- Evaluates on-site conditions (i.e., weather and chemical hazard information) and recommending to the project manager and/or the field coordinator, modifications to the work plan and personnel protection levels;
- Monitors performance of all personnel to ensure compliance with the required safety procedures;
- Ensures that all personnel have been trained in proper site-safety procedures including the use of PPE, and have read and signed the Acknowledgment Form (Attachment A);
- Halts work if necessary;
- Ensures strict adherence to the Site HASP; and
- Reviews personnel medical monitoring participation.

Project Manager

- Familiar with health and safety regulations related to area of responsibility.
- Directs and coordinates health and safety activities within area of responsibility.
- Ensures arrangements for prompt medical attention in case of serious injury
- Requires all employees supervised to use individual protective equipment and safety devices.
- Ensures that safety equipment is available, maintained, used, and stored correctly.
- Instructs and trains all persons within area of responsibility in health and safety requirements.
- Conducts frequent and regular health and safety inspections of work area. Directs correction of unsafe conditions.
- Conducts weekly safety briefings with all supervisors and/or workers.
- Requires all subcontractors and subcontractor personnel to comply with health and safety regulations.

All Employees

The minimum personal qualifications for each individual participating in field activities are:

- OSHA-specific medicals including, but not limited to, audiometric testing under the hearing conservation program;
- Participation in the FLS Occupational Health Monitoring Program;
- Successful completion of the 40-hour OSHA health and safety training for hazardous material sites (29 CFR 1910.120[e][3][i]) and valid/up-to-date 8-hour refresher training (29 CFR 1910.120[e][4]);
- Be familiar with and comply with proper health and safety practices;
- Use the required safety devices and proper personal protective safety equipment; and
- Notify HSO/supervisor immediately of unsafe conditions/acts, accidents, and injuries.

4.3 Subcontractor Compliance

All FLS contracts and subcontracts require that state laws concerning health and safety will be observed by the subcontractor. The provisions of these health and safety responsibilities apply to subcontractors and their employees working for FLS. Failure to fulfill this requirement is a failure to meet the conditions of the contract.

5.0 Individual Health and Safety Programs Listing

OSHA standards specify various individual programs that may be applicable to work performed on eligible sites. Highlights of these programs are provided below, and specific written programs or procedures may be included into this written program, attached, or developed separately, as necessary.

5.1 Hazard Communication Program

If employees are exposed to or work with hazardous chemicals at the job site, this program is required. Required elements of the written program include a master listing of chemicals; maintaining material safety data sheets on each chemical; and training of employees on the program, the chemicals exposed to, and material safety data sheets.

5.2 Respiratory Protection Program

If employees are exposed to hazardous/toxic chemical, paint or other gases, vapors, fumes, dusts, or mists above the National Institute for Occupational Safety and Health (NIOSH) permissible exposure limit (PEL), and/or employees wear respirators, this program is required. Program elements are written program for the selection, maintenance, care, and use of respirators; fit testing, training, and employee evaluation for use.

5.3 Occupational Noise Exposure/Hearing Conservation Program

If employees are exposed to noise levels above the permissible noise exposures, protection against the effects of noise and an effective hearing conservation program are required. Such a program would include elements such as a written program, noise monitoring, hearing evaluations and follow-on testing, personal protective equipment (hearing protection), and maintenance of medical records.

5.4 Emergency Response Plan

If employees are engaged in emergency response to a hazardous substance/chemical release, an emergency response plan must be developed and implemented. Program elements include a written response plan, identification and training of responding employees, medical surveillance and consultation, and post response operations.

6.0 Air Monitoring Program

6.1 Air Monitoring Equipment

Air quality monitoring equipment will be used during all work activities to measure total organic vapors. A PID (to monitor total volatile organic concentrations) will be used during on-site activities. The equipment will be calibrated daily and the results noted in the project field book. A background level will be established, at a minimum, on a daily basis, and recorded in the field book.

6.2 Total Organic Vapor Action Levels

Periodic readings above 5 ppm require caution. A sustained PID measurement greater than 5 ppm or objectionable nuisance odors, detected over a 15-minute period in the breathing zone, will require upgrading to Level C protection. A sustained PID measurement 25 ppm or greater, detected over a 15-minute period in the breathing zone, will require suspension of work activities. The source will be identified and corrective action taken to abate the VOC emissions so that VOC levels are less than 25 ppm.

7.0 DECONTAMINATION

7.1 Site/Work Area Organization

A typical site work area will consist of an exclusion zone where the actual field activity will take place; a decontamination zone; and a command post located outside the decontamination area and exclusion zones.

Levels of personal protection in the exclusion zone will vary depending on air monitoring data, and will be specified by the HSO.

7.2 Personnel Decontamination

Decontamination (decon) of personnel consists of physically removing soil or contaminants using the correct procedures for washing and removal of PPE. Decon will take place in the designated decontamination zone using the following steps, if applicable:

- Soap and potable water wash and potable water rinse of gloves
- Tyvek removal
- Glove removal
- Field wash of hands and face

7.3 Equipment Decontamination

The following decontamination procedure will be implemented in the field after field equipment has come in contact with contaminated material.

- Rinse equipment in tap water
- Scrub equipment with non-phosphate detergent and tap water
- Rinse equipment with distilled water
- Allow equipment to air dry

8.0 EMERGENCY AND CONTINGENCY PLAN

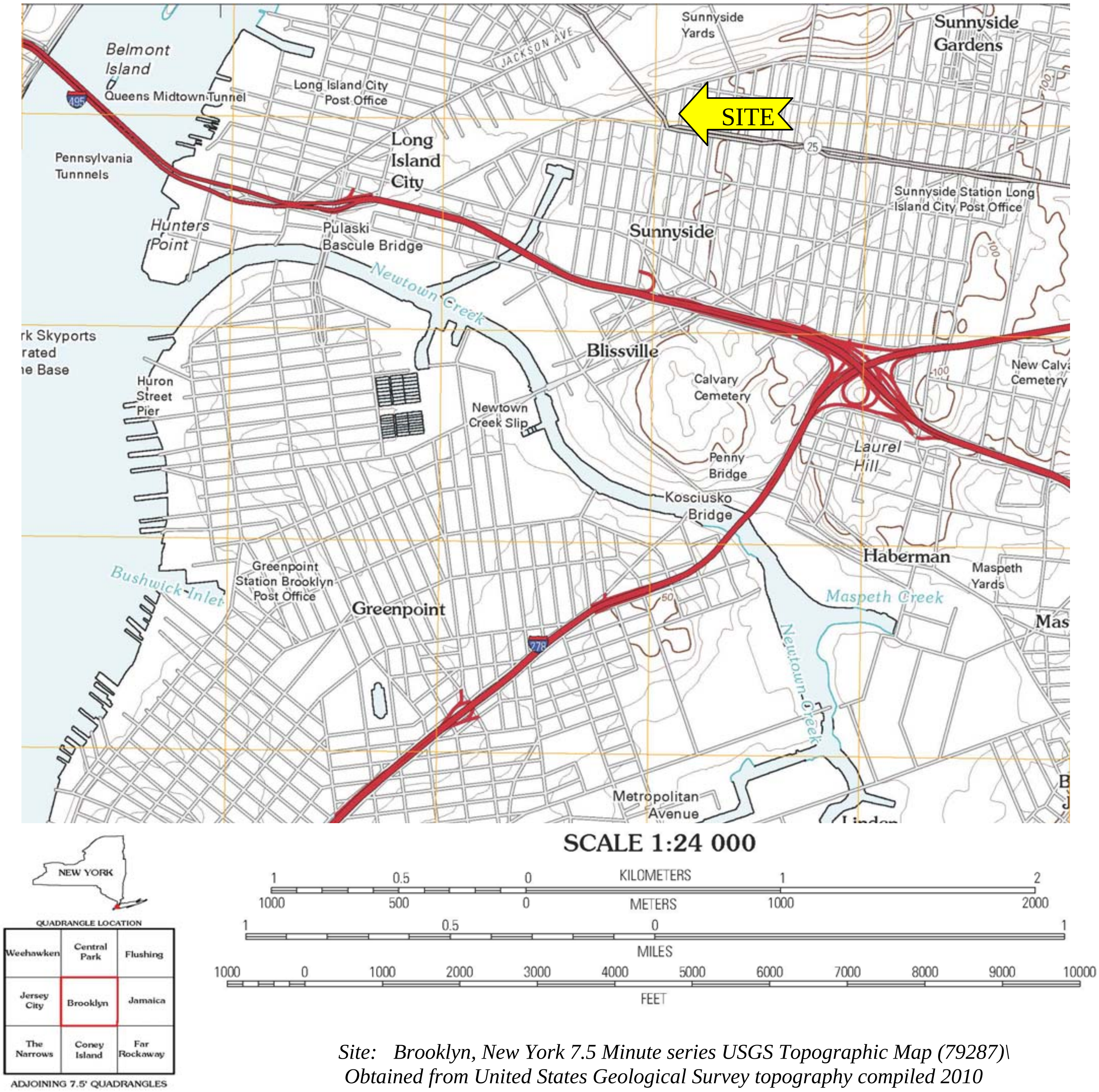
Emergency communications will be maintained during all on-site field activities. Emergency contacts and their phone numbers are presented below. The route to the closest area hospital is shown on Figure 2A.

A first aid kit will be available on-site at all times for any minor on-site injuries. Emergency medical assistance or ambulance can be reached by calling 911 for more severe injuries.

Key Personnel Emergency Phone Numbers

New York City Police Department	911
New York City Fire Department	911
Mount Sinai of Queens 25-10 30th Avenue Astoria, NY	(718) 932-1000
Emergency Medical Service (ambulance)	911
Kevin McGuinness, FLS Project Manager	(212) 675-3225 ext. 312
Susan Bianchetti, Health and Safety Officer	(212) 675-3225 ext. 310
Bill Maniquez, Site Supervisor	(212) 675-3225 ext. 315
National Response Center	(800) 424-8802
NYSDEC Spill Hotline	(800) 457-7362

FIGURES



Site: Brooklyn, New York 7.5 Minute series USGS Topographic Map (79287)
Obtained from United States Geological Survey topography compiled 2010

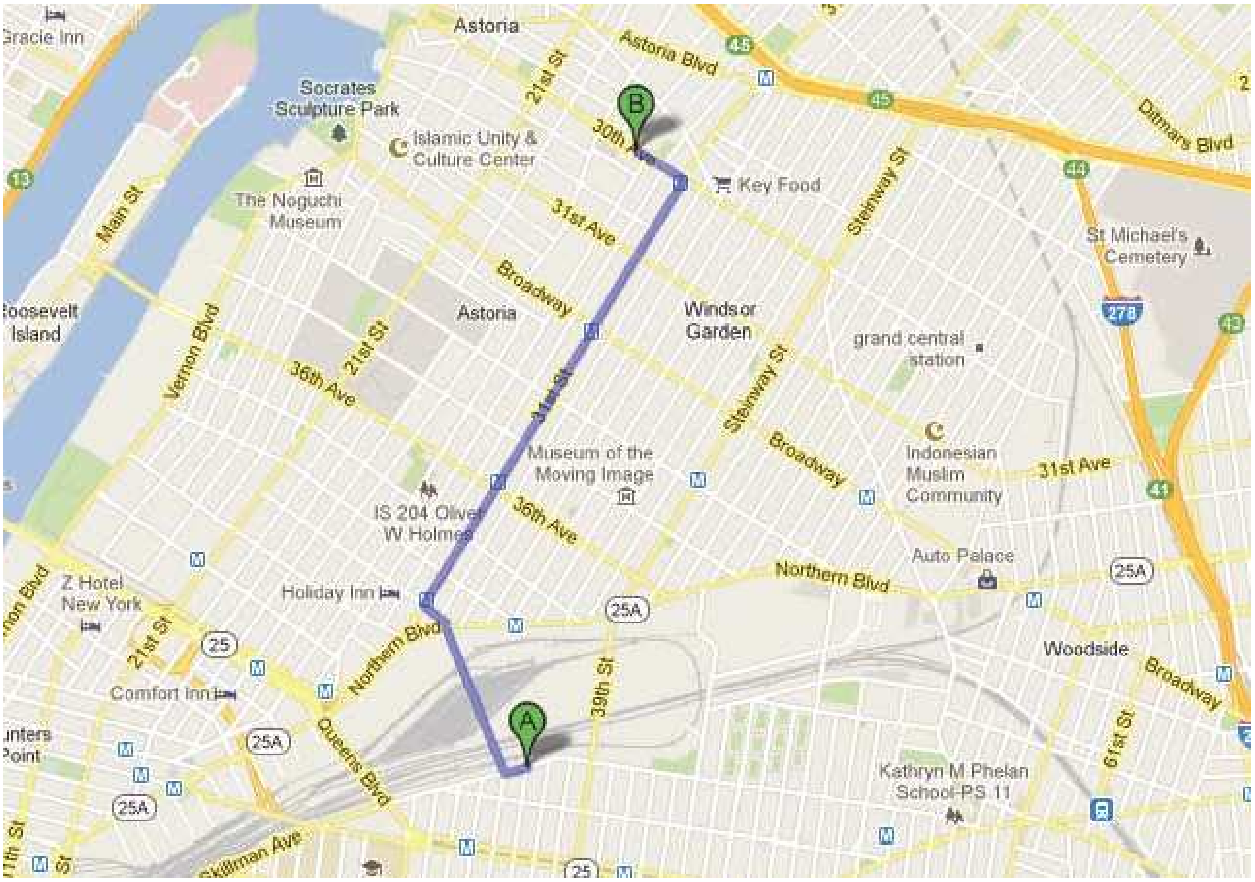
FIGURE 1: SITE LOCATION

Fleming
Lee Shue

SITE: FORMER ACCO BRANDS
32-00 SKILLMAN AVENUE
LONG ISLAND CITY, NEW YORK

Figure 2

Directions to Mount Sinai of Queens
25-10 30th Avenue
Astoria, NY 11102
(718) 932-1000



Driving Directions:	Distance (miles)
Start on 5th Street and 47th Avenue	0.1
Turn right onto 46th Road	0.4
Turn left onto 21st Street	2.1
Turn right onto 29th Avenue	0.2
Turn right onto 25th Street/Crescent Street	0.1
Arrive at 25-10 30th Avenue, Astoria	

TABLES

TABLE 1

POTENTIAL HAZARDS

Activity	Liquid	Solid	Gas	Volatile	Toxic	Volatiles	Semi-volatiles	Metals	Other	Construction Hazards	Noise	Utilities	Slips, Trips, Falls	**Protection Level (PPE)**	**Monitoring**	**Personal Decontamination**
Sub-Surface Soil Sampling		K	P	K	P	K	P	P	P	P	K	P	K	Level D, must use hearing protection while drilling	PID	Wash hands & face after sampling and before eating or drinking
Groundwater Sampling	K		P	K	P	K	P	P	P	P			P	Level D	Not required for this activity, exposure potential negligible	Wash hands & face after sampling and before eating or drinking

K – Known

P - Potential

ATTACHMENT A

Acknowledgment Form

HASP ACKNOWLEDGMENT FORM

The following personnel have read the site-specific HASP and are familiar with its provisions.

Print Name	*Signature*	*Company*	*Function*	*Date*

ATTACHMENT B

Profiles of Chemicals of Concern/ Material Safety Data Sheets

MATERIAL SAFETY DATA SHEET

CAIROX® Potassium Permanganate

Section 1 Chemical Product and Company Identification

PRODUCT NAME: CAIROX® potassium permanganate, $KMnO_4$

SYNONYMS:
Permanganic acid potassium salt
Chameleon mineral
Condy's crystals
Permanganate of potash

MANUFACTURER'S NAME: CARUS CHEMICAL COMPANY

MANUFACTURER'S ADDRESS:
Carus Chemical Company
1500 Eighth Street
P. O. Box 1500
LaSalle, IL 61301

TRADE NAME: CAIROX® potassium permanganate

TELEPHONE NUMBER FOR INFORMATION: 815/223-1500

EMERGENCY TELEPHONE NO: 800/435-6856

AFTER HOURS NO. 815/223-1565
5:00 PM-8:00 AM Central Standard Time
Monday-Friday, Weekends and Holidays

CHEMTREC TELEPHONE NO.: 800/424-9300

Section 2 Composition/Information on Ingredients

Material or component	CAS No.	%	Hazard Data	
Potassium permanganate	7722-64-7	97% min. $KMnO_4$	PEL-C	5 mg Mn per cubic meter of air
			TLV-TWA	0.2 mg Mn per cubic meter of air

Section 3 Hazards Identification

1. Eye Contact
   Potassium permanganate is damaging to eye tissue on contact. It may cause severe burns that result in damage to the eye.

2. Skin Contact
   Contact of solutions at room temperature may be irritating to the skin, leaving brown stains. Concentrated solutions at elevated temperature and crystals are damaging to the skin.

3. Inhalation
   Acute inhalation toxicity data are not available. However, airborne concentrations of potassium permanganate in the form of dust or mist may cause damage to the respiratory tract.

4. Ingestion
   Potassium permanganate, if swallowed, may cause severe burns to mucous membranes of the mouth, throat, esophagus, and stomach.

Section 4 First Aid Measures

1. Eyes
   Immediately flush eyes with large amounts of water for at least 15 minutes holding lids apart to ensure flushing of the entire surface. Do not attempt to neutralize chemically. Seek medical attention immediately. Note to physician: Soluble decomposition products are alkaline. Insoluble decomposition product is brown manganese dioxide.

2. Skin
   Immediately wash contaminated areas with large amounts of water. Remove contaminated clothing and footwear. Wash clothing and decontaminate footwear before reuse. Seek medical attention immediately if irritation is severe or persistent.

3. Inhalation
   Remove person from contaminated area to fresh air. If breathing has stopped, resuscitate and administer oxygen if readily available. Seek medical attention immediately.

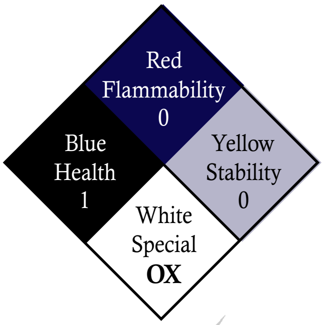
4. Ingestion
   Never give anything by mouth to an unconscious or convulsing person. If person is conscious, give large quantities of water. Seek medical attention immediately.

Section 5 Fire Fighting Measures

NFPA* HAZARD SIGNAL

Health Hazard (less than 1 hour exposure)	1	=	Materials which under fire conditions would give off irritating combustion products. Materials which on the skin could cause irritation.
Flammability Hazard	0	=	Materials that will not burn.
Reactivity Hazard	0	=	Materials which in themselves are normally stable, even under fire exposure conditions, and which are not reactive with water.
Special Hazard	OX	=	Oxidizer

***National Fire Protection Association 704**



FIRST RESPONDERS:

Wear protective gloves, boots, goggles, and respirator. In case of fire, wear positive pressure breathing apparatus. Approach site of incident with caution. Use Emergency Response Guide NAERG 96 (RSPA P5800.7). Guide No. 140.

FLASHPOINT	None	
FLAMMABLE OR EXPLOSIVE LIMITS	Lower: Nonflammable	Upper: Nonflammable
EXTINGUISHING MEDIA	Use large quantities of water. Water will turn pink to purple if in contact with potassium permanganate. Dike to contain. Do not use dry chemicals, CO_2, Halon® or foams.	
SPECIAL FIREFIGHTING PROCEDURES	If material is involved in fire, flood with water. Cool all affected containers with large quantities of water. Apply water from as far a distance as possible. Wear self-contained breathing apparatus and full protective clothing.	

Section 6 Accidental Release Measures

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED

Clean up spills immediately by sweeping or shoveling up the material. Do not return spilled material to the original container. Transfer to a clean metal drum. EPA banned the land disposal of D001 ignitable waste oxidizers. These wastes must be deactivated by reduction. To clean floors, flush with abundant quantities of water into sewer, if permitted by Federal, State, and Local regulations. If not permitted, collect water and treat chemically (Section 13).

PERSONAL PRECAUTIONS

Personnel should wear protective clothing suitable for the task. Remove all ignition sources and incompatible materials before attempting clean-up.

Section 7 Handling and Storage

WORK/HYGENIC PRACTICES

Wash hands thoroughly with soap and water after handling potassium permanganate, and before eating or smoking. Wear proper protective equipment. Remove contaminated clothing.

VENTILATION REQUIREMENTS

Provide sufficient area or local exhaust to maintain exposure below the TLV-TWA.

CONDITIONS FOR SAFE STORAGE

Store in accordance with NFPA 430 requirements for Class II oxidizers. Protect containers from physical damage. Store in a cool, dry area in closed containers. Segregate from acids, peroxides, formaldehyde, and all combustible, organic or easily oxidizable materials including anti-freeze and hydraulic fluid.

Section 8 Exposure Controls/Personal Protection

RESPIRATORY PROTECTION

In the case where overexposure may exist, the use of an approved NIOSH-MSHA dust respirator or an air supplied respirator is advised. Engineering or administrative controls should be implemented to control dust.

EYE

Faceshield, goggles, or safety glasses with side shields should be worn. Provide eye wash in working area.

GLOVES

Rubber or plastic gloves should be worn.

OTHER PROTECTIVE EQUIPMENT

Normal work clothing covering arms and legs, and rubber or plastic apron should be worn.

Section 9 Physical and Chemical Properties

APPEARANCE AND ODOR	Dark purple solid with a metallic luster, odorless
BOILING POINT, 760 mm Hg	Not applicable
VAPOR PRESSURE (mm Hg)	Not applicable
SOLUBILITY IN WATER % BY SOLUTION	6% at 20°C (68°F), and 20% at 65°C (149°F)
PERCENT VOLATILE BY VOLUME	Not volatile
EVAPORATION RATE (BUTYL ACETATE=1)	Not applicable
MELTING POINT	Starts to decompose with evolution of oxygen (O_2) at temperatures above 150°C (302°F). Once initiated, the decomposition is exothermic and self-sustaining.
OXIDIZING PROPERTIES	Strong oxidizer
SPECIFIC GRAVITY	2.7 @ 20°C (68°F)
VAPOR DENSITY (AIR=1)	Not applicable

Section 10 Stability and Reactivity

STABILITY Under normal conditions, the material is stable.

CONDITIONS TO AVOID Contact with incompatible materials or heat (>150°C/302°F).

INCOMPATIBLE MATERIALS Acids, peroxides, formaldehyde, anti-freeze, hydraulic fluids, and all combustible organic or readily oxidizable inorganic materials including metal powders. With hydrochloric acid, toxic chlorine gas is liberated.

HAZARDOUS DECOMPOSITION PRODUCTS When involved in a fire, potassium permanganate may liberate corrosive fumes.

CONDITIONS CONTRIBUTING TO HAZARDOUS POLYMERIZATION Material is not known to polymerize.

Section 11 Toxicological Information

Potassium permanganate: Acute oral LD_{50}(rat) = 780 mg/kg Male (14 days); 525 mg/kg Female (14 days)
The fatal adult human dose by ingestion is estimated to be 10 grams. (Ref. Handbook of Poisoning: Prevention, Diagnosis & Treatment, Twelfth Edition)

EFFECTS OF OVEREXPOSURE

1. Acute Overexposure
   Irritating to body tissue with which it comes into contact.

2. Chronic Overexposure
   No known cases of chronic poisoning due to potassium permanganate have been reported. Prolonged exposure, usually over many years, to heavy concentrations of manganese oxides in the form of dust and fumes, may lead to chronic manganese poisoning, chiefly involving the central nervous system.

3. Carcinogenicity
   Potassium permanganate has not been classified as a carcinogen by OSHA, NTP, IARC.

4. Medical Conditions Generally Aggravated by Exposure
   Potassium permanganate will cause further irritation of tissue, open wounds, burns or mucous membranes.

   Registry of Toxic Effects of Chemical Substances
   RTECS #SD6476000

Section 12 Ecological Information

Entry to the Environment

Potassium Permanganate has a low estimated lifetime in the environment, being readily converted by oxidizable materials to insoluble manganese dioxide (MnO_2).

Bioconcentration Potential

In non-reducing and non-acidic environments manganese dioxide (MnO_2) is insoluble and has a very low bioaccumulative potential.

Aquatic Toxicity

Rainbow trout, 96 hour LC_{50}: 1.8 mg/L
Bluegill sunfish, 96 hour LC_{50}: 2.3 mg/L

Section 13 Disposal Consideration

DEACTIVATION OF D001 IGNITABLE WASTE OXIDIZERS BY CHEMICAL REDUCTION

Reduce potassium permanganate in aqueous solutions with sodium thiosulfate (Hypo), or sodium bisulfite or ferrous salt solution. The thiosulfite or ferrous salt may require some dilute sulfuric acid to promote rapid reduction. If acid was used, neutralize with sodium bicarbonate to neutral pH. Decant or filter, and mix the sludge with sodium carbonate and deposit in an approved landfill. Where permitted, the sludge can be drained into sewer with large quantities of water. Use caution when reacting chemicals. Contact Carus Chemical Company for additional recommendations.

Section 14 Transport Information

U. S. DEPARTMENT OF TRANSPORTATION INFORMATION:

Proper Shipping Name:	49 CFR 172.101	Potassium Permanganate
ID Number:	49 CFR 172.101	UN 1490
Hazard Class:	49 CFR 172.101	Oxidizer
Division:	49 CFR 172.101	5.1
Packing Group:	49 CFR 172.101	II

Section 15 Regulatory Information

TSCA Listed in the TSCA Chemical Substance Inventory

CERCLA **Hazardous Substance**

Reportable Quantity: RQ - 100 lb 40 CFR 116.4; 40 CFR 302.4

RCRA Oxidizers such as potassium permanganate meet the criteria of ignitable waste. 40 CFR 261.21

SARA TITLE III Information

Section 302	Extremely hazardous substance: Not listed
Section 311/312	Hazard categories: Fire, acute and chronic toxicity
Section 313	CAIROX® potassium permanganate contains 97% Manganese Compound as part of the chemical structure (manganese compounds CAS Reg. No. N/A) and is subject to the reporting requirements of Section 313 of Title III, Superfund Amendments and Reauthorization Act of 1986 and 40 CFR 372.

Section 15 Regulatory Information (cont.)

STATE LISTS	Michigan Critical Materials Register:	Not listed
	California Proposition 65:	Not listed
	Massachusetts Substance List:	5 F8
	Pennsylvania Hazard Substance List:	E

FOREIGN LISTS	Canadian Domestic Substances List (DSL)	Listed
	Canadian Ingredient Disclosure List	Listed
	European Inventory of Existing Chemical Substances (EINECS)	2317603

Section 16 Other Information

NIOSH	National Institute for Occupational Safety and Health
MSHA	Mine Safety and Health Administration
OSHA	Occupational Safety and Health Administration
NTP	National Toxicology Program
IARC	International Agency for Research on Cancer
TSCA	Toxic Substances Control Act
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act of 1980
RCRA	Resource Conservation and Recovery Act
SARA	Superfund Amendments and Reauthorization Act of 1986
PEL-C	OSHA Permissible Exposure Limit-OSHA Ceiling Exposure Limit
TLV-TWA	Threshold Limit Value - Time Weighted Average (American Conference of Governmental Industrial Hygienists)

Kenneth Krogulski

Kenneth Krogulski
May 2000

CARUS

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VOC

Material Safety Data Sheet

Tetrachloroethylene

ACC# 22900

Section 1 - Chemical Product and Company Identification

MSDS Name: Tetrachloroethylene
Catalog Numbers: C182 20, C182 4, C182-20, C182-4, C18220, C1824, O4586 4, O4586-4, O45864
Synonyms: Ethylene tetrachloride; Tetrachlorethylene; Perchloroethylene; Perchlorethylene
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
127-18-4	Tetrachloroethylene	99.0+	204-825-9

Hazard Symbols: XN N
Risk Phrases: 40 51/53

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: clear, colorless liquid. Irritant. May cause severe eye and skin irritation with possible burns. May cause central nervous system depression. May cause liver and kidney damage. May cause reproductive and fetal effects. May cause cancer based on animal studies. **Caution!** May cause respiratory tract irritation.
Target Organs: Kidneys, central nervous system, liver.

Potential Health Effects
Eye: Contact with eyes may cause severe irritation, and possible eye burns.
Skin: May cause severe irritation and possible burns.
Ingestion: May cause central nervous system depression, kidney damage, and liver damage. Symptoms may include: headache, excitement, fatigue, nausea, vomiting, stupor, and coma. May cause gastrointestinal irritation with nausea, vomiting and diarrhea.
Inhalation: Inhalation of vapor may cause respiratory tract irritation. May cause central nervous system effects including vertigo, anxiety, depression, muscle incoordination, and emotional instability.
Chronic: Possible cancer hazard based on tests with laboratory animals. Prolonged or repeated skin contact may cause defatting and dermatitis. May cause respiratory tract cancer. May cause

adverse nervous system effects including muscle tremors and incoordination. May cause liver and kidney damage. May cause reproductive and fetal effects.

Section 4 - First Aid Measures

Eyes: Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.
Skin: Get medical aid if irritation develops or persists. Wash clothing before reuse. Flush skin with plenty of soap and water.
Ingestion: If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid.
Inhalation: Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Containers may explode in the heat of a fire. Vapors may be heavier than air. They can spread along the ground and collect in low or confined areas.
Extinguishing Media: Substance is noncombustible; use agent most appropriate to extinguish surrounding fire. For small fires, use dry chemical, carbon dioxide, or water spray. For large fires, use dry chemical, carbon dioxide, alcohol-resistant foam, or water spray. Cool containers with flooding quantities of water until well after fire is out.
Flash Point: Not applicable.
Autoignition Temperature: Not applicable.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: 2; Flammability: 0; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Flush down the spill with a large amount of water. Remove all sources of ignition. Use a spark-proof tool. Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use with adequate ventilation. Do not reuse this container. Avoid breathing vapors from heated material. Avoid contact with skin and eyes. Keep container tightly closed. Keep away from flames

and other sources of high temperatures that may cause material to form vapors or mists.
Storage: Keep away from heat and flame. Store in a cool, dry place. Keep containers tightly closed.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use process enclosure, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Tetrachloroethylene	25 ppm TWA; 100 ppm STEL	150 ppm IDLH	100 ppm TWA; 200 ppm Ceiling

OSHA Vacated PELs: Tetrachloroethylene: 25 ppm TWA; 170 mg/m3 TWA
Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant a respirator's use.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: clear, colorless
Odor: sweetish odor
pH: Not available.
Vapor Pressure: 15.8 mm Hg
Vapor Density: 5.2
Evaporation Rate:9 (ether=100)
Viscosity: 0.89 mPa s 20 deg C
Boiling Point: 121 deg C
Freezing/Melting Point:-22.3 deg C
Decomposition Temperature:150 deg C
Solubility: Nearly insoluble in water.
Specific Gravity/Density:1.623
Molecular Formula:C_2Cl_4
Molecular Weight:165.812

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Incompatible materials, excess heat.
Incompatibilities with Other Materials: Strong bases, metals, liquid oxygen, dinitrogen tetroxide.

Hazardous Decomposition Products: Hydrogen chloride, phosgene, carbon monoxide, carbon dioxide.
Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 127-18-4: KX3850000
LD50/LC50:
CAS# 127-18-4:
Draize test, rabbit, eye: 162 mg Mild;
Draize test, rabbit, eye: 500 mg/24H Mild;
Draize test, rabbit, skin: 810 mg/24H Severe;
Draize test, rabbit, skin: 500 mg/24H Mild;
Inhalation, mouse: LC50 = 5200 ppm/4H;
Inhalation, rat: LC50 = 34200 mg/m3/8H;
Oral, mouse: LD50 = 8100 mg/kg;
Oral, rat: LD50 = 2629 mg/kg;
Carcinogenicity:
CAS# 127-18-4:
ACGIH: A3 - Animal Carcinogen
California: carcinogen; initial date 4/1/88
NIOSH: potential occupational carcinogen
NTP: Suspect carcinogen
OSHA: Possible Select carcinogen
IARC: Group 2A carcinogen
Epidemiology: Epidemiologic studies have given inconsistent results. Studi es have shown that tetrachloroethylene has not caused canc er in exposed workers. The studies have serious weakne sses such as mixed exposures. In tests with rats and mice, i t appeared that tissue destruction or peroxisome prolifera tion rather than genetic mechanisms were the cause of the observed increases in normally occurring cancers. The oral mouse TDLo that was tumorigenic was 195 gm/kg/50W-I.
Teratogenicity: Has caused musculoskeletal abnormalities. Has caused morphological transformation at a dose of 97mol/L in a study using rat embryos.
Reproductive Effects: Has caused behavioral, biochemical, and metabolic effects on newborn rats when the mother was exposed to the TCLo of 900 ppm/7H at 7-13 days after conception. A dose of 300 ppm/7H 6-15 days after conception caused post-implantation mortality.
Neurotoxicity: No information available.
Mutagenicity: Not mutagenic in Escherichia coli. No mutagenic effects were seen in rat liver after exposure at 200 ppm for 10 weeks. No chromosome changes were seen in the bone marrow cells of exposed mice.
Other Studies: A case of 'obstructive jaundice' in a 6-week old infant has been attributed to tetrachloroethylene in breast milk.

Section 12 - Ecological Information

Ecotoxicity: Fish: Rainbow trout: LC50 = 5.28 mg/L; 96 Hr.; Static Condition, 12 degrees C Fathead Minnow: LC50 = 18.4 mg/L; 96 Hr.; Flow-through condition Bluegill/Sunfish: LC50 = 12.9 mg/L; 96 Hr.; Static Condition ria: Phytobacterium phosphoreum: EC50 = 120.0 mg/L; 30 minutes; Microtox test No data available.

Environmental: In soil, substance will rapidly evaporate. In water, it will evaporate. In air, it can be expected to exist in the vapor phase.
Physical: No information available.
Other: No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: CAS# 127-18-4: waste number U210.

Section 14 - Transport Information

	US DOT	IATA	RID/ADR	IMO	Canada TDG
Shipping Name:	TETRACHLOROETHYLENE				TETRACHLOROETHYLENE
Hazard Class:	6.1				6.1
UN Number:	UN1897				UN1897
Packing Group:	III				III

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 127-18-4 is listed on the TSCA inventory.
Health & Safety Reporting List
CAS# 127-18-4: Effective Date: 6/1/87; Sunset Date: 6/1/97
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
SARA

CERCLA Hazardous Substances and corresponding RQs
CAS# 127-18-4: 100 lb final RQ; 45.4 kg final RQ
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 127-18-4: acute.
Section 313
This material contains Tetrachloroethylene (CAS# 127-18-4, 99 0%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:
CAS# 127-18-4 is listed as a hazardous air pollutant (HAP). This material does not contain any Class 1 Ozone depletors. This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA. CAS# 127-18-4 is listed as a Priority Pollutant under the Clean Water Act. CAS# 127-18-4 is listed as a Toxic Pollutant under the Clean Water Act.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
CAS# 127-18-4 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.
The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act: WARNING: This product contains Tetrachloroethylene, a chemical known to the state of California to cause cancer. California No Significant Risk Level: CAS# 127-18-4: 14 ug/day NSRL

European/International Regulations

European Labeling in Accordance with EC Directives
Hazard Symbols:
XN N
Risk Phrases:
R 40 Limited evidence of a carcinogenic effect.
R 51/53 Toxic to aquatic organisms; may cause long-term adverse effects in the aquatic environment.

Safety Phrases:
S 23 Do not inhale gas/fumes/vapour/spray.
S 36/37 Wear suitable protective clothing and gloves.
S 61 Avoid release to the environment. Refer to special instructions/Safety data sheets.

WGK (Water Danger/Protection)
CAS# 127-18-4: 3
Canada - DSL/NDSL
CAS# 127-18-4 is listed on Canada's DSL List.
Canada - WHMIS
This product has a WHMIS classification of D1B, D2A.
Canadian Ingredient Disclosure List
CAS# 127-18-4 is listed on the Canadian Ingredient Disclosure List.
Exposure Limits
CAS# 127-18-4: OEL-ARAB Republic of Egypt:TWA 5 ppm (35 mg/m3);Skin OEL-AUSTRALIA:TWA 50 ppm (335 mg/m3);STEL 150 ppm;CAR OEL-BELGIUM:TWA 50 ppm (339 mg/m3);STEL 200 ppm (1368 mg/m3) OEL-CZECHOSLOVAKIA:TWA 250 mg/m3;STEL 1250 mg/m3 OEL-DENMARK:TWA 30 ppm (200 mg/m3);Skin OEL-FINLAND:TWA 50 ppm (335 mg/m3);STEL 75 ppm (520 mg/m3);Skin OEL-FRANCE:TWA 50 ppm (335 mg/m3) OEL-GERMANY:TWA 50 ppm (345 mg/m3);Carcinogen OEL-HUNGARY:STEL 50 mg/m3;Skin;Carcinogen OEL-JAPAN:TWA 50 ppm (340 mg/m3) OEL-THE NETHERLANDS:TWA 35 ppm (240 mg/m3);Skin OEL-THE PHILIPPINES:TWA 100 ppm (670 mg/m3) OEL-POLAND:TWA 60 mg/m3 OEL-RUSSIA:TWA 50 ppm;STEL 10 mg/m3 OEL-SWEDEN:TWA 10 ppm (70 mg/m3);STEL 25 ppm (170 mg/m3) OEL-SWITZERLAND:TWA 50 ppm (345 mg/m3);STEL 100 ppm;Skin OEL-THAILAND:TWA 100 ppm;STEL 200 ppm OEL-UNITED KINGDOM:TWA 50 ppm (335 mg/m3);STEL 15 ppm OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA

check ACGIH TLV OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGI TLV

Section 16 - Additional Information

MSDS Creation Date: 6/17/1999
Revision #3 Date: 3/18/2003

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VOC

Material Safety Data Sheet
Trichloroethylene

ACC# 23850

Section 1 - Chemical Product and Company Identification

MSDS Name: Trichloroethylene
Catalog Numbers: S80232, S80327ACS-1, S80327ACS-2, NC932384B, NC9494003, NC9494591, NC9981849, S80237ACS-1, S80237ACS-2, T340-4, T341-20, T341-4, T341-500, T341J4, T403-4, XXT341SK4LIX48
Synonyms: Ethylene trichloride; triclene; trichloroethene; benzinol cecolene
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
79-01-6	Trichloroethylene	99.5	201-167-4

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: clear, colorless liquid.

Warning! Causes eye and skin irritation. Aspiration hazard if swallowed. Can enter lungs and cause damage. May cause central nervous system depression. May cause cancer based on animal studies. Potential cancer hazard. May cause liver damage.
Target Organs: Central nervous system, liver, eyes, skin.

Potential Health Effects
Eye: Causes moderate eye irritation. May result in corneal injury. Contact produces irritation, tearing, and burning pain.
Skin: Causes mild skin irritation. Prolonged and/or repeated contact may cause defatting of the skin and dermatitis. May cause peripheral nervous system function impairment including persistent neuritis, and temporary loss of touch. Damage to the liver and other organs has been observed in workers who have been overexposed.
Ingestion: Aspiration hazard. May cause irritation of the digestive tract. Aspiration of material into the lungs may cause chemical pneumonitis, which may be fatal.
Inhalation: Inhalation of high concentrations may cause central nervous system effects characterized by nausea, headache, dizziness, unconsciousness and coma. May cause respiratory tract irritation. May cause liver abnormalities. May cause peripheral nervous system effects.
Chronic: Possible cancer hazard based on tests with laboratory animals. Chronic inhalation may

cause effects similar to those of acute inhalation. Prolonged or repeated skin contact may cause defatting and dermatitis. May cause peripheral nervous system function impairment including persistent neuritis, and temporary loss of touch. Damage to the liver and other organs has been observed in workers who have been overexposed.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid imme diately.
Skin: Get medical aid if irritation develops or persists. Flush skin with plenty of soap and water.
Ingestion: If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Possible aspiration hazard. Get medical aid immediately.
Inhalation: Get medical aid immediately. Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Do NOT use mouth-to-mouth resuscitation.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Vapors can travel to a source of ignition and flash back. Combustion generates toxic fumes. Containers may explode in the heat of a fire.
Extinguishing Media: Use water spray to cool fire-exposed containers. Use water spray, dry chemical, carbon dioxide, or chemical foam.
Flash Point: Not applicable.
Autoignition Temperature: 778 deg F (414.44 deg C)
Explosion Limits, Lower:12.5
Upper: 90.0
NFPA Rating: (estimated) Health: 2; Flammability: 1; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Remove all sources of ignition. Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Use only in a well-ventilated area. Ground and bond containers when transferring material. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Avoid ingestion and inhalation. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames.
Storage: Keep away from sources of ignition. Store in a tightly closed container. Keep from

contact with oxidizing materials. Store in a cool, dry, well-ventilated area away from incompatible substances.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Trichloroethylene	50 ppm TWA; 100 ppm STEL	1000 ppm IDLH	100 ppm TWA; 200 ppm Ceiling

OSHA Vacated PELs: Trichloroethylene: 50 ppm TWA; 270 mg/m3 TWA
Personal Protective Equipment
Eyes: Wear chemical splash goggles.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: clear, colorless
Odor: sweetish odor - chloroform-like
pH: Not available.
Vapor Pressure: 58 mm Hg @20C
Vapor Density: 4.53
Evaporation Rate:0.69 (CCl4=1)
Viscosity: 0.0055 poise
Boiling Point: 189 deg F
Freezing/Melting Point:-121 deg F
Decomposition Temperature: Not available.
Solubility: Insoluble in water.
Specific Gravity/Density:1.47 (water=1)
Molecular Formula:C2HCl3
Molecular Weight:131.366

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Incompatible materials, ignition sources, oxidizers.
Incompatibilities with Other Materials: Alkalis (sodium hydroxide), chemically active metals (aluminum, beryllium, lithium, magnesium), epoxies and oxidants. Can react violently with aluminum, barium, lithium, magnesium, liquid oxygen, ozone, potassium hydroxide, potassium nitrate, sodium, sodium hydroxide, titanium, and nitrogen dioxide. Reacts with water under heat

and pressure to form hydrogen chloride gas.
Hazardous Decomposition Products: Hydrogen chloride, carbon dioxide, chloride fumes.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 79-01-6: KX4550000
LD50/LC50:
CAS# 79-01-6:
Draize test, rabbit, eye: 20 mg/24H Moderate;
Draize test, rabbit, skin: 2 mg/24H Severe;
Inhalation, mouse: LC50 = 8450 ppm/4H;
Inhalation, mouse: LC50 = 220000 mg/m3/20M;
Inhalation, mouse: LC50 = 262000 mg/m3/30M;
Inhalation, mouse: LC50 = 40000 mg/m3/4H;
Inhalation, rat: LC50 = 140700 mg/m3/1H;
Oral, mouse: LD50 = 2402 mg/kg;
Oral, mouse: LD50 = 2400 mg/kg;
Oral, rat: LD50 = 4920 mg/kg;
Skin, rabbit: LD50 = >20 gm/kg;
Skin, rabbit: LD50 = 20 mL/kg;
Carcinogenicity:
CAS# 79-01-6:

- **ACGIH:** Not listed.
- **California:** carcinogen, initial date 4/1/88
- **NTP:** Suspect carcinogen
- **IARC:** Group 2A carcinogen

Epidemiology: Suspected carcinogen with experimental carcinogenic, tumorigenic, and teratogenic data.
Teratogenicity: No information available.
Reproductive Effects: Experimental reproductive effects have been observed.
Mutagenicity: Human mutation data has been reported. IARC and the National Toxicology Program (NTP) stated that variability in the mutagencity test results with trichloroethylene may be due to the presence of various stabilizers used in TCEwhich are mutagens (e.g.epoxybutane, epichlorohydrin).See actual entry in RTECS for complete infomation.R68 Mutagen Category 3 (CHIP 2002, UK).
Neurotoxicity: No information available.
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: No data available. Bluegill sunfish, LD50= 44,700 ug/L/96Hr. Fathead minnow, LC50=40.7 mg/L/96Hr.
Environmental: In air, substance is photooxidized and is reported to form phosgene, dichloroacetyl chloride, and formyl chloride. In water, it evaporates rapidly.
Physical: No information available.

Other: No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.

RCRA P-Series: None listed.

RCRA U-Series:

CAS# 79-01-6: waste number U228.

Section 14 - Transport Information

	US DOT	**Canada TDG**
Shipping Name:	TRICHLOROETHYLENE	TRICHLOROETHYLENE
Hazard Class:	6.1	6.1(9.2)
UN Number:	UN1710	UN1710
Packing Group:	III	III

Section 15 - Regulatory Information

US FEDERAL

TSCA

CAS# 79-01-6 is listed on the TSCA inventory.

Health & Safety Reporting List

None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs

CAS# 79-01-6: 100 lb final RQ; 45.4 kg final RQ

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 79-01-6: acute, chronic, reactive.

Section 313

This material contains Trichloroethylene (CAS# 79-01-6, 99.5%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR

Clean Air Act:

CAS# 79-01-6 is listed as a hazardous air pollutant (HAP).
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

CAS# 79-01-6 is listed as a Hazardous Substance under the CWA. CAS# 79-01-6 is listed as a Priority Pollutant under the Clean Water Act. CAS# 79-01-6 is listed as a Toxic Pollutant under the Clean Water Act.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 79-01-6 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act:

WARNING: This product contains Trichloroethylene, a chemical known to the state of California to cause cancer.

California No Significant Risk Level: CAS# 79-01-6: 50 æg/day NSRL (oral); 80 æg/day NSRL (inhalation)

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

T

Risk Phrases:

R 36/38 Irritating to eyes and skin.
R 45 May cause cancer.
R 52/53 Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
R 67 Vapours may cause drowsiness and dizziness.
R 68 Possible risk of irreversible effects.

Safety Phrases:

S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
S 53 Avoid exposure - obtain special instructions before use.
S 61 Avoid release to the environment. Refer to special instructions/safety data sheets.

WGK (Water Danger/Protection)

CAS# 79-01-6: 3

Canada - DSL/NDSL

CAS# 79-01-6 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of D1B, D2B.

Canadian Ingredient Disclosure List

CAS# 79-01-6 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 2/01/1999
Revision #5 Date: 5/31/2005

ATTACHMENT C

Heat Stress/Cold Stress and Related Illnesses

Attachment C – Heat Stress / Cold Stress

1.0 HEAT STRESS

Excessive exposure to a hot environment can bring about a variety of heat-induced disorders. The four main types of heat stress related illnesses: heat rash, heat cramps, heat exhaustion, and heat stroke, are discussed below.

1.1 Heat Rash

Heat rash also know as prickly heat, is likely to occur in hot, humid environments where sweat is not readily removed from the surface of the skin by evaporation and the skin remains wet most of the time. The sweat ducts become plugged, and a skin rash soon appears. When the rash is extensive or when it is complicated by an infection, prickly heat can be very uncomfortable and may reduce a worker's performance. The worker can prevent this condition by resting in a cool place part of each day and by regularly bathing and drying the skin.

1.2 Heat Cramps

Heat cramps are painful spasms of the muscles that occur among those who sweat profusely in heat, drink large quantities of water, but do not adequately replace the body's salt loss. Drinking large quantities of water tends to dilute the body's fluids, while the body continues to lose salt. Shortly thereafter, the low salt level in the muscles causes painful cramps. The affected muscles may be part of the arms, legs or abdomen, but tired muscles (those used to perform the work) are usually the ones most susceptible to cramps. Cramps may occur during or after work hours and may be relieved by taking salted liquids by mouth, such as the variety of sports drinks on the market.

Caution Should Be Exercised By People With Heart Problems Or Those On Low Sodium Diets Who Work In Hot Environments. These People Should Consult A Physician About What To Do Under These Conditions.

1.3 Heat Exhaustion

Heat exhaustion includes several clinical disorders having symptoms that may resemble the early symptoms of heat stroke. Heat exhaustion is caused by the loss of large amounts of fluid by sweating, sometimes with excessive loss of salt. A worker suffering from this condition still sweats but experiences extreme weakness or fatigue, giddiness, nausea, or headache. In more serious cases, the victim may vomit or lose consciousness. The skin is clammy and moist, the complexion is pale or flushed, and the body temperature is normal or only slightly elevated.

A summary of the key symptoms of heat exhaustion is as follows:

- Clammy skin
- Confusion
- Dizziness
- Fainting
- Fatigue
- Heat Rash
- Light-headedness
- Nausea
- Profuse sweating
- Slurred Speech
- Weak Pulse

In most cases, treatment involves having the victim rest in a cool place and drink plenty of fluids. Victims with mild cases of heat exhaustion usually recover spontaneously with this treatment. Those with severe cases may require extended care for several days. There are no known permanent effects.

As With Heat Cramps, Certain Persons Should Consult With Their Physician About What To Do Under These Conditions.

1.4 Heat Stroke

This is the most serious of health problems associated with working in hot environments. It occurs when the body's temperature regulatory system fails and sweating becomes inadequate. The body's only effective means of removing excess heat is compromised with little warning to the victim that a crisis stage has been reached.

A heat stroke victim's skin is hot, usually dry, red or spotted. Body temperature is usually 105^{O}F or higher, and the victim is mentally confused, delirious, perhaps in convulsions, or unconscious. Unless the victim receives quick and appropriate treatment, death can occur.

A summary of the key symptoms of heatstroke is as follows:

- Confusion

- Convulsions
- Incoherent Speech
- Staggering Gait
- Unconsciousness
- Sweating stops
- Hot skin, high temperature (yet extremities may feel chilled)

Any person with signs or symptoms of heat stroke requires immediate hospitalization. However, first aid should be immediately administered. This includes moving the victim to a cool area, thoroughly soaking the clothing with water, and vigorously fanning the body to increase cooling. Further treatment at a medical facility should include continuation of the cooling process and the monitoring of complications that often accompany the heat stroke. Early recognition and treatment of heat stroke are the only means of preventing permanent brain damage or death.

1.5 Preparing for the Heat

Humans, to a large extent, are capable of adjusting to heat. This acclimation to heat, under normal circumstances, usually takes about 5 to 7 days, during which time the body will undergo a series of changes that will make continued exposure to heat more tolerable.

On the first day of exposure, body temperature, pulse rate, and general discomfort will be higher. With each succeeding day of exposure, all of these responses will gradually decrease, while the sweat rate will increase. When the body does become acclimated to the heat, the worker will find it possible to perform work with less strain and distress.

A gradual exposure to heat gives the body time to become accustomed to higher temperatures, such as those encountered in chemical protective clothing.

1.6 Protecting Against Heat Stress

There are several methods that can be used to reduce heat stress:

- Limit duration of work periods
- Use protective clothing with cooling devices
- Enforce the use of the "Buddy System"
- Consume electrolyte solutions prior to suiting up
- Monitor workers for pulse recovery rates, body fluid loss, body weight loss, and excess fatigue
- Screen for heat stress susceptible candidates in your medical surveillance program
- Have all personnel know the signs and symptoms of heat stress

2.0 COLD STRESS

Persons working outdoors in temperatures at or below freezing may be frostbitten. Extreme cold for a short time may cause severe injury to the surface of the body, or result in profound generalized cooling, causing death. Areas of the body that have high surface-area-to-volume ratio such as fingers, toes, and ears, are the most susceptible. Two factors influence the development of a cold injury, ambient temperature and the velocity of the wind. Wind chill is used to describe the chilling effect of moving air in combination with low temperature. For instance, 10 degrees Fahrenheit with a wind of 15 miles per hour (mph) is equivalent in chilling effect to still air at minus 18 degrees Fahrenheit.

As a general rule, the greatest incremental increase in wind chill occurs when a wind of 5 mph increases to 10 mph. Additionally, water conducts heat 240 times faster than air. Thus, the body cools suddenly when chemical-protective equipment is removed if the clothing underneath is perspiration soaked.

2.1 Frostbite

Local injury resulting from cold is included in the generic term frostbite. There are several degrees of damage. Frostbite of the extremities can be categorized into:

- Frost Nip or Initial Frostbite: characterized by suddenly blanching or whitening of skin.
- Superficial Frostbite: skin has a waxy or white appearance and is firm to the touch, but tissue beneath is resilient.
- Deep Frostbite: tissues are cold, pale, and solid; extremely serious injury.

2.2 Hypothermia

Systemic hypothermia is caused by exposure to freezing or rapidly dropping temperature. Its symptoms are usually exhibited in five stages:

- Shivering
- Apathy, listlessness, sleepiness, and (sometimes rapid cooling of the body to less than 95°F)
- Unconsciousness, glassy stage, slow pulse, and slow respiratory rate
- Freezing of the extremities
- Death

Thermal socks, long cotton or thermal underwear, hard hat liners and other cold weather gear can aid in the prevention of hypothermia. Blankets and warm drinks (other than caffeinated coffee) are also recommended.

Measures shall be taken to keep workers from getting wet, such as issuance of rain gear.
Workers whose cloths become wet shall be given the opportunity to dry off and change clothes.

Appendix D

Standard Operating Procedures

FORMER ACCO BRANDS – Operable Unit 1
32-00 Skillman Ave, Long Island City, New York

Introduction

These standard operating procedures (SOPs) provide guidelines regarding water level gauging, slug testing, groundwater sampling, soil sampling, membrane interface probe well installation, and sample preservation for the Former ACCO Brands Operable Unit -1 (OU-1) Site located in the basement of 32-00 Skillman Avenue, Long Island City, New York (Entrance is located on 32nd Place between Queens Blvd. and Skillman Avenue).

Date: June 14, 2013

General Project Contact Information

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Project Manager	Susan Bianchetti Mobile: (631) 745-8477
Project Quality Assurance/Quality Control Officer:	Bill Maniquez Mobile: (646) 584-2319
Field Team Leader/Health & Safety Officer:	Bill Maniquez Mobile: (646) 584-2319
Field Team Members:	Raphael Rosenbaum Mobile: (917) 690-6778
	Maya Zung Mobile: (914) 374-0086
Basement Door Combination	1234*

Site Contacts

Rudy Radoncic/ Building Superintendent	Mobile: (646) 879-8419

Subcontractors

Analytical Laboratory	Office: (732) 355-4562
Accutest Laboratories	
PM - Tammy McCloskey	

Rental Equipment Vendor	
Pine Environmental	Office: (800) 301-9663
Contract Management Contact - John Jones	
Technical Assistance Contact – Bill Lindsay	Mobile: (215) 397-6311

Membrane Interface Probe	
Columbia Technologies	
Marketing Specialist – Dov Hoffman	Office: (888) 344-2704 ext. 207

Eastern Concrete Corer	
Joseph Neos	Mobile: 917 559 6182

HEALTH AND SAFETY

Please bring and refer to the Supplemental Remedial Investigation Work Plan (SRIWP) and the Health and Safety Plan (HASP) for the Site. Make sure all members of the sampling team have read and signed the HASP. Sampling activities will be conducted in Level D which will include safety-toe boots and nitrile gloves at all times during setup, sampling, and breakdown. All PPE will be bagged and disposed properly. Wash hands thoroughly, frequently and after work is complete.

SLUG TESTING

Purpose and Objectives

The purpose of this SOP is to present guidelines for conducting slug tests from six target monitoring wells. The slug test will be conducted using water-level data loggers. The objective of slug testing is to determine the horizontal hydraulic conductivity of aquifer materials at the six target wells.

Scope of Slug Testing

MW-1
MW-1(I)
MW-3
MW-3(I)
MW-6
MW-6(I)

Equipment List

Nitrile gloves
Hard Hat
Steel-toed boots
Hearing protection
Safety glasses
Well construction detail and location map
Field book
Water level indicator
Photoionization detector
Tools for well access
Water pressure transducer
Field computer programmed with the transducer
Solid slug
Bailer
Stopwatch / clock

Slug Test Procedure

Prepare and check the transducer. Synchronize the transducer with the field computer by making that the time and date are the same and that the logging rate is set to log one reading per second. Set transducer to start logging the data and record the readings. Record in the field logbook the transducer ID number being used.

Follow the following procedure when doing the slug test:

1. Slowly open the monitoring well and measure the depth to water.
2. Lower the transducer down the well and fasten the other end to the top of the well. Make sure that the transducer is designed to function at the desired depth.

3. Let the transducer equilibrate for 5 minutes.
4. Measure the water level and determine if groundwater returned to original depth.
5. Lower the slug to just above the water level. Quickly drop the slug and record the time.
6. Measure the water level until it recovers to 90% of the original level. Allow the water level to equilibrate.
7. Quickly pull the slug out and record the time.
8. Stop transducer from logging and retrieve it. Record the Time.
9. Review the data collected and determine if test should be repeated.

MONITORING WELL GAUGING & GROUNDWATER SAMPLING

Purpose and Objectives

The purpose of this SOP is to present guidelines for collecting groundwater samples from 7 target monitoring wells. The main groundwater contaminant of concern is Trichloroethylene (TCE).

A determination of the amount of permanganate in groundwater (added during previous chemical treatments) will be necessary to adequately preserve samples in order to prevent the oxidation of contaminants of concern in-transit to the analytical laboratory.

Scope of Sampling

MW-1
MW-1(I)
MW-3
MW-3(I)
MW-6
MW-6(I)
MW-7

Equipment List

Field Book
Site Management Plan (SMP)
Supplemental Remedial Investigation Work Plan (SRIWP)
Well Location Map
Fine Point Sharpies
Nitrile Gloves
PID (With Cal Gas/Regulator)
Horiba U-52 Water Quality Meter with AutoCal Solution
Water Level Meter
2 – 5 gallon buckets (Onsite)
1 – 55 gallon drum (Onsite)
3/16" and 1/2" socket wrench
1/4"OD Poly Tubing – 175ft
Masterflex Tubing – 5 Feet
GeoPump
2 Charged Pump Batteries
5 QuickFilter In-Line Groundwater Filters
HACH Pocket Colorimeter Kit (Manganese)
CHEMetrics Manganese Test Kits (K-6502 Low-Range & K-6502D High-Range)
5 Bailers & 100' String (Bailers onsite, string is not)
Graduated Cylinder
Spray Bottle with Liquinox
DI Water
Paper Towels

Garbage Bags
Ziploc Bags & Bubble wrap

Equipment Calibration

The PID, Water Quality Meter will be calibrated at the beginning of each field day and the results will be recorded in the field book.

Sampling Order

Based on historical VOC groundwater results, monitoring wells should be sampled in the following order: MW-1, MW-1(I), MW-3(I), MW-3, MW-6, MW-6(I), and lastly MW-7.

Monitoring well Gauging

Gently lift the wall cap just enough to insert the PID probe into the well pipe and record the VOC headspace in the casing, then fully remove the well cap. Prior to placing anything else in the wells, measure and record depth to water in each well in the field book (only if a synoptic groundwater elevation reading is desired). Using the water level indicator, measure the depth to water in the well from the black measuring point marked on the north side of the inner PVC casing (If none is marked, then make a mark). Record the time, well identification and depth to water in ft-btoc (feet below top of inner casing).

Groundwater Sampling

Measure the depth to the bottom of the well. Be sure to decontaminate the length of the meter that entered the water column, prior to gauging another well.

To determine the height of the water column, subtract the depth to the bottom of the well from the depth to water. Divide the result by two; the sum of that number and the depth to water is the desired length of the poly tubing from the top of the inner casing to the middle of the water column. Allow for additional length to get from the top of the inner casing to route through the pump before cutting the poly tubing.

Next, cut about 6-8" of Masterflex Tubing to be used in the pump head of the GeoPump. Attach the poly tubing in the well to one end of the MasterFlex tubing. Cut a minor length of poly tubing to connect the other end of Masterflex Tubing from the Geopump to the bottom of the Flow Cell of the Horiba Water Quality Meter. Ensure that the direction of flow of the GeoPump is engaged in the desired direction (from the well to the Horiba). Lastly, cut an additional minor length of poly tubing to span from the top of the Flow Cell to a purge bucket. If the fittings on the Flow Cell are not watertight, use a bit of Masterflex Tubing to bridge the gap and make the seal between the poly tubing and the Flow Cell is watertight.

In wells with initially turbid purge water, it is desirable to purge directly into the purge bucket, eliminating the Horiba from the flow of purge water for about 5 minutes to allow the purge water to clear up and prevent sedimentation of the Flow Cell. Once attached and the Flow Cell fills up with purge water, the following information should be recorded every five minutes:

*** Stable readings fall within the values listed in parentheses over three successive readings ***

-Time	
-Depth to Water	(0.3ft.)
-pH	(0.1)
-Conductivity	(3%)
-Turbidity	(10%)
-DO	(10%)
-Temperature	(3%)
-ORP	(10mv)
-Salinity	(0.1ppt)
-Flow Rate	(200-500ml/min)
-Color - Visual Identification	
-Odor - Olfactory Identification	

After the depth to water and water quality parameters have stabilized over three successive readings, disconnect the Horiba and begin collecting groundwater samples at a rate no less than 100 ml/min and no more than 500 ml/min.

Please see the attached Accutest Bottle Order Confirmation and Bottle Configuration Sheet for sample bottle Requirements.

Sample Collection

The order of collection for this sampling event is as follows: VOCs, Methane, Metals, Dissolved Iron, and then other miscellaneous parameters including Alkalinity, Sulfide, Sulfate and Chlorine. Ensure there is no headspace in VOC containers. Similarly, ensure that there is no headspace in any of the other sample bottles in order to minimize geochemical changes from aeration. This is less critical than with VOCs, but is still important.

*** Remember to detach groundwater filters prior to collecting samples for laboratory analysis ***

QA/QC

One ***duplicate*** will be collected by filling a second set of sample containers from a given well, filling VOC vials of both the initial sample set and the duplicate set prior to colleting any other sample volumes. The same tubing as the initial sample can be used for the duplicate sample. Label the sample using the same identification, adding the number one as the last number in the sample identification. For example, if the duplicate is taken from MW-3(I), label the duplicate MW-31(I).

One ***field blank*** will be collected by pumping laboratory provided deionized (DI) water through an unused section of poly and Masterflex tubing into sample containers. Label the sample by the abbreviation for field blank (FB) followed by the date. For example, if the same was taken on 1/1/13 label the field blank on the Chain of Custody as FB010113.

One ***trip blank*** will be sent for VOCs per cooler of samples being sent to the laboratory. Be sure to fill in the sample information associated with the trip blank onto the Chain of Custody.

SOIL BORING INSTALLATION & SOIL SAMPLE COLLECTION

Purpose and Objectives

The purpose of this SOP is to present guidelines for installing collecting groundwater samples from 7 target monitoring wells. The main soil contaminant of concern is Trichloroethylene (TCE).

A determination of the amount of permanganate in groundwater (added during previous chemical treatments) will be necessary to adequately preserve samples in order to prevent the oxidation of contaminants of concern in-transit to the analytical laboratory.

Scope of Sampling

SB-1
SB-2
SB-3
SB-4
SB-5
SB-6
SB-7
SB-8
SB-9
SB-10
SB-11
SB-12

Equipment List

Field Book
Site Management Plan (SMP)
Supplemental Remedial Investigation Work Plan (SRIWP)
Well Location Map
Fine Point Sharpies
Nitrile Gloves
PID (With Cal Gas/Regulator)
3/16” and 1/2” socket wrench
Paper Towels
Garbage Bags
Ziploc Bags & Bubble wrap

Equipment Calibration

The PID will be calibrated at the beginning of each field day and the results will be recorded in the field book.

Soil Boring Installation and Sample Collection

Where soil borings will be installed by means of hollow stem augers, soil samples will be collected on a continuous basis by means of a two-foot long, 2-inch diameter, stainless steel split spoon samplers. The augers will be advanced to the top of the desired sampling interval depth and the split spoon and connected rods will be lowered through the auger and driven into the soil another two-feet using a 140-pound weight dropped through a 30-inch interval. The split spoon and rods will be withdrawn to obtain the soil sample.

Where subsurface materials consist mostly of sand mixed with fill material smaller than cobble-size, FLS may obtain soil samples using a smaller direct push Geoprobe® sampling rig. In this case, a macrocore sampler with plastic liners will collect undisturbed soil cores down to the required depth. The four or five-foot long macrocore is pushed into the soil using the hydraulic pressure generated by the Geoprobe® rig. If resistance is encountered the Geoprobe® unit has a vibrating unit that either breaks up the resisting object or vibrates it aside. Plastic acetate liners are placed within the core barrel of the macro core to store the soil/sediment sample, and to prevent any cross-contamination between soil borings. To further reduce the chance of cross-contamination during sampling, the macrocores and equipment will be decontaminated between uses with a non-phosphate detergent wash followed by a clean water rinse, followed by a final rinse with deionized water. Once the macrocore is retrieved from its desired depth, the cutting end of the core barrel is removed, and the plastic core liner is removed. The acetate liner is then cut length-wise with a special knife. PID readings are taken from the soil while still in the core and undisturbed.

The following procedures will be used to complete all soil sampling:

- Identify that the staked-out sampling location is consistent with the location designated on the soil boring location plan, and in a safe location relative to overhead and underground utilities.
- Cleaning/decontamination of the split spoon samplers/macrocores
- The driller will drive the sampler through the desired sampling interval.
- Recover the sampler and open to retrieve soil core. Split/cut the sample lengthwise for inspection.
- Observe the soil core for visual evidence of contamination (i.e., staining, sheens, odor and/or oil-like/ creosote-like material).
- Using a sampling utensil (i.e., sampling spoon), burrow small holes in the core at one-foot intervals, placing the photoionization detector (PID) probe in the holes along the way to retrieve measurements of organic vapor concentrations.
- Using the modified Burmister or USCS soil classification system to describe visual observations of the soil sample.
- The soil samples for VOCs will be managed in ACCOrdance with EPA Method 5035 A – Closed System Purge-and-Trap and Extraction Procedure for Volatile Organics. A TerraCore sampler will be used to collect at least 5 grams of soil and transfer carefully in laboratory provided and sealed vials. The entire sample vial will be placed, unopened, into the instrument by the laboratory to ensure minimal loss of volatile constituents.

- Soil samples for other laboratory parameters will be collected from the highest location with the highest PID reading, or if vapors were not detected, from the soil and groundwater interface.
- Choose which samples will be analyzed at the laboratory and label and fill the laboratory-supplied sample jars with the selected soil aliquots from their respective depth intervals. Seal the sample jars and store in a cooler at 4º Celsius.
- Decontaminate soil sampling equipment between sample locations.
- Record field observations in the field log book and/or boring log data sheet, including: boring number, sample depth and sample observations (PID readings, evidence of contamination, and soil classification).

MEMBRANE INTERFACE PROBE

Purpose and Objectives

The purpose of this SOP is to present guidelines for conducting high resolution vertical profiling with the use of Membrane Interface Probe (MIP) technology. The probe is an ideal tool to determine the vertical and horizontal extent of chlorinated solvents.

Equipment List

Membrane Interface Probe
Drill Rig

Conducting VOC Investigation using MIP technology

1. Historical groundwater data will be reviewed to determine the presence, anticipated depth, and type of VOCs expected in the soil and groundwater
2. A MIP equipped with a Flame Ionization detector (FID) and an electron capture detector (ECD), for delineation of VOCs will be used in conjunction with a DPT rig.
3. MIP points will be driven in order to delineate the lateral and vertical extent of VOCs in groundwater
4. Based on the MIP direct sensing profiles, select locations will be chosen for soil and groundwater sampling to determine the total mass and compound makeup of the VIC contamination.
5. MIP borings will be advanced using the DPT drilling methods.
6. MIP data will be provided via ColumbiaTechnologies' *SmartData* Solutions cloud-based information system normally hourly, but at least daily, to the investigation team to facilitate efficient progress and decision-making by Client.
7. Several times each day, prior to subsurface advance of the MIP tooling, the detector response will be checked by the subcontractor using ASTM Standard D 7352-07 Standard Practice for Direct Push Technology for Volatile Contaminant Logging with the MIP.
8. All MIP tooling will be response tested prior to use, results recorded, and uploaded to the *SmartData* Solutions website with each boring. Any out of range response performance will be investigated and adjustments made, if necessary, to optimize the system performance. Response tests will be performed at least at the beginning and end of each day and the results documented in subcontractor's daily log.
9. Tool advancement will be at a nominal rate of 1-2 feet per minute as directed by Columbia Field Geochemist. Due to the heterogeneity of the soil or subsurface obstructions, refusal may occur while advancing the probe. The Field Geochemist will determine refusal based on the recommendations of Geoprobe Systems, Inc. and the Geochemist's experience.

10. During implementation, an adaptive approach will be used to optimize the number of MIP measurements and borings to achieve the investigation objectives in a time-efficient manner. This approach will entail frequent review of the MIP results by the project team and adjusting future MIP locations to achieve necessary delineation.
11. DPT tooling and associated sampling equipment will be decontaminated between each borehole using a three step decon process consisting of : (1) removal of excess soil form DPT tooling ; (2) a Liquinox (or similar detergent)
12. All MIP boring locations will be abandoned in ACCOrdance with local regulations and the Client’s scope of work

DECONTAMINATION OF PERSONNEL AND EQUIPMENT

Purpose and Objectives

The purpose of this SOP is to present guidelines for decontamination of field personnel and equipment that has come into contact with possible contaminated media (soil and groundwater).

Equipment List

Nitrile Gloves
Dionized water
Potable water
Liquinox/ Alconox solution
Plastic buckets
Scrubs/ brushes
Spray bottles
Garbage bags

Personnel Decontamination

After completing work, decontamination must be done prior to leaving the Site. The following decontamination procedures must be followed.

1. Wash boots with Liquinox solution and rinse with water
2. Remove nitrile gloves and discard properly.
3. Properly dispose any Personnel Protective Equipment that might have come into contact with the contaminated media.

Equipment Decontamination

Groundwater Sampling Equipment

1. Use fresh pair of nitrile gloves.
2. Prepare area that will be used for decontamination by lining the floor with plastic.
3. Detach sampling tube from the Horiba and the pump. Remember to keep the hoses/tubing from touching the ground/
4. Unscrew the flow cell cap and rinse with the Liquinox solution inside a plastic bucket.
5. Spray the meter Liquinox solution and wash thoroughly with DI water.
6. Collect all rinsate and dispose in a DOT approved 55-gallon drum.

Other Equipment

1. Use fresh pair of nitrile gloves.
2. Prepare area that will be used for decontamination by lining the floor with plastic.
3. Rinse and scrub the equipment with potable water
4. Wash the surface of the equipment that has come into contact with contaminated media.
5. Wipe clean with a paper towel.
6. Collect all rinsate and dispose in a DOT approved 55-gallon drum.

DEMOBILIZATION

Investigation-Derived Waste (IDW)

There are 55-gallon drums onsite that buckets of purge water can be transferred to. However, adjacent to where drums are stored are 475-gallon holding vats, which the contents of the 55 gallons drums should be transferred to, as it allows greater storage capacity prior to disposal of purged groundwater.

Transfer of purged groundwater from buckets to drums can be ACCOmplished by pouring the contents of the bucket carefully into an opened drum. Transfer from drums to holding vats can be done using a Whale Pump with ½” outer diameter tubing (stored onsite), attached to a charged pump battery. Tubing should be long enough to pump from the bottom of the drum well into the holding vat through the access port on the top of the holding vat.

Note that the Whale Pump may tend to float to the top of the water in the drum. To avoid this and continue pumping, attach an inert weighted object to the pump (duct tape is stored onsite). The tubing should be secured to the access port of the holding vat to prevent the outlet of the tubing from becoming dislodged from the holding vat. Do not allow the outlet of the tubing to contact the water level in the holding vat, to reduce the possibility of a syphon being created if the pump or battery were to fail.

Laboratory Items

Upon completion of field activities, the glass sample containers will be wrapped with bubble wrap as needed and placed in labeled Ziploc bags. The Ziploc bags will be placed in a thoroughly iced cooler with a temperature blank. Set up laboratory pick up from the site within 24 hours of collecting samples.

Analysis

Please see the attached Accutest Bottle Order Confirmation and Bottle Configuration Sheet for a list of the analyses to request on the chain of custody.

Ensure that all analyses and QA/QC samples are listed on the Chain of Custody. Be sure to note the Custody Seal number on the Chain of Custody, and have the Custody Seal sticker ready to affix to the cooler just before turning it over to the courier. See below for additional details regarding the Chain of Custody:

Chain of Custody Information:

- Project Name: Former ACCO Brands Supplemental Remedial Investigation
- Turn Around Time: Std. 10 Business Days
- Data Deliverable Information: NYASP B
- Comments / Remarks on Chain of Custody (Exactly as Written).

When the courier picks-up the samples, ensure that both you and the courier have signed the Chain of Custody, and retain the yellow page for FLS records. After the Chain of Custody has been signed, place the top white page inside of a Ziploc bag and place inside of cooler with samples. Attached the

Appendix B – Qualitative Human Health Exposure Assessment

Formerly ACCO Brands Inc. Site
32-00 Skillman Avenue
Long Island City, NY

NYSDEC VCP#V00331

QUALITATIVE HUMAN HEALTH EXPOSURE ASSESSMENT

Prepared for:
Jim Beam Co., Inc.
510 Lake Cook Road
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FLS Project Number: 10195-001

Submitted to:
New York State Department of Environmental Conservation
Division of Environmental Remediation
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March 2015

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1.0 QUALITATIVE EXPOSURE ASSESSMENT

This Qualitative Exposure Assessment is done in accordance with Appendix 3B of DER-10.

1.1 Contaminant Source

Groundwater analytical results from the Supplemental Remedial Investigation (SRI) indicate that the greatest concentrations of dissolved phase Tetrachloroethene (TCE) are located in the area of monitoring wells MW-1, MW-3 and MW-6.

The soil sample analytical results from the SRI similarly indicate that the greatest TCE impacts are present in the vicinity of monitoring wells MW-1, MW-3 and MW-6 and that vertically, the highest impacts were found to be within the finer grained silt formation.

1.2 Contaminant Release and Transport Mechanisms

Contamination is currently located beneath an impervious surface (basement slab, sidewalks, and roadways). The greatest TCE impacts are located in the southeast portion of the Site, in the vicinity of MW-1, MW-3 and MW-6.

No exposure pathway to the contamination currently exits. Based upon this information, there will be no exposure pathway to the contaminants until the commencement of remediation activities at the Site.

The impervious surface will be removed from the Site during the installation of soil borings to advance the electrodes, exposing the contaminants of concern to the worker population. Once the impervious surface has been penetrated and drilling commences, the worker population will be exposed to contaminated soils and groundwater. The fill material only exhibits some elevated metals, VOCs, and PAHs exceeding NYSDEC Part 375 Commercial Use Soil Cleanup Objectives (CUSCOs). Soils beneath the fill layer in the saturated zone contain elevated TCE concentrations. The VOCs could be released into the air during any soil disturbance activities. The metals and PAHs could be released through dust generation during construction activities and during accidental spillage of fill material during excavation and transportation operations.

1.3 Point of Exposure

The main point of exposure to the contaminants of concern is through direct contact with contaminated material. Since VOC contamination in the fill layer is limited, there is only a slight potential for these VOCs to vaporize. The soils containing VOC contamination in the saturated zone are not likely to vaporize. The vapors may give the contamination a slight ability to enter the ambient air at the Site as a vapor or an odor, potentially migrating off-Site into the surrounding area. Construction workers in the immediate are of the exposed borings will be monitored as per the Health and Safety Plan.

1.4 Route of Exposure

The main route of possible exposure for the contamination is through direct dermal contact by construction workers during the drilling activities and removal of the fill material and the contaminated soils. A secondary route of exposure could be inhalation of vapors and dust particles by the worker population.

1.5 Receptor Population

The main receptor population would be the equipment operators and environmental workers (target population) during the drilling and removal processes. The target population will be the only individuals who will come in direct contact with the contamination, as the access to the Site would be limited to these individuals during the remediation of the Site.

The secondary receptor population would be the individuals living, working, and shopping in the vicinity of the project. Their exposure would be limited to dust generation and vapor inhalation, however, this scenario would be highly unlikely as proper engineering controls and safety measures will be implemented during drilling and removal of debris and contaminated soil from the Site.

1.6 Conclusion

The Health and Safety Plan address the exposure to contaminated soils and potentially harmful vapors in the vicinity of the Site. The Health and Safety Plan addresses the following:

- Dust control during drilling activities;
- Prevention of unauthorized entrance to the Site;
- Site maintenance to keep perimeter areas around the outside of the site clean.

During drilling, there will be minimal exposure of any contaminants due to the adherence to the programs listed above. After the drilling is complete and contaminated soils are removed there should be no potential for exposure to the public and onsite personnel to the contaminants mentioned in this document.

2.0 SENSITIVE RECEPTOR SURVEY

FLS performed a visual survey of the area consisting of a two to three block radius surrounding the Site (study area) in order to classify the property uses of the surrounding area and to determine if there are any sensitive receptors (i.e. water bodies, sensitive ecosystems, etc.) and/or sensitive receptor populations (i.e. sick, elderly, young, etc.) located within the study area. The study area is defined as the area within the area between 30th Street and 34th Street, and Skillman Avenue and 47th Avenue.

The surrounding neighborhood consists of industrial and commercial retail establishments (i.e. food stores, restaurants, retail stores, etc.), one mixed use dwelling, and some institutions (YMCA and LaGuardia Community College).

No water bodies or sensitive ecosystems were located within the boundaries of the study area.

Young children are considered to be a sensitive receptor population since they are still in the developmental phase. Exposure to contamination has the potential to cause developmental problems, learning disabilities, and/or health problems in children. Areas where children are typically found are schools, playgrounds, pre-schools, and daycare facilities.

The following Daycare/Pre-School facilities were identified within the study area:

• YMCA Child Care & Preschool	32-23 Queens Boulevard
• LaGuardia Community College Early Childhood Learning Center	31-10 Thomson Avenue

The following Public/Private Schools were identified within the study area:

• International High School at LaGuardia	31-10 Thomson Avenue
• Middle College High School	31-10 Thomson Avenue
• Academy of Finance And Enterprise	31-20 Thomson Avenue
• High School for Applied Communications	31-20 Thomson Avenue

The following playgrounds, athletic fields, and community recreation centers were identified within the study area:

• CityView Racquet Club	43-34 32nd Place
• K2 Boxing Club	34-09 Queens Boulevard

The elderly are considered a sensitive receptor population since they are generally more susceptible to the contaminants due to weakened immune systems and lifelong exposure to environmental contaminants. Elderly populations are generally found in group homes, senior citizen buildings, or senior care facilities. No elderly facilities were identified within the study area.

The sick are considered sensitive receptor populations since their immune systems may already be weakened due to illness and/or treatment regiments. These individuals are generally found in medical facilities such as hospitals, clinics, and doctor's offices.

The following medical facilities were identified within the study area:

- Restore Plus Physical Therapy 33-10 Queens Boulevard

All of the above-mentioned sensitive receptor populations also have the potential to be located at churches and shelters since these organizations often have programs that cater to these populations. No churches or shelters were identified within the study area.

Confirmed contamination of the soil and ground water was identified on the Site. The contamination extends into the saturated zone to the confining clay layer. Buildings located within New York City are connected to municipal water supply for potable and sanitary uses; therefore, use of contaminated ground water by the sensitive receptor populations is not a concern.

During remediation activities, special care will be taken to ensure that the sensitive receptor populations will be protected from exposure to the on-site contamination. Additionally, during the remediation activities special care will be taken to monitor and control fugitive odors and dust emissions from the Site, minimizing the risk of exposure to the surround receptor population.

Appendix C – Citizen Participation Plan

New York State Department of Environmental Conservation

Voluntary Cleanup Program

Citizen Participation Plan

for

Formerly ACCO Brands, Inc. Site

32-00 Skillman Avenue
Long Island City, New York

March 2015

Contents

* * * * *

Note: The information presented in this Citizen Participation Plan was current as of the date of its approval by the New York State Department of Environmental Conservation. Portions of this Citizen Participation Plan may be revised during the site's investigation and cleanup process.

Applicant: **Beam Suntory, Inc.**
Site Name: **Formerly ACCO Brands, Inc. Site**
Site Address: **32-00 Skillman Avenue**
Site County: **Long Island City**
Site Number: **V00331**

1. What is New York's Voluntary Cleanup Program?

New York's Voluntary Cleanup Program (VCP) works with private developers to encourage the voluntary cleanup of contaminated properties known as "brownfields" so that they can be reused and developed. These uses include recreation, housing, and business.

A *brownfield* is any real property that is difficult to reuse or redevelop because of the presence or potential presence of contamination. A brownfield typically is a former industrial or commercial property where operations may have resulted in environmental contamination. A brownfield can pose environmental, legal, and financial burdens on a community. If a brownfield is not addressed, it can reduce property values in the area and affect economic development of nearby properties.

The VCP is administered by the New York State Department of Environmental Conservation (NYSDEC) which oversees Applicants that conduct brownfield site investigation and cleanup activities. An Applicant is a person who has requested to participate in the VCP and has been accepted by NYSDEC. The VCP contains investigation and cleanup requirements, ensuring that cleanups protect public health and the environment. When NYSDEC certifies that these requirements have been met, the property can be reused or redeveloped for the intended use.

For more information about the VCP, go online at: http://www.dec.ny.gov/chemical/8442.html

2. Citizen Participation Activities

Why NYSDEC Involves the Public and Why It Is Important

NYSDEC involves the public to improve the process of investigating and cleaning up contaminated sites, and to enable citizens to participate more fully in decisions that affect their health, environment, and social well being. NYSDEC provides opportunities for citizen involvement and encourages early two-way communication with citizens before decision makers form or adopt final positions.

Involving citizens affected and interest in site investigation and cleanup programs is important for many reasons. These include:

- Promoting the development of timely, effective site investigation and cleanup programs that protect public health and the environment

- Improving public access to, and understanding of, issues and information related to a particular site and that site's investigation and cleanup process

- Providing citizens with early and continuing opportunities to participate in NYSDEC's site investigation and cleanup process

- Ensuring that NYSDEC makes site investigation and cleanup decisions that benefit from input that reflects the interests and perspectives found within the affected community

- Encouraging dialogue to promote the exchange of information among the affected/interested public, State agencies, and other interested parties that strengthens trust among the parties, increases understanding of site and community issues and concerns, and improves decision making.

This Citizen Participation (CP) Plan provides information about how NYSDEC will inform and involve the public during the investigation and cleanup of the site identified above. The public information and involvement program will be carried out with assistance, as appropriate, from the Applicant.

Project Contacts

Appendix A identifies NYSDEC project contact(s) to whom the public should address questions or request information about the site's investigation and cleanup program. The public's suggestions about this CP Plan and the CP program for the site are always welcome. Interested people are encouraged to share their ideas and suggestions with the project contacts at any time.

Locations of Reports and Information

The locations of the reports and information related to the site's investigation and cleanup program also are identified in Appendix A. These locations provide convenient access to important project documents for public review and comment. Some documents may be placed on the NYSDEC web site. If this occurs, NYSDEC will inform the public in fact sheets distributed about the site and by other means, as appropriate.

Site Contact List

Appendix B contains the site contact list. This list has been developed to keep the community informed about, and involved in, the site's investigation and cleanup process. The site contact list will be used periodically to distribute fact sheets that provide updates about the status of the project. These will include notifications of upcoming activities at the site (such as fieldwork), as well as availability of project documents and announcements about public comment periods.

The site contact list includes, at a minimum:

- chief executive officer and planning board chairperson of each county, city, town and village in which the site is located;
- residents, owners, and occupants of the site and properties adjacent to the site;
- the public water supplier which services the area in which the site is located;
- any person who has requested to be placed on the site contact list;
- the administrator of any school or day care facility located on or near the site for purposes of posting and/or dissemination of information at the facility;
- location(s) of reports and information.

The site contact list will be reviewed periodically and updated as appropriate. Individuals and organizations will be added to the site contact list upon request. Such requests should be submitted to the NYSDEC project contact(s) identified in Appendix A. Other additions to the site contact list may be made at the discretion of the NYSDEC project manager, in consultation with other NYSDEC staff as appropriate.

CP Activities

The table at the end of this section identifies the CP activities, at a minimum, that have been and will be conducted during the site's investigation and cleanup program. The public is informed about these CP activities through fact sheets and notices distributed at significant points during the program. Elements of the investigation and cleanup process that match up with the CP activities are explained briefly in Section 5.

- **Notices and fact sheets** help the interested and affected public to understand contamination issues related to a site, and the nature and progress of efforts to investigate and clean up a site.

- **Public forums, comment periods and contact with project managers** provide opportunities for the public to contribute information, opinions and perspectives that have potential to influence decisions about a site's investigation and cleanup.

The public is encouraged to contact project staff at any time during the site's investigation and cleanup process with questions, comments, or requests for information.

This CP Plan may be revised due to changes in major issues of public concern identified in Section 3 or in the nature and scope of investigation and cleanup activities. Modifications may include additions to the site contact list and changes in planned citizen participation activities.

Technical Assistance Grant

NYSDEC must determine if the site poses a significant threat to public health or the environment. This determination generally is made using information developed during the investigation of the site, as described in Section 5.

If the site is determined to be a significant threat, a qualifying community group may apply for a Technical Assistance Grant (TAG). The purpose of a TAG is to provide funds to the qualifying group to obtain independent technical assistance. This assistance helps the TAG recipient to interpret and understand existing environmental information about the nature and extent of contamination related to the site and the development/implementation of a remedy.

An eligible community group must certify that its membership represents the interests of the community affected by the site, and that its members' health, economic well-being or enjoyment of the environment may be affected by a release or threatened release of contamination at the site.

For more information about TAGs, go online at http://www.dec.ny.gov/regulations/2590.html

Note: The table identifying the citizen participation activities related to the site's investigation and cleanup program follows on the next page:

Citizen Participation Requirements (Activities)	Timing of CP Activity(ies)
Application Process:	
• Prepare site contact list • Establish document repositories	At time of preparation of application to participate in the VCP.
• Publish notice in Environmental Notice Bulletin (ENB) announcing receipt of application and 30-day public comment period • Publish above ENB content in local newspaper • Mail above ENB content to site contact list • Conduct 30-day public comment period	When NYSDEC determines that VCP application is complete. The 30-day public comment period begins on date of publication of notice in ENB. End date of public comment period is as stated in ENB notice. Therefore, ENB notice, newspaper notice, and notice to the site contact list should be provided to the public at the same time.
After Execution of Voluntary Site Cleanup Agreement:	
• Prepare Citizen Participation (CP) Plan	Before start of Remedial Investigation
Before NYSDEC Approves Remedial Investigation (RI) Work Plan:	
• Distribute fact sheet to site contact list about proposed RI activities and announcing 30-day public comment period about draft RI Work Plan • Conduct 30-day public comment period	Before NYSDEC approves RI Work Plan. If RI Work Plan is submitted with application, public comment periods will be combined and public notice will include fact sheet. Thirty-day public comment period begins/ends as per dates identified in fact sheet.
After Applicant Completes Remedial Investigation:	
• Distribute fact sheet to site contact list that describes RI results	Before NYSDEC approves RI Report
Before NYSDEC Approves Remedial Work Plan (RWP):	
• Distribute fact sheet to site contact list about proposed RWP and announcing 45-day public comment period • Public meeting by NYSDEC about proposed RWP (if requested by affected community or at discretion of NYSDEC project manager) • Conduct 45-day public comment period	Before NYSDEC approves RWP. Forty-five day public comment period begins/ends as per dates identified in fact sheet. Public meeting would be held within the 45-day public comment period.
Before Applicant Starts Cleanup Action:	
• Distribute fact sheet to site contact list that describes upcoming cleanup action	Before the start of cleanup action.
After Applicant Completes Cleanup Action:	
• Distribute fact sheet to site contact list that announces that cleanup action has been completed and that summarizes the Final Engineering Report • Distribute fact sheet to site contact list announcing issuance of Certificate of Completion (COC)	At the time NYSDEC approves Final Engineering Report. These two fact sheets are combined if possible if there is not a delay in issuing the COC.

3. Major Issues of Public Concern

This section of the CP Plan identifies major issues of public concern that relate to the site. Additional major issues of public concern may be identified during the course of the site's investigation and cleanup process.

There is the possibility that individuals living, working, and shopping in the vicinity of the project could be potentially exposed through dust generation and vapor inhalation. However this is considered highly unlikely as proper engineering controls and safety measures will be implemented during drilling and removal of debris and contaminated soil from the site.

4. Site Information

The property is located at 32-00 Skillman Avenue, Long Island City, New York and is identified as Block 245 and Lot 9 on the New York City Tax Map (Site). The Site is approximately 1.8-acres and is bounded by Skillman Avenue to the north, Queens Boulevard to the south, 32nd Place to the east and Van Dam Street to the west.

Appendix C contains a map identifying the location of the site.

Site Description

The Site is developed with a 3-story commercial and light industrial building occupied by multiple tenants, including a newspaper printing facility on the ground floor and a tennis and racquet-ball club on the upper floors.

The surrounding properties are primarily used for industrial and commercial purposes, with one adjacent property for mixed use. The adjacent properties consist of four commercial buildings (one is commercial and residential), an auto repair shop to the west, a warehouse, a parking lot, and a YMCA to the east, Sunnyside Rail Yard Long Island Rail Road tracks to the north, and elevated subway tracks followed by an 8-story commercial and residential building across Queens Boulevard, to the south.

History of Site Use, Investigation, and Cleanup

The Site building was constructed in 1950 and was occupied by ACCO Brands Inc. (ACCO) starting in 1952. During ACCO's occupancy, the Site building housed a manufacturing operation for staplers and stapler components, which involved the use of various paints, thinners and cleaners. ACCO sold the property in July 1998 to Swingstell, LLC (Swingstell), and the facility ceased operations in September 1999. An inspection of the Site conducted during the facility's closure revealed a small collection of contamination in the basement adjacent to a former degreasing operations area and contamination in the soils and groundwater attributable to the former manufacturing operation.

In July 2000, ACCO entered the Site into the NYSDEC Voluntary Cleanup Program to investigate the nature and extent of this contamination and to conduct any necessary remediation. ACCO agreed to lease the basement of the Site building from Swingstell for the purposes of conducting these activities.

Previous environmental investigation includes the installation of a vapor-extraction system in 2004, which has been operating since. In addition to this, treatments have included pressurized air injection between 2005 and 2005, and chemical injections between 2004 and 2010. These treatments ranged from ineffective to mildly effective.

5. Investigation and Cleanup Process

Application

The Applicant has applied for and been accepted into New York's Voluntary Cleanup Program as a Volunteer. This means that the Applicant was not responsible for the disposal or discharge of the contaminants or whose ownership or operation of the site took place after the discharge or disposal of contaminants. The Volunteer must fully characterize the nature and extent of contamination onsite, and must conduct a Aqualitative exposure assessment; a process that characterizes the actual or potential exposures of people, fish and wildlife to contaminants on the site and to contamination that has migrated from the site.

To achieve the remedial goals set for this remediation, the Applicant will conduct cleanup activities at the site with oversight provided by NYSDEC. The current use of the Site is not expected to change after remediation. The Voluntary Cleanup Agreement executed by NYSDEC and the Applicant sets forth the responsibilities of each party in conducting these activities at the site.

Remedy Selection

When the investigation of the site has been determined to be complete, the project likely would proceed in one of two directions:

1. The Applicant may recommend in its investigation report that no action is necessary at the site. In this case, NYSDEC would make the investigation report available for public comment for 45 days. NYSDEC then would complete its review, make any necessary revisions, and, if appropriate, approve the investigation report. NYSDEC would then issue a Certificate of Completion (described below) to the Applicant.

or

2. The Applicant may recommend in its investigation report that action needs to be taken to address site contamination. After NYSDEC approves the investigation report, the Applicant may then develop a cleanup plan, officially called a Remedial Work Plan. The Remedial Work Plan describes the Applicant's proposed remedy for addressing contamination related to the site.

When the Applicant submits a proposed Remedial Work Plan for approval, NYSDEC would announce the availability of the proposed plan for public review during a 45-day public comment period.

Cleanup Action

NYSDEC will consider public comments, and revise the draft cleanup plan if necessary, before approving the proposed remedy. The New York State Department of Health (NYSDOH) must concur with the proposed remedy. After approval, the proposed remedy becomes the selected remedy.

The Applicant may then design and perform the cleanup action to address the site contamination. NYSDEC and NYSDOH oversee the activities. When the Applicant completes cleanup activities, it will prepare a final engineering report that certifies that cleanup requirements have been achieved or will be achieved within a specific time frame. NYSDEC will review the report to be certain that the cleanup is protective of public health and the environment for the intended use of the site.

Release and Covenant not to Sue

When NYSDEC is satisfied that cleanup requirements have been achieved or will be achieved for the site, it will approve the final engineering report. NYSDEC then will issue a Release and Covenant not to Sue to the Applicant. The Release and Covenant not to Sue states that cleanup goals have been achieved, and relieves the Applicant from future liability for site-related contamination, subject to certain conditions.

Site Management

Site management is the last phase of the site cleanup program. This phase begins when the Release and Covenant not to Sue is issued. Site management may be conducted by the Applicant under NYSDEC oversight, if contamination will remain in place. Site management incorporates any institutional and engineering controls required to ensure that the remedy implemented for the site remains protective of public health and the environment. All significant activities are detailed in a Site Management Plan.

An institutional control is a non-physical restriction on use of the site, such as a deed restriction that would prevent or restrict certain uses of the property. An institutional control may be used when the cleanup action leaves some contamination that makes the site suitable for some, but not all uses. An engineering control is a physical barrier or method to manage contamination. Examples include: caps, covers, barriers, fences, and treatment of water supplies.

Site management also may include the operation and maintenance of a component of the remedy, such as a system that is pumping and treating groundwater. Site management continues until NYSDEC determines that it is no longer needed.

Appendix A
Project Contacts and Locations of Reports and Information

Project Contacts

For information about the site's investigation and cleanup program, the public may contact any of the following project staff:

New York State Department of Environmental Conservation (NYSDEC):

Hasan Ahmed and Jane O'Connell
NYSDEC Region 2 – Long Island City
Division of Environmental Remediation
47-40 21st Street,
Long Island City, NY 11101
Phone: (718) 482-49

Locations of Reports and Information

The facilities identified below are being used to provide the public with convenient access to important project documents:

Formerly ACCo Brands, Inc.
32-00 Skillman Avenue
Long Island City, New York
Arnold F. Fleming, P.E.
212-325-6775

NYSDEC Region 2 – Long Island City
47-40 21st Street,
Long Island City, NY 11101
Attn: Hasan Ahmed and Jane O'Connell
Phone: (718) 482-4900

Appendix B
Site Contact List

State and Local Officials

Mayor of New York City Hon. Bill de Blasio Address: City Hall New York NY, 10007 Phone: 311 or (212) 788-9600 Fax: (212) 788-2460 Web Email Form: http://nyc.gov/html/mail/html/mayor.html	Office of the Queens Borough President Hon. Melinda Katz Address: 120-55 Queens Boulevard Kew Gardens NY, 11424 Phone: (718) 286-3000 Fax: (718) 286-2885 email: info@queensbp.org
NY City Comptroller Scott M. Stringer Address: Municipal Building 1 Centre Street New York NY, 10007 Phone: (212) 669-3916 email: action@comptroller.nyc.gov	Hon. Andrew Cuomo Governor of the State of New York The State Capitol Albany, NY 12224
Hon. Jimmy Van Bramer NYC Council District - 26 Address: 47-01 Queens Boulevard (suite 205), Sunnyside, New York 11104 Phone: (718) 383-9566 Fax: (718) 383-9076 email: JVanBramer@council.nyc.gov	Francis McLaughlin Assistant Deputy Director, New York State Parks State Office Building 163 W. 125th St., 17th Fl. New York, NY 10027
Hon. Audrey I. Pheffer Queens County Clerk 88-11 Sutphin Boulevard, 1st Floor Jamaica, NY 11439 Phone: (718) 298-0601 email: apheffer@nycourts.gov	Hon. Michael Gianaris New York State Senate 31-19 Newtown Avenue Suite 402 Astoria, NY 11102 Phone: 718-728-0960 Fax: 718-728-0963 email: gianaris@nysenate.gov
Thomas V. Panzone Regional Citizen Participation Specialist – Region 2 NYSDEC 47-20 21st St. Long Island City, NY 11101-5407	Commissioner Emily Lloyd NYC-DEP 59-17 Junction Boulevard, 13th Floor Flushing, NY 11373
Hon. Catherine Nolan NY Assembly District - 37 Address: 45-25 47th Street, Woodside, NY 11377 Phone: 718-456-9492 email: nolanc@assembly.state.ny.us	Hon. Joseph Crowley U.S. House of Representatives Address: 1651 3rd Ave.,Ste 311 New York, NY, 10128 Phone: (212) 860-0606 Fax: (212) 860-0704 Email: https://crowley.house.gov/contact-me/email-me
Charles E. Schumer U.S. Senator 780 3rd Avenue Suite 2301 New York NY, 10017 Phone: (212) 486-4430	Kirsten Gillibrand U.S. Senator 780 3rd Avenue Suite 2601 New York NY, 10017 Phone: (212) 688-6262

Fax: (202) 228-2833 Web Email Form: http://www.schumer.senate.gov/contact/email-chuck	Fax: (202) 228-0406 Web Email Form: http://www.gillibrand.senate.gov/contact/
John Zimmerman, Air Resources NYSDEC 59-17 Junction Blvd. Corona, NY 11368	John Wuthenow NYSDEC 59-17 Junction Blvd. Corona, NY 11368
Honorable Letitia James Public Advocate One Centre St., 15th Fl., North New York, NY 10007-1602	

Community Board

Joseph Conley, Chairman Queens Community Board 2 43-22 50th Street, 2nd Fl. Woodside, NY 11377 Phone: (718) 533-8773 Fax: (718) 533-8777 email: qn02@cb.nyc.gov; commboard2@nyc.rr.com	

Media

The Daily News 450 W. 33rd St. New York, NY 10001 www.nydailynews.com	Newsday: Newsday - Queens Edition 235 Pinelawn Road Melville, NY 11747 Queens newsroom: 631-843-2700
Queens Chronicle PO Box 74-7769 Rego Park, NY 11374-7769 Tel: (718) 205-8000 Fax: (718) 205-0150 email: Mailbox@qchron.com	Western Queens Gazette 42-16 34th Ave. Long Island City, NY 11101 Tel. (718) 361-6161 Fax (718)784-7552 www.qgazette.com Email: qgazette@aol.com
Queens Ledger 69-60 Grand Avenue Maspeth, New York Tel: 718-639-7000 news@queensledger.com www.queensledger.com	Daily News/Queens 118-35 Queens Blvd. Forest Hills, NY 11375 ; Queens County www.nydailynews.com Editorial Assistant -- Maxine Simpson Phone: 718-793-332 Fax: 718-793-2910

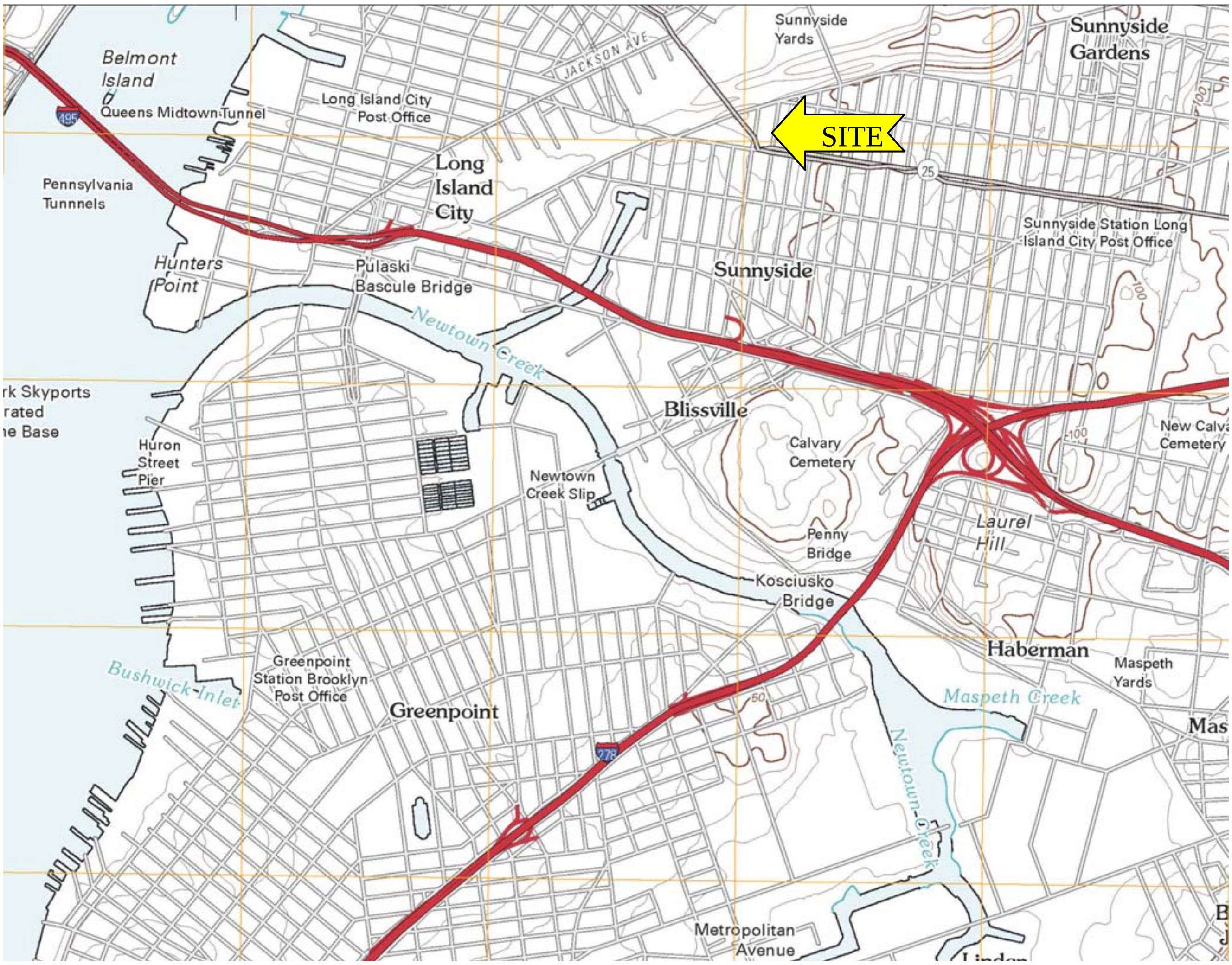
Local School Officials

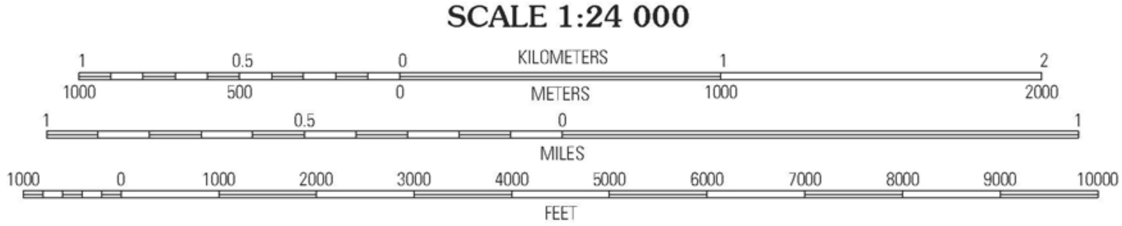
International High School at LaGuardia Principal John Starkey 31-10 Thomson Ave -MB52 Long Island City, NY 11101 Phone: 718-482-5455 Fax: 718-392-6904	High School of Applied Communication Principal Daniel Korb 30-20 Thomson Ave Long Island City, NY 11101 Phone: 718-389-3163 Fax: 718-389-3427

Middle College High School Principal Linda Siegmund 31-10 Thomson Ave Long Island City, NY 11101 Phone: 718-349-4000 Fax: 718-349-4003	Frank Sinatra High School Principal Donna Finn 35-12 35th Ave Queens, NY 11106 Phone: 718-361-9920 Fax: 718-361-9995
NYC Geographic District #30 - RIC # 4 Superintendent Philip Composto 28-11 Queens Plaza N Long Island City, NY 11101 Email: pcompos@schools.nyc.gov	NYC Queens HS (Districts 24, 25, 28, & 30) Superintendent Juan Mendez 30-48 Linden Place, Room 307 Flushing, NY 11354 Email: jmendez2@schools.nyc.gov
Avation High School Principal Deno Charalambous 45-30 36th Street Long Island City, NY 11101 Phone: 718-361-2032 Fax: 718-784-8654	Bard High School Early College Queens Principal Valeri Thomson 30-20 Thomson Ave Long Island City, NY 11101 Phone: 718-361-3133 Fax: 718-361-6742
Queens Vocational and Technical High School Principal Melissa Burg 37-02 47th Ave Long Island City, NY 11101 Phone: 718-937-3010 Fax: 718-392-8397	Robert F. Wagner Jr. Institute for Arts & Technology Principal Ann Seifullah 47-07 30th Pl Long Island City, NY 11101 Phone: 718-472-5671 Fax: 718-472-9117
Berk Trade & Business School 33-09 Queens Blvd 2nd Floor Long Island City, NY 11101 Phone: 718-729-0909 Fax: 718-729-0606	LaGuardia Community College TELC Program Program Director Victoria Badalamenti 29-10 Thomson Ave Room, C-354 Long Island City, NY 11101 Phone: 718-482-5360
LIC YMCA Early Child Care Program: Michael Keller Senior Executive Director Long Island City YMCA 32-23 Queens Blvd. Long Island City, NY 11101 Phone: 718-392-7932	LaGuardia Community College ECLC Program Inc. Sonya Evariste Associate Director of Early Childhood Education 31-10 Thompson Ave Long Island City, NY 11101 Phone: 718-482-5295 Fax: 718-609-2034
CUNY- LaGuardia Community College President Gail O. Mellow 31-10 Thomson Avenue Long Island City, NY 11101 Phone: 718-482-7200	

Document Repositories

Queens Borough Public Library: Court Square 2501 Jackson Ave. Long Island City, NY	





Site: Brooklyn, New York 7.5 Minute series USGS Topographic Map (79287)
Obtained from United States Geological Survey topography compiled 2010

APPENDIX C: SITE LOCATION MAP

Fleming
Lee Shue

SITE: FORMER ACCO BRANDS
32-00 SKILLMAN AVENUE
LONG ISLAND CITY, NEW YORK

Environmental Management & Consulting, 158 West 29th Street, 9th Fl., New York, NY 10001

Appendix D – Health & Safety Plan

Formerly ACCO Brands, Inc. Site

32-00 Skillman Avenue
Long Island City, New York
NYSDEC VCP Site # V00331

HEALTH & SAFETY PLAN

Prepared for
Jim Beam Co., Inc.
149 Happy Hollow Road
Clermont, KY 40110

FLS Project Number: 10195-001

Submitted to:
New York State Department of Environmental Conservation
Division of Environmental Remediation, Region 2
47-40 21st Street
Long Island City, New York 11101-5407

March 2015

Prepared by:

ARNOLD F. FLEMING P.E.

&

Fleming
Lee Shue

Environmental Management & Consulting
158 West 29th Street, 9th Floor
New York, New York 10001
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Attachments

PROJECT INFORMATION SHEET

Project/Site Name:	Formerly ACCO Brands, Inc.
Site Address:	32-00 Skillman Ave., Long Island City (Queens), NY
Project No:	10195
Client:	Jim Beam Co., Inc.
FLS Project Manager:	Peter Helseth
Date HASP Revised:	03/26/2015
Anticipated Dates of Site Work:	July 2015 – February 2016

1.0 INTRODUCTION

Fleming-Lee Shue, Inc. (FLS) and Arnold F. Fleming P.E. prepared this Health and Safety Plan (HASP) on behalf of Jim Beam Co., Inc. to address the general health and safety practices and guidelines that will be employed during the remediation of the former ACCO Brands property, located at 32-00 Skillman Avenue, Long Island City, New York (Site). The Site is under the VCP as VCP Site No. V00331 administered by NYSDEC. The parcel is bounded on the north by Skillman Avenue, to the east by 32nd Place, to the south by Queens Boulevard and to the west by Van Dam Street. Figure 1 is a Site location map.

1.1 Purpose

The purpose of this HASP is to identify the real and potential hazards associated with environmental field activities and to stipulate appropriate health and safety procedures, particularly where hazardous materials are potentially present. The procedures and guidelines contained in this document are intended to minimize exposure to chemical, physical, and biological hazards that may be present in the soil, groundwater, or air, and to reduce the potential for accidents and injuries associated with the implementation of remedial action.

This HASP provides a description of site-specific personal protection levels and safe operating guidelines for use by FLS personnel. Contractors, subcontractors and their employees, working under the direction of FLS, can follow the procedures in this HASP if they choose. Otherwise, contractor and subcontractors must prepare their own HASP.

This HASP will be kept onsite during field activities and shall be accessible at all times. This HASP will be reviewed as necessary and will be amended or revised as conditions change and additional activities arise. All FLS and contractor/subcontractor personnel choosing to follow the procedures of this HASP will be required to sign the Acknowledgement Form (Attachment 1).

Description of Specific Tasks

This project involves the following tasks:

- Soil borings and soil sampling
- Mobilization and equipment preparation
- Installation and operation of electrical resistance heating (ERH)
- Groundwater sampling
- Implementation of enhanced in-situ bioremediation
- Installation of long term engineering control

1.2 References

The procedures described in this document were developed in accordance with the provisions of Occupational Safety and Health Administration (OSHA) Hazardous Waste Operations and Emergency Response (HAZWOPER) Standard 29 CFR 1910.120 or 29 CFR 1926.65 and FLS' policies and procedures. The Occupational Safety and Health Act (1970) requires the following:

- Employers shall furnish each employee with a place of employment free from recognized hazards that are causing or likely to cause death or serious physical harm.
- Employers must comply with occupational health and safety standards and rules, regulations and orders pursuant to the Act, that are applicable to company business and operations.
- All employees must comply with occupational health and safety standards and regulations under the Act, which are applicable to their actions and situations.
- Employees are encouraged to contact their immediate superior for information that will help them understand their responsibilities under the Act.

2.0 SITE INFORMATION

2.1 Site Description

The Site is located at 32-00 Skillman Avenue, Long Island City, New York and is identified as Block 245 and Lot 9 on the New York City Tax Map. The Site is approximately 1.8-acres and is bounded by Skillman Avenue to the north, Queens Boulevard to the south, 32nd Place to the east, and Van Dam Street to the west. The Site is designated as M1-4 for industrial and manufacturing use. Figure 1 shows the Site location.

The subject property is developed with a three-story commercial and light industrial building occupied by multiple tenants, including a newspaper printing facility on the ground floor and a tennis and racquet ball club on the upper floors. The soil and groundwater beneath the basement area is covered under Operable Unit-1 (OU-1) while the off-site soil and groundwater are covered under the OU-2 of the VCP entered into by Jim Beam Inc. with the NYSDEC in October 2000. Figure 2 shows the Site Plan.

Based on information published by the United States Geological Survey 7.5 Minute Series Topographic Map of Brooklyn New York Quadrangle, the Site is located at approximately 10 to 15 feet (ft.) above mean sea level. The topographic gradient of the Site and the surrounding area gradually slopes south- southwest towards Dutch Kills.

The Site subsurface consists of interbedded sand and silt units that overlie a clay unit. The sand/silt unit ranges from approximately 33 to 43 ft. in thickness. The underlying clay unit was not penetrated during the FLS investigation, but based upon boring logs from prior investigations; it is believed that the clay unit is approximately 5 to 10 ft. in thickness. Both the sand/silt and clay units dip to the south-southwest. The groundwater table was encountered within the sand stratum at a depth of approximately 14 to 15 ft. below ground surface. Groundwater is inferred to flow south/southwest.

2.2 Site History

The former ACCO building, located at 32-00 Skillman Avenue, was constructed in 1950 and used for the manufacturing of staplers. The facility was closed between 1998 and 1999. As part of this closure Dames and Moore conducted a Phase I Environmental Site Assessment (ESA) and a Hazardous Waste Facility Closure Plan which was approved by the NYSDEC in 1999. During the initial site inspection an unlined pit was identified in the building's basement and found to be contaminated. In October 2000, ACCO entered into the NYSDEC VCP to investigate and remediate the subsurface contamination identified beneath the basement floor. An on-site investigation was initiated in 2000 and an off-site investigation in 2001. TCE was identified in the soils and groundwater beneath the building in addition to off-site. Concentrations as high as 720,000 ppb have been identified in one of the on-site injection wells. This gross level of impact is indicative of free phrase TCE product, which is a Dense Non-Aqueous Phase Liquid (DNAPL).

The Site has been undergoing active remediation since 2003, when the initial soil vapor extraction (SVE) system was activated. Remedial measures implemented include: SVE (2003 to present), air sparging (2004 to 2005), ozone injection (2005 to 2008) and chemical oxidation (2004 to 2010.) To date, these remedial measures have not been successful at removing the TCE source. The chemical oxidation treatment was effective for a limited period of time after treatment, but the TCE concentrations continued to rebound once the oxidant was spent. The rebound occurs due to the TCE desorbing into the sand from the underlying finer silt layer. A more detailed breakdown of past and current investigation and remediation, including isocontour maps and graphs of TCE concentrations over time is provided in the RAWP.

3.0 SCOPE OF WORK

This HASP addresses the general activities associated with the planned environmental remediation of the Site. These activities include, but are not limited to, the following:

- Mobilization/demobilization
  - Mobilization and demobilization of equipment and supplies
  - Establishment of Site access procedures, site security and work zones
- Pre-Remediation Activities
  - Site Inspection and Survey
  - Utility Clearance and Permitting
- Remedial Activities
  - Installation and operation of ERH
  - Implementation of enhanced in-situ bioremediation
  - Collection of samples for monitoring and system optimization

The planned remedial activities are detailed in the succeeding sections.

3.1 Proposed Remedial Action

Based on the comparative evaluation of proposed remedial alternatives as specified in the RAWP, Alternative 4 (Remediation via ERH with enhanced in-situ bioremediation) is recommended for the Site. The proposed remedial action for the Site consists of performing ERH treatment of the source contamination area in OU-1 to achieve Track 4 SCOs. Remediation of OU-2 would occur through enhanced in-situ bioremediation. Site management is proposed until asymptotic levels TCE are reached.

Site-specific soil Cleanup objectives based on 6 NYCRR Part 375-1.8(f) were developed in conjunction with the proposed Remedial Alternative selection.

3.2 Scope of Electrical Resistance Heating Remedial Alternative

The proposed ERH remedial alternative addresses the source contamination in OU-1. The proposed scope of the remediation is to remediate the most heavily impacted area as identified during the SRI. This area will be remediated to meet the Track 4 standards addressed in the RAWP. To accomplish this remediation in a safe manner, the following methods will be used:

1) Prior to the start of field work, fencing will be erected to prevent access by the general public. This will be supplemented with signs stating no site access.
2) A pre-treatment meeting will be scheduled with NYSDEC to review the proposed remediation.
3) All remedial activity will be reviewed by the Remedial Engineer and updates will be provided throughout the duration of the field work.
4) Utility mark-outs will be completed prior to any subsurface work.
5) Emergency contact numbers are provided in the attached HASP.
6) All remedial activities will be fully documented in the final report.

ERH passes an alternating electrical current through the soil and groundwater that requires treatment. When an electrical current is applied to the treatment volume, subsurface heating occurs due to the resistive properties of the soil. Subsurface heating continues and boils a portion of the soil moisture into steam. This in-situ steam generation occurs in all soil types, regardless of permeability. Electrical energy volatilizes the target contaminant and provides steam as a carrier gas to sweep the chlorinated VOCs to the vapor recovery (VR) wells. After the steam is condensed from the vapor stream and the extracted air is cooled to ambient conditions, the chlorinated VOC vapors are treated using conventional methods.

The design of the ERH treatment will be completed by TRS Group, Inc. (TRS) with guidance from FLS. The TRS design specifics and parameters utilized to develop the remedy are presented in the RAWP. The anticipated treatment area is 9,700 square feet (sq. ft.), with a treatment volume of approximately 11,000 cubic yards (cu. yd.). Based on initial design preparations, it is anticipated that the ERH treatment will require 60 electrodes and 60 co-located vapor recovery wells. The electrodes will be installed in the saturated zone to a depth intersecting the confining clay layer. Seven temperature monitoring points are anticipated to be installed within the ERH treatment volume to monitor subsurface temperatures throughout the ERH remediation. The recovered vapors will be treated through vapor-phase granular activated carbon prior to discharge to the ambient air.

All activities associated with the remedial action, including permitting requirements, will be conducted in accordance with the applicable Federal, State and local rules and regulations.

3.3 Scope of Enhanced In-Situ Bioremediation

Enhanced in-situ bioremediation is the process by which biostimulation and bioaugmentation are used to promote the biodegradation of contaminants in the subsurface. Biostimulation is the addition of carbon substrate to the subsurface to encourage beneficial microbial growth. Bioaugmentation is the addition of microbes that will reductively dechlorinate the contamination. In this case, degradation of the remaining chlorinated compounds will be achieved through the use of naturally occurring bacteria - *Dehalococcoides*.

The injections will be conducted to achieve accelerated reduction of TCE concentrations in groundwater for OU-2. To accomplish this remediation in a safe manner, the following methods will be used:

1) A pre-treatment meeting will be scheduled with NYSDEC to review the proposed remediation.
2) All remedial activity will be reviewed by the Remedial Engineer and updates will be provided throughout the duration of the field work.
3) Emergency contact numbers are provided in the attached HASP.
4) All remedial activities will be fully documented in the final report.

4.0 PROJECT ORGANIZATION AND PERSONNEL RESPONSIBILITIES

All personnel who participate in field activities will be required to attend a Health and Safety meeting prior to the commencement of field activities. These meetings will review the scope of work to be accomplished, any specific safety concerns, address safety questions and issues, and asses the condition of crew and equipment. The tailgate meeting represents the first opportunity to prevent an accident. The meeting will be noted and summarized in the field log.

All Site workers must review this HASP before entering the Site. The Health and Safety Officer (HSO) or designee will ensure that personnel have reviewed the HASP and will provide an opportunity to ask health and safety questions during attendance at a pre-field safety meeting. Field personnel will sign the acknowledgment form (Attachment 1) maintained on-Site during the remedial action work. The recommended health and safety guidelines in this document may be modified, if warranted, by additional information obtained prior to, or during Site investigation. The HSO will also maintain copies of pertinent health and safety records for all field personnel. The responsibilities of each personnel are listed below:

4.1 Health and Safety Officer

- Administers all aspects of the occupational health and safety program;
- Develops programs and technical guidance to identify and remove physical, chemical, and biological hazards from facilities, operations, and sites;
- Assists management and supervisors in the health and safety training of employees;
- Conducts inspections to identify unhealthy or unsafe conditions or work practices;
- Investigates all accidents and takes action to eliminate accident causes;
- Monitors to determine the degree of hazard to determine the protection levels and equipment required to ensure the safety of personnel;
- Evaluates on-site conditions (i.e., weather and chemical hazard information) and recommending to the project manager and/or the field coordinator, modifications to the work plan and personnel protection levels;
- Monitors performance of all personnel to ensure compliance with the required safety procedures;
- Ensures that all personnel have been trained in proper site-safety procedures including the use of personal protective equipment (PPE), and have read and signed the Acknowledgment Form (Attachment 1);

- Halts work if necessary;
- Ensures strict adherence to the Site HASP; and
- Reviews personnel medical monitoring participation.

4.2 Project Manager

- Familiar with health and safety regulations related to area of responsibility.
- Directs and coordinates health and safety activities within area of responsibility.
- Ensures arrangements for prompt medical attention in case of serious injury
- Requires all employees supervised to use individual protective equipment and safety devices.
- Ensures that safety equipment is available, maintained, used, and stored correctly.
- Instructs and trains all persons within area of responsibility in health and safety requirements.
- Conducts frequent and regular health and safety inspections of work area. Directs correction of unsafe conditions.
- Conducts weekly safety briefings with all supervisors and/or workers.
- Requires all subcontractors and subcontractor personnel to comply with health and safety regulations.

4.3 All Personnel

The minimum personal qualifications for each individual participating in field activities are:

- OSHA-specific medicals including, but not limited to, audiometric testing under the hearing conservation program;
- Participation in the FLS Occupational Health Monitoring Program;
- Successful completion of the 40-hour OSHA health and safety training for hazardous material sites (29 CFR 1910.120[e][3][i]) and valid/up-to-date 8-hour refresher training (29 CFR 1910.120[e][4]);
- Be familiar with and comply with proper health and safety practices;
- Use the required safety devices and proper PPE; and
- Notify HSO/supervisor immediately of unsafe conditions/acts, accidents, and injuries.

5.0 POTENTIAL CHEMICAL, PHYSICAL, AND BIOLOGICAL HAZARDS AND CONTROLS

This section discusses the potential chemical, physical, and biological hazards and controls associated with the remedial action tasks. A summary of potential site tasks, safety hazards and safety requirements is presented in Table 1.

5.1 Potential Chemical Hazards/Controls

Based on data collected during previous investigations at the Site, this HASP focuses on the identified chemicals of concern; TCE and potassium permanganate.

Attachment 2 lists the recognized and suspected health hazards, exposure limits, physical and chemical properties, recommended protection levels and symptoms of exposure for the chemicals known or suspected to be present at the Site. The chemical hazards will be minimized by limiting exposure of personnel to soil and groundwater and by the use of PPE.

5.2. Physical Hazards/Controls

Physical hazards potentially present at the Site include, but are not limited to, the following:

Hazard	Control
Slip, trip and fall (uneven terrain and slippery surfaces)	Avoid Uneven Terrain, Walk Slowly, Wear Sturdy/Supportive Shoes
Environmental (heat/cold) stress	A discussion of heat stress and cold stress and related illnesses and controls is provided in Attachment 3.
Subsurface/Aboveground Utilities	Ensure utility clearance has occurred in drilling area, respect subsurface utility marks. Inspect area where drill rig derrick will be hoisted for utilities.
Vehicular Traffic	Avoid working in high traffic areas. If necessary, use cones, reflective vests, and consider use of a flagman/additional protection.
Fire	Ensure class ABC fire extinguisher is nearby to work area when using equipment that can provide an ignition source (drill rigs, generators, power tools)
Noise hazards	Use ear plugs and/or ear muffs during drilling and boring.

Use of heavy equipment	Stay clear of heavy equipment during operation. Maintain eye contact with operator when approaching equipment.
Electrical resistance heating	Access to treatment area (electrode field) limited to ERH trained competent persons and is controlled by fencing.

Anticipated Site operations do not include the need for specific operations such as, lockout/tag-out, scaffolds or confined spaces; therefore these items are not addressed in this HASP. If Site activities require these operations, properly trained, experienced and competent personnel shall be utilized.

5.3 Biological Hazards/Controls

Hazard	Control
Bites or stings from insects/animals (particularly ticks) resulting in skin inflammation, disease, or allergic response	Keep exposed skin covered. Use insect repellant if necessary. Inspect yourself carefully after work is completed.
Allergens and toxins from plants and animals, producing dermatitis, rhinitis, or asthma	Keep exposed skin covered using proper PPE. Wash hands regularly.

6.0 HEALTH AND SAFETY PROTOCOL

6.1 Site Work Hazard Evaluation

An evaluation of the Site tasks must be conducted to identify potential hazards and anticipate hazard controls. Upon review of contaminant levels, physical hazards, and Site tasks, it has been determined that Level D protection will be implemented to start all field activities. Air monitoring and action levels for appropriate PPE levels is included in Table 2.

6.2. Training

Knowledge of the safety rules supplemented by compliance is essential to safety. New employees will be provided orientation training and will be furnished information and literature covering the company health and safety policies, rules, and procedures. This orientation training must be provided prior to the employee's visit to the Site.

All employees will have successfully completed the 40-hour OSHA health and safety training for hazardous material sites (29 CFR 1910.120[e][3][i]) and valid/up-to-date 8-hour refresher training (29 CFR 1910.120[e][4]).

All personnel must read the HASP and project-specific RAWP, which contains the applicable regulations/standards for their job.

Prior to beginning work on-Site, and weekly thereafter, the Health and Safety Officer (HSO) will lead safety-training sessions and/or training meetings. These meetings will be conducted to provide information and training on new equipment, new procedures, new chemicals, refresher/remedial training in specific areas, or meet annual requirements. Such training may be held in conjunction with the safety briefings/meetings addressed elsewhere in this program.

If necessary, the HSO will ensure that employees are scheduled and provided specialized training as required. Examples of specified training include (but are not limited to).

- Safe handling/use of flammables, poisons, or toxics
- Confined space entry
- Hazard communication (hazardous chemicals)
- Slip, trip and fall hazards and fall protection
- Blood-borne Pathogens (Non-Medical)
- ERH-specific training

Specialized training will be documented in the employees' personnel records and/or in a master training record.

6.3 Contractor and Subcontractor Compliance

All FLS contracts and subcontracts require that state laws concerning health and safety will be observed by the subcontractor. The provisions of these health and safety responsibilities apply to subcontractors and their employees working for FLS. Failure to fulfill this requirement is a failure to meet the conditions of the contract.

6.4 Personal Hygiene

Eating, drinking and the use of tobacco products in the work area are prohibited. The use of alcohol or other non-prescription drugs by personnel that could impair the ability to function at the work site is prohibited. The use of some prescription drugs may impair the ability to function and can create safety problems on-site. Field personnel taking prescription medication should alert the HSO in case of an emergency. Dermal contact with groundwater should be avoided. This includes avoiding walking through puddles, pools, and mud, sitting or leaning on or against drums, equipment, or on the ground. Field personnel should wash their hands before eating, smoking, using the toilet, etc. Field personnel should wash their hands and face and shower (daily) as soon as possible after leaving the Site.

6.5 Levels of Personal Protection

PPE must be worn as required for each job in all operations where there is an exposure to hazardous conditions. Upon review of contaminant levels, physical and biological hazards, exposure routes and the nature of the field tasks, it has been determined that Level D protection will be used during field if total organic compound concentrations in the breathing zone consistently reach or exceed 5 parts per million (ppm) as measured with a photoionization detector (PID) activities will be stopped and the area allowed to vent. If PID readings in the breathing zone consistently reach or exceed 25 ppm, work will be stopped and the Site HSO and Project Manager contacted. Protection levels are described in more detail in Section 4.6 and air monitoring is discussed in Section 6.

Level D protection

Level D applies to work in areas where the possibility of contact with potentially contaminated groundwater and soil exists. The protective equipment required for Level D includes, but is not limited to the following:

- Work clothes or coveralls

- Safety boots, with or composite steel toe
- Safety glasses
- Hard hat
- Reflective vest
- Disposable latex gloves
- Hearing protection, to be used as needed

6.6 General Workplace Safety Rules

- Report unsafe conditions, accidents, injuries, or incidents to the HSO and Project Manager.
- Use eye and/or face protection where there is danger from flying objects or particles, (such as when grinding, chipping, burning and welding, etc.) or from hazardous chemical splashes.
- Dress properly. Loose clothing and jewelry shall not be worn.
- Keep all equipment in safe working condition. Never use defective tools or equipment.
- Report any defective tools or equipment to immediate supervisor.
- Properly care for and be responsible for all PPE.
- Do not leave materials in aisles, walkways, stairways, work areas, roadways, or other points of egress.
- Practice good housekeeping at all times.
- Training on equipment is required prior to unsupervised operation.
- During work, pause every few minutes and assess surrounding conditions.
- Crossing highways and major roadways is not recommended. Expect movement of cars and buses at any time along any roadway, regardless of traffic signals, stop signs, yield signs, etc.
- When walking on right-of-ways or road-shoulders, keep a sharp lookout in both directions.
- For personal safety, be cognizant of your surroundings and ensure that equipment is properly secured.

6.7 Housekeeping

- Proper housekeeping is the foundation for a safe work environment. It definitely helps prevent accidents and fires, as well as creating a professional appearance in the work area.
- Material will be piled or stored in a stable manner so that it will not be subject to falling.
- Combustible scrap, debris, and garbage shall be removed from the work area at frequent and regular intervals.
- Stairways, walkways, exit doors, in front of electrical panels, or access to firefighting equipment will be kept clear of materials, supplies, trash, and debris.

6.8 Fire Prevention

- All firefighting equipment shall be conspicuously located, accessible, and inspected periodically, and maintained in operating condition. An annual service check and monthly visual inspections are required for fire extinguisher.
- All employees must know the location of firefighting equipment in the work area and have knowledge of its use and application.

6.9 Industrial Hygiene and Occupational Health

- Toilet facilities shall be provided as required for the number of workers.
- A first aid kit and portable eyewash station shall be kept on site.
- An adequate supply of potable water shall be provided.
- The use of a common drinking cup is prohibited.
- When no medical facility is reasonably accessible (time and distance) to the worksite, a person who has a valid certificate of first aid training will be available at the worksite to render first aid.
- Employees must be protected against exposure to hazardous noise levels by controlling exposure or by use of proper PPE.
- Any FLS Activities will be assessed for lead exposure (particularly if drywall or any painted surfaces or abrasive blasting/grinding is involved) and/or asbestos exposure.

6.10 Construction Equipment Safety Rules

A discussion of health and safety issues related to FLS and AFF employees performing work in the vicinity of common construction elements, such as electrical; compressed gas cylinders; ladders; aerial lifts; cranes; welding and brazing; tools; safety railings and other fall protection; scaffolds; excavations and trenches; motor vehicles and mechanized equipment, is provided in Attachment 4.

6.11 Spill Containment Program

The cleanup of a chemical spill should only be done by knowledgeable and experienced personnel. Spill kits, consisting of absorbents and protective equipment should be available to clean up minor spills. A minor chemical spill is one that the FLS and AFF staff is capable of handling safely without the assistance of emergency personnel. All other chemical spills are considered major. For a major spill, contact the HSO.

Procedure for Responding to a Minor Chemical Spill

- Contact HSO to obtain guidance
- Alert people in immediate area of spill
- Wear PPE, minimum level D—**First assess the spill to determine whether you have sufficient protection to continue**
- Confine spill to small area using absorbent, debris, soil etc.
- Absorb spill with vermiculite, dry sand, or oil-sorbent pads
- Collect residues, place in DOT-approved containers (labeled) and dispose as chemical waste

7.0 INDIVIDUAL HEALTH AND SAFETY PROGRAMS LISTING

The OSHA standards specify various individual programs that may be applicable to work performed on eligible sites. Highlights of these programs are provided below, and specific written programs or procedures may be included into this written program, attached, or developed separately, as necessary.

7.1 Hazard Communication Program

If employees are exposed to or work with hazardous chemicals at the job site, this program is required. Required elements of the written program include a master listing of chemicals; maintaining material safety data sheets on each chemical; and training of employees on the program, the chemicals exposed to, and material safety data sheets.

7.2 Respiratory Protection Program

If employees are exposed to hazardous/toxic chemical, paint or other gases, vapors, fumes, dusts, or mists above the National Institute for Occupational Safety and Health (NIOSH) permissible exposure limit (PEL), and/or employees wear respirators, this program is required. Program elements are written program for the selection, maintenance, care, and use of respirators; fit testing, training, and employee evaluation for use.

7.3 Occupational Noise Exposure/Hearing Conservation Program

If employees are exposed to noise levels above the permissible noise exposures, protection against the effects of noise and an effective hearing conservation program are required. Such a program would include elements such as a written program, noise monitoring, hearing evaluations and follow-on testing, PPE (hearing protection), and maintenance of medical records.

7.4 Assured Equipment Grounding Conductor Program

If the employer uses assured equipment grounding verses ground fault circuit interrupters to provide employee electrical grounding protection, this program is required. Program elements include the inclusion of all cord sets, receptacles and cord/plug connected equipment and tools; a written program; quarterly testing; recording of each test by logging, color coding, or other equally effective means; and designation of a competent person to run the program.

7.5 Fire Protection and Prevention

A fire protection and prevention program must be developed and followed throughout all phases of the construction and demolition work. Program elements include providing the specified firefighting equipment, periodic inspections of the same, providing fire alarm devices/system, and establishment and adherence to fire prevention practices.

7.6 Emergency Response Plan

If employees are engaged in emergency response to a hazardous substance/chemical release, an emergency response plan must be developed and implemented. Program elements include a written response plan, identification and training of responding employees, medical surveillance and consultation, and post response operations.

7.7 Asbestos Control Program

If employees are exposed to asbestos fibers in the workplace, then an initial monitoring for asbestos exposure must be made. If the monitoring results are above the PEL, this program is required. Program elements include regulated areas, exposure monitoring, medical surveillance and records maintenance, engineering controls, PPE, and training.

7.8 Lead Exposure Program

If employees are exposed to lead in the workplace, then an initial monitoring for lead exposure must be made. If the monitoring results are above the PEL, this program is required. Program elements include regulated areas, exposure monitoring, medical surveillance and records maintenance, engineering controls, PPE, and training.

7.9 Equipment Exhaust Control

As the remediation work will be performed in the basement of the subject property, the exhaust from gasoline and/or diesel powered equipment must by vented out of the work area. Contractors will be requested to use equipment equipped by exhaust scrubber units whenever possible. Portable high-volume vehicle exhaust systems will also be employed to vent the exhaust gasses out of the work area.

7.10 Building Access

FLS employees are prohibited from entering buildings or other structures deemed unsafe and/or structurally unsound.

8.0 AIR QUALITY MONITORING AND ACTION LEVELS

During any activity disturbing the soil, including drilling and electrode installation, air quality in the worker breathing zone will be monitored.

8.1 COMMUNITY AIR MONITORING PROGRAM

Monitoring equipment will be used to measure total organic vapors, dust, and carbon monoxide. Equipment required includes a MultiRAE (to monitor total volatile organic and carbon monoxide concentrations) and a particulate monitor. Air monitoring requirements by field activity is specified in Table 1. The instruments will be calibrated daily or as necessary due to field conditions and the results noted in the project field book. A background level will be established, at a minimum, on a daily basis, and recorded in the field book. The action levels and required responses are listed in the Table 2.

9.0 SITE/WORK AREA MANAGEMENT

The Site control measures shall be implemented to protect the public and the personnel working on-Site. A typical Site work area will consist of an exclusion zone (EZ) where the actual field activity will take place, a contaminant reduction zone (CRZ), and a support zone (SZ) located outside the CRZ and EZ.

Levels of personal protection in the EZ will vary depending on air monitoring data, and will be specified by the Site HSO.

Fences, guardrails and access devices shall be provided and maintained by the construction contractor throughout the project activities in accordance with 29 CFR 1926. In addition, barricades, warning signs and devices, temporary lighting and other safety measures shall be provided by the construction contractor, as required, to protect Site personnel.

All visitors to the Site shall report first to the Contractor field office. Visitor access shall be limited to the SZ and Level D operation areas only, and shall be allowed only with the prior consent of the Contractor Site Manager. No visitor shall enter a work area unescorted by a Subcontractor or Contractor representative. The presence of any regulatory agency on-site shall be reported immediately to the Contractor Brownfield Site Manager.

9.1 Work Zones

Entry into the work zones begins once a person comes on-Site. This approach reflects the dynamic nature of the operations and the need for everyone to be aware of the conditions while on-site. Using the concept of three zones for the Site, the following areas are identified:

Exclusion Zone (EZ)

The EZ will be within a designated area to be determined based on where field activities will take place. No employee shall enter the EZ without the required training and PPE. In the event that an employee in the EZ requires a replacement or his/her protective suit or respirator filters, the employee shall exit the EZ and utilize proper decontamination procedures in the CRZ, replace or repair the defective PPE, then re-enter the EZ.

Contamination Reduction Zone (CRZ)

The CRZ will be within a designated area to be determined based on where field activities will take place. Personnel shall be aware of and follow all control procedures with respect to entering and exiting the CRZ, to ensure that they are not exposed to contaminants and to minimize the potential for contamination of personnel and the spread of contamination outside the EZ. These measures include having personnel follow the proper procedures for donning and doffing PPE and washing in the CRZ. The measures also address the decontamination procedures for use when moving equipment between zones. The CRZ shall consist of an area to drop off equipment, plastic bags to dispose of protective clothing, adequate soap and water for personnel and equipment decontamination and a means of capturing any wash water generated.

Support Zone

This area starts at the project/property fence line and extends to the entry to where field work will be conducted. In this area all personnel shall wear Level D PPE.

9.2 Personnel Decontamination

Decontamination of personnel consists of physically removing soil or contaminants using the correct procedures for washing and removal of PPE. Decontamination will take place in the designated decontamination zone using the stations in the CRZ:

- Station 1: Equipment Drop – Equipment used in the EZ, which can be reused when returning to work after breaks or at the end of the day, will be stored in a designated area.
- Station 2: Equipment and PPE Decontamination – If the equipment will be removed from the Site, the equipment will be washed or wiped with a mild soap solution (e.g. Alconox) and rinsed with clean water and wiped dry. Wash and rinse buckets with brushes will be set up along with containers for trash and water containment for disposal purposes. Plastic sheeting will be used to collect material for containerization and proper disposal.
- Station 3: Change Out – Removal of boots, gloves, and disposable coveralls. All PPE will be collected and containerized for proper disposal.

9.3 Equipment Decontamination

The following decontamination procedure will be implemented in the field after field equipment has come in contact with contaminated material.

- Rinse equipment in tap water
- Scrub equipment with non-phosphate detergent and tap water
- Rinse equipment with distilled water
- Allow equipment to air dry

10.0 EMERGENCY AND CONTINGENCY PLAN

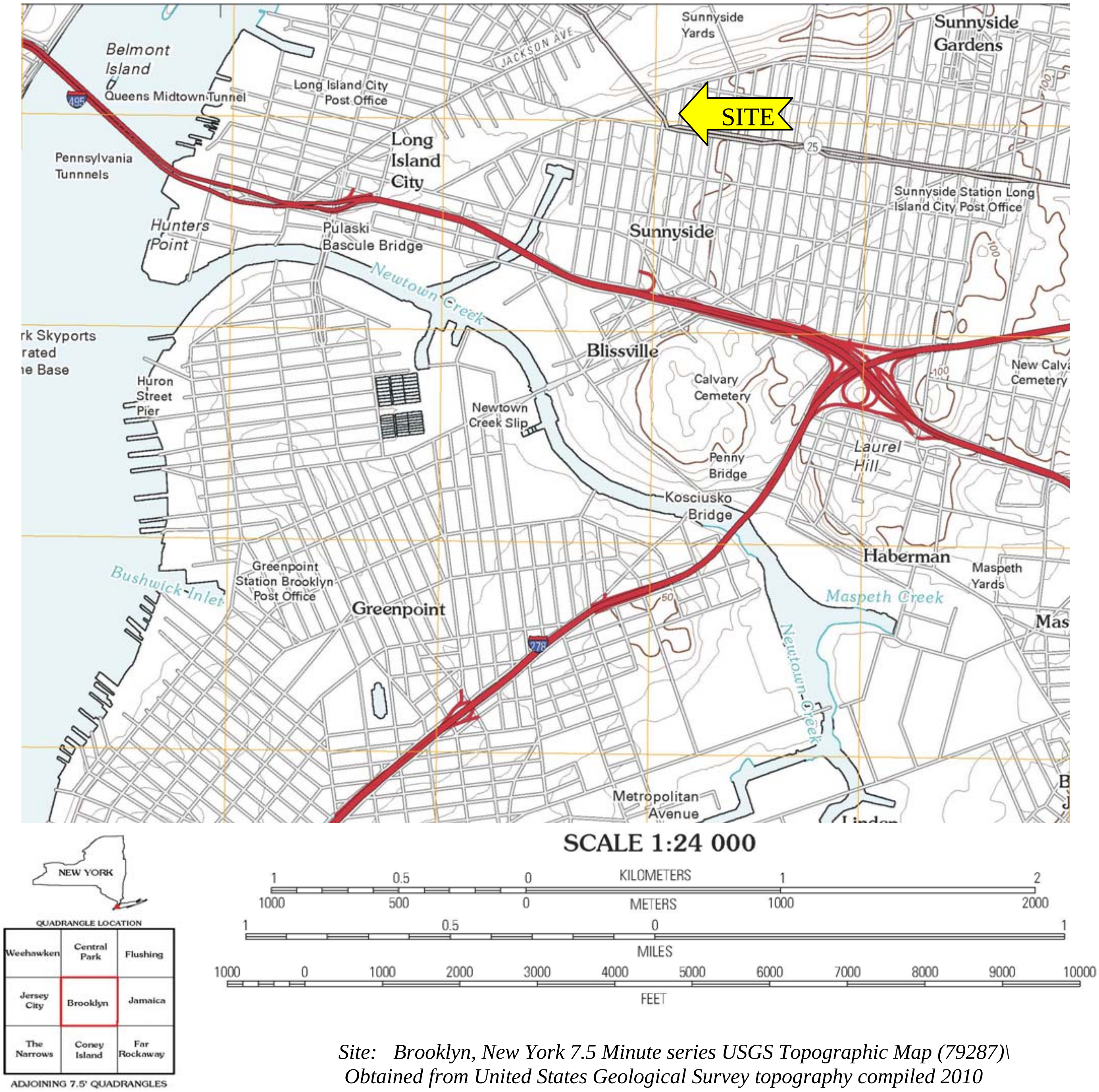
Emergency communications will be maintained during all on-site field activities. Emergency contacts and their phone numbers are presented below. The route to the closest area hospital is shown on Figure 2.

A first aid kit will be available on-site at all times for any minor on-site injuries. Emergency medical assistance or ambulance can be reached by calling 911 for more severe injuries.

Key Personnel Emergency Phone Numbers

Emergency	
New York City Police Department	911
New York City Fire Department	911
Emergency Medical Service (Ambulance)	911
National Response Center	(800) 424-8802
NYSDEC Spill Hotline	(800) 457-7362
Mount Sinai of Queens 25-10 30th Avenue Astoria, NY	(718) 932-1000
FLS Project Staff	
Peter Helseth, FLS Project Manager	(212) 675-3225 ext. 308
Adam Conti, Health and Safety Officer	(212) 675-3225 ext. 313
J. Raul Ramirez, Site Supervisor	(212) 675-3225 ext. 321

Figures



Site: Brooklyn, New York 7.5 Minute series USGS Topographic Map (79287)
Obtained from United States Geological Survey topography compiled 2010

FIGURE 1: SITE LOCATION

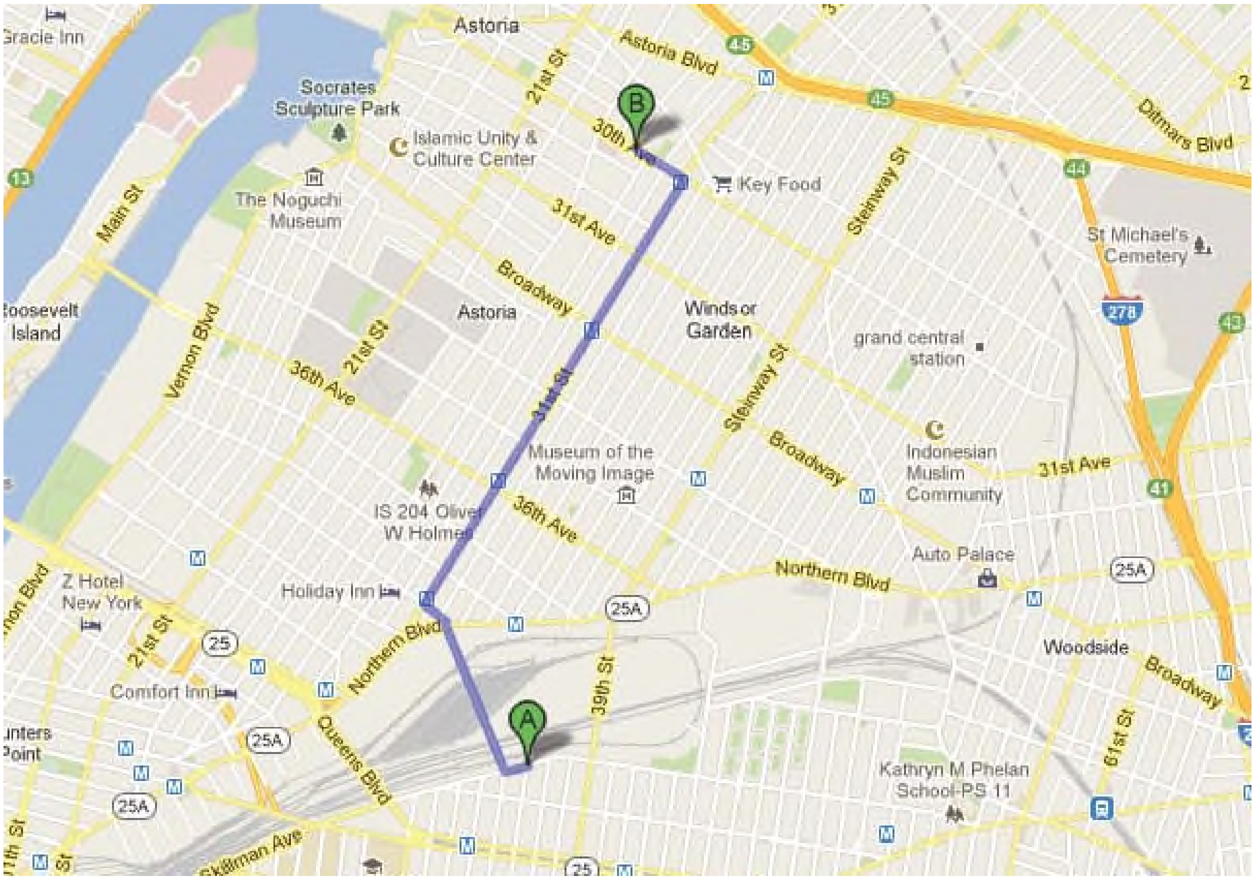
SITE: FORMER ACCO BRANDS
32-00 SKILLMAN AVENUE
LONG ISLAND CITY, NEW YORK

Fleming Lee Shue

Environmental Management & Consulting, 158 West 29th Street, 9th Fl., New York, NY 10001

Figure 2

Directions to Mount Sinai of Queens
25-10 30th Avenue
Astoria, NY 11102
(718) 932-1000



Driving Directions:	**Distance (miles)**
Start on 5th Street and 47th Avenue	0.1
Turn right onto 46th Road	0.4
Turn left onto 21st Street	2.1
Turn right onto 29th Avenue	0.2
Turn right onto 25th Street/Crescent Street	0.1
Arrive at 25-10 30th Avenue, Astoria	

Tables

Table 1
Tasks, Safety Hazards Safety Requirements

Task/Activity	Hazards	Preventative Measures	Air Monitoring Requirements
Installation and Implementation of Eletrical Resistance Heating	Subsurface utilities, vehicle hazards, trips, falls, materials handling. VOCs, DNAPL, CO, CO_2, LEL, noise, vibration	Clear utilities beforehand, exercise caution around equipment, wet area if necessary to control dust and odors. Level D PPE, hearing protection as required.	PID measurements for VOCs, particulate monitoring.
Implementation of Enhanced In-Situ Bioremediation	Subsurface utilities, vehicle hazards, trips, falls, materials handling. DNAPL, LEL, noise, vibration	Clear utilities beforehand, exercise caution around equipment. Level D PPE, hearing protection as required.	PID measurements for VOCs.
Groundwater Montoring	Vehicle hazards, trips, falls, materials handling, VOCs. DNAPL	Level D PPE.	Air monitoring not required

LEL - Lower Explosive Limit
PID - Photoionization detector
VOCs - Volatile organic compounds
DNAPL - Dense non-aqueous phase liquid

Table 2
Air Monitoring, Action Levels and Personal Protective Equipment

Instrument	Action Level	Response Action
Gas/Vapor		
PID	< 0.5 ppm total VOCs in the workers' breathing zone (WBZ)	Continue work
PID	> 0.5 ppm for a sustained period of 5 minutes in the WBZ	Briefly discontinue work and allow work area to vent.
PID	1 to 10 ppm in the WBZ	Briefly discontinue work and allow work area to vent. Notify HSO
	> 10 ppm for a sustained period of 5 minutes in the WBZ (confirmed absence of benzene)	Discontinue work and allow the work area to vent. Use mechanical ventilation as necessary. If after 15 minutes the PID reading is still greater than 10 ppm, notify HSO
	> 100 ppm for a sustained period of 5 minutes in the WBZ	Stop work. Resume work when readings are less than 100 ppm
Combustible Gas Indicator	Less than 20% LEL	Continue work
	Greater than 20% LEL	Stop work. Resume work when less than 20% LEL
Oxygen Monitor	Above 19.5% and less than 23.5%	Continue work
	Outside of this range	Stop work. Resume work when concentration is back in this acceptable range
Carbon Monoxide Monitor	Less than 25 ppm	Continue work
	Above 25 ppm	Stop work. Use mechanical ventilation as necessary. Resume work when less than 25 ppm.
Carbon Dioxide Monitor	< 1000 ppm	Continue work
	> 1000 ppm	Stop work. Use mechanical ventilation as necessary. Resume work when less than 1000 ppm.
Particulates		
Particulate Monitor	< 100 µg/m^3 above background (upwind location)	Continue work
	> 100 µg/m3 above background for a period of 5 minutes in the WBZ	Stop work. Apply dust suppression measures. Resume work only if < 100 µg/m^3 above background.

ATTACHMENT 1

Acknowledgment Form

HASP ACKNOWLEDGMENT FORM

The following personnel have read the site-specific HASP and are familiar with its provisions.

Print Name	*Signature*	*Company*	*Function*	*Date*

ATTACHMENT 2

Profiles of Chemicals of Concern/Material Safety Data Sheets

MATERIAL SAFETY DATA SHEET

CAIROX® Potassium Permanganate

Section 1 Chemical Product and Company Identification

PRODUCT NAME: CAIROX® potassium permanganate, $KMnO_4$

SYNONYMS:
Permanganic acid potassium salt
Chameleon mineral
Condy's crystals
Permanganate of potash

MANUFACTURER'S NAME: CARUS CHEMICAL COMPANY

MANUFACTURER'S ADDRESS:
Carus Chemical Company
1500 Eighth Street
P. O. Box 1500
LaSalle, IL 61301

TRADE NAME: CAIROX® potassium permanganate

TELEPHONE NUMBER FOR INFORMATION: 815/223-1500

EMERGENCY TELEPHONE NO: 800/435-6856

AFTER HOURS NO. 815/223-1565
5:00 PM-8:00 AM Central Standard Time
Monday-Friday, Weekends and Holidays

CHEMTREC TELEPHONE NO.: 800/424-9300

Section 2 Composition/Information on Ingredients

Material or component	CAS No.	%	Hazard Data	
Potassium permanganate	7722-64-7	97% min. $KMnO_4$	PEL-C	5 mg Mn per cubic meter of air
			TLV-TWA	0.2 mg Mn per cubic meter of air

Section 3 Hazards Identification

1. Eye Contact
   Potassium permanganate is damaging to eye tissue on contact. It may cause severe burns that result in damage to the eye.

2. Skin Contact
   Contact of solutions at room temperature may be irritating to the skin, leaving brown stains. Concentrated solutions at elevated temperature and crystals are damaging to the skin.

3. Inhalation
   Acute inhalation toxicity data are not available. However, airborne concentrations of potassium permanganate in the form of dust or mist may cause damage to the respiratory tract.

4. Ingestion
   Potassium permanganate, if swallowed, may cause severe burns to mucous membranes of the mouth, throat, esophagus, and stomach.

Section 4 First Aid Measures

1. Eyes
   Immediately flush eyes with large amounts of water for at least 15 minutes holding lids apart to ensure flushing of the entire surface. Do not attempt to neutralize chemically. Seek medical attention immediately. Note to physician: Soluble decomposition products are alkaline. Insoluble decomposition product is brown manganese dioxide.

2. Skin
   Immediately wash contaminated areas with large amounts of water. Remove contaminated clothing and footwear. Wash clothing and decontaminate footwear before reuse. Seek medical attention immediately if irritation is severe or persistent.

3. Inhalation
   Remove person from contaminated area to fresh air. If breathing has stopped, resuscitate and administer oxygen if readily available. Seek medical attention immediately.

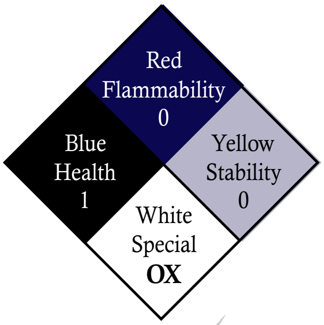
4. Ingestion
   Never give anything by mouth to an unconscious or convulsing person. If person is conscious, give large quantities of water. Seek medical attention immediately.

Section 5 Fire Fighting Measures

NFPA* HAZARD SIGNAL

Health Hazard 1 = Materials which under fire conditions would give off irritating combustion products.
(less than 1 hour exposure) Materials which on the skin could cause irritation.
Flammability Hazard 0 = Materials that will not burn.
Reactivity Hazard 0 = Materials which in themselves are normally stable, even under fire exposure conditions, and which are not reactive with water.
Special Hazard OX = Oxidizer

***National Fire Protection Association 704**



FIRST RESPONDERS:

Wear protective gloves, boots, goggles, and respirator. In case of fire, wear positive pressure breathing apparatus. Approach site of incident with caution. Use Emergency Response Guide NAERG 96 (RSPA P5800.7). Guide No. 140.

FLASHPOINT	None	
FLAMMABLE OR EXPLOSIVE LIMITS	Lower: Nonflammable	Upper: Nonflammable
EXTINGUISHING MEDIA	Use large quantities of water. Water will turn pink to purple if in contact with potassium permanganate. Dike to contain. Do not use dry chemicals, CO_2, Halon® or foams.	
SPECIAL FIREFIGHTING PROCEDURES	If material is involved in fire, flood with water. Cool all affected containers with large quantities of water. Apply water from as far a distance as possible. Wear self-contained breathing apparatus and full protective clothing.	

Section 6 Accidental Release Measures

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED

Clean up spills immediately by sweeping or shoveling up the material. Do not return spilled material to the original container. Transfer to a clean metal drum. EPA banned the land disposal of D001 ignitable waste oxidizers. These wastes must be deactivated by reduction. To clean floors, flush with abundant quantities of water into sewer, if permitted by Federal, State, and Local regulations. If not permitted, collect water and treat chemically (Section 13).

PERSONAL PRECAUTIONS

Personnel should wear protective clothing suitable for the task. Remove all ignition sources and incompatible materials before attempting clean-up.

Section 7 Handling and Storage

WORK/HYGENIC PRACTICES

Wash hands thoroughly with soap and water after handling potassium permanganate, and before eating or smoking. Wear proper protective equipment. Remove contaminated clothing.

VENTILATION REQUIREMENTS

Provide sufficient area or local exhaust to maintain exposure below the TLV-TWA.

CONDITIONS FOR SAFE STORAGE

Store in accordance with NFPA 430 requirements for Class II oxidizers. Protect containers from physical damage. Store in a cool, dry area in closed containers. Segregate from acids, peroxides, formaldehyde, and all combustible, organic or easily oxidizable materials including anti-freeze and hydraulic fluid.

Section 8 Exposure Controls/Personal Protection

RESPIRATORY PROTECTION

In the case where overexposure may exist, the use of an approved NIOSH-MSHA dust respirator or an air supplied respirator is advised. Engineering or administrative controls should be implemented to control dust.

EYE

Faceshield, goggles, or safety glasses with side shields should be worn. Provide eye wash in working area.

GLOVES

Rubber or plastic gloves should be worn.

OTHER PROTECTIVE EQUIPMENT

Normal work clothing covering arms and legs, and rubber or plastic apron should be worn.

Section 9 Physical and Chemical Properties

APPEARANCE AND ODOR	Dark purple solid with a metallic luster, odorless
BOILING POINT, 760 mm Hg	Not applicable
VAPOR PRESSURE (mm Hg)	Not applicable
SOLUBILITY IN WATER % BY SOLUTION	6% at 20°C (68°F), and 20% at 65°C (149°F)
PERCENT VOLATILE BY VOLUME	Not volatile
EVAPORATION RATE (BUTYL ACETATE=1)	Not applicable
MELTING POINT	Starts to decompose with evolution of oxygen (O_2) at temperatures above 150°C (302°F). Once initiated, the decomposition is exothermic and self-sustaining.
OXIDIZING PROPERTIES	Strong oxidizer
SPECIFIC GRAVITY	2.7 @ 20°C (68°F)
VAPOR DENSITY (AIR=1)	Not applicable

Section 10 Stability and Reactivity

STABILITY Under normal conditions, the material is stable.

CONDITIONS TO AVOID Contact with incompatible materials or heat (>150°C/302°F).

INCOMPATIBLE MATERIALS Acids, peroxides, formaldehyde, anti-freeze, hydraulic fluids, and all combustible organic or readily oxidizable inorganic materials including metal powders. With hydrochloric acid, toxic chlorine gas is liberated.

HAZARDOUS DECOMPOSITION PRODUCTS When involved in a fire, potassium permanganate may liberate corrosive fumes.

CONDITIONS CONTRIBUTING TO HAZARDOUS POLYMERIZATION Material is not known to polymerize.

Section 11 Toxicological Information

Potassium permanganate:	Acute oral LD_{50}(rat) = 780 mg/kg Male (14 days); 525 mg/kg Female (14 days) The fatal adult human dose by ingestion is estimated to be 10 grams. (Ref. Handbook of Poisoning: Prevention, Diagnosis & Treatment, Twelfth Edition)

EFFECTS OF OVEREXPOSURE

1. Acute Overexposure
   Irritating to body tissue with which it comes into contact.

2. Chronic Overexposure
   No known cases of chronic poisoning due to potassium permanganate have been reported. Prolonged exposure, usually over many years, to heavy concentrations of manganese oxides in the form of dust and fumes, may lead to chronic manganese poisoning, chiefly involving the central nervous system.

3. Carcinogenicity
   Potassium permanganate has not been classified as a carcinogen by OSHA, NTP, IARC.

4. Medical Conditions Generally Aggravated by Exposure
   Potassium permanganate will cause further irritation of tissue, open wounds, burns or mucous membranes.

   Registry of Toxic Effects of Chemical Substances
   RTECS #SD6476000

Section 12 Ecological Information

Entry to the Environment

Potassium Permanganate has a low estimated lifetime in the environment, being readily converted by oxidizable materials to insoluble manganese dioxide (MnO_2).

Bioconcentration Potential

In non-reducing and non-acidic environments manganese dioxide (MnO_2) is insoluble and has a very low bioaccumulative potential.

Aquatic Toxicity

Rainbow trout, 96 hour LC_{50}: 1.8 mg/L
Bluegill sunfish, 96 hour LC_{50}: 2.3 mg/L

Section 13 Disposal Consideration

DEACTIVATION OF D001 IGNITABLE WASTE OXIDIZERS BY CHEMICAL REDUCTION

Reduce potassium permanganate in aqueous solutions with sodium thiosulfate (Hypo), or sodium bisulfite or ferrous salt solution. The thiosulfite or ferrous salt may require some dilute sulfuric acid to promote rapid reduction. If acid was used, neutralize with sodium bicarbonate to neutral pH. Decant or filter, and mix the sludge with sodium carbonate and deposit in an approved landfill. Where permitted, the sludge can be drained into sewer with large quantities of water. Use caution when reacting chemicals. Contact Carus Chemical Company for additional recommendations.

Section 14 Transport Information

U. S. DEPARTMENT OF TRANSPORTATION INFORMATION:

Proper Shipping Name:	49 CFR 172.101	Potassium Permanganate
ID Number:	49 CFR 172.101	UN 1490
Hazard Class:	49 CFR 172.101	Oxidizer
Division:	49 CFR 172.101	5.1
Packing Group:	49 CFR 172.101	II

Section 15 Regulatory Information

TSCA Listed in the TSCA Chemical Substance Inventory

CERCLA **Hazardous Substance**

Reportable Quantity: RQ - 100 lb 40 CFR 116.4; 40 CFR 302.4

RCRA Oxidizers such as potassium permanganate meet the criteria of ignitable waste. 40 CFR 261.21

SARA TITLE III Information

Section 302	Extremely hazardous substance: Not listed
Section 311/312	Hazard categories: Fire, acute and chronic toxicity
Section 313	CAIROX® potassium permanganate contains 97% Manganese Compound as part of the chemical structure (manganese compounds CAS Reg. No. N/A) and is subject to the reporting requirements of Section 313 of Title III, Superfund Amendments and Reauthorization Act of 1986 and 40 CFR 372.

Section 15 Regulatory Information (cont.)

STATE LISTS	Michigan Critical Materials Register:	Not listed
	California Proposition 65:	Not listed
	Massachusetts Substance List:	5 F8
	Pennsylvania Hazard Substance List:	E

FOREIGN LISTS	Canadian Domestic Substances List (DSL)	Listed
	Canadian Ingredient Disclosure List	Listed
	European Inventory of Existing Chemical Substances (EINECS)	2317603

Section 16 Other Information

NIOSH	National Institute for Occupational Safety and Health
MSHA	Mine Safety and Health Administration
OSHA	Occupational Safety and Health Administration
NTP	National Toxicology Program
IARC	International Agency for Research on Cancer
TSCA	Toxic Substances Control Act
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act of 1980
RCRA	Resource Conservation and Recovery Act
SARA	Superfund Amendments and Reauthorization Act of 1986
PEL-C	OSHA Permissible Exposure Limit-OSHA Ceiling Exposure Limit
TLV-TWA	Threshold Limit Value - Time Weighted Average (American Conference of Governmental Industrial Hygienists)

Kenneth Krogulski

Kenneth Krogulski
May 2000

CARUS

Responsible Care®
A Public Commitment

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VOC

Material Safety Data Sheet
Tetrachloroethylene

ACC# 22900

Section 1 - Chemical Product and Company Identification

MSDS Name: Tetrachloroethylene
Catalog Numbers: C182 20, C182 4, C182-20, C182-4, C18220, C1824, O4586 4, O4586-4, O45864
Synonyms: Ethylene tetrachloride; Tetrachlorethylene; Perchloroethylene; Perchlorethylene
Company Identification:
Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410
For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
127-18-4	Tetrachloroethylene	99.0+	204-825-9

Hazard Symbols: XN N
Risk Phrases: 40 51/53

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: clear, colorless liquid. Irritant. May cause severe eye and skin irritation with possible burns. May cause central nervous system depression. May cause liver and kidney damage. May cause reproductive and fetal effects. May cause cancer based on animal studies. **Caution!** May cause respiratory tract irritation.
Target Organs: Kidneys, central nervous system, liver.

Potential Health Effects
Eye: Contact with eyes may cause severe irritation, and possible eye burns.
Skin: May cause severe irritation and possible burns.
Ingestion: May cause central nervous system depression, kidney damage, and liver damage. Symptoms may include: headache, excitement, fatigue, nausea, vomiting, stupor, and coma. May cause gastrointestinal irritation with nausea, vomiting and diarrhea.
Inhalation: Inhalation of vapor may cause respiratory tract irritation. May cause central nervous system effects including vertigo, anxiety, depression, muscle incoordination, and emotional instability.
Chronic: Possible cancer hazard based on tests with laboratory animals. Prolonged or repeated skin contact may cause defatting and dermatitis. May cause respiratory tract cancer. May cause

adverse nervous system effects including muscle tremors and incoordination. May cause liver and kidney damage. May cause reproductive and fetal effects.

Section 4 - First Aid Measures

Eyes: Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.
Skin: Get medical aid if irritation develops or persists. Wash clothing before reuse. Flush skin with plenty of soap and water.
Ingestion: If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid.
Inhalation: Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Containers may explode in the heat of a fire. Vapors may be heavier than air. They can spread along the ground and collect in low or confined areas.
Extinguishing Media: Substance is noncombustible; use agent most appropriate to extinguish surrounding fire. For small fires, use dry chemical, carbon dioxide, or water spray. For large fires, use dry chemical, carbon dioxide, alcohol-resistant foam, or water spray. Cool containers with flooding quantities of water until well after fire is out.
Flash Point: Not applicable.
Autoignition Temperature: Not applicable.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: 2; Flammability: 0; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Flush down the spill with a large amount of water. Remove all sources of ignition. Use a spark-proof tool. Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use with adequate ventilation. Do not reuse this container. Avoid breathing vapors from heated material. Avoid contact with skin and eyes. Keep container tightly closed. Keep away from flames

and other sources of high temperatures that may cause material to form vapors or mists.
Storage: Keep away from heat and flame. Store in a cool, dry place. Keep containers tightly closed.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use process enclosure, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Tetrachloroethylene	25 ppm TWA; 100 ppm STEL	150 ppm IDLH	100 ppm TWA; 200 ppm Ceiling

OSHA Vacated PELs: Tetrachloroethylene: 25 ppm TWA; 170 mg/m3 TWA
Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant a respirator's use.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: clear, colorless
Odor: sweetish odor
pH: Not available.
Vapor Pressure: 15.8 mm Hg
Vapor Density: 5.2
Evaporation Rate:9 (ether=100)
Viscosity: 0.89 mPa s 20 deg C
Boiling Point: 121 deg C
Freezing/Melting Point:-22.3 deg C
Decomposition Temperature:150 deg C
Solubility: Nearly insoluble in water.
Specific Gravity/Density:1.623
Molecular Formula:C_2Cl_4
Molecular Weight:165.812

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Incompatible materials, excess heat.
Incompatibilities with Other Materials: Strong bases, metals, liquid oxygen, dinitrogen tetroxide.

Hazardous Decomposition Products: Hydrogen chloride, phosgene, carbon monoxide, carbon dioxide.
Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 127-18-4: KX3850000
LD50/LC50:
CAS# 127-18-4:
Draize test, rabbit, eye: 162 mg Mild;
Draize test, rabbit, eye: 500 mg/24H Mild;
Draize test, rabbit, skin: 810 mg/24H Severe;
Draize test, rabbit, skin: 500 mg/24H Mild;
Inhalation, mouse: LC50 = 5200 ppm/4H;
Inhalation, rat: LC50 = 34200 mg/m3/8H;
Oral, mouse: LD50 = 8100 mg/kg;
Oral, rat: LD50 = 2629 mg/kg;
Carcinogenicity:
CAS# 127-18-4:
ACGIH: A3 - Animal Carcinogen
California: carcinogen; initial date 4/1/88
NIOSH: potential occupational carcinogen
NTP: Suspect carcinogen
OSHA: Possible Select carcinogen
IARC: Group 2A carcinogen
Epidemiology: Epidemiologic studies have given inconsistent results. Studi es have shown that tetrachloroethylene has not caused canc er in exposed workers. The studies have serious weaknesses such as mixed exposures. In tests with rats and mice, i t appeared that tissue destruction or peroxisome prolifera tion rather than genetic mechanisms were the cause of the observed increases in normally occurring cancers. The oral mouse TDLo that was tumorigenic was 195 gm/kg/50W-I.
Teratogenicity: Has caused musculoskeletal abnormalities. Has caused morphological transformation at a dose of 97mol/L in a study using rat embryos.
Reproductive Effects: Has caused behavioral, biochemical, and metabolic effects on newborn rats when the mother was exposed to the TCLo of 900 ppm/7H at 7-13 days after conception. A dose of 300 ppm/7H 6-15 days after conception caused post-implantation mortality.
Neurotoxicity: No information available.
Mutagenicity: Not mutagenic in Escherichia coli. No mutagenic effects were seen in rat liver after exposure at 200 ppm for 10 weeks. No chromosome changes were seen in the bone marrow cells of exposed mice.
Other Studies: A case of 'obstructive jaundice' in a 6-week old infant has been attributed to tetrachloroethylene in breast milk.

Section 12 - Ecological Information

Ecotoxicity: Fish: Rainbow trout: LC50 = 5.28 mg/L; 96 Hr.; Static Condition, 12 degrees C Fathead Minnow: LC50 = 18.4 mg/L; 96 Hr.; Flow-through condition Bluegill/Sunfish: LC50 = 12.9 mg/L; 96 Hr.; Static Condition ria: Phytobacterium phosphoreum: EC50 = 120.0 mg/L; 30 minutes; Microtox test No data available.

Environmental: In soil, substance will rapidly evaporate. In water, it will evaporate. In air, it can be expected to exist in the vapor phase.
Physical: No information available.
Other: No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: CAS# 127-18-4: waste number U210.

Section 14 - Transport Information

	US DOT	IATA	RID/ADR	IMO	Canada TDG
Shipping Name:	TETRACHLOROETHYLENE				TETRACHLOROETHYLENE
Hazard Class:	6.1				6.1
UN Number:	UN1897				UN1897
Packing Group:	III				III

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 127-18-4 is listed on the TSCA inventory.
Health & Safety Reporting List
CAS# 127-18-4: Effective Date: 6/1/87; Sunset Date: 6/1/97
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
SARA

CERCLA Hazardous Substances and corresponding RQs
CAS# 127-18-4: 100 lb final RQ; 45.4 kg final RQ
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 127-18-4: acute.
Section 313
This material contains Tetrachloroethylene (CAS# 127-18-4, 99 0%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act:
CAS# 127-18-4 is listed as a hazardous air pollutant (HAP). This material does not contain any Class 1 Ozone depletors. This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA. CAS# 127-18-4 is listed as a Priority Pollutant under the Clean Water Act. CAS# 127-18-4 is listed as a Toxic Pollutant under the Clean Water Act.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
CAS# 127-18-4 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.
The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act: WARNING: This product contains Tetrachloroethylene, a chemical known to the state of California to cause cancer. California No Significant Risk Level: CAS# 127-18-4: 14 ug/day NSRL

European/International Regulations

European Labeling in Accordance with EC Directives
Hazard Symbols:
XN N
Risk Phrases:
R 40 Limited evidence of a carcinogenic effect.
R 51/53 Toxic to aquatic organisms; may cause
long-term adverse effects in the aquatic environment.

Safety Phrases:
S 23 Do not inhale gas/fumes/vapour/spray.
S 36/37 Wear suitable protective clothing and
gloves.
S 61 Avoid release to the environment. Refer to
special instructions/Safety data sheets.

WGK (Water Danger/Protection)
CAS# 127-18-4: 3
Canada - DSL/NDSL
CAS# 127-18-4 is listed on Canada's DSL List.
Canada - WHMIS
This product has a WHMIS classification of D1B, D2A.
Canadian Ingredient Disclosure List
CAS# 127-18-4 is listed on the Canadian Ingredient Disclosure List.
Exposure Limits
CAS# 127-18-4: OEL-ARAB Republic of Egypt:TWA 5 ppm (35 mg/m3);Skin OEL-AUSTRALIA:TWA 50 ppm (335 mg/m3);STEL 150 ppm;CAR OEL-BELGIUM:TWA 50 ppm (339 mg/m3);STEL 200 ppm (1368 mg/m3) OEL-CZECHOSLOVAKIA:TWA 250 mg/m3;STEL 1250 mg/m3 OEL-DENMARK:TWA 30 ppm (200 mg/m3);Skin OEL-FINLAND:TWA 50 ppm (335 mg/m3);STEL 75 ppm (520 mg/m3);Skin OEL-FRANCE:TWA 50 ppm (335 mg/m3) OEL-GERMANY:TWA 50 ppm (345 mg/m3);Carcinogen OEL-HUNGARY:STEL 50 mg/m3;Skin;Carcinogen OEL-JAPAN:TWA 50 ppm (340 mg/m3) OEL-THE NETHERLANDS:TWA 35 ppm (240 mg/m3);Skin OEL-THE PHILIPPINES:TWA 100 ppm (670 mg/m3) OEL-POLAND:TWA 60 mg/m3 OEL-RUSSIA:TWA 50 ppm;STEL 10 mg/m3 OEL-SWEDEN:TWA 10 ppm (70 mg/m3);STEL 25 ppm (170 mg/m3) OEL-SWITZERLAND:TWA 50 ppm (345 mg/m3);STEL 100 ppm;Skin OEL-THAILAND:TWA 100 ppm;STEL 200 ppm OEL-UNITED KINGDOM:TWA 50 ppm (335 mg/m3);STEL 15 ppm OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA

check ACGIH TLV OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGI TLV

Section 16 - Additional Information

MSDS Creation Date: 6/17/1999
Revision #3 Date: 3/18/2003

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 Fisher 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 Fisher has been advised of the possibility of such damages.

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VOC

Material Safety Data Sheet
Trichloroethylene

ACC# 23850

Section 1 - Chemical Product and Company Identification

MSDS Name: Trichloroethylene
Catalog Numbers: S80232, S80327ACS-1, S80327ACS-2, NC932384B, NC9494003, NC9494591, NC9981849, S80237ACS-1, S80237ACS-2, T340-4, T341-20, T341-4, T341-500, T341J4, T403-4, XXT341SK4LIX48
Synonyms: Ethylene trichloride; triclene; trichloroethene; benzinol cecolene
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
79-01-6	Trichloroethylene	99.5	201-167-4

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: clear, colorless liquid.
Warning! Causes eye and skin irritation. Aspiration hazard if swallowed. Can enter lungs and cause damage. May cause central nervous system depression. May cause cancer based on animal studies. Potential cancer hazard. May cause liver damage.
Target Organs: Central nervous system, liver, eyes, skin.

Potential Health Effects
Eye: Causes moderate eye irritation. May result in corneal injury. Contact produces irritation, tearing, and burning pain.
Skin: Causes mild skin irritation. Prolonged and/or repeated contact may cause defatting of the skin and dermatitis. May cause peripheral nervous system function impairment including persistent neuritis, and temporary loss of touch. Damage to the liver and other organs has been observed in workers who have been overexposed.
Ingestion: Aspiration hazard. May cause irritation of the digestive tract. Aspiration of material into the lungs may cause chemical pneumonitis, which may be fatal.
Inhalation: Inhalation of high concentrations may cause central nervous system effects characterized by nausea, headache, dizziness, unconsciousness and coma. May cause respiratory tract irritation. May cause liver abnormalities. May cause peripheral nervous system effects.
Chronic: Possible cancer hazard based on tests with laboratory animals. Chronic inhalation may

cause effects similar to those of acute inhalation. Prolonged or repeated skin contact may cause defatting and dermatitis. May cause peripheral nervous system function impairment including persistent neuritis, and temporary loss of touch. Damage to the liver and other organs has been observed in workers who have been overexposed.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid imme diately.
Skin: Get medical aid if irritation develops or persists. Flush skin with plenty of soap and water.
Ingestion: If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Possible aspiration hazard. Get medical aid immediately.
Inhalation: Get medical aid immediately. Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Do NOT use mouth-to-mouth resuscitation.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Vapors can travel to a source of ignition and flash back. Combustion generates toxic fumes. Containers may explode in the heat of a fire.
Extinguishing Media: Use water spray to cool fire-exposed containers. Use water spray, dry chemical, carbon dioxide, or chemical foam.
Flash Point: Not applicable.
Autoignition Temperature: 778 deg F (414.44 deg C)
Explosion Limits, Lower:12.5
Upper: 90.0
NFPA Rating: (estimated) Health: 2; Flammability: 1; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Remove all sources of ignition. Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Use only in a well-ventilated area. Ground and bond containers when transferring material. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Avoid ingestion and inhalation. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames.
Storage: Keep away from sources of ignition. Store in a tightly closed container. Keep from

contact with oxidizing materials. Store in a cool, dry, well-ventilated area away from incompatible substances.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Trichloroethylene	50 ppm TWA; 100 ppm STEL	1000 ppm IDLH	100 ppm TWA; 200 ppm Ceiling

OSHA Vacated PELs: Trichloroethylene: 50 ppm TWA; 270 mg/m3 TWA
Personal Protective Equipment
Eyes: Wear chemical splash goggles.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: clear, colorless
Odor: sweetish odor - chloroform-like
pH: Not available.
Vapor Pressure: 58 mm Hg @20C
Vapor Density: 4.53
Evaporation Rate:0.69 (CCl_4=1)
Viscosity: 0.0055 poise
Boiling Point: 189 deg F
Freezing/Melting Point:-121 deg F
Decomposition Temperature: Not available.
Solubility: Insoluble in water.
Specific Gravity/Density:1.47 (water=1)
Molecular Formula:C_2HCl_3
Molecular Weight:131.366

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Incompatible materials, ignition sources, oxidizers.
Incompatibilities with Other Materials: Alkalis (sodium hydroxide), chemically active metals (aluminum, beryllium, lithium, magnesium), epoxies and oxidants. Can react violently with aluminum, barium, lithium, magnesium, liquid oxygen, ozone, potassium hydroxide, potassium nitrate, sodium, sodium hydroxide, titanium, and nitrogen dioxide. Reacts with water under heat

and pressure to form hydrogen chloride gas.
Hazardous Decomposition Products: Hydrogen chloride, carbon dioxide, chloride fumes.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 79-01-6: KX4550000
LD50/LC50:
CAS# 79-01-6:
Draize test, rabbit, eye: 20 mg/24H Moderate;
Draize test, rabbit, skin: 2 mg/24H Severe;
Inhalation, mouse: LC50 = 8450 ppm/4H;
Inhalation, mouse: LC50 = 220000 mg/m3/20M;
Inhalation, mouse: LC50 = 262000 mg/m3/30M;
Inhalation, mouse: LC50 = 40000 mg/m3/4H;
Inhalation, rat: LC50 = 140700 mg/m3/1H;
Oral, mouse: LD50 = 2402 mg/kg;
Oral, mouse: LD50 = 2400 mg/kg;
Oral, rat: LD50 = 4920 mg/kg;
Skin, rabbit: LD50 = >20 gm/kg;
Skin, rabbit: LD50 = 20 mL/kg;
Carcinogenicity:
CAS# 79-01-6:

- **ACGIH:** Not listed.
- **California:** carcinogen, initial date 4/1/88
- **NTP:** Suspect carcinogen
- **IARC:** Group 2A carcinogen

Epidemiology: Suspected carcinogen with experimental carcinogenic, tumorigenic, and teratogenic data.
Teratogenicity: No information available.
Reproductive Effects: Experimental reproductive effects have been observed.
Mutagenicity: Human mutation data has been reported. IARC and the National Toxicology Program (NTP) stated that variability in the mutagencity test results with trichloroethylene may be due to the presence of various stabilizers used in TCEwhich are mutagens (e.g.epoxybutane, epichlorohydrin).See actual entry in RTECS for complete infomation.R68 Mutagen Category 3 (CHIP 2002, UK).
Neurotoxicity: No information available.
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: No data available. Bluegill sunfish, LD50= 44,700 ug/L/96Hr. Fathead minnow, LC50=40.7 mg/L/96Hr.
Environmental: In air, substance is photooxidized and is reported to form phosgene, dichloroacetyl chloride, and formyl chloride. In water, it evaporates rapidly.
Physical: No information available.

Other: No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.

RCRA P-Series: None listed.

RCRA U-Series:

CAS# 79-01-6: waste number U228.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	TRICHLOROETHYLENE	TRICHLOROETHYLENE
Hazard Class:	6.1	6.1(9.2)
UN Number:	UN1710	UN1710
Packing Group:	III	III

Section 15 - Regulatory Information

US FEDERAL

TSCA

CAS# 79-01-6 is listed on the TSCA inventory.

Health & Safety Reporting List

None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs

CAS# 79-01-6: 100 lb final RQ; 45.4 kg final RQ

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 79-01-6: acute, chronic, reactive.

Section 313

This material contains Trichloroethylene (CAS# 79-01-6, 99.5%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR

Clean Air Act:

CAS# 79-01-6 is listed as a hazardous air pollutant (HAP).
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

CAS# 79-01-6 is listed as a Hazardous Substance under the CWA. CAS# 79-01-6 is listed as a Priority Pollutant under the Clean Water Act. CAS# 79-01-6 is listed as a Toxic Pollutant under the Clean Water Act.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 79-01-6 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act:

WARNING: This product contains Trichloroethylene, a chemical known to the state of California to cause cancer.

California No Significant Risk Level: CAS# 79-01-6: 50 æg/day NSRL (oral); 80 æg/day NSRL (inhalation)

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

T

Risk Phrases:

R 36/38 Irritating to eyes and skin.
R 45 May cause cancer.
R 52/53 Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
R 67 Vapours may cause drowsiness and dizziness.
R 68 Possible risk of irreversible effects.

Safety Phrases:

S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
S 53 Avoid exposure - obtain special instructions before use.
S 61 Avoid release to the environment. Refer to special instructions/safety data sheets.

WGK (Water Danger/Protection)

CAS# 79-01-6: 3

Canada - DSL/NDSL

CAS# 79-01-6 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of D1B, D2B.

Canadian Ingredient Disclosure List

CAS# 79-01-6 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 2/01/1999
Revision #5 Date: 5/31/2005

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 Fisher 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 Fisher has been advised of the possibility of such damages.

ATTACHMENT 3

Heat Stress / Cold Stress and Related Illnesses

Heat Stress / Cold Stress

1.0 HEAT STRESS

Excessive exposure to a hot environment can bring about a variety of heat-induced disorders. The four main types of heat stress related illnesses: heat rash, heat cramps, heat exhaustion, and heat stroke, are discussed below.

1.1 Heat Rash

Heat rash also know as prickly heat, is likely to occur in hot, humid environments where sweat is not readily removed from the surface of the skin by evaporation and the skin remains wet most of the time. The sweat ducts become plugged, and a skin rash soon appears. When the rash is extensive or when it is complicated by an infection, prickly heat can be very uncomfortable and may reduce a worker's performance. The worker can prevent this condition by resting in a cool place part of each day and by regularly bathing and drying the skin.

1.2 Heat Cramps

Heat cramps are painful spasms of the muscles that occur among those who sweat profusely in heat, drink large quantities of water, but do not adequately replace the body's salt loss. Drinking large quantities of water tends to dilute the body's fluids, while the body continues to lose salt. Shortly thereafter, the low salt level in the muscles causes painful cramps. The affected muscles may be part of the arms, legs or abdomen, but tired muscles (those used to perform the work) are usually the ones most susceptible to cramps. Cramps may occur during or after work hours and may be relieved by taking salted liquids by mouth, such as the variety of sports drinks on the market.

Caution Should Be Exercised By People With Heart Problems Or Those On Low Sodium Diets Who Work In Hot Environments. These People Should Consult A Physician About What To Do Under These Conditions.

1.3 Heat Exhaustion

Heat exhaustion includes several clinical disorders having symptoms that may resemble the early symptoms of heat stroke. Heat exhaustion is caused by the loss of large amounts of fluid by sweating, sometimes with excessive loss of salt. A worker suffering from this condition still sweats but experiences extreme weakness or fatigue, giddiness, nausea, or headache. In more serious cases, the victim may vomit or lose consciousness. The skin is clammy and moist, the complexion is pale or flushed, and the body temperature is normal or only slightly elevated.

A summary of the key symptoms of heat exhaustion is as follows:

- Clammy skin
- Confusion
- Dizziness
- Fainting
- Fatigue
- Heat Rash
- Light-headedness
- Nausea
- Profuse sweating
- Slurred Speech
- Weak Pulse

In most cases, treatment involves having the victim rest in a cool place and drink plenty of fluids. Victims with mild cases of heat exhaustion usually recover spontaneously with this treatment. Those with severe cases may require extended care for several days. There are no known permanent effects.

As With Heat Cramps, Certain Persons Should Consult With Their Physician About What To Do Under These Conditions.

1.4 Heat Stroke

This is the most serious of health problems associated with working in hot environments. It occurs when the body's temperature regulatory system fails and sweating becomes inadequate. The body's only effective means of removing excess heat is compromised with little warning to the victim that a crisis stage has been reached.

A heat stroke victim's skin is hot, usually dry, red or spotted. Body temperature is usually 105^{o}F or higher, and the victim is mentally confused, delirious, perhaps in convulsions, or unconscious. Unless the victim receives quick and appropriate treatment, death can occur.

A summary of the key symptoms of heatstroke is as follows:

- Confusion
- Convulsions
- Incoherent Speech
- Staggering Gait
- Unconsciousness
- Sweating stops
- Hot skin, high temperature (yet extremities may feel chilled)

Any person with signs or symptoms of heat stroke requires immediate hospitalization. However, first aid should be immediately administered. This includes moving the victim to a cool area, thoroughly soaking the clothing with water, and vigorously fanning the body to increase cooling. Further treatment at a medical facility should include continuation of the cooling process and the monitoring of complications that often accompany the heat stroke. Early recognition and treatment of heat stroke are the only means of preventing permanent brain damage or death.

1.5 Preparing for the Heat

Humans, to a large extent, are capable of adjusting to heat. This acclimation to heat, under normal circumstances, usually takes about 5 to 7 days, during which time the body will undergo a series of changes that will make continued exposure to heat more tolerable.

On the first day of exposure, body temperature, pulse rate, and general discomfort will be higher. With each succeeding day of exposure, all of these responses will gradually decrease, while the sweat rate will increase. When the body does become acclimated to the heat, the worker will find it possible to perform work with less strain and distress.

A gradual exposure to heat gives the body time to become accustomed to higher temperatures, such as those encountered in chemical protective clothing.

1.6 Protecting Against Heat Stress

There are several methods that can be used to reduce heat stress:

- Limit duration of work periods
- Use protective clothing with cooling devices
- Enforce the use of the "Buddy System"
- Consume electrolyte solutions prior to suiting up
- Monitor workers for pulse recovery rates, body fluid loss, body weight loss, and excess fatigue
- Screen for heat stress susceptible candidates in your medical surveillance program
- Have all personnel know the signs and symptoms of heat stress

2.0 **Cold Stress**

Persons working outdoors in temperatures at or below freezing may be frostbitten. Extreme cold for a short time may cause severe injury to the surface of the body, or result in profound generalized cooling, causing death. Areas of the body that have high surface-area-to-volume ratio such as fingers, toes, and ears, are the most susceptible. Two factors influence the development of a cold injury, ambient temperature and the velocity of the wind. Wind chill is used to describe the chilling effect of moving air in combination with low temperature. For instance, 10 degrees Fahrenheit with a wind of 15 miles per hour (mph) is equivalent in chilling effect to still air at minus 18 degrees Fahrenheit.

As a general rule, the greatest incremental increase in wind chill occurs when a wind of 5 mph increases to 10 mph. Additionally, water conducts heat 240 times faster than air. Thus, the body cools suddenly when chemical-protective equipment is removed if the clothing underneath is perspiration soaked.

2.1 Frostbite

Local injury resulting from cold is included in the generic term frostbite. There are several degrees of damage. Frostbite of the extremities can be categorized into:

- Frost Nip or Initial Frostbite: characterized by suddenly blanching or whitening of skin.
- Superficial Frostbite: skin has a waxy or white appearance and is firm to the touch, but tissue beneath is resilient.
- Deep Frostbite: tissues are cold, pale, and solid; extremely serious injury.

2.2 Hypothermia

Systemic hypothermia is caused by exposure to freezing or rapidly dropping temperature. Its symptoms are usually exhibited in five stages:

- Shivering
- Apathy, listlessness, sleepiness, and (sometimes rapid cooling of the body to less than 95°F)
- Unconsciousness, glassy stage, slow pulse, and slow respiratory rate
- Freezing of the extremities
- Death

Thermal socks, long cotton or thermal underwear, hard hat liners and other cold weather gear can aid in the prevention of hypothermia. Blankets and warm drinks (other than caffeinated coffee) are also recommended.

Measures shall be taken to keep workers from getting wet, such as issuance of rain gear. Workers whose cloths become wet shall be given the opportunity to dry off and change clothes.

ATTACHMENT 4

Remediation Construction Equipment Safety Rules

Construction Equipment Safety Rules

1.0 ELECTRICAL

1. Live electrical parts shall be guarded against accidental contact by cabinets, enclosure, location, or guarding. Cabinet covers will be replaced.

2. Working and clear space around electric equipment and distribution boxes will be kept clear and assessable.

3. Circuit breakers, switch boxes, etc. will be legibly marked to indicate their purpose.

4. All 120-volt, single-phase 15- and 20-ampere receptacle outlets on construction sites, which are not a part of the permanent wiring of the building or structure and which are in use by employees, shall have approved ground-fault circuit interrupters for personnel protection. If the prime contractor has not provided this protection with GFCI receptacles at the temporary service drop, employees will ensure portable GFCI protection is provided. (Employers may wish to use assured equipment grounding conductor program in lieu of this GFCI protection.) This requirement is in addition to any other electrical equipment grounding requirement or double insulated protection.

5. All extension cords will be three-wire (grounded) type and designed for hard or extra hard usage (Type S, ST, SO, STO, or SJ, SJO, SJT, SJTO).

6. Ground prongs will not be removed.

7. Cords and strain relief devices/clamps will be in good condition.

8. All lamps for general illumination will have the bulbs protected against breakage.

9. Electrical cords will not suspend temporary lights unless cords and lights are designed for such suspension. Flexible cords used for temporary and portable lights will be designed for hard or extra hard usage.

10. Employees will not work in such close (able to contact) proximity to any part of an electric power circuit unless the circuit is de-energized, grounded, or guarded by insulation.

11. Equipment or circuits that are de-energized will be locked out and tagged out. The tags will plainly identify the equipment or circuits being worked on.

2.0 COMPRESSED GAS CYLINDERS

1. All gas cylinders will have their contents clearly marked on the outside of each cylinder.
2. Cylinders must be transported, stored, and secured in an upright position. They will never be left laying on the ground or floor, nor used as rollers or supports.
3. Cylinder valves must be protected with caps and closed when not in use.
4. All leaking or defective cylinders must be removed from service promptly, tagged as inoperable and placed in an open space removed from the work area.
5. Oxygen cylinders and fittings will be kept away from oil or grease.
6. When cylinders are hoisted, they will be secured in a cradle, sling-board, or pallet. Valve protection caps will not be used for lifting cylinders from one vertical level to another.

3.0 LADDERS

1. A competent person to identify any unsafe conditions will periodically inspect ladders.
2. Those ladders with structural defects will be removed from service, and repaired or replaced.
3. Straight ladders used on other than stable, level, and dry surfaces must be tied off, held, or secured for stability.
4. Portable ladder side rails will extend at least three feet above the upper landing to which the ladder is used to gain access.
5. The top or top step of a stepladder will not be used as a step.

4.0 AERIAL LIFTS

1. Aerial lifts include cherry pickers, extensible boom platforms, aerial ladders, articulating boom platforms, vertical towers, and any combinations of the above.
2. Only authorized and trained persons will operate aerial lifts.
3. Lift controls will be tested each day before use.
4. Safety harness will be worn when elevated in the aerial lift.
5. Lanyards will be attached to the boom or basket.

6. Employees will not belt off to adjacent poles, structures, or equipment while working from an aerial lift.

7. Employees will always stand firmly on the floor of the basket, and will not sit or climb on the edge of the basket.

8. Planks, ladders, or other devices will not be used for work position or additional working height.

9. Brakes will be set and outriggers will be used.

10. The aerial lift truck will not be moved with the boom elevated and employees in the `basket, unless the equipment is specifically designed for such.

5.0 CRANES

1. A competent person prior to each use/during use to make sure it is in safe operating condition will inspect all cranes. Also, a certification record of monthly inspections to include date, inspector signature, and crane identifier will be maintained.

2. A thorough annual inspection of hoisting machinery will be made by a competent person, or by a government or private agency, and records maintained.

3. Loads will never be swung over the heads of workers in the area.

4. Employees will never ride hooks, concrete buckets, or other material loads being suspended or moved by cranes.

5. Hand signals to crane operators will be those prescribed by the applicable ANSI standard to the type of crane in use.

6. Tag lines must be used to control loads and keep workers away.

7. Loads, booms, and rigging will be kept at least 10 feet from energized electrical lines rated 50 KV or lower unless the lines are de-energized. For lines rated greater that 50 KV follow OSHA Rules and Regulations, 1926.550(a)(15).

8. Cranes will always be operated on firm, level surfaces, or use mats/pads, particularly for near-capacity lifts.

9. Accessible areas within the swing radius of the rear of the rotating superstructure of the crane, either permanently or temporarily mounted, will be barricaded in such a manner as to prevent employees from being struck or crushed by the crane.

10. If suspended personnel platforms are to be lifted with a crane, reference 1926.550(g) for general and specific requirements.

11. Rigging equipment (chains, slings, wire rope, hooks, other attachments, etc.) will be inspected prior to use on each shift to ensure it is safe. Defective rigging and equipment will be removed from service.

12. Job or shop hooks or other makeshift fasteners using bolts, wire, etc. will not be used.

13. Wire rope shall be taken out of service when one of the following conditions exist:

    - In running ropes, 6 random distributed broken wires in one lay or 3 broken wires in one strand or one lay.

    - Wear of one-third the original diameter of outside individual wires.

    - Kinking, crushing, bird caging, heat damage, or any other damage resulting in distortion of the rope structure.

    - In standing ropes, more than two broken wires in one lay in sections beyond end connections, or more than one broken wire at an end connection.

6.0 WELDING and BRAZING

1. Combustible material will be cleared from the area around cutting or welding operations.

2. Welding helmets and goggles will be worn for eye protection and to prevent flash burns.

3. Eye protection to guard against slag while chipping, grinding and dressing of welds will be worn.

4. Only electrode holders specifically designed for arc welding will be used.

5. All parts subject to electrical current will be fully insulated against the maximum voltage encountered to ground.

6. A ground return cable shall have a safe current carrying capacity equal to, or exceeding, the specified maximum output capacity of the arc-welding unit that it services.

7. Cables, leads, hoses, and connections will be placed so that there are no fire or tripping hazards.

7.0 TOOLS

1. Take special precautions when using power tools.

2. Defective tools will be removed form service.

3. Electric power tools will be the grounded-type or double insulated.

4. Power tools will be turned off and motion stopped before setting tool down.

5. Tools will be disconnected from power source before changing drills, blades or bits, or attempting repair or adjustment. Never leave a running tool unattended.

6. Power saws, table saws, and radial arm saws will have operational blade guards installed and used.

7. Unsafe/defective hand tools will not be used. These include sprung jaws on wrenches, mushroomed head of chisels/punches, and cracked/broken handles of any tool.

8. Portable abrasive grinders will have guards installed covering the upper and back portions of the abrasive wheel. Wheel speed ratings will never be less than the grinder RPM speed.

9. Compressed air will not be used for cleaning purposes except when pressure is reduced to less than 30 psi by regulating or use of a safety nozzle, and then only with effective chip guarding and proper personal protective equipment.

10. Abrasive blasting nozzles will have a valve that must be held open manually.

11. Only trained employees will operate powder-actuated tools.

12. Any employee furnished tools of any nature must meet all OSHA and ANSI requirements.

8.0 SAFETY RAILINGS AND OTHER FALL PROTECTION

1. All open sided floors and platforms six feet or more above adjacent floor/ground level will be guarded by a standard railing (top and mid rail, toeboard if required).

2. A stairway or ladder will be provided at any point of access where there is a break in elevation of 19 inches or more.

3. All stairways of four or more risers or greater than 30 inches high will be guarded by a handrail or stair rails

4. When a floor hole or opening (greater than two inches in its least dimension) is created during a work activity, through which a worker can fall, step into, or material can fall through, a cover or a safety guardrail must be installed immediately.

5. Safety nets will be provided when workplaces are more than 25 feet above the ground, water, or other surfaces where the use of ladders, scaffolds, catch platforms, temporary floors, safety lines, or safety belts, is impractical.

6. Safety harnesses, lanyards, lines, and lifelines may be used in lieu of other fall protection systems to provide the required fall protection.

7. Adjustment of lanyards must provide for not more than a six-foot fall, and all tie off points must be at least waist high.

8.1 Scaffolds

1. Scaffolds will be erected, moved, dismantled, or altered only under the supervision of a competent person qualified in scaffold erection, moving, dismantling, or alteration.

2. Standard guardrails (consisting of top-rail and mid-rail) will be installed on all open sides and ends of scaffold platforms and/or work levels more than ten feet above the ground, floor, or lower level.

3. Scaffolds four to ten feet in height with a minimum horizontal dimension in any direction less than 45 inches will have standard railings installed on all open sides/ends.

4. Platforms at all working levels will be fully planked. Planking will be laid tight with no more than one inch space between them, overlap at least 12 inches, and extend over end supports 6 - 12 inches.

5. The front edge of all platforms will be no more than 14 inches from the face of the work, except plastering/lathing may be 18 inches.

6. Mobile scaffolds will be erected no more than a maximum height of four times their minimum base dimension.

7. Scaffolds will not be overloaded beyond their design loadings.

8. Scaffold components should not be used as tie-off/anchor points for fall protection devices.

9. Portable ladders, hook-on ladders, attachable ladders, integral prefabricated scaffold frames, walkways, or direct access from another scaffold or structure will be used for access when platforms are more than two feet above or below a point of access.

10. Cross braces will not be used as a mean of access to scaffolds.

11. Scaffolds will not be erected, used, dismantled, altered, or moved such that they or any conductive material handled on them might come closer to exposed and energized power lines than the following:

    - Three feet from insulated lines of less than 300 volts;
    - Ten feet plus for any other insulated or un-insulated lines.

8.2 Excavations and Trenches

1. Any excavation or trench five feet or more in depth will be provided cave-in protection through shoring, sloping, benching, or the use of hydraulic shoring, trench shields, or trench boxes.

2. Trenches less than five feet in depth and showing potential of cave-in will also be provided cave-in protection. Specific requirements of each system are dependent upon the soil classification as determined by a competent person.

3. A competent person will inspect each excavation/trench daily prior to start of work, after every rainstorm or other hazard-increasing occurrence, and as needed throughout the shift.

4. Means of egress will be provided in trenches four feet or more in depth so as to require no more than 25 feet of lateral travel for each employee in the trench.

5. Spoil piles and other equipment will be kept at least two feet from the edge of the trench or excavation.

9.0 MOTOR VEHICLES AND MECHANIZED EQUIPMENT

1. All vehicles and equipment will be checked at the beginning of each shift, and during use, to make sure it is in safe operating condition.

2. All equipment left unattended at night adjacent to highways in normal use shall have lights or reflectors, or barricades with lights or reflectors, to identify the location of the equipment.

3. When equipment is stopped or parked, parking brakes shall be set. Equipment on inclines shall have wheels chocked as well as having parking brakes set.

4. Operators shall not use earth-moving or compaction equipment having an obstructed rear view unless vehicle has an audible reverse signal alarm, or is backed only when observer says it is safe to do so.

5. All vehicles shall have in operable condition:

- Horn (bi-directional equipment)
- Seats, firmly secured, for the number of persons carried. Passengers must ride in seats.
- Seat belts properly installed.
- Service, parking and emergency brake system.
- All vehicles with cabs will be equipped with windshields with safety glass.
- All material handling equipment will equipped with rollover protective structures.

10.0 MISCELLANEOUS

1. All protruding reinforcing steel, onto and into which employees could fall, shall be guarded to eliminate the impalement hazard.

2. Enclosed chutes will be used when material, trash, and debris are dropped more than 20 feet outside the exterior walls of a building. A substantial gate will be provided near the discharge end of the chute, and guardrails at the chute openings into which workers drop material.

3. Only trained employees will service large truck wheels. A cage or other restraining device plus an airline assembly consisting of a clip-on chuck, gauge, and length of hose will be used to inflate any large truck tires.

4. Only trained employees will operate forklifts and other industrial trucks.

Appendix E – Quality Assurance Project Plan

Formerly ACCO Brands Inc. Site
32-00 Skillman Avenue
Long Island City, NY

NYSDEC VCP#V00331

QUALITY ASSURANCE PROJECT PLAN

Prepared for:
Jim Beam Co., Inc.
510 Lake Cook Road
Deerfield, IL 60015

FLS Project Number: 10195-001

Submitted to:
New York State Department of Environmental Conservation
Division of Environmental Remediation
1 Hunters Point Plaza
47-40 21st Street
Long Island City, NY 11101

Arnold F. Fleming, P.E.
&

Fleming
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March 2015

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1.0 INTRODUCTION

The Quality Assurance Project Plan (QAPP) outlines the protocols and procedures that will be followed during the Remedial Action Work Plan (RAWP) at the former ACCO Brands site, located at 32-00 Skillman Ave., Long Island City (Queens), NY, (hereafter referred to as the "Site"). The Site is part of the Brownfield Cleanup Program (BCP# V00331) administered by the New York State Department of Environmental Conservation. A Site Location Map is included as Figure 1. The remedial action will be conducted in accordance with the approved Remedial Action Work Plan (RAWP) for Operable Unit 1 (OU-1) and OU-2 of the Site. This QAPP has been prepared in order to ensure Quality Assurance (QA) and Quality Control (QC) for the environmental sampling activities which will be conducted under the RAWP and to ensure the acquisition of defensible data.

2.0 PROJECT TEAM

The project team will consist of Fleming Lee-Shue Inc. (FLS) personnel and subcontractors. All field personnel and subcontractors will have completed a 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) training course and the annual HAZWOPER 8-hour refresher in accordance with the Occupational Safety and Health Administration (OSHA) regulations and will have the training required for their respective duties as outlined for this work plan. The project team qualifications are provided in Attachment I.

2.1 Remedial Engineer

The oversight of all aspects of the project will be conducted by the Remedial Engineer (RE). The RE is responsible for compliance with the RAWP. Mr. Arnold F. Fleming, P.E., will act as the RE for the site investigation and remedial action at the Site.

2.2 Project Director

The general oversight of all aspects of the project will be conducted by the Project Director. Tasks will include the scheduling, budgeting, data management and decision-making for the field program. Mr. Kevin McGuinness, PG will act as the Project Director for the remediation.

2.3 Project Manager

All components of the remedial action will be directed and coordinated by the Project Manager. The Project Manager will ensure a smooth flow of information between all parties involved in the remediation by communicating regularly with professionals from the New York State Department of Environmental Conservation (NYSDEC), the Site management personnel, and all members of the FLS project team. Mr. Kevin McGuinness, PG, will act as the Project Manager for the project.

2.4 Field Team Leader

Daily onsite sampling and health and safety activities will be supervised by a Field Team Leader. The Team Leader's responsibilities will include ensuring adherence to the RAWP and Health and Safety Plan (HASP) and regularly reporting daily progress and deviations from the RAWP to the Project Manager. Upon approval of the RAWP, FLS will assign the role of Field Team Leader to appropriate FLS personnel.

2.5 Project Quality Assurance / Quality Control Officer

Adherence to the QAPP will be ensured by a FLS QA/QC Officer. Tasks will include reviewing the QA procedures with all personnel before any fieldwork is conducted onsite as well as completing periodic site visits in order to assess the implementation of these procedures. Mr. Bill Maniquez, will act as the QA/QC officer for the remedial action.

2.6 Laboratory Quality Assurance / Quality Control Officer

Quality control procedures will be ensured by the selected laboratory, Accutest, QA/QC officer. This officer will be responsible for the adherence to laboratory protocols, quality control procedures, and checks in the laboratory. The officer will track the movement of the samples from check-in to issue of the analytical results, conducting a final check on the analytical calculations. The laboratory groups performing the respective analyses will complete their own QA/QC and sign off on the data. The Accutest QA/QC manual is attached to the end of this document.

3.0 LABORATORY PROCEDURES

3.1 Laboratory Methods

The sample container type, preservation, applicable holding time, and laboratory methods of analysis of the field samples have been included as Table 1. Holding times are based on the SW-846 analytical method which, when adjusted to account for an assumed 2-day sample shipping time, match NYSDEC Analytical Services Protocol (ASP) holding times. Sample analyses will be completed by a New York State Department of Health Environmental Laboratory Approval Program (NYSDOH-ELAP) certified laboratory and reported as NYSDEC ASP Category B deliverables.

3.2 Quality Control Sampling

Additional analysis will be conducted for quality control assurance in addition to the laboratory analysis of the field soil and groundwater samples. Quality control samples will include: equipment rinsate blanks, duplicate samples, and trip blanks. The quantities of field samples and quality control samples have been summarized in Table 2.

The equipment blank and duplicate samples will be analyzed for the same parameters as the samples, as shown on Table 1.

4.0 STANDARD OPERATING PROCEDURES

The standard operating procedures for the soil sampling, groundwater sampling, and sampling equipment decontamination have been described in the following sections. Safety monitoring will be performed in accordance with the Site-specific HASP, which mandates that all field personnel wear the appropriate personal protective equipment (PPE).

4.1 Direct Push Soil Sampling

Soil sampling will be performed using 5-foot long acetate macro-core sleeves that will be advanced continuously to the desired depth below the ground surface. Soil samples will be screened continuously using a photoionization detector (PID) for organic vapors. Organic vapor screening will be performed by puncturing holes in the acetate liners, or making a small slice in the soil column with a knife or sampling tool. The PID will then be inserted to collect a headspace reading for approximately 5-10 seconds. This procedure will be repeated at intervals along the soil column at the field geologist's discretion.

. The samples will be examined for staining, discoloration, odors, and debris indicative of contamination (ash, coal fragments, wood chips, cinders, petroleum staining, etc.)

Soil samples for laboratory analysis will be collected form the 6-inch interval most likely to be contaminated, based on PID readings, discoloration, staining, and the field geologist's judgement (field conditions may require longer that 6-ichesto make a sufficient sample; however this will be field based).

The samples will be collected by cutting the soil in two places. Soil samples for VOCs will be managed in accordance with EPA Method 5035 A – Closed System Purge-and-Trap and Extraction Procedure for Volatile Organics. A TerraCore sampler will be used to collect at least 5 grams of soil and transfer carefully in laboratory provided and sealed vials. The entire sample vial will be placed, unopened, into the instrument by the laboratory to ensure minimal loss of volatile constituents.

Other samples can be collected using stainless steel or aluminum trowel, spoon or knife and homogenized (composite) in a decontaminated stainless steel pan before placing in the sample bottles.

Samplers will wear phthalate-free gloves such as nitrile (no latex will be used). Only decontaminated clean metal instruments will be allowed to touch the sample. If there is insufficient soil volume in the spoon, them this will be made up by attempting a second direct push sleeve at the same depth, or by using the next immediate sample interval above or below this depth, when appropriate. If there is no recovery, then the sample depth will be skipped , and drilling will progress to the next interval depth.

4.2 Hollow Stem Auger Sampling

Due to Site clearance limitations, a track-mounted Geoprobe 6620 rig will be utilized to collect the soil samples. Modifications to the rig will include a hollow stem auger (HSA) attachment for clearing the borehole followed by direct-push technology for collection of samples. In the event that a HSA rig will be utilized, augers with a minimum of 4 ¼ inches will be utilized to pre-clear the borehole. Then a direct-push sampler will be driven to desired depth.

Each macro-core sample will be screened using a PID to detect possible organic vapors. Organic vapor screening will be performed by puncturing holes in the acetate liners, or making a small slice in the soil column with a knife or sampling tool. The PID will then be inserted to collect a headspace reading for approximately 5-10 seconds. This procedure will be repeated at intervals along the soil column at the field geologist’s discretion.

The samples will be examined for staining, discoloration, odors, and debris indicative of contamination (ash, coal fragments, wood chips, cinders, petroleum staining, etc.)

The samples will be collected by cutting the soil in two places. Soil samples for VOCs will be managed in accordance with EPA Method 5035 A – Closed System Purge-and-Trap and Extraction Procedure for Volatile Organics. A TerraCore sampler will be used to collect at least 5 grams of soil and transfer carefully in laboratory provided and sealed vials. The entire sample vial will be placed, unopened, into the instrument by the laboratory to ensure minimal loss of volatile constituents.

Other samples can be collected using stainless steel or aluminum trowel, spoon or knife and homogenized (composite) in a decontaminated stainless steel pan before placing in the sample bottles.

4.2 Groundwater Sampling

Groundwater samples will be collected from the monitoring wells applying the following procedures:

- A headspace reading for vapor concentrations will be conducted. Prior to any sampling, remove the well plug slowly and measure the vapor concentrations within the well using a PID.
- Measure depth-to-water using a water-level meter or an oil/water interface probe. For wells that do not have NAPL use a water level meter. For wells that historical had NAPL, measure depth to water using an oil/water interface probe to check for light non-aqueous phase liquid (LNAPL) and dense non-aqueous phase liquid (DNAPL). If NAPL is measurable groundwater samples will not be collected from such a well.
- Connect a dedicated tubing to either a peristaltic or submersible pump and lower such that the intake of the pump is set at a mid-point of the water column within the screened interval of the well. The intake should be a minimum of 2-feet above the bottom of the well screen. Record the depth of the intake in the field notes. Connect the discharge end of the tubing to the flow-through cell of multi-parameter (or equivalent) meter, such as a Horiba U-22. Connect the tubing to the output of the cell and place the discharge end of the tubing in a 5 gallon bucket.
- Low-flow purging and sampling will be implemented.
- Each monitoring well will be purged to ensure that a representative groundwater sample is obtained. Purge samples will be collected periodically (every 5 minutes) and analyzed for water-quality parameters (e.g., turbidity, pH, temperature, dissolved oxygen, reduction-oxidation potential, and specific conductivity). Each well will be purged until the water-quality parameters stabilize (three successive readings) or three well volumes have been removed. All purge water will be containerized in a 55-gallon drum.

Parameter	Stabilization Criteria
pH	+/- 0.1 pH units
Specific Conductance	+/- 3 % S /cm
ORP / Eh	+/- 10 mV
Turbidity	+/- 10 % NTUs (<50 NTUs)
Dissolved Oxygen	+/- 0.3 mg /L

- After purging is complete, the tubing will be disconnected. The groundwater samples will be collected directly from the discharge end of the tubing into the required sample containers listed in Table 1. The containers will be labeled as described in Section 4.4.1 and stored in cooler with ice. The samples will be maintained at 4° +/- 2° C in the field and during transport.

- A final field sample will be collected and analyzed for water-quality parameters (e.g., turbidity, pH, temperature, dissolved oxygen, reduction-oxidation potential, and specific conductivity). The final parameter readings will be recorded in the field notes.

- When the sampling is completed, the pump and tubing will be removed from the well.

- The pump, water-level meter and flow-through cell will be decontaminated as described in Section 4.5.

- All field measurements (depth-to-water, water-quality parameters), calculations (well volume) and observations will be recorded in the project logbook and on field data sheet.

4.4 Sample Handling

4.4.1 Sample Identification

All sample containers will be labeled with the following information:

- Project identification
- Sample identification
- Date and time of collection
- Analysis(es) to be performed
- Samplers initials

Collected and labeled samples will be placed in ice-filled coolers away from direct sunlight to await shipment/delivery to the laboratory. The samples will be maintained at 4° +/- 2° C in the field and during transport.

Prior to shipment each sample will be placed in a sealable plastic bag. Fresh ice will be placed in two sealable plastic bags, or “blue ice” blocks will be put into the cooler along with the chain of custody (COC) form. The samples may be shipped overnight (e.g., via Federal Express) or transported by a laboratory courier. Any coolers that are shipped to the laboratory will be sealed with tape and a COC seal to ensure that the coolers remain sealed during delivery.

4.4.2 Sample Preservation

During the sampling day, samples collected will be preserved by placing the containers in coolers immediately after collection. At the end of the sampling day, all field samples that are to be shipped overnight will be packaged in coolers and shipped with the appropriate chain-of-custody (COC) forms. Each of these coolers will also contain a temperature blank so that the receiving laboratory may verify sample temperature upon receipt.

Soil Samples

Soil samples will be placed in designated sample containers and EnCore samplers.

Groundwater samples collected

Groundwater samples will be collected and directly placed in laboratory prepared sample containers with appropriate preservatives. The analytical method for VOCs call for the addition of preservatives to the vial prior to sampling. The preservatives include hydrochloric acid (HCL) and ascorbic acid (HCL). The ascorbic acid sample preservation guideline is outlined in Attachment 2.

4.4.2 Sample Custody

The field personnel will be responsible for maintaining the sample coolers in a secured area until arrival at the laboratory. Sample possession record from the time of obtainment in the field to the time of delivery to the laboratory or shipping off-site will be documented on COC forms. The COC forms will contain the following information: project name; names of sampling personnel; sample number; date and time of collection and matrix; signatures of individuals involved in sample transfer; and the dates and times of transfers. The laboratory personnel will examine the custody seal's condition at sample check-in.

4.5 Decontamination Procedures

Decontamination will be performed on plastic sheeting or other containment area that is deemed to prevent runoff to the ground. Prior to use onsite and between sampling locations, pump, water-level meter and other non-disposable sampling equipment will be decontaminated using the following protocol:

1. Scrub using tap water /non-phosphate detergent mixture and bristle brush.
2. Rinse with tap water.
3. Repeat step 1 and 2.
4. Final rinse with distilled water.
5. Air-dry.

4.6 Field Instrumentation

All field instruments will be calibrated at the start of each day of field work in accordance with the manufacturer's specifications. In the instance that an instrument fails calibration, the Project Manager or QA/QC Officer must be contacted so as to arrange repairs or obtain a replacement instrument. A calibration log will be maintained onsite in the field book in order to record specific details regarding instrument calibration, including: dates, problems, and corrective actions. The PID will be calibrated each day using a standard of 100 parts per million (ppm) isobutylene, zeroed as per manufacturer specifications.

All field personnel will be trained in the proper operation of all field instruments at the start of the field program; however, instruction manuals for all equipment will be stored onsite as a reference of the proper procedures for operation, maintenance and calibration.

5.0 DOCUMENTATION AND RECORDS

5.1 Documentation Standards

This procedure will be used for all field activities regardless of purpose. These activities may include, but are not limited to; all types of media (soil, soil vapor, groundwater) sampling, GPR and all survey work, well installation, Site reconnaissance and inspection, remediation, OM&M tasks, and waste disposal and handling. The field personnel will keep an accurate written record of their daily activities in a bound field notebook sufficient to recreate the project activities without reliance on memory. All entries must be written in waterproof indelible ink. There should be no blank line. If only part of the page is used, the remainder of the page should have an "X" drawn across it.

For New Projects and New Field Books the following items must be included:

1) Clearly written on the cover and on the binding:

- Project Name
- FLS Project Number
- Client
- Field Book Number (applicable to projects with more than one field book)

2) Clearly written on the inside front cover:

- Fleming-Lee Shue, Inc, address and phone number
- Project Name
- Project Address
- FLS Project Number
- Client
- Site Contact Name and Phone Number

- Field Book Number (applicable to projects with more than one field book)

3) Clearly written on the inside rear cover:

- Site Location or directions to the Site from the office via car and/or public transportation
- Important Contacts with phone numbers (could include laboratory, driller, client, site contacts, etc.)

4) Miscellaneous items to include in prominent place in field book:

- Photocopy of Site Plan, showing monitoring wells if applicable, reduced to fit inside field book, taped into field book
- Photocopy of Monitoring Well Construction Details, reduced to fit inside field book, taped into field book
- Keys to the site should be placed in a small envelope attached to the back of the field book.

Upon arriving at the site each day, the following information should be transcribed in the field book:

1) TOP MARGIN: Project name, project number and date
2) BOTTOM MARGIN: Page number (excluding field books with preprinted numbers)
3) FIRST LINE: Time On Site
4) Personnel On Site, with company or agency affiliation
5) Weather and forecast (if significant), including temperature, relative humidity, atmospheric pressure (obtain from radio, internet or newspaper) and other unusual conditions, along with recent precipitation events.
6) Objective – Includes purpose of visit, intended scope of work, ***be specific and thorough –*** describe all tasks.
7) Arrival and departure of client, site contact, state regulatory agent, subcontractors, etc.
8) Significant change in weather
9) Items for future action, such as missing well caps.

10) Time field activities are conducted, such as the beginning and ending of boring installation, sampling, etc.
11) Start all entries by giving the time.
12) Record significant, pertinent observations.
13) Record measurements and other data, with units.

At the end of the field visit, note:

1) Time off-site
2) If only part of the page is used, the remainder of the page should have an “X” drawn across it.
3) Sign the end of notes at the end of each work day

Additional field records may be required for each specific field event. These other records may include:

- Soil boring logs during drilling,
- Well Construction and Development records,
- Groundwater Purge and Sample Collection Records,
- Water Level Monitoring,
- Investigation Derived Waste (IDW) Tracking Records,
- Instrument Calibration Records, and
- Health and Safety Monitoring Records and sign-off sheets.

Prior to field activities, the field sampling personnel will coordinate with the Project Manager to determine which additional records will be required for the specific field task. The type of additional records, when applicable, must be noted in the field notebook.

At the completion of the project, all original field logbooks and records will be scanned and stored in the project files. The field records will then be archived after project finalization and will be kept indefinitely in archive.

5.2 Laboratory Data Packages

The samples collected will be sent to a NYS Environmental Laboratory Approval Program-certified laboratory for analysis and the summary data packages will be delivered in the New York State Analytical Services Protocol (NYSASP) - Category B which include the results, QC summaries, and all raw data. The full data package will contain all information required for validation.

5.3 Data Usability Summary Reports and Electronic Data Deliverable

A data usability review and validation of the laboratory analytical results will be performed by a third party. The purpose of the data usability review is to determine whether or not the data meets the Site-specific criteria for data quality and use. A Data Usability Summary Report (DUSR) will be prepared in accordance with NYSDEC DER-10 - Appendix 2B Guidance for Data Deliverables of Data Usability Summary Reports.

The data will be submitted to NYSDEC in an EQUIS Electronic Data Deliverable (EDD) format in accordance with Section 1.15 of NYSDEC's May 2010 *DER-10 Technical Guidance for Site Investigation and Remediation*.

Appendix F – FLS Project Personnel Resumes

Fleming
Lee Shue

Environmental Management & Consulting

Arnold F. Fleming, PE
Owner

Education

- Bachelor of Science, Civil Engineering, Manhattan College (1968)
- Masters of Engineering, Manhattan College (1969)

Professional Registration

Professional Engineer, New York

General Expertise

Arnold F. Fleming is an environmental engineer with over 30 years of experience in the areas of water quality and planning studies, domestic and industrial wastewater treatment and disposal, environmental impact analysis, contaminated materials assessment and remediation, and environmental permitting. Mr. Fleming was one of the founders of Allee King Rosen & Fleming, Inc., AKRF, Inc., and AKRF Engineering P.C. For over 20 years, Mr. Fleming has provided these firms with engineering expertise in all technical areas relating to permitting and hazardous waste assessment and management and the assessment of impacts in these technical areas. Mr. Fleming has been Principal in charge for Phase II Environmental Assessments for over 100 residential, commercial and industrial sites in the Metropolitan New York area. Duties include design of sampling program, oversight of means and methods of sample collection, and preparation of final reports including recommendations for remediation. He has also been involved with the design for over 50 remediation systems including UST tank removals, contaminated soil disposal, soil vapor extraction systems, sparged air/ soil vapor extraction systems. Remedial designs include approximately 20 sites remediated under the State of New York Voluntary Clean-up program, and two sites on the Registry of Inactive Hazardous Waste Sites. Mr. Fleming has been the Principal in charge of the preparation of Phase I Environmental Assessments for several hundred residential, commercial and industrial properties, as well as several hospitals throughout the New York Metropolitan Area. He has been the Project manager for the preparation of 208 wastewater facility planning studies, and has prepared the infrastructure and utility assessments for over 100 EIS's in the Metropolitan New York Area.

PROJECT EXPERIENCE

535 West 23rd Street Development

Prepared the Phase I and asbestos surveys for this Manhattan development site. Designed the Phase II sampling program, executed the sampling and on the basis of the findings obtained approval to remediate an extensive oil spill via bio-remediation. The system was designed and installed under the new building with operation to begin upon occupancy of the building. The approach allowed the construction schedule to proceed without delay due to the discovered contamination.

Queens West Redevelopment
Technical representative to the Queens West Development Corporation (QWDC) a subsidiary to the Empire State Development Corporation charged with developing the 78 area redevelopment of the Hunters Point waterfront into a mixed commercial/residential development. Mr. Fleming developed a model remediation plan for the first residential building in 1995 and has applied this model to the next three residential development sites in Stage 1 of the development, the first having opened for residency in the summer of 2002. Mr. Fleming is assisting QWDC in selecting a developer for Stage 2 and 4 and is advising them on the remediation of Stage 2, a former oil refinery and paint factories. Development of Stage 2 is to occur simultaneous to the remediation efforts in the refinery portion of the site.

Staten Island Muss Site Redevelopment
Managed the initial Phase II sampling for this former industrial site re-zoned for single family residential development. The site was listed on the Registry of Inactive Hazardous Waste Sites. Prepared in Remedial Investigation and Feasibility Studied that led to a Record of Decision (ROD) setting forth the remediation for the site. Prepared the remedial Design to satisfy the ROD and managed the oversight of the remediation leading up to the removal of the site from the registry. Designed a revetment system to protect the capping material that was an integral part of the remediation from storm related erosion from the adjacent Raritan Bay. Petitioned the Federal Emergency Management Agency to remove the site from the 100-year flood plain on the basis of the new elevations and erosion measures implemented on the site.

Rego Park, Queens Remediation
Prepared a Voluntary Clean-up Application, performed additional sampling and developed a remedial work plan to remove solvent contaminated soils from this development site. Designed a sparged air/ Vapor Extraction System to remediated contaminated groundwater and site soils. Operated the system for two years reducing the groundwater contamination by over 90%. The sparged air / VES was designed to be installed under the building avoiding the delay of remediation the site prior to construction.

Hudson River Park Redevelopment
For this new park stretching from Battery Park City to 59th Street, Mr. Fleming oversaw the preparation of the US Army Corps of Engineers and the New York State Department of Environmental Conservation permit application s and responses to comments leading to issuance of this waterfront development permit. This permit was unique in that it addressed the first segment that was designed and ready to be built as well as the entire park for which no design was available. To address the future segments, schematic design drawings were submitted showing conceptual designs that would be refined as the park was designed and build. A permit condition to submit each segment design for review and determination of consistency with the master permit was included to assure that no impacts were introduced in the design process. If a determination on any segment were made that the design was not consistent with the master permit, a new permit process would be initiated.

Greenpoint Brooklyn Waterfront Development Planning
For a private developer, Mr. Fleming has prepared an evaluation of the permitting concerns including a jurisdictional assessment of the existing waterfront edge, to assist in the establishing of a development plan that will be compatible with the requirements of federal and state permits.

Queens West Redevelopment
Mr. Fleming led the permitting effort to allow redevelopment of the waters edge associated with this 78 acre mixed Commercial/Residential waterfront development. The project has three stages, the first under construction and permitted in 1995. Mr. Fleming managed the permitting effort for this first waterfront permit. The current application to the state and federal permitting agencies is for a project wide permit covering the remaining 3 stages of which 2 are under design. The final stage of the project was the subject to a schematic design only. Notable in the current permit is the reconstruction of collapsed platforms that are to become a site wide park and esplanade providing water access to this portion of the east river for the first time in over a century.

West Side Ferry Terminal
For the New York City Economic Development Corporation, Mr. Fleming led the permit effort to allow a new public ferry terminal located within the bounds of the Hudson River Park. Because the ferry terminal was not approved when the Park permit was issued, this project was carved out of the park permitting process and followed a separate permit track. The permit application was assembled using updated submissions from the Park permit application and addressed the specific concerns of the State and federal permitting

Jersey City Colgate Site Redevelopment
For this mixed commercial/residential waterfront redevelopment project, Mr. Fleming prepared the state Coastal Zone Development permit and a US army Corp of Engineers dredge and fill permit to allow a marina, esplanade and a new combined sewer manifold to be built. The sewer manifold was placed in the river because of space limitations and was permitted, the first fill permit in this portion of the Hudson River in 20 years.

River East Environmental Permits for Shoreline Protection
For this 10 acre site obtained the permits to install 500 feet of revetment to allow a 1.4 million square foot residential development on a former oil terminal. Also prepared the Remedial Action Work Plan to remove historic spilled oil simultaneous to Vernon Realty shoreline construction.

Peter S. Helseth, PE
Associate

Education

- Master of Business Administration (MBA), Finance, Fordham University (2010)
- Bachelor of Science (BS), Civil Engineering, University of Vermont (2003)

Professional Registration

- Professional Engineer, New York (2008)

Health and Safety Training

- OSHA 40-Hour HAZWOPER Training
- OSHA 30-Hour Construction Safety Training

General Expertise

Peter Helseth is currently an Associate with Fleming Lee-Shue. Mr. Helseth has extensive experience with sites under the New York State Department of Environmental Conservation (NYSDEC) Brownfield Clean-up Program (BCP) and New York City Office of Environmental Remediation (OER) E-Designated sites, including hazardous materials, noise attenuation, and air quality. As an Associate, Mr. Helseth has been involved with UST removals, soil excavation, remedial investigation and design, monitoring and sampling, sub-slab depressurization system (SSDS) and vapor barrier design, construction and inspections, submittals review, engineer's estimates, roadway profiling design, grading and earthwork design, and drainage design. He has over 11 years of civil engineering design experience on various types of projects.

PROJECT EXPERIENCE

NYSDEC BROWNFIELD CLEANUP PROGRAM

Queens West Redevelopment
Provided construction oversight of several (SSDS) installations. Direct and oversee quarterly groundwater sampling and submitted reports to NYSDEC as required under Site Management Plan (SMP). Drafted SMP revisions to lower clients environmental maintenance costs. Prepared annual Period Record Review (PRR) reports for NYSDEC.

388 Bridge Street Development
Prepared Remedial Action Work Plan (RAWP) for new residential high-rise building participating in NYSDEC BCP. Designed the SSDS. Provided construction oversight of engineering controls (EC) installation, which included Soil Vapor Extraction (SVE) system and SSDS.

Skillman Avenue Environmental Liability Assessment & Remediation
Provided 3rd party evaluation of SSDS designs prepared by other firms. Created multiple alternative SSDS design options with greater efficiency and more cost effective installation. Assisted with preparation of Conceptual Site Model (CSM) analyzing approximately ten years of groundwater sampling data.

517 West 28th Street Redevelopment
Designed the Sub-Slab Depressurization System SSDS for new residential high-rise. Provide construction oversight of engineering controls EC installation.

511 West 21st Street
Submitted application for BCP program. Oversaw completion of RAWP and Remedial Investigation (RI) report for new residential high-rise building.

Queens Plaza Residential Development
Oversaw completion of RAWP and RI report. Designed the SSDS for the new residential high-rise building.

OER E-Designation Sites

3595 Broadway Redevelopment
Prepared RI scope for hazardous declaration property meeting OER requirements. Designed the SSDS for new mixed-use residential building with a hazardous materials E-Designation.

500 West 30th Street Redevelopment
Screened potential air impacts and determined proper windows to address air and noise E-Designations. Oversaw completion of air and noise Remedial Action Plan (RAP). Designed the SSDS for new residential high-rise with a hazardous materials E-Designation participating in the OER Voluntary Clean-up Program (VCP). Provided construction oversight of EC installation. Assisted with preparation of OER VCP required documents including RAWP and Remedial Action Report (RAR).

312 West 37th Street Redevelopment
Designed the SSDS for new hotel high-rise participating in OER VCP. Provided construction oversight of EC installation. Assisted with preparation of OER VCP required documents including RAWP and RAR.

West 28th Street Chelsea Redevelopment
Screened potential air impacts and determined proper windows to address air and noise E-Designations. Designed the SSDS system for new high-rise building with hazardous materials E-Designation. Provided construction oversight of EC installation.

J. Raúl Ramírez
Environmental Engineer

Education

- Bachelor of Science (BS), Civil Engineering, The University of Texas at Austin (2011)

Health and Safety Training

- OSHA 40-Hour HAZWOPER Training
- LIRR Track Safety Training

General Expertise

J. Raúl Ramírez is currently an Environmental Engineer with Fleming Lee-Shue. As an Environmental Engineer, Mr. Ramírez has been involved with remedial investigations & design, monitoring & sampling, and sub-slab depressurization system (SSDS) and soil vapor extraction (SVE) system design. He also has experience in performing Phase I Environmental Site Assessments (ESAs) in accordance with ASTM standard E1527- 05 and providing due diligence updates for commercial real estate transactions. He has participated in the redevelopment of Sites in the Brownfields Cleanup Program (BCP) for the New York State Department of Environmental Conservation (NYSDEC), and the Voluntary Cleanup Program (VCP) for the Office of Environmental Remediation (OER). Mr. Ramírez also participated in the development of New York City e-designation Sites.

PROJECT EXPERIENCE

Park Avenue Development

Coordinated and oversaw the disposal of 8,000 cubic yards of contaminated soil for a NYSDEC Brownfields Site. Implemented Community Air Monitoring Program in accordance with Remedial Action Work Plan. Prepared Air Quality and Noise Installation Report required for the OER e-designation.

Skillman Avenue Environmental Liability Assessment & Remediation

Assisted with the research for applicability of new electrical resistance heating technology to remediate chlorinated volatile organics in a complex geologic setting for a NYSDEC VCP Site. Assisted with the design of an in-situ bioremediation treatment to remediate off-Site groundwater. Conducted Site-specific groundwater sampling protocols, including dosing and application of field preservation. Provided oversight during a supplemental remedial investigation utilizing membrane interface probe technology to determine the extent and distribution of the chlorinated volatile organics.

Queens Plaza Residential Development

Conducted remedial investigation for Site with creosote impacts from former operation for a BCP Site and prepared RIR for NYSDEC. Assisted with coordination for collection and analysis of over 150 soil samples for waste characterization.

511 West 21st Street Redevelopment
Conducted remedial investigation for Site with former Underground Storage Tanks and an active spill. Prepared Remedial Investigation Report (RIR) for NYSDEC's BCP. Assisted with SSDS design.

500 West 30th Street Redevelopment
Prepared draft Remedial Closure Report (RCR), Site Management Plan (SMP) and Air Quality and Noise Installation Report required for the OER e-designation. Obtained Notice of Satisfaction for the completion of VCP.

529 West 29th Street Redevelopment
Prepared Remedial Action Report (RAR) and Noise Installation report required for OER VCP. Obtained Notice of Satisfaction for the completion of VCP.

290 11th Avenue Redevelopment
Prepared Air Quality and Noise Installation Report required for the OER e-designation. Coordinated proper installation of the SSDS and tested its efficiency. Obtained Notice of Satisfaction for the completion of VCP.

1113 York Avenue Redevelopment
Prepared Air Quality and Noise Installation Report required for the OER e-designation. Obtained Notice of Satisfaction.

Fleet Renovation Projects Remediation
Assisted with design of several retrofitted SSDSs throughout several properties, oversaw construction of the systems and tested their efficiency. Drafted Construction Completion Reports (CCRs) to document the completed construction of the SSDSs for OER.

Co-op City Remediation
Conducted remedial investigation to determine soil vapor impacts at the three different sites with active dry cleaning operations. Coordinated and oversaw construction of two SSDSs to mitigate vapors beneath two dry cleaners. Drafted CCRs to document the completed construction of the SSDSs for NYSDEC.

388 Bridge Street Redevelopment
Conducted inspection and monitoring of SVE System and SSDS for Site with chlorinated solvents impacts for a BCP Site. Optimized system for maximum removal. Collected and analyzed soil vapor data.

Queens West Parcel 8 and Center Boulevard Remediation
Conducted quarterly groundwater sampling and reporting for the Voluntary Cleanup Site previously contaminated with 18,500 pounds of coal tar waste.

Adam T. Conti, E.I.T.
Environmental Engineer

Education

- Bachelor of Science, Environmental Systems Engineering, The Pennsylvania State University (2011)

Health and Safety Training

- OSHA 40-Hour HAZWOPER Training
- 10-Hour Construction Safety and Health Training
- 8-Hour OSHA Site Supervisor Training

General Expertise

Adam Conti is currently an Environmental Engineer with Fleming Lee-Shue with over three years of experience in the environmental field. As an Environmental Engineer, Mr. Conti has been involved with remedial investigations & design, monitoring & sampling, and sub-slab depressurization system (SSDS) design. He also has experience in performing Phase I Environmental Site Assessments (ESAs) in accordance with ASTM standard E1527- 05 and providing due diligence updates for commercial real estate transactions. He has participated in the redevelopment of Sites in the Brownfields Cleanup Program (BCP) for the New York State Department of Environmental Conservation (NYSDEC), and the Voluntary Cleanup Program (VCP) for the Office of Environmental Remediation (OER). Mr. Conti also participated in the development of New York City e-designation Sites.

PROJECT EXPERIENCE

16th Street Development

Collected soil vapor samples to determine chlorinated solvent impacts. Oversaw the removal of contaminated dry cleaning equipment and materials. Assisted in the design of and oversaw construction of the SSDS. Conducted pre and post-construction diagnostic testing for SSDS. Drafted Construction Completion Report (CCR).

17th Street Co-Op

Conducted Site inspection and collected mercury vapor samples to determine historical mercury impacts.

388 Bridge Street Redevelopment

Conducted inspection and monitoring of Soil Vapor Extraction System (SVE) and SSDS for Site with chlorinated solvents impacts. Optimized system for maximum removal. Collected and analyzed soil vapor data.

Avenue C Development

Collected soil vapor samples to determine chlorinated solvent impacts. Drafted letter report.

Park Avenue Development
Coordinated and oversaw the disposal of 8,000 cubic yards of contaminated soil. Implemented Community Air Monitoring Program in accordance with Remedial Action Work Plan

Skillman Avenue Environmental Liability Assessment & Remediation
Conducted site specific groundwater sampling protocols, including dosing and application of field preservation. Provided oversight during a supplemental remedial investigation utilizing membrane interface probe technology to determine the extent and distribution of chlorinated volatile organics in a complex geologic setting.

Walsh Avenue New Windsor, NY
Conducted groundwater gauging and site inspection for the Brownfield BCP Site. Drafted SMP and FER.

Queens West Parcel 8 and Center Boulevard Remediation
Conducted quarterly groundwater sampling and reporting for the Voluntary Cleanup Site previously contaminated with 18,500 pounds of coal tar waste.

Queens Plaza Residential Development
Drafted the Waste Characterization Work Plan for the Brownfield BCP site. Executed plan which included the collection and analysis of over 150 soil samples. Conducted supervision and air monitoring of remediation activities.

Appendix G – Electrical Resistance Heating Design Documents

TRS Group, Inc.
PO Box 737
Longview, WA 98632

March 18, 2015

Mr. J. Raúl Ramírez
Fleming-Lee Shue, Inc.
158 West 29th Street
New York, NY 10001
(212) 675-3225
kevin@flemingleeshue.com

Subject: **Technical Approach and Scope of Work (SOW) split for ERH Remediation Former ACCo Brand Facility, Long Island City, New York**

Dear Raúl,

TRS Group, Inc. (TRS) is pleased to provide Fleming-Lee Shue, Inc. (FLS) and Jim Beam, Inc. (Jim Beam) with our revised technical approach and Scope of Work (SOW) split for remediation at the Former ACCo Brands Facility in Long Island City, New York (the Site). TRS will perform the remediation using Electrical Resistance Heating (ERH). This document presents the site parameters, our technical approach, and respective scopes of work.

This technical approach includes a 20% increase in the proposed treatment area (see Figure Y-1 at the end of this document) and volume and a 34% increase in the estimated contaminant mass based on the most recent site investigation data provided by FLS (August 2014). We expanded the ERH treatment area around MW-7 (in the sidewalk next to Van Dam Street) and along the eastern boundary to include sample location PI18S as well as south into the office and north into the men's bathroom.

The final contract terms have not yet been completed. The ERH remediation is also contingent on final approval from Consolidated Edison Company of NY (ConEd) for an appropriately sized power drop for the remediation at the facility.

SITE DATA REVIEW

Our technical approach for the site is based on our review of the following documents and files provided by FLS:

1. Draft Supplemental Remedial Investigation Report (January 2014)
2. Third Quarter 2012 Dissolved TCE Concentrations in Shallow and Intermediate Groundwater (Figure 3, February 2013)
3. Proposed Treatment Area (Figure 2, January 2014)
4. TRS Site Evaluation Form completed by FLS (January 2014)
5. Total Organic Carbon (Figure 4, June 2014)
6. VOC Mass in Groundwater Spreadsheet (March 2014)
7. Geologic Cross Section (Figure 3, May 2014)
8. Foundation Elements (Figure 1, May 2014)
9. Soil Boring Logs
10. TCE Concentrations in Treatment Area (Figure 1, August 2014)

In addition, FLS provided TRS with two samples for bench testing. Our technical approach for the site was updated based on the results of the bench test. Two independent bench test reports were submitted to FLS on July 7, 2014.

FLS contracted with RA Consultants (RA) to determine how the building was constructed and how the soils will respond to ERH treatment. It is TRS' understanding that RA has determined ERH will not pose a risk to building stability, though they recommend monitoring throughout operation of the ERH project.

REMEDIATION OBJECTIVES

The primary chlorinated volatile organic compound (CVOC) at the site requiring remediation in groundwater is trichloroethene (TCE). There are also minor amounts of cis 1,2-dichloroethene and tetrachloroethene (PCE) in groundwater. The beginning maximum concentration of TCE in groundwater is 720,000 µg/l that was identified in location PI4S from the August 2014 sampling event conducted by FLS. The remedial objective is 100 µg/l TCE in groundwater.

The ERH remediation will focus on the suspected source area including shallow and intermediate groundwater treatment. ERH will not be used to treat the deep groundwater zone. Upgradient TCE concentrations in the shallow and intermediate zones have been reported, though they are close to or below the remedial objectives for the ERH area. TRS has assumed the New York State Department of Environmental Conservation (NYSDEC) will agree that contamination in the deep groundwater zone is not the responsibility of Jim Beam. These deep TCE groundwater concentrations exceed the ERH remedial goal. TRS has not included any deep groundwater treatment.

Downgradient concentrations to the southwest have also been reported, although with the exception of the area surrounding MW-7, concentrations outside of the building footprint will be addressed with another remedial technology.

DESCRIPTION AND BACKGROUND

The Former ACCo Brands Facility is located at 32-00 Skillman Avenue, Long Island City, New York and it is covered by an occupied three-story commercial and light industrial building. The proposed ERH remediation area is in the basement of the building at the intersection of Queens Boulevard and Van Dam Street. The basement is currently unoccupied, though the remaining levels of the building are occupied by various tenants.

Several remedial technologies have been applied at the site including soil vapor extraction, air sparging, ozone injection and chemical oxidation. Evidence of the chemical oxidation was noted during bench testing in the form of a purple stain in the soil. Previous remedial technologies have had limited effectiveness.

There are no known voids in the subsurface. The treatment volume at depth consists of native soil with essentially no disturbance by man. This paragraph is based on investigations by others (FLS and RA) and if it is inaccurate then it could effect the implementation of the ERH technology and may result in a changed condition. Please let us know if your understanding of the subsurface is different than stated above.

Geology

The local site lithology within the treatment area generally consists of silty sand extending to 19 to 25 feet below ground surface (ft bgs) with occasional cobble/boulder lenses (reported at MW-9). The silty sand is underlain by a silt layer, which extends to 31 to 45 ft bgs, and is underlain by a clay layer. The clay layer appears to be continuous and has acted as an impermeable barrier to prevent contamination from extending below the clay layer. The confining layer starts an average of 41 ft bgs and is approximately 3-5’ thick in most locations. The hydraulic conductivity for shallow groundwater ranges from 4.6 x 10^{-4} cm/sec to 7.4 x 10^{-4} cm/sec. The hydraulic conductivity for intermediate groundwater ranges from 1.6 x 10^{-3} cm/sec to 2.0 x 10^{-3} cm/sec.

Groundwater

Groundwater is first encountered approximately 14 ft bgs. The groundwater flow direction is typically to the southwest. Shallow groundwater flow velocity ranges from 6.9 x 10^{-3} ft/day to 6.1 x 10^{-2} ft/day. Intermediate groundwater flow velocity ranges from 6.9 x 10^{-3} ft/day to 9.2 x 10^{-2} ft/day.

Groundwater electrical conductivity is in the range of 1,600 to 3,700 µs/cm based on data provided by FLS.

If our conceptual model of site lithology and hydrogeology is not in agreement with yours, please let us know so that we can review our conceptual approach to remediation of the Site.

Treatment Area and Contaminant Extent

The proposed ERH remediation region is 9,700 square feet (see Figure Y-1). Our preliminary ERH design is based on treatment from 13 ft bgs to two feet into the top of the confining clay layer. This is expected to average 44 ft bgs across the treatment area. The resulting treatment volume is approximately 11,100 cubic yards. FLS estimates that the total mass of volatile organic compounds (VOCs) at the Site to be about 321 pounds (lbs). No additional site characterization is necessary before ERH can be implemented at the site.

CVOC FLUX

Contaminant mass has been moving out of the source region since the time of the original release and continues today (a.k.a. “CVOC flux”), albeit very slowly. Presently, the groundwater plume downgradient from the proposed ERH treatment area has considerable TCE concentrations. It is also believed by FLS that there is an upgradient source impacting the deep groundwater concentrations upgradient of the ERH treatment area. Deep groundwater treatment is not included as part of this ERH remediation.

Operation of the ERH system will affect the CVOC flux. During the early stages of ERH operation, the CVOC flux downgradient of the treatment area may temporarily increase due to increases in the CVOC solubility’s and decreases in groundwater viscosity as the site is heated through 80°C. Once the ERH system is up to steaming temperatures, the net extraction of water from the site in the form of steam will reduce or eliminate the CVOC flux depending on the net water removal rate and the groundwater flow rate. Continued ERH operation will deplete the CVOC source mass and will inevitably result in a permanent reduction of the CVOC flux.

After ERH, groundwater flow will return to existing conditions and clean, warm groundwater with dissolved organic carbon (DOC) will slowly flow downgradient. This “beneficial flux” may significantly speed natural attenuation of the downgradient plume.

While ERH will significantly reduce the CVOC flux downgradient from the ERH treatment area, any flux on the upgradient side of the ERH treatment area will be unaffected.

ELECTRICAL RESISTANCE HEATING

ERH passes an electrical current through the soil and groundwater that requires treatment. The electrical current warms the soil and then boils a portion of the soil moisture into steam. This *in situ* steam generation occurs in all soil types, regardless of permeability. Electrical energy evaporates the target contaminant and provides steam as a carrier gas to sweep the CVOCs to the vapor recovery (VR) wells. For the Former ACCo Brands site, TRS anticipates generating thousands of pore volumes of steam during ERH. At the surface, after the steam is condensed and the recovered air is cooled to ambient conditions. The extracted VOC vapors are treated using conventional methods, such as vapor phase activated carbon (VGAC) for adsorption.

The type of contaminant and the desired clean-up goal affect the energy, time and cost to remediate a site. However, two subsurface parameters are particularly important: the amount of total organic carbon (TOC) and the presence of heavy hydrocarbons such as diesel, oil, or grease.

TOC preferentially adsorbs VOCs in comparison to water; this is why activated carbon is often used for vapor and water treatment. The reported average TOC content in soil at the Site is 1.63% by weight. The US average is 0.25%.

The presence of oil, grease, or other low volatility hydrocarbons can also slow the evaporation rate of VOCs. Raoult’s Law describes this effect. No petroleum hydrocarbons have been reported within the ERH treatment area.

TRS has tested the energy impacts to the ERH remediation due to the elevated TOC at this site through two independent bench scale tests. These bench scale tests indicated that additional energy and time would be required to remediate the site than we had originally forecast in previous estimates.

Other *in Situ* Treatment Process Enhancements Resulting From ERH

Although volatilization is usually the primary removal mechanism for CVOCs, TRS has documented on several sites that a significant fraction of the CVOCs will be degraded in place by other *in situ* processes. Depending on the site, these *in situ* secondary processes may include biodegradation, hydrolysis, and reductive dehalogenation by zero-valent iron. Bioremediation is the only secondary removal mechanism that will be a factor at this site.

Bioremediation

Heat accelerates most chemical reactions, both the breakdown of the Site contaminants and the breakdown of naturally occurring materials such as soil humus or TOC will be accelerated with increased temperatures. TCE is degraded by anaerobic microbes through the pathway:

Trichloroethene → *cis* 1,2-dichloroethene → vinyl chloride → ethene
Thermophilic (heat-loving) bacteria are an important contributor to the first step in the above chain. For this reason, we may see some temporary, slight increase in *cis* 1,2-dichloroethene (DCE)

concentrations during the remediation; however, the temporary increase would be insignificant in comparison to the TCE decreases.

When the subsurface is heated, many of the TOC long chain humic acids also break apart into smaller compounds with greater water solubility. Heating speeds the conversion of TOC into dissolved organic carbon (DOC). This conversion makes the organic carbon bioavailable and improves the Site bioremediation activity.

When TOC is broken apart into simpler molecules, most of the DOC consists of unregulated compounds. However, about 1 percent of the DOC consists of acetone and other ketones (acetone is the simplest ketone and butanone, also known as methyl ethyl ketone, is the second simplest ketone). Like the other DOC components, the ketones have low health risk and are rapidly consumed by soil microbes. Low levels of acetone and butanone are continually produced at the Site and may be seen during groundwater sampling events. After ERH is complete, the DOC production rate will return to baseline levels, microbes will consume any extra DOC, and ketones will return to low or non-detectable levels. Following cessation of ERH remediation, the latent heat and dissolved DOC remaining will continue to improve the remaining contamination due to increased rates of bioremediation.

SCOPE OF WORK

The sections that follow present summaries of the upcoming tasks and the corresponding responsible company for each ERH project task. TRS' experience suggests that the most efficient and economical approach to ERH project execution is the formation of a strong team with specific experience, skills and attributes. TRS' suggested task split attempts to capitalize on the strengths of FLS for specific ERH project tasks and also utilize their local presence for efficiency.

Design and Permitting

Under a separate contract, TRS is providing design support to FLS. This support includes:

- Permitting to obtain the electrical installation and sidewalk (IBM) permits,
- Review/comment on the results of the geotechnical investigation,
- Continuing to work with ConEd to gain their support for the ERH project,
- Attendance of one meeting with ConEd to provide them with information about the electrical requirements of our ERH system to support obtaining a power drop for the project (This meeting occurred on 5/26/2014), and
- Support the development of the Remedial Action Work Plan.

This work is ongoing under a $15,000 purchase order (PO).

The remaining Design and Permitting support tasks for the Former ACCo Brands Facility ERH remediation include:

TRS Design Tasks and Submittals

- Design Package – This package will include:
  - Site Plan with electrode layout
  - Site Plan with vapor recovery (VR) piping
  - Electrode Detail
  - Temperature Monitoring Point Detail
  - Process Flow Diagram
  - Piping and Instrumentation Diagrams
  - Mass Balance Table
  - Voltage Mitigation Plan
  - Monitoring Well Head Detail
  - Electrical One-Line Diagram

- Health & Safety Plan (HASP). TRS will develop the ERH-specific HASP for its work at the Site, and will be responsible for its health and safety and the health and safety of its subcontractors. TRS understands that the HASP will be incorporated as an addendum into the FLS site-wide plan.
- Subcontractor identification and vetting.
- Material takeoff.
- Development of status reporting document (Weekly Report).
- Development of data collection system.
- Creation of safety interlock system.
- ERH construction approved drawings for installation and removal of the system. These drawings are considered confidential/trade secret and will not be shared unless a specific question arises.
- Development of internal operations plans and schedule. These operations plans are considered confidential/trade secret and will not be shared unless a specific question arises.

At this time, no stand-alone Sample Analysis Plan (SAP) or Quality Assurance and Quality Control (QA/QC) Plan are considered necessary and these are not included in the TRS scope of work.

FLS Regulatory Product Submittals

FLS will produce the physical copies of the Work Plan (WP) and submit it to the regulators.

Permitting

FLS will acquire all permits for the ERH remediation. This is expected to include:

- Air permit for remediation system (if required).
- Sewer discharge permit for discharge of treated condensate (if required).
- Sidewalk closure permit.
- Building permit for a new ConEd power drop (if required).

TRS will also assist FLS with acquiring these permits by providing required text, calculations, and drawings in electronic format (Adobe PDF).

It is difficult for TRS to estimate all of the permits that may be required by the local authorities in New York City. Any additional permits that are required by local New York City authorities that require added TRS support will be billed on a T&M basis.

SUBSURFACE INSTALLATION

TRS proposes 60 electrodes with co-located vapor recovery (VR) screens and seven temperature monitoring points (TMPs) as shown in Figure Y-1. As a means of monitoring the ERH process, TMPs will be installed within the treatment volume to provide continuous temperature monitoring within the subsurface. Temperature data will be automatically recorded at least once per day from the seven TMPs that will be located within the treatment volume.

Temperature monitoring points (TMPs) are used to evaluate project progress during the early stages of the project. As mass removal increases, the focus shifts from temperature to mass removal rates and finally to groundwater concentrations towards the end of the project. TMP data will help us to determine if system changes are needed to improve performance. TMPs outside of the treatment area will not provide valuable data for operating the system. Temperatures outside of the treatment area drop off quickly and we would not expect to see elevated temperatures more than 10 ft outside of the treatment area.

TRS will supply and complete the following related to subsurface installation:

- TRS and FLS will manually mark the extent of treatment and all drilling locations.
- On-site technical supervision of electrode installation. TRS will not provide a geologist for drilling oversight and will not produce boring logs or completion reports for the electrodes or TMPs.
- While FLS will be responsible for contracting and payment of the drilling subcontractor, TRS will assist in the installation of electrodes and TMPs. This will include supplying and supervising installation of all electrode conductive materials, well screens, and casings for all electrodes and co-located VR wells in the ERH treatment area. The electrode conductive backfill interval is expected to extend from 14 to 45 ft bgs on average. Should the actual depth to clay result in an average electrode depth of more than 46 ft bgs or should 9.45-inch borings not be possible, these will be considered changed conditions requiring redesign and re-pricing by TRS.
- Supply and oversee installation of TMP casing.
- Supply and install TMP cables and thermocouple strands.
- TRS has allocated 67 days for drilling oversight.

FLS or Jim Beam will supply and complete the following:

- Coordinate marking electrode locations with TRS.
- Obtain all necessary right of entry/access agreements required for TRS to perform its scope of work.
- Complete a building structural crack survey prior to ERH to document existing cracks in the building walls, floor, and ceiling. Any additional building inspections or surveys.
- Complete a subsurface utility survey and mark the locations of the subsurface utilities, building footers and piping prior to starting intrusive activities. It is important to identify all

buried utilities in and adjacent to the ERH treatment area so that proper measures can be designed into the system to mitigate the potential for preferential pathways.

- Direct contract with the drilling company and supervise the installation of the electrodes and the TMPs. The electrode and VR well borings will be installed using 9.45-inch boreholes.
- Sand and neat Portland cement grout for electrode and TMP construction and completion (via driller).
- Abandonment of any existing PVC monitoring wells within 10 ft of the ERH treatment area.
- Installation of replacement monitoring wells. Locations for replacement monitoring wells for ERH confirmatory sampling are shown in Figure Y-1. Replacement wells will be nested to allow for sampling of both shallow and intermediate groundwater. Wells must be constructed of a temperature resistant material such as stainless steel or fiberglass resin epoxy (FRE). Wells will be completed no deeper than 42 ft bgs. The replacement monitoring wells must be completed with national pipe thread (NPT) at the top of the casing to allow the installation of an ERH specific well cap (See Figure 1 below). TRS recommends sampling each new monitoring well twice prior to beginning ERH, shortly after the well is installed and shortly before beginning ERH. For each well, the “pre-ERH concentration” will be considered to be the higher of the two most-recent CVOC concentration measurements.
- Provide waste roll-off bins or drums to containerize drilling spoils.
- Responsible for characterization, manifest preparation, and transportation of the wastes for disposal. TRS estimates that 65 tons of contaminated soil cuttings will be generated during system construction.
- Safety monitoring (PID).
- Any soil sampling and analysis required.
- Identify a potable water source with a capacity of at least five gpm on or near the property and provide this water source to the ERH system.
- Physical security of the basement by repositioning the fence to include all drilling locations.

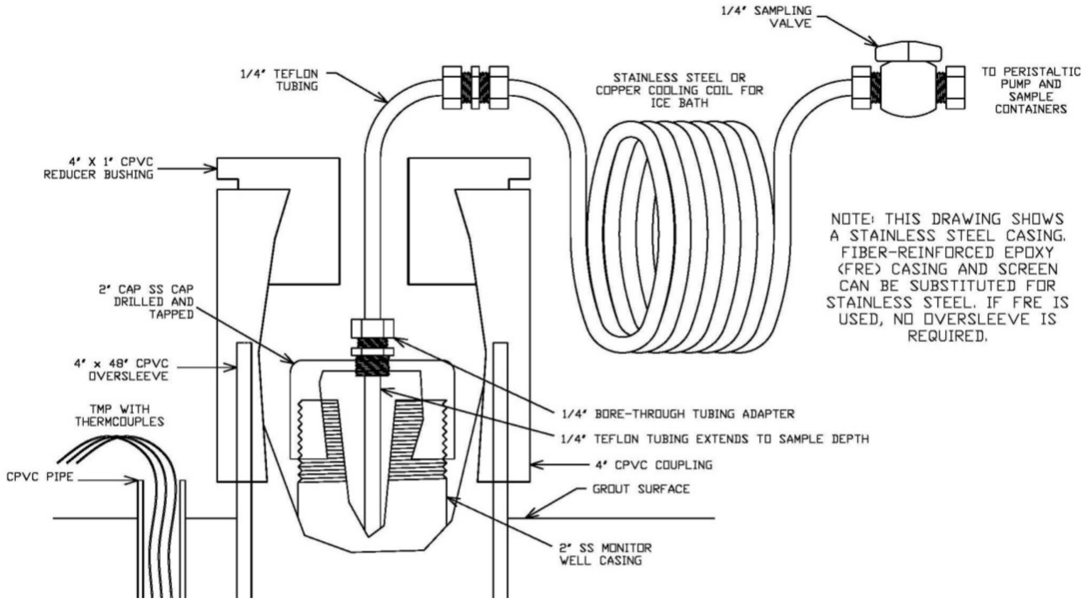


Figure 1 - Monitoring Wellhead Detail

ERH SURFACE INSTALLATION

TRS will supply and complete the following related to surface installation:

- An internal security system. TRS will provide the security sensors and security monitoring system on a rental basis for the job. The security system will be interlocked to the ERH PCU to prevent contact with voltage should unauthorized access occur into the treatment area.
- 2000 kilowatt (kW) Power Control Unit with operating system for remote telemetry.
- 2 Stepdown transformers (if required).
- One specialty ERH Condenser and cooling tower.
- Cabling electrodes to the ERH equipment.
- Provide and install the piping and fittings necessary to connect the electrode VR wells to the inlet of the steam condenser and interconnection piping between the condenser, VR blower, vapor granular activated carbon (VGAC), and liquid granular activated carbon (LGAC) vessels.
- One 40-hp vapor recovery blower.
- Provide and install a temperature monitoring system, interlock wiring between all system components, and a remote monitoring system.
- Complete electrical connections downstream of the PCU, including power connections to the condenser, cooling tower, and VR blower and to each of the electrodes. TRS assumes downstream electrical work is a non-permit activity.
- Flow measuring devices and vacuum gauges. Please note: flow cannot accurately be determined in pipes or other locations containing steam.
- Install the sample apparatus depicted in Figure 1 at the top of the MWs casing.
- Equipment compound fence for equipment staged on the sidewalk.
- Large blower fans for building ventilation.
- TRS assumes that an NRTL inspection will not be required for the equipment to meet local requirements.
- The water treatment system (LGAC vessels and carbon) for liquid treatment.
- Secondary containment for the TRS condenser and cooling tower (if required).

FLS or Jim Beam will supply and complete the following related to surface installation:

- Establish a new electrical service from ConEd to the input disconnect of TRS' 2000-kW PCU. For this project, the PCU will require 100 amps of 3-phase electricity at an input voltage of 12.4 or 13.8kV. TRS previously estimated a utility connection cost of $100,000. Utility connection costs are highly variable and TRS suggests obtaining a quote from ConEd for this service. FLS will pay ConEd directly for the utility connection.
- Contract with licensed electrician to connect the power drop from the new temporary service to the input disconnect of the TRS PCU.
- The vapor treatment system (VGAC vessels and carbon) for vapor treatment.
- All vapor and liquid permit-related sampling and analysis.
- Maintain a potable water source with a capacity of at least five gpm on or near the property and provide this water source to the ERH system.
- Maintain electrical service to the TRS Power Control Unit (PCU).
- Discharge stack for discharge of treated air from the VGAC vessels (current 6-inch PVC stack is sufficient).
- Any building or wall penetrations required for piping or cable connections.

Equipment Staging Locations:

Because the treatment area is in the basement of the Former ACCo Brands Facility, some of the equipment must be staged on the sidewalk outside of the building and some will be staged in the basement. Equipment staged on the sidewalk will be enclosed in a secured, fenced area. This staging area will be on the Van Dam Street sidewalk at the intersection of Van Dam Street and Queens Boulevard. The expected staging locations for the various pieces of equipment are included below.

- 2000-kW PCU – Sidewalk
- Condenser and Cooling Tower Package – Sidewalk
- LGAC Vessels – Sidewalk
- 40-hp Blower – Basement
- VGAC Vessels – Basement
- Step Down Transformers - Basement

Because there is a limited footprint for equipment outside and access in the building is limited, the power control units (PCUs) and condenser must remain on the sidewalk outside and the blower and carbon vessels will be inside, in the basement. Vapors leaving the electrodes will be routed outside through the condenser, back into the basement and through the blower and carbon vessels, before finally going back outside to the discharge stack.

ERH OPERATIONS

Once installation is complete, TRS will perform system startup and testing. This process is anticipated to take one to two weeks to complete. Once testing is complete, power application to the treatment volume will be continuous except for system adjustments, routine maintenance, and scheduled groundwater sampling events. TRS estimates that 3,350,000 kWh of electrical energy will need to be input to the subsurface in order to achieve the established remedial goal. A further approximate 100,000 kWh will be used by the surface equipment. The approximate time to apply this amount of energy to the subsurface will be 124 to 165 days.

During startup and operations, TRS will provide the following:

- Equipment operational checkout.
- Data acquisition verification.
- ERH system-interlock verification and safety checks.
- ERH system voltage safety checks and required corrections.
- Pre-startup equipment function testing.
- Completion of Startup Checklist. TRS safety procedures require completion of an extensive checklist before the first application of ERH power to the site. As part of the startup checklist, TRS will provide written notification to FLS that TRS must be notified before any digging occurs within 50 feet of the ERH system. TRS recommends forwarding this written notification to adjacent property owners or occupants. This “pre-dig” requirement is also described on warning signs that TRS will post on the remediation area fence at the Site.

- Subscription to the public notification system to alert TRS if any public utility drilling will occur near the ERH area.
- ERH system application verification.
- Establishment of baseline vapor recovery flow and subsurface vacuum conditions.
- System safety training with FLS and any other site personnel.
- Operate TRS equipment listed in Surface Installation (above).
- Operational oversight and monitoring of the heating, vapor capture, and temperature monitoring systems.
- On-site checks, including electrode current surveys and voltage surveys.
- ERH Equipment maintenance.
- Weekly operational status reports provided in electronic format to FLS. Reports include temperature, power, energy, and condensate rates along with recommendations for confirmatory sampling and system optimization. FLS may attach the TRS weekly report to the weekly reports submitted to DEC that include work under FLS scope.
- Provide estimation of the appropriate schedule to collect confirmatory groundwater samples. Each TRS weekly report will include an updated estimate of the optimal time to conduct the next round of groundwater samples.
- Provide alarm or emergency response.
- All LGAC for water/condensate treatment.

TRS has been in contact with ConEd to discuss the ERH remediation. As requested by ConEd, we have provided indemnification language and our standard operating procedure (SOP) for voltage testing. TRS will continue to work in concert with ConEd and FLS to ensure any surface voltage concerns are resolved before unattended operations is approved.

Extensive voltage testing is done to detect surface voltages and ensure a safe environment (both inside and outside of the treatment area), for both workers and the public. Any area accessible to either workers or the public will be tested under multiple conditions to ensure the environment is safe. In-situ voltage measurements are not taken outside of the treatment area. A 50-ft No-Dig perimeter will be established around the treatment area. TRS should be notified before any intrusive ground work is initiated within 50 ft of the treatment area. ConEd will also be performing voltage testing in the public area as part of the joint service agreement.

During startup and operations, FLS or Jim Beam will provide the following:

- All VGAC for vapor treatment.
- All vapor sampling and analyses for air permit compliance.
- Sampling and analyses of mass recovery rates.
- All process water sampling and analyses for permit compliance or batch discharge (if required).
- All ambient air monitoring required for project compliance.
- Coordination and completion of groundwater sampling and analysis. Groundwater samples will be collected from the replacement groundwater monitoring wells. The water will be collected using a Teflon tube inserted through the well cap into the wells to the appropriate sample depth. The upper end of the sample tube will be connected to a stainless steel cooling coil at the surface. The cooling coil will be immersed in ice water during sampling. Groundwater will be pulled up through the tube and cooling coil and the cooled groundwater will be collected in containers. Any down-well materials will be dedicated materials for the

duration of the project. TRS will provide the above grade components for modifying the monitoring wells including the cap, tubing and cooling coils. The peristaltic pump is to be provided by FLS during sampling.

- Regulatory reporting of groundwater sampling.
- Continue to provide a potable water source with a capacity of at least five gpm on or near the property.
- Electrical service for the TRS PCU.

GROUNDWATER SAMPLING

TRS will continually communicate with FLS on the predicted schedule for groundwater sampling.

TRS will determine and advise FLS when to collect groundwater samples from the replacement monitoring wells during operation of the ERH system. To provide timely information for remedial decisions, sample turnaround times must be 72-hours. The wells to be used for confirmatory sampling are shown in Figure Y-1.

After obtaining groundwater sampling results, TRS will shut down the portions of the site that are sufficiently clean and concentrate energy and effort on those portions and depth intervals of the site that still contain significant CVOCs.

Project progress will be measured by different metrics throughout the course of the project. Temperature will be closely watched and evaluated during the early stages of the project. As the site heats up and mass removal rates increase, the focus will shift to the extraction rates. Once the peak mass extraction has passed the focus will shift to groundwater concentrations. Groundwater concentrations will be used to determine when the system has reached the remedial goals and subsequently can be shut down.

Fourteen days prior to sample collection, TRS will advise FLS by email of a recommended date for groundwater confirmatory sampling. It is critical that confirmatory sampling by FLS not be unreasonably delayed (i.e. more than one week beyond the sample collection date identified in advance by TRS). In the event that confirmatory sampling is unreasonably delayed, this will constitute a changed condition and an additional charge may apply.

DEMOBILIZATION AND FINAL REPORT

Demobilization will be completed within 60 days of ERH completion. After ERH remediation is complete, the subsurface will slowly cool. The long period at elevated temperatures provides an important polishing step for further reduction in CVOC concentrations by heat-enhanced bioremediation.

Upon completion of power application, and receipt of the confirmatory groundwater sample results, TRS will prepare a final report that summarizes the ERH system installation, power application to the subsurface over time, subsurface temperatures over time, and CVOC extraction data. This report will be provided to FLS in electronic format.

TRS will provide the following demobilization activities and final reporting:

- TRS will be responsible for removing all above grade temporary structures, piping, and equipment that it placed on the site. TRS provides equipment and cable as rented items and maintains ownership of these items at project completion.
- Vapor recovery will be continued for 5 days after the cessation of heating, if desired.
- The final report submitted to FLS will cover topics including:
    - Site background and construction description.
    - Total energy application.
    - Power delivery and energy usage summaries.
    - Temperature profiles at various points during operations.
    - Vapor stream parameters including flow, vacuum and volume.
    - Condensate production, blow down discharge, and water balance.
    - Any major operational changes.
    - Groundwater result analysis (based on samples collected and analytical results provided by others).

FLS or Jim Beam will provide the following demobilization and final reporting:

- Coordination with City and Regulatory agencies related to any decommissioning or abandonment of ERH system subsurface components.
- Abandon in place all of the electrodes, co-located VR wells, and TMPs in accordance with local regulations. FLS will be responsible for abandonment of all electrodes, VR wells and TMPs in accordance with local regulations. TRS assumes wells will be grouted in place and overdrilling of the TMPs/Electrodes will not be required.
- Tabulated analytical data and mass removed calculations for inclusion in TRS final reporting (with TRS support).
- Electrical service to the TRS PCU until directed by TRS that it is no longer required.
- Abandonment of the electrical services that feed the PCU.
- Decommissioning of the electrical service with ConEd including removal costs.
- Continue to provide a potable water source with a capacity of at least five gpm on or near the property until directed by TRS that it is no longer required.
- Coordination and payment for wastewater disposal (if required).
- Complete wall restoration within the building following ERH.
- Disposal of spent LGAC, one drum total anticipated.

PROJECT SCHEDULE

Our proposed project schedule is presented below in Table 1. Following notice-to-proceed (NTP), TRS will prepare a more detailed project schedule that will be used to monitor the progress of the work. The more detailed schedule will show all activities, durations, planned and actual start and finish dates and the sequence of activities from the start of the project to completion. The project schedule will be revised during the project to show new developments.

Table 1 - Proposed ERH Project Schedule

TRS Scope of Work Items	Estimated Duration (months)
Design, Work Plan, Power Drop, and Permit Assistance	**6.0**
Materials and Equipment Mobilization	**0.5**
Drilling and Subsurface Construction	**3.6**
Surface Installation	**2.2**
Operations, Confirmatory Sampling	**4.6**
Demobilization and Final Report	**2.2**
Total	**19.1**

Hours of Work

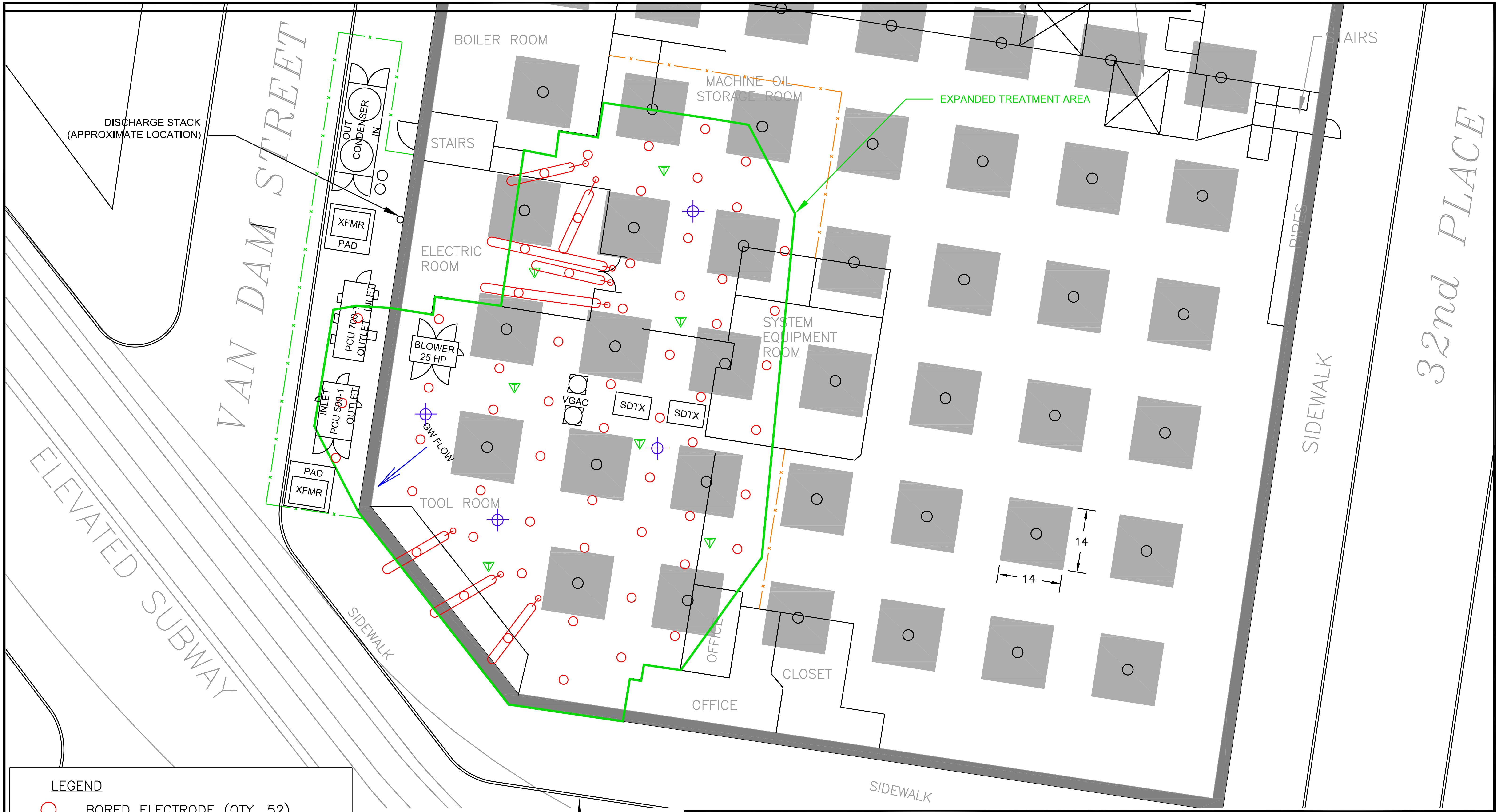
TRS intends to work between 8:00 AM and 6:00 PM on Monday through Friday. We may shift work hours based on weather conditions. Initial start-up of the ERH system may occur outside of normal work hours of the building in order to prevent disturbance of work by our testing. TRS might respond to a fault condition of the ERH system at any time.

Please let us know if you have questions or if you need more information. We look forward to working with on this very important project.

Sincerely,
TRS Group, Inc.

Michelle Nanista

Michelle Nanista
Senior Engineer



LEGEND

○ BORED ELECTRODE (QTY. 52)

⊂⊃ ANGLED ELECTRODE (QTY. 8)

▽ TMP (QTY. 7)

—×— SECURITY FENCE

—×— TEMPORARY FENCE/BARRIER

⌖ REPLACEMENT MONITORING WELL

TRS
Accelerating Value

DESIGNED BY
M. NANISTA
DRAWN BY
A. PEABODY
CHECKED BY
NOT APPROVED
PROJECT MANAGER
TRS PERSONNEL

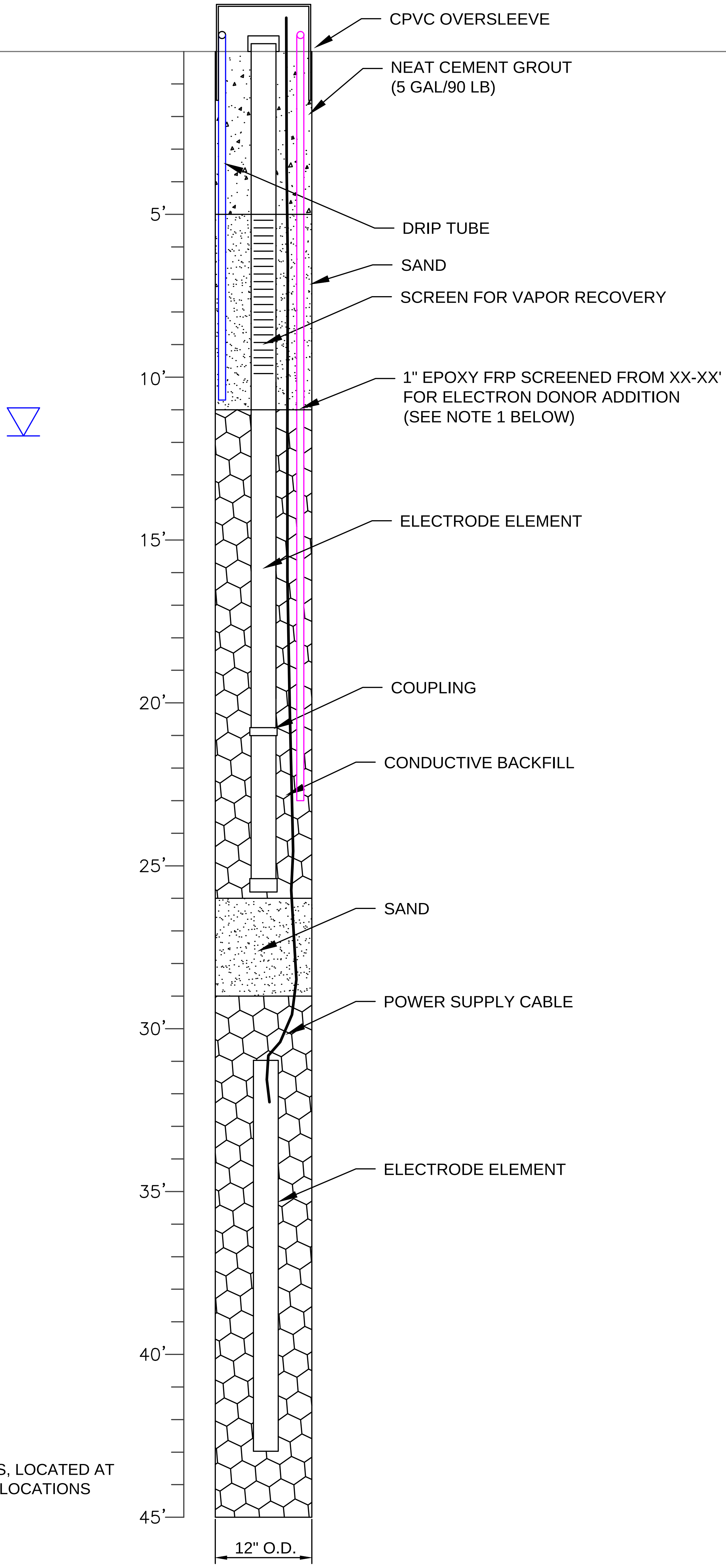
FOR
32-00 SKILLMAN AVENUE
LONG ISLAND CITY, NEW YORK

SITE PLAN WITH ELECTRODE LAYOUT

APPROVED FOR CONSTRUCTION
BY ____________
DATE ____________

DATE 3/18/15
PROJECT LIC59
SHEET Y-1

ELECTRODE
(TYPICAL OF XX)



NOTES:

1. TYPICAL X OF THE XX ELECTRODES, LOCATED AT THE DOWNGRADIENT ELECTRODE LOCATIONS (OPTIONAL).

LEGEND

▽ DEPTH TO WATER

TRS
Accelerating Value

DESIGNED BY
M. NANISTA

DRAWN BY
A. PEABODY

CHECKED BY
NOT APPROVED

PROJECT MANAGER
TRS PERSONNEL

FOR
32-00 SKILLMAN AVENUE
LONG ISLAND CITY, NEW YORK

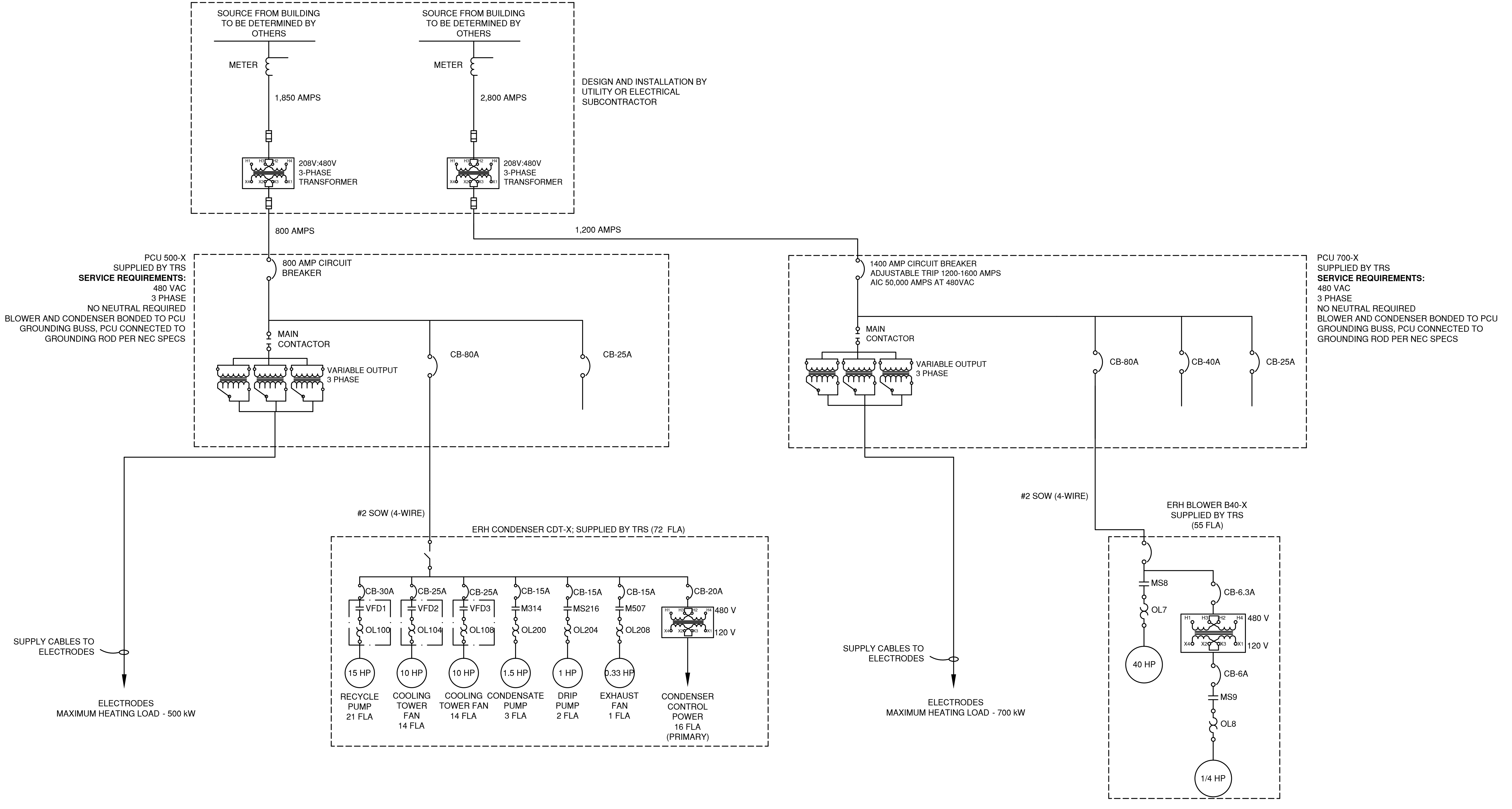
ELECTRODE DETAIL

APPROVED FOR CONSTRUCTION
BY ____________________
DATE ____________________

DATE 5/13/14

PROJECT PROJID

SHEET M-1



TRS
Accelerating Value

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DESIGNED BY
M. NANISTA

DRAWN BY
M. NANISTA

CHECKED BY
NOT APPROVED

PROJECT MANAGER
TRS

FOR
32-00 SKILLMAN AVENUE
LONG ISLAND CITY, NEW YORK

ELECTRICAL ONE-LINE DIAGRAM

APPROVED FOR CONSTRUCTION
BY ____________________
DATE ____________________

DATE 3/16/15
PROJECT LIC59
SHEET E-1

Appendix H – Bioremediation Treatability Analysis

SiREM
Leading Science · Lasting Solutions

130 Research Lane, Ste 2
Guelph ON N1G 5G3
(519) 822-2265

SiREM Technical Note 1.5:

Guidelines for Interpretation of Gene-Trac® Test Results

This document provides technical background information and guidelines for interpreting the results for the following Gene-Trac® assays:

(1) Gene-Trac® Dhc
(2) Gene-Trac® VC
(3) Gene-Trac® Dhb

SiREM Technical Note 1.4 - *Quantitative Gene-Trac® Assay Test Procedure and Reporting Overview* provides detailed information on Gene-Trac® test procedures and reporting. Explanation of data qualifiers and commonly used notes is provided as Appendix A. Table 1 provides a brief interpretation for some common scenarios, more detailed interpretation information is provided in the following sections.

Table 1: Common Gene-Trac® Test Result Scenarios and Interpretation

Gene-Trac® Dhc (*Dehalococcoides*)	**Gene-Trac® VC (*vcrA*)**	**Gene-Trac® Dhb (*Dehalobacter*)**	**Interpretation**
>1 x10^7/L	**>1 x10^7/L**	Not Analyzed	Complete dechlorination to ethene likely as Dhc high and *vcrA* high
1 x10^7/L	**Not Detected**	Not Analyzed	VC accumulation possible as *vcrA* negative
Not Detected	**Not Detected**	Not Analyzed	Dhc negative/ lack of dechlorination or *cis*-DCE accumulation likely
Not Analyzed	Not Analyzed	**1 x10^6/L**	Dhb positive,potential for biodegradation of 1,1,1-TCA, 1,2-DCA, carbon tetrachloride and chloroform, PCE and TCE to *cis*-DCE
Not Analyzed	Not Analyzed	**Not Detected**	Biodegradation of 1,1,1-TCA, carbon tetrachloride and chloroform not expected as Dhb negative

Gene-Trac® Dhc -Total *Dehalococcoides* Test

Background:

Gene-Trac® Dhc is a quantitative PCR (qPCR) test for total *Dehalococcoides* (Dhc) microbes that targets Dhc specific sequences of the 16S ribosomal ribonucleic acid (rRNA) gene, a gene commonly used to indentify microbes. Dhc are the only known microorganisms capable of complete dechlorination of chloroethenes (i.e., tetrachloroethene, trichloroethene, cis-1,2-dichloroethene [cis-DCE] and vinyl chloride) to non-toxic ethene. Gene-Trac® Dhc may also be used to assess the in situ growth of Dhc containing bioaugmentation cultures such as KB-1®.

Negative Gene-Trac® Dhc Test Results (U qualified)

A non-detect in the Gene-Trac® Dhc assay (e.g., 4,000U) indicates that Dhc were not detected in the sample. The absence of Dhc is frequently associated with a lack of complete dechlorination or incomplete dechlorination of chlorinated ethenes. Where Dhc are absent the accumulation of cis-DCE is commonly observed, particularly after addition of electron donors. Bioaugmentation with Dhc containing cultures, such as KB-1®, is commonly used to improve bioremediation performance at sites that lack an indigenous Dhc population.

Positive Gene-Trac® Dhc Test Results

The detection of Dhc has been correlated with the complete biological dechlorination of chlorinated ethenes to ethene at contaminated sites (Hendrickson et al., 2002). A positive Gene-Trac® Dhc test indicates that Dhc DNA was detected in the sample and is encouraging for dechlorination of chlorinated ethenes to ethene. Note not all Dhc are capable of conversion of vinyl chloride to ethene; this capability can be determined by the Gene-Trac® VC test (see Section 2) which is commonly performed as a follow-on analysis after positive Gene-Trac® Dhc tests. In most cases Dhc must be present at sufficient concentrations in order for significant dechlorination to be observed, guidelines for expected impacts at various Dhc concentrations are indicated below.

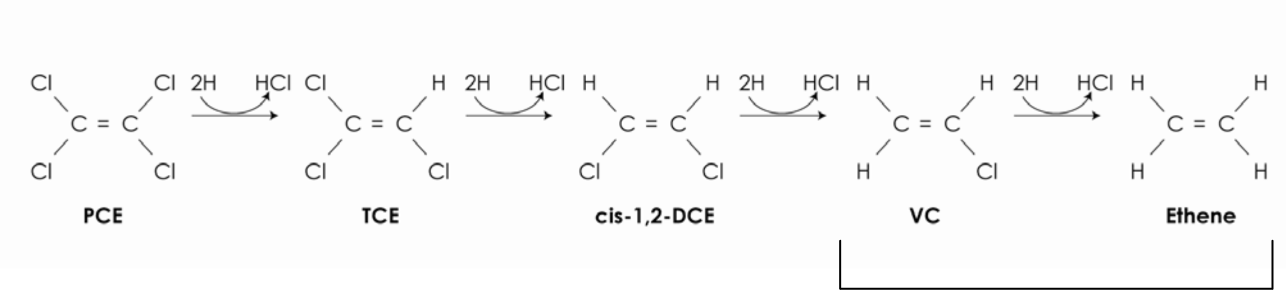
> **Values of 10^4 Dhc gene copies per liter (or lower):** indicates that the sample contains low concentrations of Dhc which may indicate that site conditions are suboptimal for high rates of dechlorination. Increases in Dhc concentrations at the site may be possible if conditions are optimized (e.g., electron donor addition).
>
> **Values of 10^5-10^6 Dhc gene copies per liter:** indicates the sample contains moderate concentrations of Dhc which may, or may not, be associated with observable dechlorination activity (i.e., detectable ethene).
>
> **Values at or above 10^7 Dhc gene copies per liter:** indicates that the sample contains high concentrations of Dhc that are often associated with high rates of dechlorination (Lu et al., 2006) and the production of ethene.
>
> **Values of 10^9 Dhc gene copies per liter** are generally the highest observed for groundwater samples with rare exceptions.

Gene-Trac® VC- Vinyl Chloride Reductase (*vcrA*) Test

Background

Gene-Trac® VC is a qPCR test for the vinyl chloride reductase (*vcrA*) gene that codes for a Dhc enzyme that converts (VC) to ethene, a critical step in reductive dechlorination of chlorinated ethenes. Gene-Trac® VC is commonly used where Gene-Trac® Dhc test results are positive to confirm that the Dhc detected are capable of complete dechlorination to ethene.#

The vinyl chloride reductase gene (*vcrA)* (Müller et al., 2004) produces an enzyme that is found in many (but not all) Dhc and is reported to be the most common identified VC reductase in the environment (van der Zaan et al., 2010).



Key activity of vinyl chloride reductase vcrA gene/enzyme

Interpretation of Gene-Trac® VC Results

Detect in Gene-Trac® VC Test

A detect in the Gene-Trac® VC test indicates that a Dhc population has the *vcrA* gene and the prospects for complete dechlorination to ethene are good. As a minimal requirement, *vcrA* copies exceeding 10^5/L combined with observed increases over time (i.e., cell growth) are required for robust VC dechlorination (van der Zaan et al., 2010). Also the guidelines for detection of ethene provided under Gene-Trac® Dhc are conservative for interpretation of Gene-Trac® VC (i.e., > 1 x10^7 gene copies/L indicate a high likelihood of detection of ethene). In one study, more than 90% of samples where *vcrA* enumeration exceeded 1 x10^7 gene copies/L had detectable ethene (Dennis, 2009). In cases where *vcrA* gene copies are lower the likelihood of detectable ethene decreases.

Non-Detect in Gene-Trac® VC Test (U qualified)

A non-detect in the Gene-Trac® VC test indicates that *vcrA* gene sequences in the sample are below the detection limit of the assay (typically 4 x 10^3 *vcrA* gene copies/L). This indicates VC accumulation (VC stall) is possible. Note negative Gene-Trac® VC test results do not indicate with 100% certainty that a VC-stall will occur as there are other vinyl chloride reductase genes, such as *bvcA* (van der Zaan et al., 2010) that also convert VC to ethene.

Comparing Gene-Trac® VC and Gene-Trac® Dhc Test Results

Sites may contain different types of Dhc populations. At some sites the Dhc population is homogenous while other sites have Dhc populations that are mixtures of different types of Dhc. This can lead to differing results for Gene-Trac® Dhc and Gene-Trac® VC.

In many cases, the numerical results of Gene-Trac® VC test are identical to those obtained in the Gene-Trac® Dhc test, indicating that the entire Dhc population contains the *vcrA* gene. In other cases, Gene-Trac® VC results may differ significantly (i.e., more than an order or magnitude) from the total Dhc for a number of reasons.

Table 3 provides some common scenarios for Gene-Trac® VC and Gene-Trac® Dhc test results. In general, where Gene-Trac® VC results are non-detect, or significantly lower than Gene-Trac® Dhc, accumulation of VC is more likely.

Table 2: Interpretation of Gene-Trac® VC in Relation to Gene-Trac® Dhc

Gene-Trac® Dhc (16S rRNA gene copies/ L)	**Gene-Trac® VC (*vcr*A gene copies/L)**	**Results Summary**	**Interpretation**	**Potential Site Implications**
2 x 10^8 /L	3 x 10^8/L	Total Dhc and *vcrA* are ~the same (within 3-fold)	Entire Dhc population has *vcrA* gene	Potential for complete dechlorination high. VC stall unlikely-sites with *vcr*A above 1x10^7/L typically have detectable ethene
1 x 10^8/L	Non-detect	Total Dhc high; *vcrA* non-detect	High concentration of Dhc and entire population lacks the *vcrA* gene	Likelihood for VC accumulation high as *vcrA* non-detect
1 x 10^8/L	1 x 10^6 /L	Total Dhc is significantly higher (100 fold) than *vcrA*	*Dhc* population consists of different types, some with the *vcrA* gene (~1%) and some without (~99%)	VC-accumulation possible; Dhc/*vcrA* proportions may change over course of remediation
1 x 10^6/L	1 x 10^8/L	*vcrA* orders of magnitude higher than Dhc	Significantly higher *vcrA* may indicate the presence of populations of non-Dhc microorganisms with *vcrA* like genes	Potential for VC-stall likely low

Gene-Trac® Dhb-Total *Dehalobacter* Test

Gene-Trac® Dhb is a qPCR test targeting the 16S rRNA gene sequences unique to *Dehalobacter* (Dhb). Dhb are implicated in the biodegradation of 1,1,1-trichloroethane (to chloroethane), 1,1,2-trichloroethane and 1,2-dichloroethane to ethene (Grostern and Edwards, 2006) and chloroform (to dichloromethane) (Grostern et al., 2010) as well as incomplete dechlorination of PCE and TCE to cis-DCE (Holliger et al.,1998). Gene-Trac® Dhb may also be used as a tool to assess the impact of bioaugmentation with the KB-1® Plus cultures which contain high concentrations of Dhb.

Positive Gene-Trac® Dhb Test Results (Detects)

A positive Gene-Trac® Dhb indicates that a member of the *Dehalobacter* (Dhb) genus was detected in the sample. The detection of Dhb indicates that some or all of the dechlorination activities attributed to Dhb may be present at the subject site. Increasing concentrations of Dhb are indicative of increased potential to degrade some or all of these compounds.

Note: the Gene-Trac® Dhb test will not differentiate the type of Dhb*;* therefore, observations of the specific biodegradation pathways and end products based on chemical analytical methods in conjunction with Gene-Trac® Dhb will increase the interpretability of Gene-Trac® Dhb results.

Note: Dhb have been reported to contain multiple copies (up to 4 per cell) of the 16S rRNA gene (Grostern and Edwards, 2008). This means that, unlike Dhc, there is not a 1:1 ratio between the 16S rRNA gene copy and the number of Dhb cells in a sample. Calculating the number of Dhb cells requires dividing the Gene-Trac® Dhb test result by the 16S rRNA gene copy number (often 3-4 copies/cell).

Non-detect Gene-Trac® Dhb Results (U qualified)

In cases where Gene-Trac® Dhb is not detected (e.g., 4,000U) this indicates that *Dehalobacter* species were not identified in the sample and that anaerobic reductive dechlorination of 1,1,1-TCA, 1,1,2-TCA, 1,2-DCA or chloroform, which are dechlorinated by *Dehalobacter*, may not be observed. This activity can be introduced at sites through the addition of bioaugmentation cultures containing *Dehalobacter* such as KB-1® Plus.

Key Elements of Gene-Trac® Data

Gene-Trac® test results include two key values (a) Target Gene Enumeration, an enumeration of target gene sequence by quantitative PCR (e.g. “Dhc Enumeration” “Dhb 16S Gene Copies” or “*vcrA* gene copies”) and (b) Target gene percent (e.g. “Percent Dhc”), an estimated percentage of the microbial population comprised by microbes harboring the target gene and other microbes present in sample. Further explanation of these values is provided below.

a) Target Gene Enumeration

This value is the concentration of Dhc or Dhb 16S rRNA or *vcrA* gene copies detected in the sample. Results may be reported as either gene copies per liter (for groundwater) or per gram (for soil). In general, the greater the number of gene copies in a sample the greater the likelihood of related dechlorination activity. Dhc 16S gene copies are typically equivalent to the number of Dhc as they have 1 gene copy per cell this is not necessarily true for Dhb or *vcrA* which have the potential be present in multiple gene copies per cell. Guidelines for relating target gene presence and concentration to observable dechlorination activity for groundwater samples are provided below in previous sections.

b) Target Gene Percent (%Dhc, %Dhb, %*vcrA*)

This value estimates the percentage of the target gene (e.g., %Dhc) relative to other microorganisms in the sample based on the formulas/assumptions presented below. For example, %Dhc is a measure of the predominance of Dhc and, in general, the higher this percentage the better.

$$\%Dhc = \frac{\text{Number Dhc}}{\text{Number Dhc} + \text{Number other Bacteria}}$$

Where:

$$\text{Number other Bacteria} = \frac{\text{Total DNA in sample (ng)} - \text{DNA attributed to Dhc (ng)}}{{}^{*}4.0 \times 10^{-6} \text{ ng DNA per bacterial cell}}$$

*Paul and Clark, (1996).

Percent Dhc (and % *vcrA*) values can range from very low fractions of percentages, in samples with low numbers of Dhc and a high number of other bacteria (incompletely colonized by Dhc), to greater than 50% in Dhc enriched locations (highly colonized by Dhc).

In addition to determining the predominance of the target gene target gene percent is also useful for interpretation of Dhc counts from different sampling locations, or the same location over time. For example, the %Dhc value can be used to correct Dhc counts where samples are biased due to non-representative sampling. Example 1 illustrates a hypothetical scenario where the %Dhc value improved data interpretation.

Example 1, use of %Dhc to interpret enumeration data

Table 2 presents results from MW-1 sampled in April, May and June. Based on the Dhc enumeration alone one would conclude that the concentration of Dhc held steady between April and May; however, the %Dhc indicates the proportion of Dhc actually increased from April to May and the unchanged count in May could be a case of low biomass recovery during sampling or other losses such as sample degradation in transit. The higher raw count and the higher percentage of Dhc in June confirm the trend of increasing Dhc concentrations over time.

Table 3: Use of % Dhc* Value to Diagnose Sampling Bias

Sample	Dhc Enumeration	%Dhc	Interpretation Based on %Dhc
MW-1, April	1.0 x 10^5/Liter	0.1%	Dhc is a low proportion of total microbial population
MW-1, May	1.0 x 10^5/Liter	1%	Dhc proportion increased 10-fold from April. Dhc enumeration was unchanged possibly due to low biomass recovery from monitoring well, non-biased sample would be [(1.0/0.1) x 1.0 x10^5] = 1.0 x 10^6/Liter
MW-1, June	1.0 x 10^7/Liter	10%	Dhc has increased 100-fold from April and confirms May sample was likely low biased

**Note: the above approach is also applicable to the "%vcrA" and "%Dhb" values provided on their respective test certificates*

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Appendix A: Data Qualifiers

Data Qualification

Data qualifiers and notes are used to clarify Gene-Trac® test results. Additional explanation beyond that provided on the test certificate is provided below.

"**U" Not detected, associated value is the quantitation limit.** Indicates that the target gene (microbe) was not detected in the sample above the quantitation limit of the assay. Note the quantitation limit value can change between samples as the volume filtered can vary; thus, a sample in which 100 ml was tested would have a 5–fold higher quantification limit compared with a sample in which 500 ml was tested.

"J" The associated value is an estimated quantity between the method detection limit and quantitation limit. Indicates that the target gene was conclusively detected but the concentration is below the quantitation limit where it cannot be accurately quantified.

"I" Sample inhibited the test reaction. This means universal primers were incapable of amplifying DNA from this sample. The inability to amplify with universal primers suggests that the sample may be imparting matrix interference. Matrix interference is commonly attributed to humic compounds, polyphenols and metals. Non-detects with an "I" qualifier are more likely to be false negative.

"B" Analyte was also detected in the method blank. Indicates that DNA was detected in a method blank or negative control; detectable contamination of the blanks with microbes or DNA containing the gene of interest is not uncommon as the test reaction is extremely sensitive. In most cases, blank contamination is at a very low level relative to test results (often orders of magnitude lower). In these cases, blank contamination is not relevant to interpretation of test results. The potential of test samples being contaminated (i.e. false positives) should be considered in cases where blank results are within 1 order of magnitude of test results.