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New York State Department of Environmental Conservation

Division of Environmental Remediation

Active Industrial Uniform Site

Site No. 152125

Membrane Interface Probe Summary Report

D&B Engineers and Architects, P.C.

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1.0 Introduction

The Active Industrial Uniform site (the Site) is a New York State Department of Environmental Conservation (NYSDEC) Class 2 Inactive Hazardous Waste Site listed on the New York State Registry of Inactive Hazardous Waste Sites (Site No. 152125). As further detailed below, a groundwater extraction and treatment system (GWE&TS) has been operating at the Site in order to capture and treat on-site and off-site portions of a chlorinated-solvent groundwater plume associated with the Site. An ongoing Remedial System Optimization (RSO) evaluation is being completed at the Site by D&B Engineers and Architects P.C. (D&B) in an effort to improve the efficiency, effectiveness and net environmental benefit of the GWE&TS.

As part of these RSO activities, D&B completed a membrane interface probe (MIP) investigation at the Site from June 17, 2014 through July 8, 2014. The objective of the MIP Program was to gather additional data to supplement the data collected during a temporary probe plume re-delineation field effort completed in February and March 2013, also conducted as part of the overall RSO evaluation of the Site. This report presents relevant background information, a summary of the field activities and associated findings and recommendations of the MIP investigation.

2.0 Site and Project Background

The below narrative provides a brief Site description and remedial history, and includes a brief description of the GWE&TS.

2.1 Site Location and Description

The Site is located in the Village of Lindenhurst, Suffolk County, New York. A Site location map is provided as *Figure 2-1*. The Site is approximately 0.5 acres in size. Surrounding properties are primarily commercial; however, a residential area is located immediately south and downgradient of the Site. Primary access to the Site is from Tomkins Lane, to the south of the Site.

2.2 Remedial History and GWE&TS Description

As described above, the Site is a NYSDEC Class 2 Inactive Hazardous Waste Site and was listed on the New York State Registry of Inactive Hazardous Waste Sites (Site No. 152125), following the identification of chlorinated solvent contamination at the Site due to its historical use as a commercial dry cleaner during the 1980s.

In accordance with the requirements of the NYSDEC Record of Decision (ROD), dated March 1997, on-site and off-site remedial actions have been implemented at and downgradient of the Site in order to remediate the chlorinated-solvent contamination associated with the Site. The primary site-specific chlorinated VOCs include the following constituents: tetrachloroethylene (PCE), trichloroethene (TCE), cis-1,2-dichloroethene (cis-1,2-DCE) and vinyl chloride (VC).

The GWE&TS installed at the Site was designed to capture and treat on-site and off-site portions of the chlorinated-solvent groundwater plume associated with the Site. The GWE&TS has generally been operating since December 2001, and was operated by others until D&B assumed site management duties in February 2005.

In general, the GWE&TS consists of two extraction wells (one located in the southwest portion of the Site [RW-1] and one located approximately 1,500 feet southwest of the Site [RW-2]), two series-configured packed-tower air strippers and two granular activated carbon (GAC) vessels connected in series. On-site extraction well RW-1 is screened at 10 to 35 feet bgs and off-site extraction well RW-2 is screened at 12 to 37 feet bgs. Refer to *Figure 2-2* for an "as-built" system layout diagram.

Based on consistently low contaminant concentrations detected in groundwater extracted from RW-2, this well has not been continuously operated since April 2010. In addition, based on low contaminant concentrations detected in vapor-phase effluent samples collected from the GAC vessels, the GAC vessels were bypassed in June 2011. The ultimate aqueous-phase discharge of the GWE&TS is to Little Neck Creek, located to the southwest and downgradient of the Site.

2.3 Completed RSO Activities

As part of the overall RSO evaluation and consistent with the requirements of the NYSDEC-approved RSO Technical Scope of Work Letter, dated February 7, 2013, field activities associated with an on-site source area assessment and a temporary probe re-delineation investigation were completed at the Site in February and March 2013.

The results of these investigations were detailed in the RSO On-site Source Area Assessment and Plume Re-Delineation Data Summary Report, dated July 2013, as provided as *Appendix A* for reference. The on-site "source area" assessment did not indicate that significant concentrations of the site-specific chlorinated VOCs exist in soil within the investigated area on-site. However, elevated concentrations of the site-specific chlorinated VOCs were identified in groundwater at and downgradient of the Site.

In general, the higher concentrations of site-specific chlorinated VOCs (PCE, TCE, cis-1,2-DCE and VC) were identified in "deep" groundwater samples, collected from immediately above the upper surface of the Gardiners Clay unit (ranging from approximately 60 to 72 feet below grade at and downgradient of the Site). Contaminant concentrations generally decrease with increased distance from the Site.

Significant chlorinated VOC concentrations (predominantly PCE) in groundwater were detected in on-site temporary probe location AITW-07, located in close proximity to monitoring well MW-4D and extraction well RW-1. The most significant concentrations of site-specific chlorinated VOCs were detected in samples collected from immediately above the Gardiners Clay unit (68 to 70 feet below grade), over 25 feet below the screened interval of RW-1.

Moderately elevated concentrations of chlorinated VOCs were also detected in groundwater samples collected from immediately above the Gardiners Clay unit in off-site temporary probe locations AITW-10 and AITW-12 (at 66 to 68 and 60 to 62 feet below grade, respectively). These locations are approximately 1,000 to 1,400 feet north/upgradient of and well below the screened interval of off-site extraction well RW-2.

Chlorinated VOCs were also detected slightly above their respective Class GA Standards in several groundwater samples collected from depths ranging from the water table at the time of the investigation (approximately 7 feet below grade) to 60 feet below grade in several on-site and upgradient/cross gradient locations (AITW-02 through AITW-04, and AITW-08) and at depths ranging from approximately 19 to 68 feet below grade in several downgradient locations (AITW-11 and AITW-13 through AITW-16) temporary probe locations.

A summary of the most significant site-specific contaminant concentrations identified during the temporary probe plume re-delineation program is provided below:

Table 2-1: Temporary Probe Maximum Site-Specific Contaminant Concentrations

Temporary Probe ID	Depth (feet below grade)	PCE	TCE	cis-1,2-DCE	VC
On-Site Temporary Wells					
AITW-07	59-61	3,000 ug/l	18 ug/l	ND	ND
AITW-07	68-70	11,000 ug/l	220 ug/l	ND	ND
Downgradient Temporary Wells					
AITW-10	66-68	25 ug/l	390 ug/l	72 ug/l	3.6 ug/l
AITW-12	60-62	440 ug/l	370 ug/l	710 ug/l	4.7 ug/l

Notes:
ND: Not detected.
Red font denotes an exceedance of the Class GA Standard (5.0 ug/l for PCE, TCE, cis-1,2-DCE and 2.0 ug/l for VC).

Based on these sampling results, the NYSDEC requested that D&B draft a brief remedial alternatives study in which several alternate remedial approaches would be investigated for possible implementation at the Site. These proposed remedial alternatives included implementation of a chemical injection program, an air sparge/soil vapor extraction system and enhancement of the existing GWE&TS to extract and treat additional groundwater from areas where the greatest contamination concentrations were identified. Following review of the remedial alternatives study and several follow-up discussions with the NYSDEC, it was determined that further plume re-delineation would be required prior to implementing any modified remedial approach for the Site.

As requested by the NYSDEC, several technologies, such as electrical resistivity imaging (REI), were evaluated to be utilized for the further plume re-delineation; however, the NYSDEC decided that MIP technology was the most cost-effective and practical technology for this effort.

It should be noted that the MIP locations were selected based on the contaminant concentrations detailed in the July 2013 Remedial System Optimization On-Site Source Area Assessment and Plume Re-delineation Data Summary Report. Based on the elevated contaminant concentrations detected in temporary probe location AITW-07, located in the southern portion of the Site, the MIP locations were biased towards this area and generally extended in a southerly direction downgradient from on-site temporary probe location AITW-07. The sample locations proposed for the MIP Program were selected to supplement the data gathered as part of the temporary probe plume re-delineation effort in order to better define the vertical and horizontal limits of the plume in these areas.

3.0 Completed Field Activities

MIP Program field activities were completed from June 17, 2014 through July 8, 2014. All work was completed in accordance with the NYSDEC-approved MIP Technical Scope of Work Letter, dated May 2, 2014. Any changes to the scope of work are summarized below, as appropriate.

It should be noted that the GWE&TS was shut down several months preceding and during the MIP Program field work to ensure static conditions with respect to the aquifer and the chlorinated solvent plume associated with the Site.

The installation of all MIPs, and associated groundwater probes, was completed by Zebra Environmental Corp. (Zebra) of Lynbrook, New York, under subcontract to D&B. D&B provided full-time oversight of all field activities. Laboratory analyses were performed by Test America Laboratories, Inc. (TAL) of Edison, New Jersey.

Prior to initiation of any intrusive activities, One-Call utility mark outs were completed in the vicinity of each MIP location.

In addition, the upper five feet of all MIPs were "cleared" utilizing hand tools to further prevent the likelihood of damaging below-grade utilities.

3.1 Membrane Interface Probe Installations

The May 2014 Scope of Work for the MIP Program consisted of the installation of 10 MIPs (AIMIP-01 through AIMIP-10) at locations primarily downgradient of the Site. However, based on accessibility issues at several proposed MIP locations located on residential and commercial properties and as directed by the NYSDEC, only eight of the initially proposed 10 MIP locations were completed (AIMIP-02 through AIMIP-09), and one additional on-site MIP location (AIMIP-11) was added to the program. AIMIP-11 was installed on-site in close proximity to historical temporary probe location AITW-07 in order to further investigate contaminant concentrations in this area. Completed MIP locations are provided as *Figure 3-1*.

Each MIP was advanced to the top of the Gardiners Clay unit, located at a depth of generally 62 to 70 feet below grade. Each MIP was installed utilizing direct-push technology. The MIP probe was equipped with four detectors, including an electrical conductivity (EC) detector, a flame ionization detector (FID), a photoionization detector (PID) and a halogen-specific detector (XSD). These detectors were utilized to transmit "real-time" basic geology and chemical data as each MIP was advanced, and generally function as follows:

- The EC detector provides soil conductivity data, which is used to detect clay-rich, fine-grained and dense soils.
- The FID is used for the detection of straight-chain alkanes, such as methane.
- The PID is used for the detection of aromatic VOCs, such as benzene.
- The XSD detector is utilized for the detection of halogen-specific compounds, including chlorinated VOCs.

Graphical representations of the data recorded throughout the advancement of each MIP are provided as *Appendix B*.

In addition and as detailed below, groundwater probes were advanced in association with MIP locations AIMIP-07 and AIMIP-09 and one groundwater sample was collected from each probe to verify the data generated during advancement of the MIPs.

3.2 Groundwater Probe Installations and Sample Collection

Following the completion of MIP locations AIMIP-02, AIMIP-07 and AIMIP-09, one groundwater probe was advanced in association with each MIP location by driving probe rods to a depth of approximately 65 feet below grade and retracting four feet of rod to expose a decontaminated stainless steel screen within the bottom-most probe rod. Sample locations are provided as *Figure 3-1*. Disposable polyethylene tubing was then inserted into the rod assembly and groundwater was purged from the screen utilizing a peristaltic pump. Prior to sample collection, water quality parameters (temperature, pH, conductivity, turbidity, oxidation-reduction potential [ORP] and dissolved oxygen) were measured using a Horiba U-50 multi-parameter water quality meter.

One groundwater sample was collected from groundwater probes AIMIP-02, AIMIP-07 and AIMIP-09 for analysis of VOCs by EPA Method 8260. Analytical results were compared to the Class GA Groundwater Standards and Guidance Values. Analytical results are discussed in the following section and an analytical data summary table is provided in *Appendix C*.

All of the data packages submitted by Test America have been reviewed by Ms. Donna Brown, D&B's Quality Assurance/ Quality Control (QA/QC) Officer. Ms. Brown meets the NYSDEC requirements of a data validator as listed in the DER-10 Technical Guidance for Site Investigation and Remediation, dated June 2010. Data Validation Checklists were prepared for the laboratory data packages and are provided as *Appendix D*.

Following the completion of all MIPs and groundwater probes, all boreholes were allowed to collapse and any remaining void space was backfilled with clean sand. Each location was then restored at grade in-kind with asphalt patch or concrete, as appropriate.

In order to limit waste disposal costs, all purge water generated as part of the MIP Program was contained for transport to and treatment at the GWE&TS.

Each of the completed MIP and groundwater probe locations was surveyed for location (northing and easting coordinates) and elevation following completion of the MIP Program.

4.0 Investigation Findings

A summary of the analytical data and other pertinent results from the MIP investigation are provided below:

4.1 Membrane Interface Probes

As referenced above, several different data sets were generated through the advancement of the MIPs. Graphical representations of the data sets obtained during each MIP are provided as *Appendix B*.

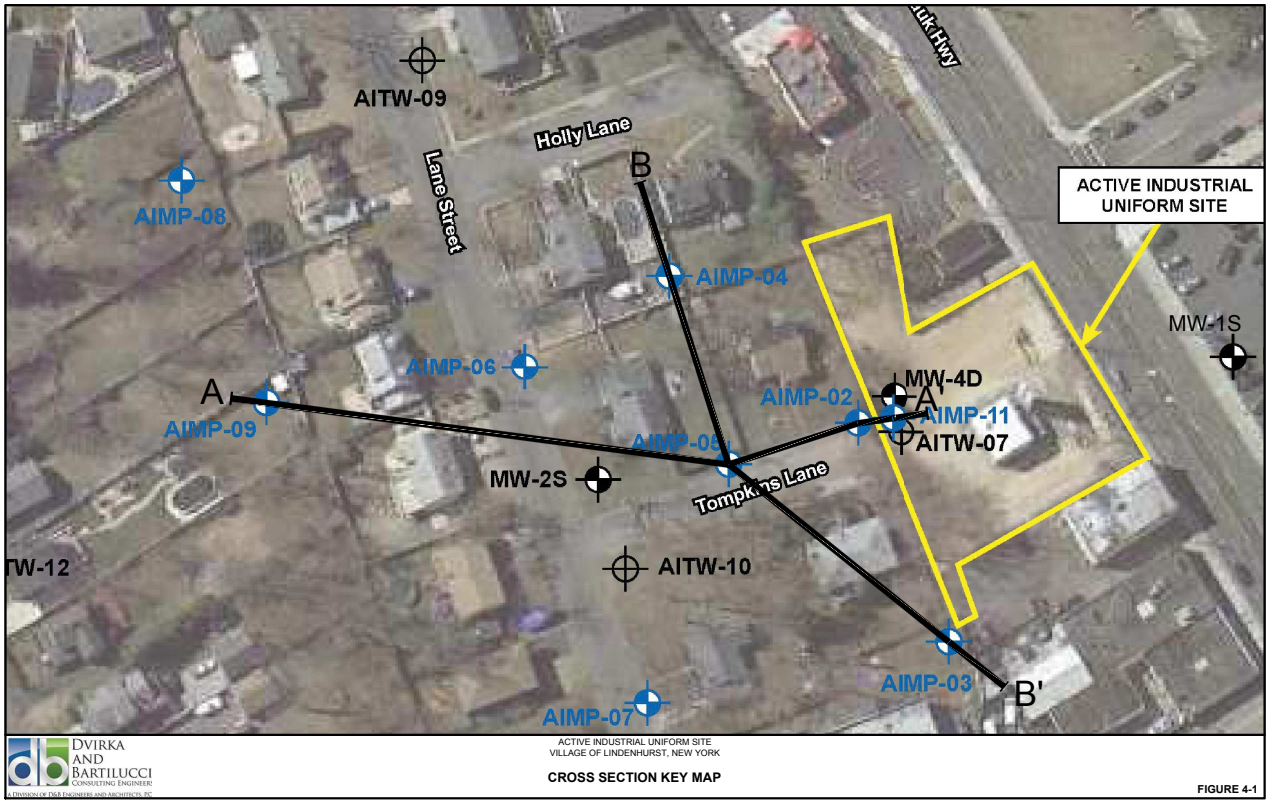
As the EC detector provides soil conductivity data, which relates to clay content and particle size of soil, the EC data set was utilized to determine the approximate top of the Gardiners Clay unit at each MIP location. As the XSD detector is utilized for the detection of halogen-specific compounds, including the site-specific chlorinated VOCs, the below analysis of contaminant responses in groundwater focuses on the XSD data set. It should be noted that, as petroleum contamination from an upgradient source has previously been identified at and downgradient of the Site, the PID and FID data sets exhibit responses to petroleum-related compounds. Therefore, these data sets are not useful for the purposes of re-delineating the chlorinated VOC plume associated with the Site, and were not analyzed.

As both the EC and XSD detectors monitor voltage differentials, the resulting readings are provided in millisiemens per meter (mS/m) for the EC detector and millivolts (uV) for the XSD detector. It should also be noted that the response threshold for the XSD detector is approximately 1 parts per million (ppm) for halogen-specific compounds.

EC Detector Results

Based on review of the EC data sets for all MIP locations, a fairly low electrical conductivity response was observed throughout the advancement of each probe, which is indicative of a predominantly sand and gravel soil mix, consistent with the results of the February and March 2013 temporary probe effort. However, significant electrical conductivity response "spikes" were observed at all MIP locations at depths ranging from approximately 62 to 70 feet below grade, which is indicative of clay-rich, fine-grained and dense soil. Based on these "spikes," it was determined that the top of the Gardiners Clay unit varied in depth from approximately 62 to 70 feet below grade throughout the MIP investigation area.

Below, Figure 4-1 depicts two transects (A to A' and B to B') extending north/south and east/west, respectively, on and in the vicinity of the Site associated with MIP locations AIMIP-02 through AIMIP-05, AIMIP-09 and AIMIP-11. A cross sectional depiction of a transect from the southern portion of the site extending approximately 450 feet downgradient from the site (transect A to A') associated with MIP locations AIMIP-09 to AIMIP-11 is provided as *Figure 4-2*, and a cross sectional depiction of a transect extending east to west approximately 410 feet downgradient of the site (transect B to B') associated with MIP locations AIMIP-03 to AIMIP-04 is provided as *Figure 4-3*.



The "higher" elevations (approximately 62 feet below grade) associated with the Gardiners Clay unit were observed at the southernmost MIP locations (AIMIP-08 and AIMIP-09), located downgradient and approximately 350 feet south of the Site. The "lower" elevation (approximately 70 feet below grade) associated with the Gardiners Clay unit was observed at MIP location AIMIP-11, located on-site in close proximity to historical temporary well location AITW-07.

Although the Gardiners Clay unit generally slopes to the south in the area of the Site, localized irregularities in the upper surface of this unit cause a slight rise extending several hundred feet south of the Site. This is consistent with the Gardiners Clay unit depth information gathered during the February and March 2013 temporary probe effort.

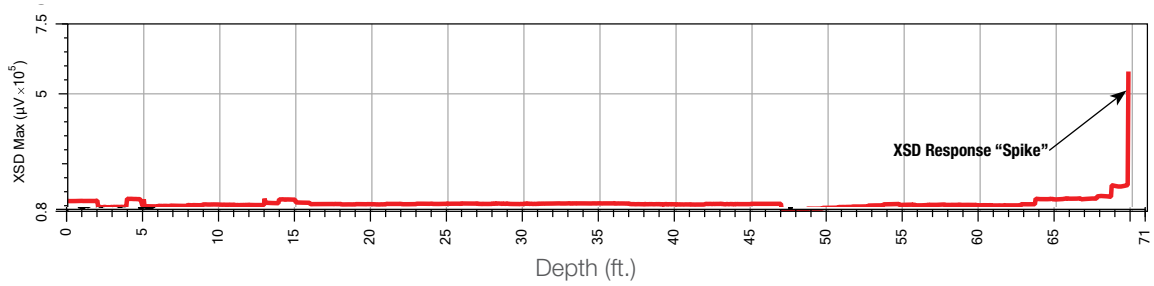
XSD Detector Results

Based on review of the XSD data sets for all MIP locations, halogen-specific responses were generally limited. However, halogen-specific response "spikes" were observed in association with MIP locations AIMIP-05 and AIMIP-09 at depths corresponding to the top of the Gardiners Clay unit (as determined be evaluation of the EC data sets), as shown below in tabular and graphical forms:

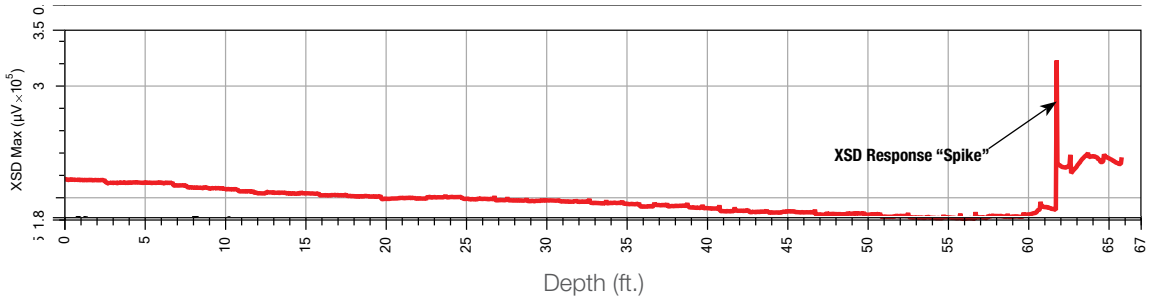
Table 4-1: Maximum XSD Detector Response "Spikes"

MIP ID	Maximum Appropriate XSD Response (uV x 10^5)	Approximate Depth (feet below grade)	MIP Boring Location
AIMIP-05	5.8	70	AIMIP-05 was installed downgradient and approximately 100 feet south of the Site.
AIMIP-09	3.25	62	AIMIP-09 was installed downgradient and approximately 350 feet south of the Site.

AIMIP-05



AIMIP-09



Although not exhibiting the halogen-specific response "spikes" noted in the AIMIP-05 and AIMIP-09 XDS data sets, halogen-specific responses were observed in association with three additional MIP locations (AIMIP-02, AIMIP-07 and AIMIP-11), as follows:

- MIP location AIMIP-02, located downgradient and approximately 20 feet south of the Site, generally exhibited a slight halogen-specific response at depths of approximately 23 to 50 feet below grade, with a maximum XSD response of approximately 1.8 uVx10^5, detected at approximately 41 feet below grade.
- MIP location AIMIP-07, located downgradient and approximately 200 feet southwest of the Site, exhibited a halogen-specific response which generally decreased with increasing depth from grade to approximately 65 feet below grade, with a maximum XSD response of approximately 4.4 uVx10^5, detected at approximately 7 feet below grade.
- MIP location AIMIP-11, located on-site, in close proximity to historical temporary probe location AITW-07, exhibited a halogen-specific response which generally decreased with increasing depth from grade to approximately 70 feet below grade, with a maximum XSD response of approximately 2.9 uVx10^5, detected at approximately 12 feet below grade.

Maximum XSD responses associated with MIP locations AIMIP-02 through AIMIP-05, AIMIP-09 and AIMIP-11 are depicted

on the cross sectional representations for transects A to A' and B to B' provided as *Figure 4-2* and *Figure 4-3*, as appropriate.

In order to confirm the XSD detector results and to provide for additional analytical data for the plume re-delineation effort, groundwater probes were installed in the immediate vicinity of MIP locations AIMIP-02, AIMIP-07 and AIMIP-09 and one groundwater sample was collected from each location for laboratory analysis, as detailed below.

4.2 Groundwater Sampling Results

A total of three groundwater samples were collected for laboratory analysis from groundwater probes installed in the immediate vicinity of MIP locations AIMIP-02, AIMIP-07 and AIMIP-09. Groundwater samples were collected from a depth of approximately 63 to 67 feet below grade at MIP location AIMIP-02 and from depths of approximately 61 to 65 feet below grade at MIP locations AIMIP-07 and AIMIP-09, corresponding to the top of the Gardiners Clay unit at each location. The results of the analysis of the groundwater samples were compared to the Class GA Groundwater Standards and Guidance Values (Class GA Standards). Analytical data is provided as *Appendix C*.

Several VOCs, primarily the site-specific chlorinated VOCs (PCE, TCE, cis-1,2-DCE and VC), along with acetone and 1,1-dichloroethene (1,1-DCE), were detected at concentrations exceeding their respective Class GA Standards in two of the three collected groundwater samples, as summarized below:

Table 4-2: MIP Groundwater Probe Contaminant Exceedances

Groundwater Probe ID	PCE	TCE	1,1-DCE	CIS-1,2-DCE	VC	Acetone
AIMIP-07 (60.7 to 64.7 feet)	ND	0.38 ug/l	ND	ND	ND	76 ug/l
AITW-09 (61 to 65 feet)	3,300 ug/l	2,100 ug/l	22 ug/l	2,900 ug/l	16 ug/l	ND

Notes:

ND: Not detected or no exceedance detected.

Red font denotes an exceedance of the Class GA Standard (5.0 ug/l for PCE, TCE, 1,1-DCE and cis-1,2-DCE; 2.0 ug/l for VC; and 50 ug/l for acetone).

In addition to the contaminants listed in the table, the following compounds were detected in one or more of the three collected groundwater samples, generally well below their respective Class GA Groundwater Standards: benzene, 2-chlorotoluene, chlorobenzene, 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, ethylbenzene, methyl-ethyl-ketone, MTBE and toluene.

The analytical results from the groundwater samples collected in association with MIP locations AIMIP-02 and AIMIP-07 did not exhibit elevated site-specific contaminant concentrations, as was expected based on review of the limited halogen-specific responses noted in the XSD data sets generated at approximately 63 to 67 and 61 to 65 feet below grade, respectively, from these MIP locations. In addition, the analytical results from the groundwater sample collected in association with MIP location AIMIP-09 exhibited elevated site-specific contaminant concentrations, as was expected based on review of the halogen-specific response "spike" noted in its XSD data set at approximately 62 feet below grade, within the sampled groundwater interval. Acetone and 1,1-DCE have been detected in groundwater samples collected in association with the Site; however, typically at concentrations well below their respective Class GA Standards.

It should be noted that the maximum PCE concentration associated with MIP location AIMIP-09 is depicted on the cross sectional representation for transect A to A' provided as *Figure 4-2*.

These analytical results are also generally consistent with the temporary probe groundwater analytical results, as presented in the July 2013 Remedial System Optimization On-Site Source Area Assessment and Plume Re-delineation Data Summary Report.

4.3 Data Validation

All sample results have been reviewed by D&B and deemed valid and usable for environmental assessment purposes. Data Validation Checklists are presented in *Attachment D*. Based on D&B's review, qualification of the data was necessary for the following analyses:

- Methylene chloride was detected in the trip blank associated with groundwater sample AIMIP-02, collected on July 9, 2014; however, it was not detected in groundwater sample AIMIP-02. Therefore, qualification of the data was not required.
- The percent recovery (%R) for vinyl acetate was above the quality control (QC) limit in the laboratory control sample (LCS) associated with groundwater sample AIMIP-02, collected on July 9, 2014; however, vinyl acetate was not detected in groundwater sample AIMIP-02. Therefore, qualification of the data was not required.
- Chloroform and methylene chloride were detected in the trip blank associated with groundwater sample AIMIP-07, collected on July 11, 2014; however, chloroform and methylene chloride were not detected in the groundwater sample AIMIP-07. Therefore, qualification of the data was not required.
- Acetone was detected in the method blank on July 14, 2014. Chloroform and methylene chloride were detected in the field and trip blanks associated with groundwater sample AIMIP-09, collected on July 14, 2014. However, acetone, chloroform and methylene chloride were not detected in groundwater sample AIMIP-09. Therefore, qualification of the data was not required.

5.0 Conclusions

Based on the MIP Program findings presented above, the following conclusions have been established:

- Gardiners Clay Unit Depth: The Gardiners Clay unit generally slopes to the south in the area of the Site; however, based on review of the EC detector results, localized irregularities in the upper surface of this unit exist, which result in a slight rise in the upper portion of the Gardiners Clay unit extending several hundred feet south of the Site. This is consistent with the Gardiners Clay unit depth information gathered during the February and March 2013 temporary probe effort.
- Site-Specific Contaminant Concentrations: Based on review of the XSD detector results, slight to moderate halogen-specific responses, which are indicative of chlorinated VOCs, were generally observed in association with MIP locations AIMIP-02, AIMIP-05, AIMIP-07, AIMIP-09 and AIMIP-11. The most significant halogen-specific responses were determined to be the response "spikes" observed at depths corresponding to the top of the Gardiners Clay unit at MIP locations AIMIP-05 and AIMIP-09, located downgradient and approximately 100 and 350 feet south of the Site, respectively.

  Analytical results from the groundwater sample associated with MIP location AIMIP-09 exhibited elevated site-specific chlorinated VOCs, indicating that the elevated halogen-specific response observed at MIP location AIMIP-09, and therefore all MIP locations, positively identified chlorinated VOCs associated with the Site. These analytical results are also generally consistent with the results from the February and March 2013 temporary probe effort.

  The results from the MIP Program indicate that "deep" chlorinated VOC contamination exists at and downgradient of the Site, immediately above the upper surface of the Gardiners Clay unit, which is likely acting as a "confining layer" for downward contaminant migration, located between 62 and 70 feet below grade.

  The results of the MIP Program and the temporary probe program completed in February and March 2013 indicate that the most significant concentrations of site-specific chlorinated VOCs generally appear to be concentrated in the vicinity of on-site temporary probe location AIMIP-07 (up to 11,000 ug/l of PCE at 68 to 70 feet below grade) and off-site MIP probe locations AIMIP-05 (no groundwater sample is associated with this MIP location) and AIMP-09 (up to 3,300 ug/l of PCE at 61 to 65 feet below grade). It should also be noted that PCE concentrations in on-site groundwater monitoring well MW-4D have fluctuated from 3,700 ug/l to a high of 110,000 ug/l (detected in June and September 2012) since the

well has been routinely sampled starting in September 2012. PCE concentrations are currently approximately 66,000 ug/l, based on the most recent sampling event completed in April 2014.

6.0 Recommendations

Based on the conclusions presented above, the following is recommended:

Focused Remedial Alternatives Study: Based on the results of the MIP Program, along with the results of the February and March 2013 temporary probe plume re-delineation effort and current groundwater monitoring well quarterly sampling results, D&B recommends that a Focused Remedial Alternatives Study be completed, including the evaluation of the installation of an additional off-site extraction well and the evaluation of the implementation of a chemical injection program. The goal of the Focused Remedial Alternatives Study would be to identify which of the two remedial approaches identified above would be best suited to the Site at this time, with respect to current contaminant concentrations/locations and cost considerations. A detailed scope of work and estimated cost proposal can be prepared for NYSDEC review and approval to complete the Focused Remedial Alternatives Study.

The following briefly summarizes these two remedial approaches to be included in the Focused Remedial Alternatives Study:

Additional Off-Site Extraction Well

Installation of an additional off-site extraction well to capture and treat the elevated site-specific chlorinated VOCs detected in the vicinity of MIP locations AIMIP-05 and AIMIP-09 will be evaluated. Based on the groundwater sampling results discussed above, this well would be installed to the top of the Gardiners Clay unit between MIP locations AIMIP-05 and AIMIP-09.

It is recommended that this additional off-site extraction well evaluation include the following items:

- An evaluation of the current system arrangement and its ability to accommodate and treat additional influent volumes and contaminant concentrations from this additional extraction well, including any recommended system modifications.
- Radius of influence and flow potential estimates for the proposed extraction well.
- Expected time-frame to recover and treat the identified groundwater contamination.
- Proposed as-builts and construction details for the additional well and electrical/piping hook-ups to the existing system influent piping and electrical systems.
- As assessment of the general installation and operating costs for the additional extraction well, and any necessary associated system modifications.

It should be noted that the existing off-site extraction well influent piping and electrical wiring already exists in this area, limiting the costs and complexity of this extraction well installation.

Chemical Injection Program

Implementation of a chemical injection program in the vicinity of temporary probe location AITW-07, MIP locations AIMIP-05 and AIMIP-09 and groundwater monitoring well MW-4D will be evaluated. Based on the concentrations of PCE detected in temporary probe location AITW-07 and monitoring well MW-4D, and as identified in the brief remedial alternatives study drafted following the February and March 2013 temporary probe effort, persulfate was previously identified as the preferred chemical for a future chemical injection program at the Site. It should also be noted that the GWE&TS should be shut down for the duration of the persulfate injection program.

It is recommended that this chemical injection program evaluation include the following items:

- A description of the chemical process, specifically in relation to the contaminant concentrations currently detected at the Site.
- A review of the advantages and disadvantages of implementing a persulfate injection program at the Site.
- A review of the costs associated with the implementation of a persulfate injection program at the Site.
- A projected timeline/schedule of events for the persulfate injection program, and any associated groundwater monitoring program implemented to gauge the effectiveness of the chemical injection program. The existing monitoring well network, and possibly an additional "deep" groundwater monitoring well to be installed in the vicinity of MIP locations AIMIP-05 and AIMIP-09, will be utilized for this effectiveness monitoring.

It should be noted that the "deep" groundwater monitoring well to be installed as part of the effectiveness monitoring program could also be utilized as an injection point and/or extraction well, following or preceding any planned chemical injection program.

7.0 Certification

I, Brian Veith, certify that I am currently a New York State registered professional engineer and that this Membrane Interface Probe Summary Report 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.

NYS Professional Engineer #

2/19/2015
Date

Brian Veith
Signature